Should I Stay or Should I Go: Equilibrium Selection in a Transportation Network

APPENDIX A (For reviewers only, not for publication)

A1. Predictions and Results for morning drives

Table A1: Payoffs in the Morning for Northbound travel (South commuters)

Route Choice	Number other northbound in downtown	Number southbound in downtown	Payoffs with $4 charge	Payoffs with $3 charge	Payoffs with $0 charge
Downtown	0	4	-$5.00	-$4.00	-$1.00
Perimeter	0	4	-$2.83	-$2.83	-$2.83
Downtown	1	4	-$5.08	-$4.08	-$1.08
Perimeter	1	4	-$2.80	-$2.80	-$2.80
Downtown	2	4	-$5.11	-$4.11	-$1.11
Perimeter	2	4	-$2.70	-$2.70	-$2.70
Downtown	3	4	-$5.19	-$4.19	-$1.19
Perimeter	3	4	-$2.66	-$2.66	-$2.66
Downtown	0	0	-$4.96	-$3.96	-$0.96
Perimeter	0	0	-$3.03	-$3.03	-$3.03
Downtown	1	0	-$5.04	-$4.04	-$1.04
Perimeter	1	0	-$2.94	-$2.94	-$2.94
Downtown	2	0	-$5.13	-$4.13	-$1.13
Perimeter	2	0	-$2.85	-$2.85	-$2.85
Downtown	3	0	-$5.25	-$4.25	-$1.25
Perimeter	3	0	-$2.74	-$2.74	-$2.74

Payoffs shown here include only the charge and the travel time cost, which is why they are negative. Commuters have to take the morning drive in order to earn the wage and the shopping values in the subsequent stage of the game, which ultimately makes their payoffs positive. With a $3 or a $4 charge the payoffs for downtown are always worse than the payoffs for the perimeter, thus the perimeter is the preferred choice in the morning. The same thing is true for southbound travel (north commuters), shown in Table A2.

Table A2: Payoffs in the Morning for Southbound travel (North commuters).

Route Choice	Number other northbound in downtown	Number southbound in downtown	Payoffs with $4 charge	Payoffs with $3 charge	Payoffs with $0 charge
Downtown	0	4	-$4.96	-$3.96	-$0.96
Perimeter	0	4	-$2.50	-$2.50	-$2.50
Downtown	1	4	-$5.03	-$4.03	-$1.03
Perimeter	1	4	-$2.49	-$2.49	-$2.49
Downtown	2	4	-$5.07	-$4.07	-$1.07
Perimeter	2	4	-$2.42	-$2.42	-$2.42
Downtown	3	4	-$5.15	-$4.15	-$1.15
Perimeter	3	4	-$2.36	-$2.36	-$2.36
Downtown	0	0	-$4.95	-$3.95	-$0.95
Perimeter	0	0	-$2.51	-$2.51	-$2.51
Downtown	1	0	-$5.01	-$4.01	-$1.01
Perimeter	1	0	-$2.50	-$2.50	-$2.50
Downtown	2	0	-$5.04	-$4.04	-$1.04
Perimeter	2	0	-$2.41	-$2.41	-$2.41
Downtown	3	0	-$5.07	-$4.07	-$1.07
Perimeter	3	0	-$2.35	-$2.35	-$2.35

Table A3: Observed Morning Commuter Route Choice across treatments and periods

Period	A	B	C	D	Period	E	F	G	H
1	2	74%	4	75%	11	11	90%	12	88%
2	7	81%	3	78%	12	1	65%	13	92%
3	10	87%	10	89%	13	6	83%	16	96%
4	11	92%	9	87%	14	10	90%	19	99%
5	7	88%	11	90%	15	12	92%	17	97%
6	10	91%	12	92%	16	15	95%	17	98%
7	15	95%	14	93%	17	13	92%	18	97%
8	13	93%	14	94%	18	15	96%	15	96%
9	13	93%	17	96%	19	13	93%	19	99%
10	14	94%	15	94%	20	14	94%	19	99%
All periods	10.2	89%	10.9	89%	All periods	11	89%	16.5	96%

