

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

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**Final Exam – Solutions**

Wednesday, May 8, 2013

This is a 109-minute test. There is a total of 109 points allocated across five 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 space provided. You can use the backs of the sheets for scrap paper, but to get full credit you must show all relevant work in the space provided.

Please follow my instructions at all times.

Concentrate and think carefully, but try to relax too!

**University ID:**

1. [13 points total, 4 parts] Suppose that a director named Tarantino makes a film called *Reservoir Dogs* that bears a suspicious stylistic resemblance to an earlier film by a director named Lam called *City on Fire*. Before *Reservoir Dogs* was made, Lam was earning \$30,000 per year and Tarantino was earning \$10,000 per year, and this would continue indefinitely if *Reservoir Dogs* were not released. If, on the other hand, *Reservoir Dogs* is released, Lam would earn \$5,000 per year and Tarantino would earn \$135,000 per year thereafter.

a) [4 points] Briefly state the fundamental trade-off that is faced when deciding on the strength of intellectual property protections in general.

answer:

Giving producers of creative goods some monopoly power allows them to charge a higher price for such goods than they otherwise could, and therefore gives them a stronger incentive to produce such goods. But the wide availability of creative goods can be very beneficial in generating further creativity and other surplus, and such further benefits might be suppressed if existing creative goods are too expensive to access.

b) [2 points] In the present case of Tarantino and Lam, what is the efficient outcome? Why?

answer:

Total social surplus with both films:  $135 + 5 = \$140k$ .

Total social surplus with only *City on Fire*:  $30 + 10 = \$40k$ .

The efficient outcome is for both films to be released, since this leads to the highest social surplus.

Suppose that Lam sues Tarantino for copyright infringement.

c) [3 points] Will efficiency be achieved if the court upholds Tarantino's right to release *Reservoir Dogs* and be free of any liability to Lam? Explain.

answer:

Lam can either choose to silently abide by the court's decision and earn \$5k, or can attempt to bribe Tarantino to suppress *Reservoir Dogs*. Lam would be willing to pay up to \$25k for such a bribe (the difference between the 30 he would earn without *Reservoir Dogs* and the 5 he would earn with it). But Tarantino would require a bribe of at least \$125k (the difference between the 135 that the court ruling guarantees him and the 10 he would earn if he suppressed *Reservoir Dogs*). Since no bargain is possible, Lam's only feasible choice is to do nothing. So yes, both films will be released, which is the efficient outcome.

d) [4 points] Will efficiency be achieved if, instead, the court issues an injunction against Tarantino and orders him to suppress *Reservoir Dogs*? Explain.

answer:

Tarantino can either choose to silently abide by the court's decision and continue to earn just \$10k, or he can attempt to bribe Lam to allow him to release *Reservoir Dogs*. Tarantino would be willing to pay up to \$125k for such a bribe (the difference between the 135 he stands to earn if *Reservoir Dogs* is released and the 10 he would earn if it is not). Lam would require a bribe of at least \$25k (the difference between the 30 that the court order entitles him to and the 5 he would earn if *Reservoir Dogs* is released).

This bargaining range is very large, so the two parties should be able to reach a mutually beneficial bargain. Transaction costs would have to be enormous to interfere, so it seems reasonable to assume that the bargain will be made. [Mentioning transactions costs is important. If there were never any transaction costs, the trade-off discussed in part a) would not exist since, if courts accidentally gave too much protection, bargaining would ensure that the efficient outcome would be obtained anyway. But what if there were very large transaction costs in the present example? On the one hand, giving property rights to Lam, as in this part, might lead to *Reservoir Dogs* never being released due to a bargain as outlined above being too expensive to complete. On the other hand, if Lam had guessed ahead of time that a court would give Tarantino property rights, as in the previous part, Lam might never have made *City on Fire* in the first place (which, ironically, might even have led to Tarantino never being inspired enough to make *Reservoir Dogs*).]

So yes, Tarantino will choose to bargain with Lam because this will lead to his highest private surplus, and both films will be released, which is the efficient outcome.

