

More Planning Economics Review Problems

Note: There are several review sheets floating around and some of these problems may have appeared on them. A set of problems on urban location/agglomeration was posted earlier.

1) Consider two cases of pricing that vary over time:

- ◆ It was reported that Coke is experimenting with soft drink machines where prices can be changed automatically as so that higher prices can be charged on hotter days and lower prices can be charged on colder days.
- ◆ An electric power that serves cities in Virginia is experimenting with time-of-day pricing in the summer such that electricity prices are higher during the day (when noontime temperatures average 104 degrees f) and are lower between 5:00 PM and 8:00 AM.

Both of these cases involve obvious examples of price discrimination. But one of the cases might also be justified as an attempt to deal with a negative externality. What is the nature of the externality and how might we check on whether the negative externality is real?

Answer: The potential negative externality is a brownout – a congestion externality that occurs when demand for electricity exceeds generating capacity. The result is that electricity customers get less than full electric power causing lights to dim, etc.

You could test for the existence of this externality by monitoring electricity demand to see whether it really was coming close to the power company's generating capacity during the day time hours of high temperature days.

2) Suppose the city of Phoenix is considering a new airport which, like all airports, will charge a landing fee to every airplane that lands there. Even as we sit here, the airport's Director of Physical Maintenance and the airport's Director of Scheduling are arguing over the structure of that fee.

Director of Physical Maintenance: "The reality is that a 180 seat airliner like a Boeing 757 weighs about 40 times as much as four-seater private plane like a Piper Cub. People in Physical Maintenance have to deal with that extra weight every time a 757 lands. Given this reality, we have to have a landing fee schedule that charges a much higher fee for big planes than for small planes -maybe a fee schedule based on weight. If landing fees are the same for big and small airplanes we will be creating a negative externality that will undermine efficiency."

Director of Scheduling: "The reality is that a four-seater private plane, when it lands, utilizes a runway for about as much time as a 180 seat jet. If we have a weight-based landing fee schedule you want, a Piper Cub will pay much less to land than a Boeing 727. That is what will create a negative externality that undermines efficiency."

a) Assume both directors are correct, but that they are talking about different externalities. Explain the externality that each director is talking about.

Answer: The Director of Physical Maintenance is talking about an externality in which a heavy airplane does significant runway damage that affects the ability of all other airplanes to land. The Director of Scheduling is talking about a congestion externality in which a small private airplane ties up the runway for a significant amount of time and so imposes delays on all other passengers who wish to land.

b) Based on the externality she is talking about, what kind of landing fee schedule would the Director of Scheduling want?

Answer: From her perspective, the scarce resource is runway capacity which is subject to a congestion externality (like a bridge during rush hour) and so that is the resource she would price. She would likely set a high fee per minute of runway use. In doing this, she would know that a 757 or 727 will have an easier time paying the fee because it would be divided among multiple passengers while a Piper Cub would have to pay almost the same fee (since it takes almost the same time to land) but that fee would have to be divided only among 3 or 4 people. The result would be to tilt runway use toward large airplanes which would maximize the number of people using the airport.

3) The town of Carencro, Louisiana recently built a bridge over a local bayou. The monthly demand function for trips across the bridge can be written:

