Sorting Problem Set Report

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Q2

(i) I only include the point estimates here. P-values and t-statistics are omitted.

Ramp	Restroom	Walleye	Salmon	Panfish	Travel Cost
0.04317939	-0.1829116	1.73617013	4.60051012	0.38598474	-0.1030538

(ii)

Ramp	Restroom	Walleye	Salmon	Panfish
-0.4118046	-0.2778558	1.29926911	4.55619637	0.43786029
Travel Cost	Kid_Panfish	Kid_Restroom	Boat_Ramp	Boat_Walleye
-0.1030564	-0.1632874	0.34420192	0.98188914	0.69610267

(iii)

First stage:

Travel Cost	Kid_Panfish	Kid_Restroom	Boat_Ramp	Boat_Walleye
-0.1230496	-0.1417187	0.50972645	1.40174552	0.58992906

Second Stage:

Constant	Ramp	Restroom	Walleye	Salmon	Panfish
-0.1389737	-0.5155344	-0.7163362	2.08674626	2.37740555	0.52493428

(iv)

First stage:

Travel Cost	Kid_Panfish	Kid_Restroom	Boat_Ramp	Boat_Walleye	Sigma
-0.1230532	-0.1418382	0.50983455	1.40329972	0.60894339	0.07251411

Second Stage:

Constant	Ramp	Restroom	Walleye	Salmon	Panfish
-0.1362989	-0.5158469	-0.715756	2.06860359	2.37691764	0.52501795

(a) Based on the estimation results in model (i), fishing sites with a restroom and higher travel costs are less attractive. Sites with higher Walleye, Salmon and Panfish catch rate are more attractive. Notice the coefficient of boat ramp is not significantly different from zero, so sites with a boat ramp is as attractive as the ones without a boat ramp on average.

(b) Conclusions in this part are drawn based on the estimates of model (ii). Sites with higher travel costs are still less attractive. Sites with paved boat ramps are less attractive to anglers without

boats (-0.41) but are more attractive to those with boats (-0.41+0.98=0.57). Sites with restrooms are less attractive to anglers without kids (-0.28) but are more attractive to those with kids (-0.28+0.34=0.06). These two findings match my prior expectation. Paved boat ramps are useful to anglers with boats but may hinder the fishing process of anglers without boats. Anglers with kids tend to prefer sites with restrooms because their kids may use restrooms more frequently.
Sites with higher Walleye, Salmon and Panfish catch rate are more attractive to all anglers, regardless of individuals' observed characteristics, but the magnitude is different. A higher panfish catch rate improves the sites' attractiveness to anglers without a kid more than the attractiveness to anglers with a kid. A higher walleye catch rate improves the sites' attractiveness to anglers with boats more than the attractiveness to anglers without boats. The first result does not comply with my prior expectation because sites with higher panfish catch rate should theoretically be more attractive to anglers with kids because these sites may be easier to keep kids excited.

(c) The estimates of model (i) and (ii) tell us the importance of accounting for observable and unobservable heterogeneity. The reason is that individuals' observed and unobserved heterogeneity will greatly affect the attractiveness of the attributes of the fishing sites, both quantitatively and qualitatively. Two representative examples are boat ramp and restroom. When we ignore individual heterogeneity, we find that boat ramp has no effect on sites attractiveness and restroom has a negative effect. However, when we account for the individual heterogeneity, we find that individuals with different heterogeneity have opposite preference over these two attributes.

(d) Based on the estimates of model (ii), (iii) & (iv), the inclusion of the unobserved site attributes affects my results quantitatively. All the coefficients maintain the same sign in all three models. However, the coefficients of Restrooms, Walleye Catch rate and Salmon Catch rate change significantly when I include the unobserved site attributes. The reasons accounts for this change are that the unobserved site attributes could directly affect anglers' decision process and they are also correlated with the observed site attributes.

Q3

(i)

Ramp	Restroom	Walleye	Salmon	Panfish	Travel Cost	Shares
-0.0077523	-0.2249888	0.17327733	0.23815149	0.23074979	-0.1044365	0.69403381

Ramp	Restroom	Walleye	Salmon	Panfish	Travel Cost
-0.5094309	-0.3200699	-0.2055671	0.18408841	0.26785619	-0.10444

Kid_Panfish	Kid-Restroom	Boat_Ramp	Boat_Walleye	Shares
-0.1266354	0.37442997	1.04810714	0.59476425	0.69396785

First stage:

Travel Cost	Kid_Panfish	Kid_Restroom	Boat_Ramp	Boat_Walleye
-0.1230493	-0.1417271	0.50970542	1.40179451	0.59006333

Second Stage:

Constant	Ramp	Restroom	Walleye	Salmon	Panfish	Shares
-0.301805	-0.5415426	-0.7585151	0.95380989	-0.9765833	0.38355084	0.69978869

The estimates of the parameters on non-congestion attributes change significantly in magnitude compared to those found earlier. In particular, the coefficients of Walleye, Salmon and Panfish drop significantly. This result suggests that congestion may be correlated with the sites attributes and could directly affect individuals' decision processes. This makes sense because sites with higher fish catch rates and other desirable attributes would attract more anglers. Moreover, a more congested site would make fishing harder and thus the site is less attractive to anglers. Also notice that the coefficient of congestion is positive in this case, which suggest that congestion makes a fishing site more attractive, i.e. anglers enjoy congestion. This result is not compatible with economic theory and the argument above, which implies that congestion may be an endogenous attribute and our estimate may be biased.