2. [35 points total, 7 parts] Consider a dairy farmer and a grain farmer with adjoining properties. The dairy farmer has a single cow and earns \$100 per year from selling the milk. The grain farmer grows \$200 worth of crops per year, but the dairy farmer's cow does \$50 of damage per year to the grain farmer's crops. The dairy farmer could tether her cow at a cost of \$80 per year and thereby prevent the cow from doing any crop damage. The crop farmer could spray a pesticide at a cost of \$10 per year that would reduce the crop damage done by the cow to \$15 per year but also reduce the dairy farmer's milk profits to \$90 per year.

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

answer:

Both. If there were no dairy farmer, there would be no cow doing damage to the crops; but if there were no grain farmer, there would be nothing for the cow to do damage to.

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

answer:

The efficient outcome is for the pesticide to be sprayed. This eliminates 35 in damage (50 minus the remaining 15) at a cost of 20 (10 for the pesticide and 10 in lost dairy profits). Any other option eliminates 50 in damage at a cost much higher than 50.

[In other words, spraying the pesticide is the option that maximizes the social surplus. You should be able to calculate that the social surplus is 265 with the pesticide, 220 with the tether, 250 with the status quo, 200 if the dairy farmer leaves, or 100 if the crop farmer leaves.]

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

c) [6 points] Will efficiency be achieved if the court issues an injunction against the dairy farmer? Explain.

answer:

The dairy farmer could choose to tether the cow rather than close shop altogether, leaving a private surplus of 20, which is better than the 0 he would get by literally complying with the injunction by moving away. But it's not the best possible. The dairy farmer could instead offer to pay the 50 in damages plus a pure bribe to get the grain farmer to agree not to sue again, for a private surplus of  $100 - 50 - \text{bribe}$ . Finally, the dairy farmer could buy the pesticide for 10 as well as pay the grain farmer at least 15 to compensate for the remaining damage, leaving a private surplus of  $90 - 10 - 15 - \text{whatever additional pure bribe might be agreed upon}$ . This last option is privately best for the dairy farmer as long as the pure bribe is not too large [for the sake of argument, say the bribe necessary with the payment of damages is fixed at 20, so that the straight damages option would become more attractive than the pesticide option if the bribe necessary with the pesticide exceeded 35], but the grain farmer will be better off with any bribe greater than 0. Since there are no transaction costs, a bargain will be reached.

The dairy farmer's private surplus will be highest if she bargains with the crop farmer to spray the pesticide, which she will thus choose to do. Therefore, the injunction order will lead to the efficient outcome.

d) [6 points] Will efficiency be achieved if, instead, the court asserts the right of the dairy farmer to let her cow roam without any liability and to continue to earn \$100 per year? Explain.

answer:

Under the court's decision, the dairy farmer is entitled to a private surplus of 100. The crop farmer could do nothing and simply suffer the 50 in damage, being left with a private surplus of 150. Or he could buy the pesticide for 10 and suffer the remaining 15 in damages as well as pay 10 to the dairy farmer for her lost profit caused by the pesticide. This would leave his private surplus at  $200 - 15 - 10 - 10 = 165 > 150$  (and the dairy farmer's private surplus would then be exactly 100, which is all that the court's ruling requires).

The grain farmer's private surplus will be highest if he sprays the pesticide and compensates the dairy farmer, which he will thus choose to do. Therefore, assigning property rights to the dairy farmer will also lead to the efficient outcome.

Now assume that a transaction cost exists of the following specific form: whenever the two farmers make a cash exchange between themselves, the one making the payment must pay an additional \$55 to an outside party to witness the transaction.

e) [6 points] Now will efficiency be achieved if the court issues an injunction against the dairy farmer? Explain.

answer:

As discussed above for part c), implementing the pesticide solution and placating the crop farmer involves a cash payment from the dairy farmer to the crop farmer of at least 15. Now this cash payment needs to be witnessed, so the dairy farmer would have to pay an additional 55 to an outside party. So the dairy farmer's private surplus with the pesticide solution would be  $90 - 10 - 15 - 55 = 10$  – pure bribe, which is always less than 20. So the dairy farmer will be better off just tethering her cow [which requires no cash payment and thus no 55 transaction cost payment] and obtaining a private surplus of 20. [The grain farmer's surplus with the tethering option will be 200, which is the minimum required. By tethering, the dairy farmer does not literally comply with the injunction, but does technically comply because the damage will no longer be done. So no additional bribe is necessary. Note that, since the option of paying straight damages to the grain farmer would also entail paying the 55 witness cost, this option too will always be less attractive than the tethering option, whether or not the respective bribes make it more or less attractive than the pesticide option.]

