DUSP 11.202 Frank Levy
Planning Economics November 11, 2010

Problem Set #1

Note: Because of the holiday, some questions in the questions in this problem set have not been covered in lecture but they are covered in Nicholson and Snyder – Chapter 16 in the 11'th edition or Chapter 18 in the 10'th edition. Some copies of each addition are on reserve at Roche and we can put a couple of additional copies in reserve if necessary. Let me know if they are needed.

1) One of the readings for this past Tuesday was "A Pure Theory of Local Expenditures" by Charles Tiebout. Tiebout's ideas have led to many economic studies of "Tiebout Sorting" - the process by which families with different tastes and incomes choose to reside in different communities.

In recent years, a number of states have passed large-scale reform packages for K-12 education that contain two major elements: targeted state aid to increase the spending-per-pupil level of poorer towns, and state-wide testing with highly publicized results of student scores to help improve the accountability of each town's schools.

Describe how each of these elements – raising the expenditures in the lowest expenditure towns, and extensive publicity for standardized test scores – can be expected to affect the sorting of families among towns that Tiebout postulates.

2) Jo and Maureen (aka Mo) are the only two people who drive cabs from the Leominster Airport to the Leominster Inn. The two cabs have the following identical total cost functions.

$TC_{Jo} = \$3.00xQ_{Jo}$, $TC_{Mo} = \$3.00xQ_{Mo}$ where Q_X = number of trips per day made by driver X.

a) Write down the average and marginal cost functions for this cab "industry".

b) Assume Jo and Mo agree to cooperate to set the price per trip and split any profits they generate. Determine the industry equilibrium price and quantity.

c) The Leominster Environmental Protection Agency (LEPA) has determined that each cab trip between the Leominster Airport and the Leominster Inn generate a pollution cost equal to $.50 per trip. What is the implication of this cost for your solution in (b)? Discus in as much detail as you can LEPA's policy options for dealing with this cost.

3) In class, we discussed both financial incentives and legal restrictions to deal with externalities. A third option is negotiation between the parties creating the externalities (either positive or negative). We will discuss this next Thursday in class and it is also discussed in Nicholson-Snyder under the heading of the Coase Theorem.

A standard example of *positive* externalities involves a beekeeper who keeps hives in a yard that is next door to an apple orchard. Bees pollinate the apple trees so the orchard owner benefits

from more hives. Similarly bees use the apple blossom nectar to make honey so the beekeeper benefits from more apple trees.

(Nicholson 18.5). Suppose that a beekeeper is located next to a 20 acre apple orchard. Each hive of bees is capable of pollinating ¼ acre of apple trees, thereby raising the value of apple output by $25.00

a) Suppose the market value of the honey from one hive is $50.00 and the beekeeper's marginal costs are given by:

$$MC = 30 + .5Q$$

Where Q is the number of hives employed. In the absence of any bargaining between the beekeeper and the orchard owner, how many hives will the beekeeper have and what portion of the apple orchard will be pollinated.

b. What is the maximum amount per hive the orchard owner would pay as a subsidy to the beekeeper to prompt her to install extra hives? Will the owner have to pay this much to prompt the beekeeper to use enough hives to pollinate the entire orchard?

4) In class, we discussed congestion externalities. In particular, we discussed a theoretical model of the relationship between automobile speed (miles per hour) and automobile density (congestion) on the Throggs Neck Bridge summarized in the following equation:

$$MPH = 113 - .353*(\text{cars per mile})$$

Consider one lane of the Throggs Neck Bridge For simplicity we will say the bridge length is one mile long. Suppose that at 7:15 in the morning, the density of the lane is 275 cars per mile at which point you decide to enter the lane.

a) What was the speed of cars on the bridge before you entered the lane? After you entered the lane?

b) Besides you, there are currently 275 cars in the one mile lane. What is the increase in time it will take each of these 275 cars to cross the bridge now that you have entered the lane?

c) If we value people's time at $25.00 per hour, what total cost have you imposed on the other cars by entering the bridge at this time?

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