A: Number of sessions with all commuters in downtown in $0 case
B: Percentage of commuters in downtown in $0 case
C: Number of sessions with all commuters on perimeter in $4 case
D: Percentage of commuters in downtown $4 case
E: Number of sessions with all commuters on perimeter in $3 case treatment 1 with $0 history
F: Percentage of commuters on perimeter in $3 case treatment 1 with $0 history
G: Number of sessions with all commuters on perimeter in $3 case treatment 2 with $4 history
H: Percentage of commuters on perimeter in $3 case treatment 2 with $4 history

Play of downtown is increasing throughout the 10 periods of the $0 case in the morning. For column B the difference between the 95% in period 7 and the 74% in period 1 is significant (p-value<.001 using a ranksum test). While there are only two sessions in which all commuters go through downtown in the first period, the number of sessions with all commuters taking downtown increases rapidly and reaches a maximum of 15 in period 7.

Play of the perimeter is increasing throughout the 10 periods of the $4 case in the morning. For column D the difference between the 96% in period 9 and the 75% in period 1 is significant (p-value<.001 using a ranksum test), and the drop to 89% in the final period is not significant. The number of sessions in which all commuters take the perimeter rapidly increases until it reaches a maximum of 17 in period 9.

For the $3 part of treatment 1 we see that 11 sessions have all commuters in the perimeter in period 11 (column E), but only 1 session shows this in period 12. A maximum is reached in period 18 with 15 sessions having all commuters choosing the perimeter, and 96% of all commuters choosing the perimeter route (column F). Period 18 with 96% of all commuters taking the perimeter is significantly greater than period 11 with 90% (p-value<.001 using a ranksum test). The period 12 drop in perimeter choice is a phenomenon that is consistent across 17 of the 21 sessions in Treatment 1, so this is not just one or two sessions, it is a common pattern. This pattern is unique to this treatment, but appears both in the morning and the afternoon drives. We conclude that the observations on commuters in the $3 part of Treatment 1

(when commuters have a $0 history) quickly converges to the Perimeter route. After having chosen predominantly the downtown route during the first 10 periods when the charge was $0, they immediately change to the perimeter but with some experimentation on the downtown route in period 12.

For the $3 part of treatment 2 we see that 88% of commuters choose the perimeter already in period 11 (with 12 sessions having all commuters choosing the perimeter), and it then increases to a maximum of 99% (with 19 sessions having all commuters choosing the perimeter). Period 14 (19 or 20) with 99% of all commuters taking the perimeter is significantly greater than the already high 88% in period 1 (p-value<.11 using a ranksum test). The lack of support for the downtown equilibrium is even stronger than in the $0 history treatment, and we see no sign of the experimentation behavior we observed there.

A2. Predictions and Results for Afternoon $0 charge

Table A4 shows the payoffs to the north commuters as they return home in the afternoon, for the case where there is a $0 charge. The table has 7 columns and 16 rows. The first eight rows show the case when all southbound commuters go through downtown (as shown in column 3) and the last eight rows show the case when all south commuters are taking the perimeter route instead. The first three columns indicate the route choice options for a typical north commuter, the number of other north commuters in downtown and the number of south commuters in downtown. The following four columns condition on the location of the two business owners. The rows are organized into pairs, separated by a thicker line. Each pair shows the route choice options for a typical north commuter: downtown on the first and perimeter on the second row of each pair. The paired rows differ according to what the other north commuters are assumed to do, as shown in column 2, and what the south commuters are assumed to do, as shown in column 3.

The first pair of rows shows the choice between the downtown and the perimeter when no other north commuters go through downtown but all south commuters do. The second pair of rows shows when one other north commuter go through downtown and the remaining two take the perimeter. The third pair of rows shows when two others go through downtown, and the fourth and final pair of rows shows when all three others go through downtown. The same logic applies to the bottom 8 rows of the table where the south commuters are all taking the perimeter route. Columns 4-7 show the dollar payoffs that are implied by the choice of the typical north commuter, as shown in column 1, and what the other commuters are doing, as shown in columns 2 and 3.

