

**EC337 – Economic Analysis of Legal Issues
Spring 2013, Boston University**

Instructor: Jeremy Smith

First Mid-term Practice Test – Solutions

Monday, February 11, 2013

This is a 38-minute test. There is a total of 38 points allocated across two questions. Use the number of points allocated to each part as a suggestion for how long to spend on that part. I recommend that you attempt all parts before using more time than is suggested for any one part. If you complete some parts in less than the suggested time, use your extra time to revisit parts you may have had trouble with the first time through and to check your work.

Please read the questions carefully and write your answers in the blue booklets provided. Please follow my instructions at all times.

You only need to identify yourself with your BU ID on the blue booklets. You may keep this question sheet when the exam is over.

1. [24 points total, 7 parts] Consider a large factory with profits of \$1000 per year that emits smoke as a by-product of its operations. It is located outside a small town made up of just five households. The smoke from the factory does damage worth \$80 per year to *each* household. The factory can eliminate all damage caused by its smoke to every household by purchasing a smokestack screen for \$200 per year. Alternatively, each household could avoid the damage it individually faces by purchasing an air filter for \$50 per year. (Assume that the number of households in the town will never grow or shrink.)

a) [2 points] Which party is causing the externality? Explain.

answer:

Both. If there were no factory, there would be no smoke doing damage to the households; but if there were no households, there would be nothing for the smoke to do damage to.

b) [3 points] What is the efficient outcome? Why?

answer:

Social surplus in the status quo: $1000 - 80 \cdot 5 = \$600$.

If households had air filters: $1000 - 50 \cdot 5 = \$750$.

If the smokestack screen were in place: $1000 - 200 = \$800$.

The efficient outcome is therefore for the screen to be in place, since this maximizes the social surplus.

[Note that the assumption about the town never growing or shrinking means that we can ignore the possibility of the town “leaving” and therefore can leave out the value to the households of the town continuing to exist without loss of generality.]

Suppose that the townspeople sue the factory. Assume for now that there are no transaction costs whatsoever.

c) [4 points] Will efficiency be achieved if the court issues an injunction against the factory? Explain.

answer:

The factory can effectively comply with the injunction by ensuring that the households are no longer harmed.

Factory’s private profit if it closes: \$0.

If it pays money compensation for the damage: \$600 less whatever additional bribe is agreed to.

If it bargains with households to install filters: \$750 less whatever bribe is agreed to.

If it does this by installing the screen: \$800.

The factory will therefore choose to install the screen, since this maximizes its private profit. Thus, the efficient outcome will be achieved.

d) [4 points] Will efficiency be achieved if, instead, the court asserts the right of the factory to emit as much smoke as it wants to without any liability? Explain.

answer:

Town's collective surplus if it does nothing: -\$400.

If households install filters: -\$250.

If they bargain with the factory to install the screen: -\$200 minus whatever bribe is agreed to.

The factory would be better off with any bribe greater than \$0 and the town would be better off with any bribe less than \$50, and since there are no transaction costs, an agreement will be reached.

The town will therefore choose to bargain for the screen to be installed, since this minimizes its cost burden [or in other words, maximizes its private collective surplus]. Thus, the efficient outcome will be achieved.

Now assume that a transaction cost exists of the following specific form: before the townspeople can make any collective decision, they must pay \$100 to organize a town hall meeting.

e) [4 points] Now will efficiency be achieved if the court issues an injunction against the factory? Explain.

answer:

As in part c), the profit-maximizing option for the factory is to install the screen. Therefore, this is what it will choose, and efficiency will thus be achieved.

f) [4 points] Now will efficiency be achieved if, instead, the court asserts the right of the factory to emit as much smoke as it wants to without any liability? Explain.

answer:

Town's collective surplus if it does nothing: -\$400.

If households install filters: -\$250. [No collective decision necessary.]

If they bargain with the factory to install the screen: $-\$200 - \100 organizational cost minus whatever bribe is agreed to.

Now it is cheaper for the households to individually install air filters than to attempt to collectively bargain with the factory, even if the bribe were \$0.