(ii)

First stage

Travel Cost	Kid_Panfish	Kid_Restroom	Boat_Ramp	Boat_Walleye
-0.1230493	-0.1417271	0.50970542	1.40179451	0.59006333

Second Stage (2SLS)

Constant	Ramp	Restroom	Walleye	Salmon	Panfish	Shares
0.7095482	-0.3800046	-0.49654	7.990534	19.85521	1.26169	-3.646634

The coefficient of Shares is negative and statistically significant. This implies that individual dislike congestion when they make decisions. Compared to the estimates in the model 2(iii), we could find

that the coefficients of fish catch rates are much larger in this model and the coefficients of boat ramp and restroom in this model is smaller (in absolute value) in this model.

The explanation of a smaller coefficients on catch rates in the OLS-without-shares model is following: Coefficients on catch rates in the OLS-without-shares model measures the total effect of catch rates on sites' attractiveness. This total effect could be decomposed into two parts: the direct effect of catch rates on sites' attractiveness and an indirect effect of catch rates on sites' attractiveness through the channel of congestion. The 2SLS estimation in this part captures the direct effect of catch rates on sites' attractiveness, which is positive. To find out the indirect effect, first notice that catch rates are positively correlated with congestion because anglers like sites with higher catch rates. Second, congestion itself negatively affects the attractiveness of a fishing site. This implies that the indirect effect of catch rate through the channel of congestion is negative. Therefore, the total effect of catch rates (coefficients on catch rates in the OLS-without-shares model) is smaller than its direct effect (2SLS estimation in this part) because the direct effect is offset partially by the indirect effect.

Q4

Partial Equilibrium		General Equilibrium	
Q4(a)	-5.0879	Q4(a)	-3.4967
Q4(b) affected	-4.6957	Q4(b) affected	-1.8291
Q4(b) not affected	-2.9014	Q4(b) not affected	-1.2811
Q4(c) pick	8.3421	Q4(c) pick	28.4414
Q4(c) not pick	3.8624	Q4(c) not pick	19.9868
Q4(d) choose	4.5682	Q4(d) choose	2.7442
Q4(d) not choose	2.3429	Q4(d) not choose	2.0174

Interpretation of finding: According to the definition of compensating variation, a negative sign means that anglers are better off and a positive sign means that the anglers are worse off.

In scenario (a), anglers are better off in both cases, however, anglers' utilities increase less in the general equilibrium case compared to the partial equilibrium case. In scenario (b), anglers are better off in both equilibria regardless of whether they go to the selected sites. Anglers who initially go to the affected sites are worse off in the general equilibrium than themselves in partial equilibrium. In scenario (c), anglers are worse off in both equilibria regardless of whether they initially pick one of the eliminated sites. Moreover, anglers not picking one of the eliminated sites are much worse off in

the general equilibrium. In scenario (d), all anglers are worse off in both equilibria. Anglers choosing one of the affected sites are better off in the general equilibrium than themselves in the partial equilibrium.

The change in the congestion level incurred by the resorting in general equilibrium explains the difference between the two equilibria. To be specific, in scenario (a), the majority of the increase of the congestion level is concentrated on several sites with initially higher congestion level, while the decrease of the congestion level concentrated on sites with initially lower congestion level. This resorting pattern makes more anglers suffering from a high congestion level than the partial equilibrium case, so the anglers are worse off overall in general equilibrium compared to partial equilibrium.

In scenario (b), in general equilibrium, anglers who do not go to the selected sites initially will resort to the selected places because of higher fish catch rates and this increases the congestion level in those selected sites. This makes people who initially go to the selected sites worse off than the partial equilibrium.

In scenario (c), in general equilibrium, more than 18*1.5=24% of people resort to the remaining 82 sites, which could significantly increase the congestion level of those remaining sites. As a result, anglers who initially pick one of the remaining sites would be severely worse off due to the large increase in the congestion level.

In scenario (d), some anglers who choose one of the affected sites will resort to the unaffected sites to reduce travel costs. This would not only lower the travel cost of these anglers but lower the congestion level in those affected sites as well. As a result, in general equilibrium, anglers who initially choose the affected sites would be better off than themselves in the partial equilibrium.