As an example of how to read the table, consider the first row pair in Table A4. Here there are no other north commuters in downtown (0), but all south commuters go through downtown (4). Thus, if the typical north commuter for whom this table is constructed, chooses to go through downtown, there will be a total of 5 commuters in downtown, 3 commuters on the northbound perimeter and 0 commuters on the southbound perimeter. The north commuter will make a wage of $3 from which the travel costs are subtracted. These travel costs are higher on the perimeter (row 2) than in downtown (row 1). The payoffs shown in column 4 (Both business owners in downtown) includes the $4 shopping value for the downtown route choice on row 1

and a $2 shopping value for the perimeter on row 2. Due to both the difference in shopping value and in travel time costs, the payoff for the downtown route is higher than for the perimeter route. The payoff in column 5 (One business owner in downtown and the other on southbound (west) perimeter) is the same as the one in column 4 since the commuter can still get $4 shopping value in downtown but is restricted to the lower $2 shopping value on the perimeter since the one business owner on the perimeter is not on the northbound side. In column 6 the payoff on the perimeter increases since there is now a business owner on the northbound perimeter. The payoff in downtown is still the same since the other business owner is still in downtown. In the final column, 7, the payoffs to choosing downtown is less by $1 since the shopping value drops to $3 when there are no business owners there. For all pairwise comparisons between downtown and perimeter the payoffs for downtown are higher. This is true even under the condition that there are no business owners in downtown so that only inferior shopping is possible, although the difference in payoffs is smaller then. Thus, downtown is a dominant strategy for north commuters when the charge is $0.

Table A4: Typical North Resident Payoffs in the Afternoon with $0 Charge

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Route Choice	Number other Northbound in Downtown	Number Southbound in Downtown	Both business owners in downtown	One business owner in downtown and the other on southbound (east) perimeter	One business owner in downtown and the other on northbound (west) perimeter	One business owner on southbound (east) perimeter and one on northbound (west) perimeter
Downtown	0	4	6	6	6	5
Perimeter	0	4	2.17	2.17	4.17	4.17
Downtown	1	4	5.92	5.92	5.92	4.92
Perimeter	1	4	2.2	2.2	4.2	4.2
Downtown	2	4	5.89	5.89	5.89	4.89
Perimeter	2	4	2.3	2.3	4.3	4.3
Downtown	3	4	5.81	5.81	5.81	4.81
Perimeter	3	4	2.34	2.34	4.34	4.34
Downtown	0	0	6.04	6.04	6.04	5.04
Perimeter	0	0	1.97	1.97	3.97	3.97
Downtown	1	0	5.96	5.96	5.96	4.96
Perimeter	1	0	2.06	2.06	4.06	4.06
Downtown	2	0	5.87	5.87	5.87	4.87
Perimeter	2	0	2.15	2.15	4.15	4.15
Downtown	3	0	5.75	5.75	5.75	4.75
Perimeter	3	0	2.26	2.26	4.26	4.26

Table A5 shows the payoffs to the south commuters as they return home in the afternoon, for the case where there is a $0 charge. This table is constructed in the same way as Table A4, but with the recognition that everything is viewed from the perspective of a south, rather than a north, commuter, where the only difference between them is in the travel cost. Thus, column 2 now shows what the other south commuters do, and column 3 what the four north commuters do. Notice how the payoffs to choosing the perimeter route is now higher in columns 5 and 7, instead of columns 6 and 7 as it was for the north commuter. While the structure of the payoffs in Table A5 resemble those of Table A4 they are not identical due to the stochastic nature of the traffic simulations that generate the travel times. Just like we found for north commuters, downtown is a dominant strategy for south commuters when the charge is $0.