The households will therefore choose to have air filters installed, since this minimizes their cost burdens. Thus, the efficient outcome will NOT be achieved.

g) [3 points] Briefly discuss the following statement: "This example proves that following the 'polluter pays' principle will always lead to the efficient outcome being achieved."

answer:

Despite the reciprocal nature of externalities alluded to in part a), the polluter pays principle would target the factory as the polluter in this case and thus place the onus of reducing the harm on it. Assigning property rights to the town is therefore consistent with the polluter pays principle, and as this example demonstrates, this leads to efficiency, regardless of transaction costs, in this case. However, this is not a general result. Efficiency instead requires that property rights be assigned to the higher-cost avoider. The so-called "polluter" will not always be the lower-cost avoider, as it happened to be in this case, so the polluter pays principle will not necessarily always lead to efficiency being achieved.

2. [14 points total, 4 parts] Consider a dairy farmer and a grain farmer with adjoining properties. The dairy farmer has a single cow and earns \$200 per year from selling the milk. The grain farmer earns \$100 per year from selling crops. The dairy farmer's cow does \$60 of damage per year to the grain farmer's crops. Either farmer could build and maintain a fence between the properties that would prevent the cow from doing any crop damage for \$80 per year.

a) [2 points] What is the efficient outcome? Why?

answer:

Social surplus in the status quo: $200 + 100 - 60 = \$240$.

If the fence were built and maintained: $200 + 100 - 80 = \$220$.

The efficient outcome is therefore for the damage to stand (i.e. for nothing to be done and for the cow to keep roaming), since this maximizes the social surplus.

Suppose that the grain farmer sues the dairy farmer. Assume that there are no transaction costs.

b) [4 points] Will efficiency be achieved if the court asserts the right of the dairy farmer to let his cow roam without any liability? Explain.

answer:

Grain farmer's profit if she does nothing: $100 - 60 = \$40$.

If she builds the fence: $100 - 80 = \$20$.

The grain farmer will therefore choose to do nothing, since this maximizes her private profit. Thus, efficiency will be achieved.

c) [4 points] Will efficiency be achieved if, instead, the court finds the dairy farmer liable and orders him to fully compensate for all damage his cow does to the grain farmer? Explain.

answer:

Dairy farmer's profit if he does nothing and pays money compensation for the damage: $200 - 60 = \$140$.

Dairy farmer's profit if he builds the fence: $200 - 80 = \$120$.

The dairy farmer will therefore choose to do nothing, since this maximizes his private profit. Thus, efficiency will be achieved.

d) [4 points] Will efficiency be achieved if, instead, the court finds the dairy farmer liable and orders him to pay *twice* the damage his cow does to the grain farmer? Explain.

answer:

Dairy farmer's profit if he does nothing and pays money compensation for the damage: $200 - 120 = \$80$.

Dairy farmer's profit if he builds the fence: $200 - 80 = \$120$.

[This would seem to indicate that the dairy farmer would choose to build the fence, and thus that efficiency would not be obtained. But is there another option that is even better for the dairy farmer? Consider the grain farmer. If the dairy farmer builds the fence, the grain farmer's profits will be \$100. The grain farmer would of course prefer that the dairy farmer do nothing and pay double damages, giving the grain farmer a profit of \$160 – but the dairy farmer will never choose this option. So the question is whether there is some option that leaves the dairy farmer better off than \$120 and leaves the grain farmer better off than \$100.]

Dairy farmer's profit if he bargains with the grain farmer to let the cow roam and pay damages: $200 - 60$ minus bribe = $\$140 - \text{bribe}$.

Grain farmer's profit if she agrees to this bargain: $100 - 60 + 60 + \text{bribe} = \$100 + \text{bribe}$.

The dairy farmer would agree to any bribe less than \$20, and the grain farmer would agree to any bribe greater than \$0. Since there are no transaction costs, an agreement will be reached.

The dairy farmer will therefore choose to bargain with the grain farmer to let the cow roam, since this maximizes his profit. Thus, efficiency will be achieved.

[Remember: if there are no transaction costs, efficiency will always be achieved! The trick is to figure out and explain how privately optimal actions will lead to the efficient outcome.]