Now the dairy farmer's private surplus will be highest if she tethers the cow, which she will thus choose to do. Therefore, the injunction order will not lead to the efficient outcome when these specific transaction costs exist.

f) [6 points] Now will efficiency be achieved if, instead, the court asserts the right of the dairy farmer to let her cow roam without any liability and to continue to earn \$100 per year? Explain.

answer:

As discussed above for part d), implementing the pesticide solution and placating the dairy farmer involves a cash payment from the crop farmer to the dairy farmer of 10. Now this cash payment needs to be witnessed, so the crop farmer would have to pay an additional 55 to an outside party. So the crop farmer's private surplus with the pesticide solution would be  $200 - 10 - 15 - 10 - 55 = 110 < 150$ . So the crop farmer would be better off just suffering the 50 in damage [which requires no cash payment and thus no 55 transaction cost payment] and obtaining a private surplus of 150. [And the dairy farmer's private surplus would be 100, which is all that is necessary to prevent a counter suit from the dairy farmer.]

Now the grain farmer's private surplus will be highest if he just lets the cow keep roaming and suffers the resulting 50 in damage, which he will thus choose to do. Therefore, assigning property rights to the dairy farmer will also not lead to the efficient outcome when these specific transaction costs exist.

g) [6 points] Suppose, still in the world of this specific transaction cost, that the court, instead of assigning property rights to one side or the other, simply rules that the grain farmer must spray the pesticide. Will efficiency be achieved? Does the outcome seem fair to you? [There is no right or wrong concept of “fairness”. I just want you to briefly discuss why the outcome does or does not conform to your own notions of fairness.]

answer:

The first thing to do is to check that the grain farmer will indeed choose to spray the pesticide. Remember, he need not literally comply with the order if there is a better option available (and if he can bribe the dairy farmer into going along with this better option if necessary). But in this case, there isn't, since the court order in the present part does not oblige the grain farmer to compensate the dairy farmer for the loss of 10 in dairy profits: moving away or suffering the 50 in damage silently are both more expensive than the 25 net cost of spraying the pesticide. So the grain farmer will choose to spray the pesticide under this court order, and efficiency will hence be achieved.

I accepted any reasonably well-supported argument concerning the fairness of the outcome. I personally like the outcome in this part, since it accords well with the Coasean conception of the multi-lateral nature of externalities – as espoused in the answer to part a) – in that each party ends up bearing some cost (sort of like a pure comparative negligence standard as applied to a property case?). But some thought that a polluter-pays approach would be more fair, and others made other interesting points, e.g. related to inequality in private surpluses, rights to protection of private property, personal freedoms, etc. I did not penalize anyone simply for having a different opinion or emphasis than I have, but did take points off for poorly supported responses and responses that were only weakly related to the question.

[Note that there are actually two externalities at play in this example, though they are inextricably linked: the crop damage done by the cow; and the damage done to the cow by the pesticide. As a result, the normative advice that we would generally draw from Coase's work – that property rights should be assigned to the high-cost avoider – becomes more complicated to apply. In this example, it turns out that the dairy farmer is the high-cost avoider where the first externality is concerned, but the low-cost “avoider”/complier where the second is concerned. This is the reason that transaction costs can interfere with efficiency being achieved in *both* parts e) and f). The ruling in part g) is essentially a hybrid approach that grants the dairy farmer property rights as far as the first externality is concerned but grants the grain farmer property rights as far as the second externality is concerned, thus ensuring that the efficient outcome can be achieved without any bargaining and thereby removing the possibility that transaction costs will interfere.]