Table A5: Typical South Commuter Payoffs with $0 Charge

Route Choice	Number other Southbound in Downtown	Number Northbound in Downtown	Both business owners in downtown	One business owner in downtown and the other on southbound (east) perimeter	One business owner in downtown and the other on northbound (west) perimeter	One business owner on southbound (east) perimeter and one on northbound (west) perimeter
Downtown	0	4	6.04	6.04	6.04	5.04
Perimeter	0	4	2.50	4.50	2.50	4.50
Downtown	1	4	5.97	5.97	5.97	4.97
Perimeter	1	4	2.51	4.51	2.51	4.51
Downtown	2	4	5.93	5.93	5.93	4.93
Perimeter	2	4	2.58	4.58	2.58	4.58
Downtown	3	4	5.85	5.85	5.85	4.85
Perimeter	3	4	2.64	4.64	2.64	4.64
Downtown	0	0	6.05	6.05	6.05	5.05
Perimeter	0	0	2.49	4.49	2.49	4.49
Downtown	1	0	5.99	5.99	5.99	4.99
Perimeter	1	0	2.50	4.50	2.50	4.50
Downtown	2	0	5.96	5.96	5.96	4.96
Perimeter	2	0	2.59	4.59	2.59	4.59
Downtown	3	0	5.93	5.93	5.93	4.93
Perimeter	3	0	2.65	4.65	2.65	4.65

Table A6 shows the payoffs for the merchants, who are the first movers, conditional on commuters following their dominant strategy and going through downtown. This table is constructed assuming 8 commuters. For the 6 commuter case all payoffs are scaled up somewhat. For example, the top left cell which now shows $2 (from $0.50*4) for both business owners, would show $2.25 (from $0.75*3). There is only one Nash Equilibrium and it is subgame perfect: both business owners will locate in downtown. The business owners cannot influence the

commuters to leave downtown by shifting their own location, since commuters have a dominant strategy.

Table A6: Payoff Matrix for the Business Owners with $0 Charge

	B2 in Downtown	B2 in Perimeter
B1 in Downtown	$2.00 / $2.00	$4.00 / $0.00
B1 in Perimeter	$0.00 / $4.00	$0.00 / $0.00

Our observations on the $0 case of the afternoon drives show behavior very similar to in the morning, supporting dominant strategies. This is shown in Figure 3 in the main text. In the $0 case the maximum proportion of commuters in downtown are slightly smaller than in the morning, and these differences are significant using a t-test p-value<.001.

A3. Predictions and Results for Afternoon $4 charge

Table A7 shows the payoffs to north commuters when the charge for entering the downtown is $4. By inspecting the top 8 rows, where the south commuters all go through downtown, it can be seen that taking the perimeter is a dominant strategy in this case. This is true even under the condition that there are no business owners on the perimeter so that only inferior shopping is possible. The bottom eight rows show the payoffs as all south commuters take the perimeter route instead. We can now see that the somewhat lower congestion in the downtown makes it preferable for a north commuter to take that route under certain conditions. These conditions are that none of the other north commuters do so, and at least one business owner is located there and the other business owner is not on the northbound perimeter so that shopping values there are low. Under those conditions one north commuter is predicted to go through downtown and the other three on the perimeter. However, as we will show below, merchants will locate on the Perimeter in the unique SPNE, so that the conditions for one commuter to go through downtown are not fulfilled.

Table A8 shows in a similar way the payoffs to south commuters. No matter how many north commuters are in downtown, taking the perimeter is a dominant strategy for the south commuters. Conditional on these predictions, Table A9 shows the payoff matrix for the business owners, who are the first movers. If both business owners locate in downtown, only one north commuter would go through downtown by the earlier reasoning. If so the chance is 50% for each of them of getting the $0.50 earnings, so the expected earnings is $0.25. If both locate on the perimeter, all commuters would take the perimeter and both business owners would sell to four commuters for $0.50 each. If one locates in downtown and the other on the perimeter, there is a 50% chance that the perimeter location will be northbound and a 50% chance that it will be southbound, since the computer program selects the location. Thus there is a 50% chance that the business owner on the perimeter will be on the northbound side in which case there will be no commuters taking downtown and the downtown business owner makes no sales, and a 50%

chance that the perimeter business owner will be on the southbound side, in which case there will be one northbound commuter in downtown implying one sale at $0.50, so the expected earnings of the downtown business owner are $0.25. Thus, conditional on the responses by the commuters, the business owners have a dominant strategy to locate on the perimeter. The perimeter is a unique Nash Equilibrium which is subgame perfect.

