

Homework Assignment 2 Solution.

1. (1 point) Name two properties that a good must satisfy to be classified as public good. Also give at least two examples of public goods and a few examples of goods that satisfy one property but not the other (at least one for each property).

A public good must be non-excludable (impossible or prohibitively expensive to exclude anyone from consuming it) and non-rival (costs associated with providing it to one additional person are zero).

There are a few good examples of the so-called pure public goods: lighthouse, national defense.

Examples of goods that are non-rival but excludable: TV channels (once a TV show is created and aired it is costless for one more person to watch it. This person, however, can be excluded from consuming the TV show in question by requiring him to buy a decoder to be able to watch this channel), highway with light traffic (if I merge on this highway, I don't impose any additional cost on anyone else already driving there because traffic is light, however, I may be charged toll to use the highway).

Examples of goods that are non-excludable but rival: congested road (it's impossible to put a toll-booth on each intersection in a downtown area of some big city, but if my car is stuck in a traffic there that prevents someone else from using it), public wildlife park (access is free but if there are too many people in there already, the value to additional visitors goes down because sightseeing is no longer such fun. The good becomes rival – if I'm there, someone else no longer likes it).

2. (4 points) Consider two college roommates Tom and Jerry. They both demand the good called 'clean bathroom' (as opposed to 'not-so-clean bathroom'). The quantity in this case is expressed in terms of 'cleanness units' that are common to both Tom and Jerry. Instead of money the prices/costs are expressed in terms of hours spent cleaning the bathroom. The (inverse) demand functions are given by:

$$P_T = 100 - 2Q_T; \quad P_J = 150 - 3Q_J;$$

and the marginal cost is given by $MC = 90 = \text{const}$.

- a. First suppose that Tom and Jerry have separate bathrooms, i.e. the 'clean bathroom' should be considered private good. What is the efficient amount of 'cleanness' and hours spent cleaning in this case? Show all your work.

First we have to find the total demand in this economy. In case of private goods, we perform *horizontal summation* of individual demand curves. We first invert both of the individual demand curves

$$Q_T = 50 - 1/2P_T, \quad 0 \leq P_T \leq 100; \quad Q_J = 50 - 1/3P_J; \quad 0 \leq P_J \leq 150$$

Then we sum the two demands (we sum quantities for each level of price) to get

$$Q = 100 - 5/6 P, \text{ if } 0 \leq P \leq 100 \quad (=50 - 1/2P + 50 - 1/3P) \\ = 50 - 1/3 P, \text{ if } 100 < P \leq 150.$$

Now, to find the equilibrium in this market, we need to invert it back (to be able to equate it with supply, which is expressed in dollar terms)

$$P = 120 - 6/5 Q, \text{ if } 50/3 \leq Q \leq 100 \\ = 150 - 3 Q, \text{ if } 0 \leq Q \leq 50/3$$

It's easy to check that supply crosses demand where demand is $P = 120 - 6/5 Q$.

So Supply = 90 = $120 - 6/5 Q$ = demand produces the following quantity $Q_{pr}^* = 25$, $P_{pr}^* = \$90$.

We know that in private good case, competitive markets produce efficient result.

- b. Now assume that Tom and Jerry share the same bathroom, so that now 'clean bathroom' is public good. What is the efficient amount of 'cleanness' and hours spent cleaning in this case? Show all your work.

Again, we have to find the total demand (valuation may be a better word here) in this economy. In case of public goods, we perform *vertical summation* of individual demand curves. This amounts to summing the inverse demands given in the setup of the problem.

Moreover, since for both Tom and Jerry quantity demanded fluctuates between 0 and 50, there will be no kinks in the total demand.

$$P = 250 - 5Q \quad (=100 - 2Q + 150 - 3Q)$$

Now, to find the efficient level of public good, we just set our total valuation schedule given above equal to supply (=90)

$$\text{So } 90 = 250 - 5Q$$

By solving the equation above we get quantity $Q_{pb}^* = 160/5 = 32$, $P_{pb}^* = \$90$. This is not an equilibrium because market doesn't even exist in this case.

- c. Based on your results in part (b), comment if free-rider problem is present in this dorm-room?

The efficient production is 32 units whereas markets will only produce 25 units. The reason for underprovision of cleaning by market system is free-rider problem. In this case free-rider problem means that both Tom and Jerry have strong incentives to shirk when it comes to cleaning. Each hopes

that the other one wouldn't be able to take it any more and would clean the bathroom. The other roommate would just enjoy the benefits without doing anything – would be able to get a free-ride. This incentive leads to underprovision of cleaning compared to the efficient level of cleaning.

3. (2 points) (Question 5 on page 77) It has been estimated that private prisons are about 10 percent cheaper, on a per prisoner basis, than public prisons. On this basis, would you recommend that prisons be privatized? If not, what other information would you require?

Lower cost of private prisons is definitely necessary if we think about privatizing them. (Private prison costing more wouldn't interest a lot of people.) However, the cost of providing prison services is only one side of the story. The other important issue that we need to look at is quality. Some people argue that reduced quality is the price paid for lower cost in the private sector. It might be possible to write a contract requiring certain level of quality of any privately operated prison. Whether it is, in fact, possible or not depends on how "routine" the prison operation is.

4. (1 point) Which commodities 'the commodity egalitarianism' refers to? Are all of these commodities public goods?

These are commodities that members of society believe should be made available to everyone. The examples would include education and medical care (the latter one is not universally provided in US but it is provided in many other countries). Not all of these commodities (if any at all) are public goods. For example, both education and medical care are private goods. They are both excludable (students pay tuition and patients pay fees for medical services) and rival (if I'm taking econ 101 someone else may not be able to because class is full, similarly if I'm seeking physician's help someone else can't do it at the same time).

5. (2 points) Discuss whether the following activities can have externalities, and if so whether it is positive or negative externality:
- Taking Econ 101 class.

It is arguable whether this activity has any externality at all. Though some people believe that education has a positive externality associated with it. For example, after taking econ 101, you may become more knowledgeable about current economic policy issues and can provide expert advice to your grandma over a cup of tea.

- Talking on the cell-phone during Econ 101 lecture.

This activity entails negative externality because your classmates won't be able to hear the instructor (though one may argue that since what

prof. says is useless anyway, a classmate talking on the phone is not that bad).

c. Asking really good questions during Econ 101 lecture.

This activity has positive externality. If you ask a really good question, all other students in class may gain some important insights that they wouldn't get otherwise.

d. Cheating during Econ 101 final exam (assume that only relative (to other students) performance matters).

This activity entails negative externality because grades are determined by the relative standing in class. If someone cheats (s)he moves up in class ranking and reduces the rankings of some other students thereby hurting their utilities (that is so provided those students care about grades at all).