$$\text{Trips} = 5,000 - 1000p$$

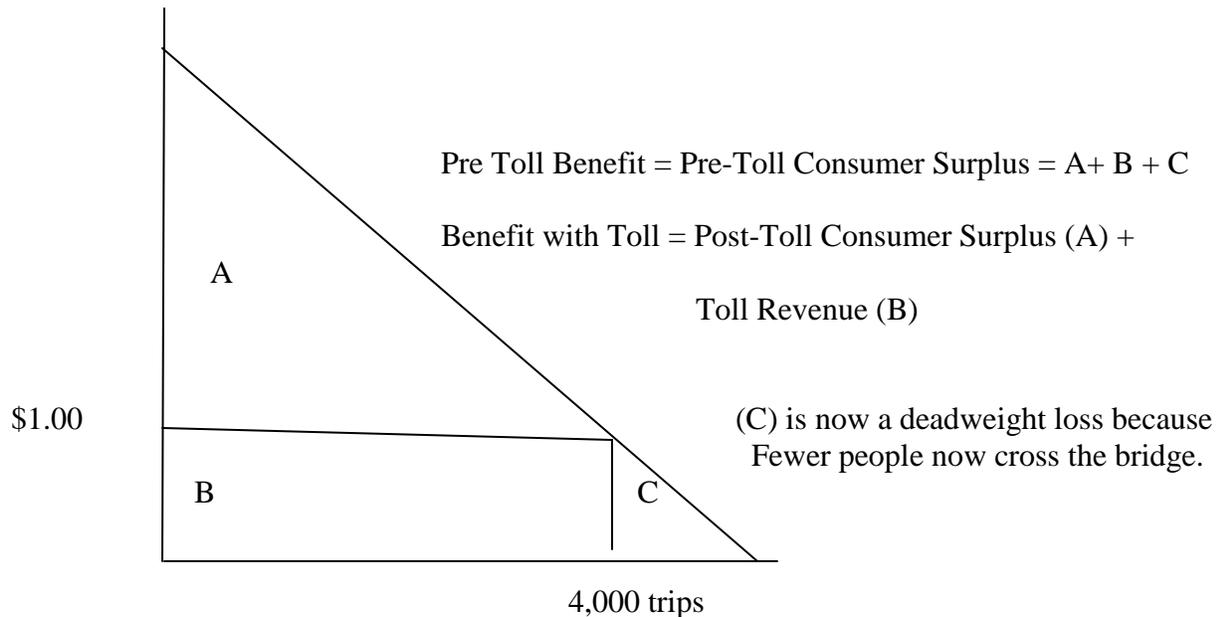
where p is the toll (price) per trip.

When the bridge first opened, the city council chose to charge no toll and assuming the bridge would be funded entirely from other tax revenues and its expense would be justified by consumer surplus. After several months, City Counselor LaFourche made the following argument:

"Because this bridge is a government project, the correct accounting of benefits should be the sum of consumer surplus and any revenues generated by bridge tolls. If we were to charge a modest \$1.00 per trip, we would get monthly revenue of \$4,000 which, when added to the consumer surplus, would represent a substantial increase in benefits over the current situation."

Analyze LaFourche's statement, explaining the parts with which you agree and disagree.

Answer: This is the kind of question that might come up in evaluating whether the government ought to pursue a particular public project. LaFourche is correct that the proper measure of benefits is the sum of consumer surplus plus any revenue. He is also right that a \$1.00 toll will collect \$4,000 in revenue. His mistake is to assume that consumer surplus does not change once the toll is imposed (see the graph below). As you can see from the graph, imposing the toll creates deadweight loss and the sum of the new consumer surplus and toll revenue will be less than the consumer surplus when there was no toll.



4) (a) In order to fulfill a two year contract to produce car doors, Acme Metal Company needs to acquire a specialized stamping press. Because of the special nature of the press, Acme has no use for the press after the contract is completed. It can acquire the press in either of two ways:

- Buy – Acme can purchase the press today for \$130,000. At the end of two years, when the contract is completed, it can sell it on the market for \$90,000.
- Lease – Acme can lease the machine for two years by making an immediate \$32,000 payment and a second \$32,000 payment at the end of the first year. The leasing company will take back the stamping press at the end of the second year.

Use appropriate calculations to explain which option you would choose if the interest rate were 7%. Could the interest rate fall far enough below 7% to cause you to change your mind? Explain your reasoning (no calculations necessary).

Answer: Answering the question involves comparing present discounted values of the two plans.

Under the buy scenario, the PDV = $-\$130,000 + \$90,000/(1.07)^2$

Under the lease scenario, the PDV = $-\$32,000 - \$32,000/(1.07)$

As I calculate the answers as $-\$51,390$ under the buy scenario and $-\$61,000$ for the lease scenario. Ergo, it is cheaper to buy. Lowering the interest rate will not change this since it will make the $\$90,000$ re-sale price count for more in the buy scenario, making it more valuable.

b) (10 points) Consider the following statement.