3. [18 points total, 4 parts] Suppose that drinks manufacturers use glass bottles to package their products. Occasionally, glass bottles become damaged during shipping, in which case tiny glass shards can become mixed with the drink. If a purchaser consumes a drink from such a damaged container, she will sustain an injury from the glass shards. Assume that 5% of drink bottles contain glass shards, so that, if neither party takes care, there is a 5% probability that a purchaser will be injured. The true damage suffered from such an injury would be \$6000. Purchasers/Plaintiffs (P) can reduce the probability of an injury occurring to zero if they always pour their drinks through a filter before consuming them, at a cost of \$200 (in time and effort). Drinks manufacturers/Defendants (D) can reduce the probability of an injury occurring to zero if they use stronger bottles, at a cost of \$200 (in increased production costs). All parties know this information with certainty.

a) [3 points] What is the efficient level of prevention, and what is the associated outcome? Explain briefly.

answer:

social loss if neither invests =  $0.05 \times 6000 = 300$

social loss if only D invests = 200

social loss if only P invests = 200

The efficient level of prevention is therefore for *either* D or P to take care, since this minimizes the total social loss. The associated outcome in either case is for there to be no injuries.

b) [5 points] Will efficiency be achieved if everyone knows that courts always apply the original Hand Rule when determining which party is at fault? Explain.

answer:

Under the original Hand Rule, D must pay full damages if D's burden of prevention is less than the expected harm. In this case,  $200 < 300$ , so D will be found negligent and ordered to pay 6000 if there is an injury.

P's private loss if she invests in prevention is 200. P's private net loss if she doesn't invest in prevention is 0. So P will not invest, since this minimizes her private loss.

D's private loss if he invests in prevention is 200. D's private expected loss if he doesn't invest is 300. So D will invest, since this minimizes his private loss.

Therefore, D will choose to invest and P will not. So, yes, efficiency will be achieved.

c) [5 points] Will efficiency be achieved if everyone knows that courts always apply the contributory negligence standard when determining which party is at fault? Explain.

answer:

Under contributory negligence, P will receive zero compensation if D's burden of prevention is less than expected harm and P's burden of prevention is also less than expected harm. In this case,  $200 < 300$  and  $200 < 300$ , so P will receive zero compensation if there is an injury.

D's private loss if he invests in prevention is 200. D's expected private loss if he doesn't invest in prevention is 0. So D will not invest, because this minimizes his private loss.

P's private loss if she invests in prevention is 200. P's expected private loss if she doesn't invest in prevention is 300. So P will invest, since this minimizes her private loss.

Therefore, P will choose to invest and D will not. So, yes, efficiency will be achieved.

d) [5 points] Will efficiency be achieved if everyone knows that courts always apply the pure comparative negligence standard when determining which party is at fault? Explain.

answer:

Under the pure comparative negligence standard, if both D and P have a burden of prevention less than expected harm, D will have to pay the fraction  $\left(1 - \frac{B_D}{B_D + B_P}\right)$  of damages. In this case,  $200 < 300$  and  $200 < 300$ , so D will have to pay  $(1 - 200/400) \times 6000 = 3000$  to P if there is an injury.

P's private loss if she invests in prevention is 200. P's *maximum* expected private loss if she doesn't invest is 150 [i.e.  $(6000 - 3000) \times 0.05$  if D doesn't invest]. So P will not invest, since this minimizes her private loss *regardless of what D chooses*.

D's private loss if he invests in prevention is 200. D's *maximum* expected private loss if he doesn't invest in prevention is 150 [i.e.  $3000 \times 0.05$  if P doesn't invest]. So D will not invest, because this minimizes his private loss *regardless of what P chooses*.

Therefore, neither D nor P will choose to invest. So, no, efficiency will not be achieved.