Table A7: Typical North Commuter Payoffs with $4 Charge

Route Choice	Number other Northbound in Downtown	Number Southbound in Downtown	Both business owners in downtown	One business owner in downtown and the other on southbound (east) perimeter	One business owner in downtown and the other on northbound (west) perimeter	One business owner on southbound (east) perimeter and one on northbound (west) perimeter
Downtown	0	4	$2.00	$2.00	$2.00	$1.00
Perimeter	0	4	$2.17	$2.17	$4.17	$4.17
Downtown	1	4	$1.92	$1.92	$1.92	$0.92
Perimeter	1	4	$2.20	$2.20	$4.20	$4.20
Downtown	2	4	$1.89	$1.89	$1.89	$0.89
Perimeter	2	4	$2.30	$2.30	$4.30	$4.30
Downtown	3	4	$1.81	$1.81	$1.81	$0.81
Perimeter	3	4	$2.34	$2.34	$4.34	$4.34
Downtown	0	0	$2.04	$2.04	$2.04	$1.04
Perimeter	0	0	$1.97	$1.97	$3.97	$3.97
Downtown	1	0	$1.96	$1.96	$1.96	$0.96
Perimeter	1	0	$2.06	$2.06	$4.06	$4.06
Downtown	2	0	$1.87	$1.87	$1.87	$0.87
Perimeter	2	0	$2.15	$2.15	$4.15	$4.15
Downtown	3	0	$1.75	$1.75	$1.75	$0.75
Perimeter	3	0	$2.26	$2.26	$4.26	$4.26

Table A8: Typical South Commuter Payoffs with $4 Charge

Route Choice	Number other Southbound in Downtown	Number Northbound in Downtown	Both business owners in downtown	One business owner in downtown and the other on southbound (east) perimeter	One business owner in downtown and the other on northbound (west) perimeter	One business owner on southbound (east) perimeter and one on northbound (west) perimeter
Downtown	0	4	$2.04	$2.04	$2.04	$1.04
Perimeter	0	4	$2.50	$4.50	$2.50	$4.50
Downtown	1	4	$1.97	$1.97	$1.97	$0.97
Perimeter	1	4	$2.51	$4.51	$2.51	$4.51
Downtown	2	4	$1.93	$1.93	$1.93	$0.93
Perimeter	2	4	$2.58	$4.58	$2.58	$4.58
Downtown	3	4	$1.85	$1.85	$1.85	$0.85
Perimeter	3	4	$2.64	$4.64	$2.64	$4.64
Downtown	0	0	$2.05	$2.05	$2.05	$1.05
Perimeter	0	0	$2.49	$4.49	$2.49	$4.49
Downtown	1	0	$1.99	$1.99	$1.99	$0.99
Perimeter	1	0	$2.50	$4.50	$2.50	$4.50
Downtown	2	0	$1.96	$1.96	$1.96	$0.96
Perimeter	2	0	$2.59	$4.59	$2.59	$4.59
Downtown	3	0	$1.93	$1.93	$1.93	$0.93
Perimeter	3	0	$2.65	$4.65	$2.65	$4.65

Table A9: Payoff Matrix for the Business Owners with $4 Charge

	B2 in Downtown	B2 in Perimeter
B1 in Downtown	$0.25 / $0.25	$0.25 / $2.00
B1 in Perimeter	$2 .00 / $0.25	$2.00 / $2.00

Just as in the $0 case, our observations on the $4 case of the afternoon drives show behavior very similar to in the morning, supporting dominant strategies. This is shown in Figure 3 in the main text.

