The Problem Set

COMM 407 Real Estate Economics

Due Date: Sunday February 18th–11:59pm (email a pdf to: justin.tyndall@sauder.ubc.ca).
If you want to hand in a hard copy (probably easier) then you can submit in class on Feb 15th.

Instructions

Working in groups is acceptable but every student must submit an assignment individually. Of the 10% of your grade derived from the problem set, 5% will be given for submitting a completed assignment on time and the other 5% will be for providing correct and full solutions. I will post an answer key shortly after the due date.

Question 1

Suppose that the demand for housing units in Sicamous, BC is set according to the following function:

$$q_d = 1500 - 0.5p$$

Suppose that the short-run housing supply is fixed at 500 units but the long run supply of housing is set according to the following supply function:

$$q_s^{lr} = 2p$$

a) Draw a graph that displays the demand function, short run supply function and long run supply function. Label the axis intercepts with their values.
b) What is the equilibrium quantity and price in the short run?
c) What is the equilibrium quantity and price in the long run?
d) Suppose the Sicamous city council implements a new tax on housing: a tax of $500 assessed on landlords for every unit they provide. After the tax comes into effect, what will be the **long run**, after tax market price for a unit of housing?
e) What is the effect of the bylaw on Consumer Surplus in the long run? What is the effect on Producer Surplus in the long run? Does the policy create a deadweight loss?
f) If long run supply of housing was perfectly inelastic, would there be a dead weight loss associated with the tax?

Question 2

The Spanish town of Elástico has the following housing supply function:

$$q_s = 2p$$

The demand for housing in Elástico is:

$$q_d = 1500 - p$$

The neighbouring town of Fijo has the following housing supply function:

$$q_s = 1000$$

The demand for housing in Fijo is:

$$q_d = 2000 - p$$

a) Draw separate supply and demand graphs for Elástico and Fijo. Solve for the equilibrium price and quantity of housing.

The Spanish government has decided that rents are too high in Spain. The government passes a law stating that the price charged for housing cannot exceed 400.

b) After the law is implemented, what quantity of housing will trade in the Elástico housing market? What quantity of housing will trade in the Fijo market?
c) What is the effect of the law on Consumer Surplus in Elástico? What is the effect of the law on Consumer Surplus in Fijo?
d) Do you think this law would be popular amongst consumers (aka renters) in Elástico? What about in Fijo?

Question 3

The city of Gondolin is a standard monocentric city. In Gondolin, each household occupies $\frac{1}{4}$ acres of land ($l = 0.25$). The city population is fixed at 1,000. Agricultural land rent is \$100 per acre. Every household in the city must walk to work at the city center. Transportation costs are \$200 per km. (1 acre = 0.004 km^2)

a) Graph the residential bid rent curve and agricultural bid rent curve for Gondolin.
b) At what distance from the city center does land use change from residential to agricultural? Mark it on the graph.
c) What is land rent **per acre** at the city center? Mark it on the graph.

Suppose that cars become available in Gondolin and half of the city's households decide to purchase a car. There are now two types of households in the city: 500 Walkers and 500 Drivers. Walkers have monthly transportation costs of \$200 per km. Drivers have monthly transportation costs of \$50 per km. All workers still occupy a $\frac{1}{4}$ acre lot.

d) At what distance from the city center does the population change from Walkers to Drivers?
e) What is land rent **per acre** at the city center? (a new bid rent graph may help)

Question 4

Consider the following hedonic regression equation:

$$HomePrice_i = \beta_0 + \beta_1 Bedrooms_i + \beta_2 Bathrooms_i + \beta_3 Age_i + \beta_4 AgeSquared_i + \beta_5 Parking_i + \beta_6 Pool_i + \varepsilon_i$$

Where i indexes a particular home, $HomePrice$ is home value in dollars, $Bedrooms$ is number of bedrooms, $Bathrooms$ is number of bathrooms, Age is how old the house is in years, $AgeSquared$ is equal to $(Age)^2$, $Parking$ is a dummy variable that takes a value of 1 if the house has on site parking and 0 otherwise, and $Pool$ is a dummy variable that takes a value of 1 if the house has a pool and 0 otherwise.

In Stata, I estimate the above equation using data on the full set of homes in Vancouver.