[There is a fairness vs. efficiency story in the background of this problem as well. Because of this very specific example in which the prevention cost is identical for D and P, either the original Hand Rule or the contributory negligence standard will achieve efficiency. But these rules put the burden of avoidance entirely on one party or the other, whereas the identical avoidance costs make it very difficult to say that one party is any more "at fault" than the other. Alas, if we try to divide the burden of avoidance in an ostensibly fair manner, the incentives of each party are sufficiently altered such that efficiency will no longer be achieved.]

4. [25 points total, 5 parts] Ivan will be hosting an event at his home on Saturday. On the preceding Wednesday, a pipe at his home breaks. If the pipe is not fixed, he will have to cancel the event, which will cause him to miss out on \$1200 in certain profit. He calls Joe, who is the only plumber available. Ivan and Joe enter a contract that states that Joe will fix the pipe on Saturday morning and Ivan will pay Joe \$600. On Friday, Qiao offers Joe \$1800 to fix her hot tub on Saturday. If Joe accepts this offer, he will have to breach his contract with Ivan.

a) [4 points] Is it efficient for the contract between Ivan and Joe to be breached? Explain briefly.

answer:

Surplus with no breach: 1200 profit minus 600 plumbing cost for Ivan; 600 revenue for Joe; 1200 total.

Surplus with breach: 0 profit and 0 plumbing cost for Ivan; 1800 revenue for Joe; 1800 total.

Yes, it is efficient for the contract to be breached, since the total surplus is higher under breach (1800) than under performance (1200).

b) [5 points] Assume that Joe knows that courts always employ the “expectancy” remedy rule when a breach of contract is found, and that Joe and all courts know exactly how much profit Ivan stands to earn from hosting the event. Will Joe decide to breach the contract? Explain briefly.

answer:

Ivan expects profit net of the plumbing cost of 600 under the contract, but gets 0 if there is a breach. So Joe will have to pay Ivan 600 under the expectancy rule if he breaches.

After breaching, receiving 1800 from Qiao, and paying 600 in damages to Ivan, Joe would be left with 1200.

Yes, Joe will decide to breach, since his private surplus from doing so (1200) is higher than his private surplus from performing the contract as written (600).

c) [6 points] Assume instead that Joe knows that courts always employ the “expectancy” remedy rule when a breach of contract is found, but that Joe also knows that Ivan will lie to the court and be able to convince them that he stands to earn \$1600 in certain profit from the event. Will Ivan benefit from this lie? Explain briefly.

answer:

If the court is convinced that Ivan would earn \$1600 from hosting the event, it will rule that his expectancy under the contract was this profit minus the \$600 plumbing cost, or \$1000, and order Joe to pay this amount as compensation for breaching.

After breaching, receiving 1800 from Qiao, and paying 1000 in damages to Ivan, Joe would be left with 800.

So Joe will decide to breach, since his private surplus from doing so (800) is greater than his private surplus from performing the contract as written (600). Since Ivan’s lie still leaves it in Joe’s best interests to breach, Ivan will indeed benefit relative to not lying, since the payment he will receive from Joe will be \$400 higher (1000 vs. 600).

d) [5 points] Suppose instead that, on Friday afternoon, Ivan learns that Joe has agreed to fix Qiao’s hot tub on Saturday, and that Joe will hence breach his contract with Ivan. Ivan manages to get the case brought in front of the court immediately. Assume that the court orders specific performance. Will Ivan’s event be held as planned on Saturday? Explain. [You may assume that there are no legal or constitutional issues preventing the court from ordering specific performance. This is not a trick question.]

answer:

By ordering specific performance, the court is telling Joe that he must perform the contract with Ivan as written. But that doesn’t mean it will actually happen, since it might be possible for all three parties to come to a mutually beneficial bargain in which Ivan’s pipe does not get fixed.

For example, Joe could agree to split the payment of 1800 from Qiao evenly with Ivan. Ivan would then have 900, which is greater than the 600 he would get under performance of the contract. And Joe would have 900, which would be greater than the 600 he would get under performance of the contract. [Ivan would not have the 1000 he would have gotten in the previous part in this scenario, but that is irrelevant. When bargaining with Joe, Ivan will simply compare how well off he will be under the bargain relative to how well off he would be if he insisted on the specific performance order being carried out. This is the relevant counterfactual, not how well off he could be under some hypothetical alternative ruling that the court hasn’t made. It of course turns out that Joe could give Ivan 1000 and still be better off than under performance, but the ruling itself by no means makes Ivan’s lie a credible threat in a private

bargain, especially considering the assumption of the previous part that Joe is well aware of Ivan's lie.]