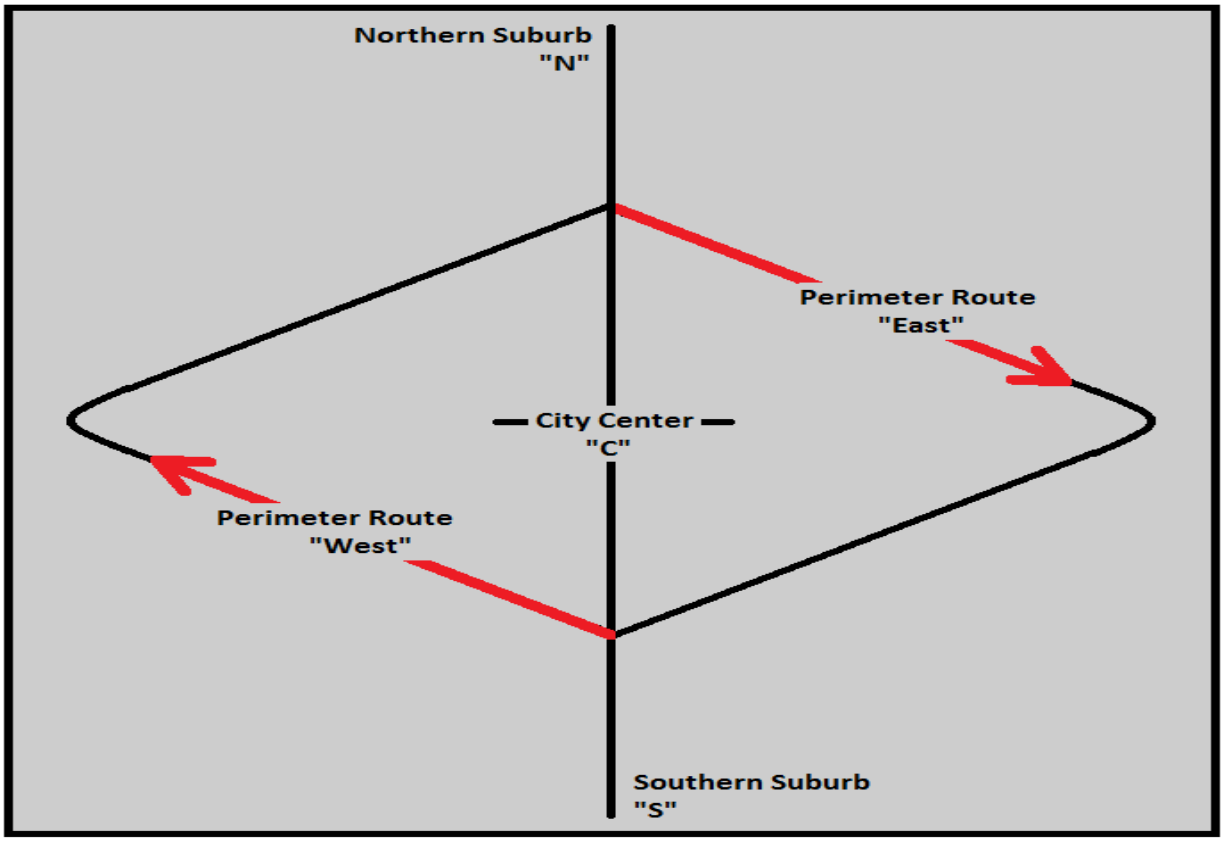
Table A10: Typical South Commuter Payoffs with $3 Charge

Route Choice	Number other Southbound in Downtown	Number Northbound in Downtown	Both business owners in downtown	One business owner in downtown and the other on southbound (east) perimeter	One business owner in downtown and the other on northbound (west) perimeter	One business owner on southbound (east) perimeter and one on northbound (west) perimeter
Downtown	0	4	3.04	3.04	3.04	2.04
Perimeter	0	4	2.5	4.5	2.5	4.5
Downtown	1	4	2.97	2.97	2.97	1.97
Perimeter	1	4	2.51	4.51	2.51	4.51
Downtown	2	4	2.93	2.93	2.93	1.93
Perimeter	2	4	2.58	4.58	2.58	4.58
Downtown	3	4	2.85	2.85	2.85	1.85
Perimeter	3	4	2.64	4.64	2.64	4.64
Downtown	0	0	3.05	3.05	3.05	2.05
Perimeter	0	0	2.49	4.49	2.49	4.49
Downtown	1	0	2.99	2.99	2.99	1.99
Perimeter	1	0	2.5	4.5	2.5	4.5
Downtown	2	0	2.96	2.96	2.96	1.96
Perimeter	2	0	2.59	4.59	2.59	4.59
Downtown	3	0	2.93	2.93	2.93	1.93
Perimeter	3	0	2.65	4.65	2.65	4.65