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. reg value_tot bedrooms full_bath age age_squared parking pool
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Source	SS	df	MS		
Model	5.3565e+16	6	8.9276e+15	Number of obs =	163217
Residual	7.9788e+16	163210	4.8886e+11	F(6,163210) =	18261.85
				Prob > F =	0.0000
				R-squared =	0.4017
				Adj R-squared =	0.4017
Total	1.3335e+17	163216	8.1703e+11	Root MSE =	7.0e+05

value_tot	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
bedrooms	77123.9	1720.833	44.82	0.000	73751.1	80496.7
full_bath	200219.5	2367.443	84.57	0.000	195579.4	204859.7
age	-9150.28	237.321	-38.56	0.000	-9615.424	-8685.136
age_squared	114.9657	2.19904	52.28	0.000	110.6556	119.2757
parking	432142.2	5191.826	83.24	0.000	421966.4	442318.1
pool	2564615	20547.4	124.81	0.000	2524343	2604888
_cons	322379	5553.015	58.05	0.000	311495.2	333262.8

Recall that the column "Coef." displays the estimated β values and "_cons" displays the estimate of β_0.

a) Consider a 20 year old house with 2 bedrooms and 1 bathroom. The house has on site parking, but does not have a pool. Use the above hedonic results to estimate the value of this home.
b) The estimated value of a pool (β_6) is \$2,564,615. What does this tell us about people's willingness to pay for a pool?
c) The value of age in the sample ranges from 0 years (brand new) to 115 years old. The estimated coefficient of Age is negative (β_3), while the estimated coefficient of $AgeSquared$ (β_4) is positive. What does this tell us about people's preferences over the age of homes? (Just describing the intuition is fine)
d) What percentage of statistical variation in the data is our model explaining?
e) Which β estimates are statistically significant at the 1% level?

Question 5

The town of Olika has 100 homes. 50 homes are large mansions and 50 are condos.
In 2016, 4 mansions and 1 condo were sold in Olika. The average home sold for $340,000.
In 2017, 1 mansion and 4 condos were sold. The average home sold for $200,000.

An article recently appeared in Olika's newspaper with the following headline:

"Average Sales Price of Homes in Olika Plummet by Over 40%."

a) Is the headline true? Does it tell the whole story? Briefly explain.

You want to create a more informative estimate of price appreciation by constructing a repeat sales index. You obtain the following sales data:

Sale Date	Address	House Type	Sale Price
2016	1 Main Street	Mansion	$400,000
2016	67 Broad Street	Mansion	$400,000
2016	16 Tiger Road	Mansion	$450,000
2016	88 Indigo Way	Mansion	$350,000
2016	2 Water Street - Unit 1	Condo	$100,000
2017	1 Main Street	Mansion	$400,000
2017	51 Oliver Way - Unit 8	Condo	$125,000
2017	68 Oliver Way - Unit 17	Condo	$175,000
2017	22 Oak Street - Unit 9	Condo	$200,000
2017	2 Water Street - Unit 1	Condo	$100,000

b) Focusing only on the 2 cases of repeat sales in the data, what is the average appreciation of a home in Olika?

Looking into local property assessment data, you note that the house at 1 Main Street constructed a swimming pool between the 2016 sale and the 2017 sale. Using hedonic estimates from the area, you know that swimming pools are valued at $20,000. All other observable characteristics of the home remained constant.

c) Holding observable characteristics constant, by how much did the property at 1 Main Street change in value between the 2016 and 2017 sales?

Question 6

The metropolitan region of Dickens contains two municipalities: Manette and Defarge. Dickens is comprised of 1,000 homes, with 500 located in Manette and 500 in Defarge. Housing supply is fixed. Every household earns $10,000 in income annually. With the exception of school quality, Manette and Defarge are identical.

Manette and Defarge are responsible for providing only one public good to residents: public schools. The governments of Manette and Defarge charge each household within their city a flat annual tax (poll tax), denoted T_M and T_D respectively. Each city therefore raises revenue equal to the number of households times their poll tax (Manette raises $R_M = 500 \times T_M$ dollars and Defarge raises $R_D = 500 \times T_D$ dollars). The cities spend 100% of their revenue on local public schools, so that local school spending equals local R.

Households with children value school spending within their municipality at $\$(4 \times \sqrt{R})$.
Households with no children value school spending within their municipality at $0.

500 households have children and 500 have no children.
Manette charges an annual poll tax of $1,000 ($T_M = 1000$). Defarge charges an annual poll tax of $400 ($T_D = 400$).

a) How much money does each municipality spend on public schools?
b) If households are free to sort across cities and have no moving costs, how many children will live in Defarge?
c) The residents of Manette and Defarge can democratically select the tax rate they want to pay. What tax rate would the residents of Defarge select? What would be more popular in Manette: marginally increasing taxes or marginally decreasing taxes?