“When a company calculates the net present value of a project, it discounts future revenues and costs by a bank’s rate of interest because that interest rate reflects the rate the company must pay for any borrowed money. In other words, for a project to be profitable, funds invested in the project need to grow faster than the company’s interest obligation to the bank. But in many cases, a company funds a project from its own funds and does not need to borrow any money. In those cases, since the company is supplying its own funding, the bank’s rate of interest is of no relevance as a discounting factor.

Explain which parts of the statement (if any) you agree with and which parts (if any) you disagree with.

ANS: The first part of the statement is a correct understanding of why we discount when using borrowed money. The second part of the statement is wrong for the following reason: When a corporation has internal funds, it always has the option of investing it in a bank – thus the bank’s interest rate is the opportunity cost of the funds and so any project worth investing in still should be better than this alternative. (For simplicity, we can forget about distinctions between borrowing and lending interest rates).

5) The town of Sea City sits on a wide expanse of beach and is a famous summer resort. You are considering purchasing a particular single family home there purely as an investment opportunity. You will not live in the house yourself but you will rent it out to vacationers. In order to decide whether or not to buy, you take an extensive survey of other houses in the area that gives you an idea of:

R = rent per month you can charge for the house during the summer season.

T = the total property taxes you will have to pay per year

U = the amount of upkeep you will have to spend on the house per year.

N = the number of years the house will last before it becomes too dilapidated to rent.

a) Develop a formula that combines this information you into an estimate of V , the maximum amount you would consider paying for the house. (If you need other variables to complete the formula, define them and include them.)

Answer: $V = \sum_{i=1}^{i=N} \frac{mR_i - (T_i + U_i)}{(1+r)^i}$ This is this is the sum of this term for each year i (from year

1 through N). You need two other terms: m is the number of months in the summer season (usually 3) and r is the interest or discount rate. Each term is then the difference between (the revenue you collect each year) minus (the taxes and upkeep you must pay each year), discounted back to the present.

Using the formula you have just developed, show how (if at all) V would change if:

b) An article in People magazine calls Sea City one of the four best beaches in America.

Answer: People's willingness to pay for this type of rental increases allowing owners to charge higher rents. As a result, V increases.

c) The Sea City government increases property taxes by 15% to improve the Sea City Public School system.

Answer: Taxes go up. Since summer renters care very little about the quality of the schools at the location, there is presumably no change in willingness to pay. V decreases.

d) The Sea City government increases property taxes by 15% to build a set of open access tennis courts.

Answer: Taxes go up. Since summer renters would benefit from a tennis court, there is presumably an increase in willingness to pay and owners are able to charge higher rents. Whether V increases, decreases, or stays the same depends on the magnitude of these two changes (R and T).

6) 5) We have seen a number of different theories that seek to explain why economic activity concentrates in a limited number of locations: increasing returns to scale in production, cheap land, natural advantages of certain locations (e.g. good climate); locating near one's market to minimize transportation, and so on.

Below are two empirical facts. For each fact, choose three explanations for the concentration of economic activity other than cheap land and discuss to what extent the fact is consistent or inconsistent with that explanation.

- I. Repeated empirical studies have shown that firm branches in large cities are smaller in absolute size than branches of firms in rural areas.

- II. When a city is heavily damaged by war or natural disaster, in most cases, it eventually regains its national population ranking rather than, say, just dissolving into a small jurisdiction.

Answer: A reasonable answer might be something like this:

Theories: Locating near to market to minimize transportation;

 Locating to pick a natural advantage like a good climate;

 Locating in a cluster with other firms to gain the three Marshallian benefits (knowledge spillovers, etc.).

The finding about larger plants in rural areas may or may not be consistent with the first theory. We can imagine locating in a rural area that is equally spaced between two cities, both of which are markets, but generally, a rural location doesn't sound like it involves being close to market. This same finding could be consistent with the idea of locating near a natural advantage like a good climate. It clearly is not consistent with locating in a cluster of firms – i.e. a cluster makes it sound like the area isn't rural in the first place.

The finding about cities recovering their position is consistent with all three theories – i.e. each of them gives a reason why firms didn't disperse in the first place and so each may explain why firms don't use the disaster as a reason to disperse.

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