Table A10 shows the payoffs to south commuters when the charge for entering the downtown is $3. We find the same pattern of choice optimality as we did for the north commuters. If there is no business owner on the southbound perimeter the dominant strategy in the subgame is to go through downtown. Similarly, when there is a business owner on the southbound perimeter, the dominant strategy in the subgame is the perimeter route. The incentives to make the optimal choice are stronger when the perimeter is the optimal route choice than when the downtown is optimal, and this is true for both south- and northbound commuters. For the north commuter, the average difference in payoffs between downtown and the perimeter when the downtown is preferred is $0.41. It is $1.59 and $2.59, respectively with one or zero business owners in downtown, when the perimeter is preferred. For the south commuters the average difference in payoffs between the downtown option and the perimeter when the downtown is preferred is $0.72. It is $1.27 and $2.27, respectively with one or zero business owners in downtown, when the perimeter is preferred.

APPENDIX B (For reviewers only, not for publication)

Experimental Instructions for treatment 1, 9 commuters



In this experiment you will be in one of two roles. You will be either a business owner or a commuter. There are eight commuters and they drive from home to work and then back, and they also shop at some business. There are two business owners in your city. The business owner chooses a location for his or her shop and sells goods to the commuters. The map above shows you the city in which all these activities take place.

At the beginning of each round, both business owners choose whether they want to locate on a Perimeter Route or in Downtown. It is possible for both business owners to serve the Downtown at the same time, but there can be only one business owner on each of the Perimeter Routes. Since there are two sides of the Perimeter Routes, it is possible for both owners to be on the Perimeter at the same time, but they will have to be on different sides. The computer program will randomly allocate the business owners to either side. Business owners will make money only if commuters choose to drive past their location in the evening. For each commuter that drives by on their way home and does their shopping, a business owner will make 50 cents. If both business owners are in Downtown, they will share all sales revenues equally. Since they will never be located on the same Perimeter side, sharing is never an issue there.

Commuters live either in the Southern Suburb, or in the Northern Suburb. There are 4 commuters in each suburb. If you live in the Southern Suburb you will have to commute to the Northern Suburb each morning in order to get to work. You may choose between two routes for your morning commute: Perimeter Route West or Downtown. In the evening you will make a second commute, this time from the Northern Suburb back to the Southern Suburb, that is back home. For the evening commute you may choose between Perimeter Route East or Downtown. Notice that the Perimeter Route is a one way route so if you go West in the morning you have to go East in the evening. If you live in the Northern Suburb your choices are the same, except that if you take the Perimeter Route in the morning it is on the East side and if you take it in the evening it is on the West side.

On your evening commute you will also have to do some shopping. There will be shopping centers to stop at both along the perimeter and in the city center. If at least one of the business owners have chosen to locate on the route you take in the evening, you are able to buy superior goods that you then resell to us for $4. If you take Perimeter Route East (or West) and none of the business owners located there you can only do shopping at a discount store that has goods that you can resell to us for $2. If you take the Downtown route and none of the business owners located there you can again only shop at a discount store, but the downtown discount stores sell goods that you resell to us for $3. All the goods that you buy are resold to us and this adds to your earnings.

In addition to earnings from the shopping, commuters will also earn a wage of $3 in each period because they commute to work and back. However, there is also a charge for the time it takes to drive to work. The travel is computer simulated so that the speed cannot be controlled by the commuter. The drive time therefore depends entirely on whether you take the Perimeter Route or the Downtown Route, and on how many other commuters take the same route.

We have used computerized traffic simulations to calculate travel time on a route. The simulation software is the same that many traffic engineers use when they are planning transportation routes. We have generated 25 different simulations of varying traffic conditions that are a result of all possible route choices that can be taken by the commuters from the north and south. The travel time on the Perimeter West Route in the morning will only depend on the number of commuters from the South choosing the Perimeter West Route. Similarly, the travel time on the Perimeter East Route in the morning will only depend on the number of commuters from the North choosing the Perimeter East Route. Evening travel times are determined similarly. The travel time through downtown depends on the total number of commuters traveling either from North to South or from South to North, because all commuters pass through a common roundabout. The travel time on all routes increases based on the number of commuters on that particular route, and is determined based on a stochastic traffic simulation.