So, despite specific performance being ordered, it does not seem likely that Ivan's event will be held as planned. Large transaction costs could prevent such a mutually beneficial bargain from being reached, but it seems unlikely that such large transaction costs would arise with so few people involved, especially since they have negotiated contracts with one another in the past.

e) [5 points] Go back to assuming that Joe knows that courts always employ the "expectancy" remedy rule when a breach of contract is found, and that Joe and all courts know exactly how much profit Ivan stands to earn from hosting the event. However, suppose that it is common knowledge that an emergency plumbing service becomes available that can fix pipes (but not hot tubs) at a cost of \$900 at any time. Just considering Ivan and Joe, now is it efficient for the contract between them to be breached? Will Joe decide to breach? Explain.

answer:

Now, if Joe breaches, Ivan can hire the emergency plumber and still hold his event as planned. In this case, Ivan's private surplus would be  $1200 - 900 = 300$ , and Joe's would be 1800, for a total social surplus of 2100. Under performance of the original contract, the total social surplus would still be 1200. So yes, it is still efficient for the original contract to be breached.

Ivan's expectancy under the contract is 600, but under a breach, instead of being stuck with 0, he now has a better option that would leave him with 300. So the compensation Joe would be ordered to pay would be the amount that would bring Ivan from 300 up to his expected 600, i.e. \$300. [See the solutions to the second mid-term practice test for a further explanation of this point.]

After breaching, receiving 1800 from Qiao, and paying 300 in damages to Ivan, Joe would be left with 1500.

Yes, Joe will decide to breach, since his private surplus from doing so (1500) is higher than his private surplus from performing the contract as written (600).

5. [18 points total, 4 parts] Consider a hypothetical accident involving a driver and a pedestrian. Two types of accidents could result: a minor accident or a major accident. If neither party takes care, the probability of a minor accident occurring at any given location at any given time is 20%, while the probability of a major accident occurring at any given location at any given time is 1% (so that there is a 21% chance of an accident of either kind occurring). In the event that a minor accident occurs, the pedestrian/plaintiff (P) will suffer true damages in the amount of \$1000, while, in the event that a major accident occurs, P will suffer true damages in the amount of \$100 thousand. The driver/defendant (D) will suffer no damages in either type of accident. Suppose that, to independently reduce the probability of *any* accident to zero, drivers could install a sensor on their cars at a cost of \$1100 each. Also suppose that, to independently reduce the probability of a minor accident to zero, pedestrians could buy special running shoes at a cost of \$400 each. Pedestrians have no means to reduce the probability of a major accident to zero. Finally, suppose that the hassle of going to court is so high that, when a minor accident occurs, pedestrians never sue, so there is never a resulting court case. Assume that all parties know all of this information with certainty.

a) [3 points] What is the efficient level of prevention, and what is the associated outcome? Explain briefly.

answer:

$$\text{social loss if neither invests} = 0.01 \times 100,000 + 0.2 \times 1000 = 1200$$

$$\text{social loss if only D invests} = 1100$$

$$\text{social loss if only P invests} = 400 + 0.01 \times 100,000 = 1400$$

The efficient level of prevention is therefore for only D to take care, since this minimizes the total social loss. The associated outcome is for there to be no accidents of *either* type.

[Note that this problem required no knowledge of punitive damages or the associated discussions and material from the end of the semester that I told you were not required. I admit that it was motivated by the story of scratches versus severe illnesses from canned food and the debatable role of punitive damages in achieving efficiency that we touched upon in a couple of the last classes. However, all of the relevant definitions are given in the question itself, and the calculation of social and private losses should be familiar from all of the other torts problems. The problem was quite well done on average, which is a great example and indication of how the tools we have developed over the semester are transferrable to more general situations and less familiar types of cases.]

