

Problem Set 4: Tort Law

Assigned: Oct. 26

Answers: Nov. 17

Quiz: Nov. 21

Question 1. The rope tying a barge (injurer) to the dock snapped; the barge began floating down the river, and struck a small boat (victim). Suppose that the barge operator can reduce the probability of the rope's snapping by using a thicker rope. Let x be the thickness of the ropes and $p(x) = e^{-x}$ be the probability of snapping. Assume that rope costs 1,000 per inch of thickness (for the length of rope needed) and that the accident produces \$100,000 worth of damage. Compute the optimal negligence standard for rope thickness: i.e., compute the rope thickness that minimizes total social costs. (Note: the optimal negligence standard is called the Hand Rule after the judge who first implemented it and described its logic.)

Question 2. An accident occurs with probability $p(x_v, x_i) = \exp(-(x_v + 1)(x_i + 1))$, where x_v is the precaution taken by the victim and x_i is the precaution taken by the injurer. Suppose precaution costs $w_v = w_i = 1$ per unit for both parties and that the accident produces harm of $A = 100$. (This problem leads you through analysis of alternative legal rules similar to the analysis in class. The difference is that the probability function assumed here makes it difficult to find closed-form solutions of first-order conditions. Instead, you will use graphical techniques to solve the problem.)

- (a) Compute the socially-optimal levels of precaution for both parties, $x_v^{s.o.}$ and $x_i^{s.o.}$. Compute total social cost in the social optimum, $SC^{s.o.}$. (To solve this problem proceed in several steps. First, note that the problem is symmetric, so that $x_v^{s.o.} = x_i^{s.o.}$. Thus, make the substitution of x_i for x_v and write total social cost, SC , only as a function of x_v . Second, graph SC for various values of x_v and find where SC bottoms out.)
- (b) Suppose the legal regime involves no liability. Compute the equilibrium levels of precaution for both parties, x_v^* and x_i^* , and equilibrium total social cost SC^* . (Hint: it is obvious without any calculation what the equilibrium precaution for one of the two parties should be. Given this value, solve for the other party's equilibrium precaution. Do this in a similar way to the social optimum: graph the cost facing the individual as a function of its precaution and see where the cost function bottoms out.)
- (c) Suppose the legal regime involves strict liability. Compute the equilibrium levels of precaution for both parties, x_v^* and x_i^* , and equilibrium total social cost SC^* . (Hint: similar solution method to no liability case.)
- (d) Return to the computation of the social optimum, but assume that the harm from the accident is $A = 200$ rather than $A = 100$. Find the socially-optimal levels of precaution. What do you conclude from this exercise about the effect of an increase in A on the optimal levels of precaution?

Question 3. Suppose the harm caused by the accident is $A = 1$. Consider a situation in which precaution doesn't have much influence on the probability of an accident. Rather, the amount of time spent in the activity by both the victim (a_v) and the injurer (a_i) are more important determinants. Suppose the utility that the victim obtains from its activity (not including harm from the accident) is $u_v(a_v) = a_v - a_v^2$ and the injurer obtains from its activity (not including damage payments) is $u_i(a_i) = a_i - a_i^2$.

- (a) Compute the activity levels that would be chosen in equilibrium if there were no influence of activity on accident probability.
- (b) Assume the probability of accident is influenced by activity levels. Specifically, $p(a_v, a_i) = a_v a_i$. Compute the socially-optimal activity levels and total social welfare (benefits from activities minus harm from accident).
- (c) Compute the equilibrium levels of activity and social welfare under three alternative legal regimes: no liability, strict liability, and negligence.

Question 4. Analyze the case of product liability for soda containers exhibited in Table 8.4 (page 324 of Cooter and Ulen) with \$4,000 substituted for \$10,000 in the entry for "loss if accident" column and "use bottle" row.