We will now show you what one of these simulations look like. This simulation is a case where 75% of southbound commuters go through the Downtown and 25% of northbound commuters go through the Downtown. Apart from the 8 vehicles that each of the commuters control, there are an additional 5 who follow each of these. Thus in this simulation, out of the 24 southbound vehicles, 18 go through Downtown, and out of the 24 northbound vehicles, 6 go through Downtown.

pause for video

We will now show you what one of these simulations look like. This simulation is a case where 75% of southbound commuters go through the Downtown and 25% of northbound commuters go through the Downtown. Apart from the 6 vehicles that each of the commuters control, there are an additional 8 who follow each of these. Thus in this simulation, out of the 24 southbound vehicles, 18 go through Downtown, and out of the 24 northbound vehicles, 6 go through Downtown.

We are not actually going to show you the simulation each time that you drive; that would take up too much time. Instead we have prepared a handout table so that you can see for yourself how long the travel time will be, depending on how many commuters take each route. The table shows the travel time in seconds. The cost of the travel time is 1 cent per second.

Please look at the travel time handout now. (*Pause here and go over the handout)*

Once we start the experiment program you will first be able to make decisions in one practice round so that you better understand what is happening. Before the practice round starts you will learn whether you are a business owner, a commuter who lives in the North Suburbs, or a commuter who lives in the South Suburbs. After the practice you will be making these choices over 10 rounds. Everything is exactly the same in each round, except of course the choices made by everyone. You will remain in the same role across all rounds, and the people who are participating with you in the same city will remain the same as well.

After finishing the 10 rounds we will start another set of 10 rounds with a brief set of instructions regarding some things that change before we start.

SUMMARY

1. Business owners choose location: Downtown, Perimeter East, or Perimeter West. If both business owners choose the same perimeter location the computer will randomly put one on the east side and the other on the west side.

2. All commuters choose morning commuter route: Perimeter or Downtown.

3. All commuters choose evening commuter route: Perimeter or Downtown. If there is at least one business owner on the route selected, the commuter earns $4 from the shopping.

4. Commuters earnings are calculated as:

   +$3 wage

   +$2 or $3 or $4 shopping value (depending on which route it is and on the presence of business owners or not)

   -$ _____ travel time cost at 1 cent per second

5. Business owners earnings are calculated as:

   If you are the only business owner at the location you are paid 50 cents for each commuter who drives by in the evening.

   If both of the business owners are in the Downtown location you share the total sales revenues which are 50 cents for each commuter who takes the Downtown route in the evening.

TO BE HANDED OUT AFTER COMPLETING THE FIRST 10 ROUNDS

Second set of 10 rounds additional instructions

Everything is exactly the same as before with one important exception:

Each time a commuter decides to commute through Downtown there will be a $3 charge to enter the area. This is the case both in the morning and in the evening. There is no such charge on the perimeter.

There is no additional charge to business owners, only to commuters who take the Downtown route.

Commuters earnings are now calculated as:

+$3 wage

+$2 or $3 or $4 shopping value (depending on which route it is and on the presence of business owners or not)

-$ _____ travel time cost at 1 cent per second

-$3 / -$6 if travelling through Downtown during one or both commutes

Handout

Number of commuters	Route Selected	Time (if traveling Northbound)	Time (if traveling Southbound)
6	Downtown	100	95
12	Downtown	108	101
18	Downtown	111	104
24	Downtown	119	107
30	Downtown	96-116	96-110
36	Downtown	104-118	103-112
42	Downtown	113	107-114
48	Downtown	125	115
6	Perimeter	266	235
12	Perimeter	263-270	236-241
18	Perimeter	260-280	235-250
24	Perimeter	260-279	236-251
30	Perimeter	263-281	236-252
36	Perimeter	273-285	242-251
42	Perimeter	279-294	249
48	Perimeter	303	250