Assume that courts always apply a “strict liability” rule, whereby drivers/defendants are automatically found to be negligent whenever an accident occurs and the case goes to court. The court therefore does not apply any negligence standard, but simply decides what damage payment that the defendant must make to the plaintiff.

b) [5 points] Suppose that courts only award “compensatory damages” in the amount of the true damages suffered by the specific plaintiff in the case. Will efficiency be achieved if all parties know this? Explain.

answer:

Drivers know for sure that they will be held liable in any court case, that they will never be sued following a minor accident, and that pedestrians cannot prevent major accidents. Putting all of this together, their expected private loss if they don't invest in prevention is  $0.01 \times 100,000 = 1000$  [i.e. the probability that they will be sued at all – 1% – times the compensation they will automatically be ordered to pay in that event], whether or not pedestrians also invest in prevention. Their private loss if they invest is 1100. So D will not invest, because this minimizes his private loss *regardless of what P chooses*.

[This is sufficient to be able to say that efficiency will not be achieved, since it is efficient for D to take care and we have just argued that D will not take care. But I required a full characterization of the outcome, including P's choice, for full points, or at least a conclusive demonstration of the independence of the choice of each side from the other side's choice.]

P's private loss from investing in prevention is 400, whether or not D invests [since major accidents will either not happen or will be fully compensated, and minor accidents will not happen if P invests]. P's maximum expected private loss from not investing in prevention is 200 [i.e.  $0.2 \times 1000$  if D doesn't invest, since both types of accidents will occur, but major accidents will be fully compensated when they occur]. So P will not invest, because this minimizes her private loss *regardless of what D chooses* [although, given the independence of D's choice, P is aware that D will not invest either].

Therefore, neither D nor P will choose to invest. So, no, efficiency will not be achieved.

c) [5 points] Suppose that courts award “compensatory damages” in the amount of the true damages suffered by the specific plaintiff in the case, as well as “punitive damages” in the amount of \$200 thousand. Will efficiency be achieved if all parties know this? Explain.

answer:

Again, drivers know for sure that they will be held liable in any court case, that they will never be sued following a minor accident, and that pedestrians cannot prevent major accidents. Putting all of this together, their expected private loss if they don’t invest in prevention is  $0.01 \times 300,000 = 3000$  [i.e. the probability that they will be sued at all – 1% – times the *total* compensation they will automatically be ordered to pay in that event], whether or not pedestrians also invest in prevention. Their private loss if they invest is 1100. So D will invest, because this minimizes his private loss *regardless of what P chooses*.

P’s private loss from investing in prevention is 400. P’s expected private loss from not investing in prevention is 0 [since she knows that D will invest and knows that his investment also prevents minor accidents]. So P will not invest, because this minimizes her private loss.

Therefore, D will choose to invest and P will not. So, yes, efficiency will be achieved.

[It might seem that punitive damage awards would entice pedestrians to start bringing minor accidents to trial; but this would only sharpen D’s incentive to invest, so that no huge awards would end up being paid out in any case. Regardless, I required the stated assumption of no minor accidents making it to trial to be carried through the entire problem for full credit.]

d) [5 points] Now assume that the cost of special running shoes falls to \$50 (and that they stay equally effective in terms of reducing the probability of minor accidents to zero). Continue to suppose that courts award “compensatory damages” in the amount of the true damages suffered by the specific plaintiff in the case, as well as “punitive damages” in the amount of \$200 thousand. Now will efficiency be achieved if all parties know this? Explain.

answer:

The choices of D and P are the same as in the previous part in substance. (P compares the new private cost of investment of 50 instead of the old private cost of investment of 400 to the expected private loss of 0 from not investing, but of course chooses not to invest regardless.) Therefore, D will choose to invest and P will not.

However, it is now efficient for only P to invest in prevention and for major accidents to continue happening at a 1% rate, as the associated social loss is  $50 + 0.01 \times 100,000 = 1050$ , which is lower than the [unchanged] social losses associated either with only D investing or with neither D nor P investing.

So, no, efficiency will not be achieved.