Dis 7: Tort Law [†]

1 Basics

- Languages of tort law:
  - **Tort**: Meaning injury or harm in French.
  - **Tort law**: Area of law that deals with injury / harm / accidents; specifically, tort law deals with situations where someone harms you without having made any promises beforehand.
  - **Plaintiff**: The party bringing a lawsuit (also known as a **victim**).
  - **Defendant**: The party being sued in a lawsuit (also known as an **injurer**).
- Components of tort law:
  - **Harm**: The plaintiff (victim) must suffer from being harmed (incurred a downward shift in victim's utility level set).
    - Harm can be **tangible** (property damage) or **intangible** (emotional damage). Though courts often are hesitant to award damages for intangible harms.
    - **Perfect compensation**: Restore victim to the level of utility before harm.
  - **Causation**: The defendant needs to have caused harm to the plaintiff.
    - **Cause-in-fact**: But-for test
      ("But for the defendant's actions, would the harm have occurred?")
    - **Proximate cause**: Actions by the defendant cannot be too distant in the past.
  - **Breach of duty (fault)**: It must be shown that the defendant breached a duty he owed to the plaintiff, and that this breach led to the harm.
    - Requisite standards of care may be explicitly specified by the law, or they may be vague (ex. reasonable care).
    - One way to determine level of due care: **whatever care level that is efficient**
      $\Rightarrow$ **The Hand rule** (by Judge Learned Hand in 1947): a party should be considered negligent whenever

$$\underbrace{B}_{\text{burden (costs of precaution)}} < \underbrace{P}_{\text{probability of accident}} \times \underbrace{L}_{\text{liability (costs of accident)}}$$

      Thinking in terms of margins:

$$\underbrace{w}_{\text{marginal (additional) cost of precaution}} < \underbrace{-p'(x)}_{\text{reduction in the prob of harm}} \times \underbrace{A}_{\text{harm done in the accident}=L}$$

      which is equivalent to the problem of finding the efficient level of precaution $x = x^*$.

[†] Adapted from Jonathan Becker's Fall 2018 handout

2 Accidents Between Strangers

- Various liability rules:
  - **No liability**: Neither the victim nor the injurer pays for an accident.
  - **Strict liability**: The injurer pays damages for any accidents they cause.
  - **Simple negligence**: Injurer is only liable if they breached the duty of due care.
  - **Negligence with a defense of contributory negligence**: Injurer owes nothing if the victim was also negligent.
  - **Comparative negligence**: If both parties were negligent, the cost is shared between defendant and plaintiff.
  - **Strict liability with defense of contributory negligence**: The injurer is liable (even if they weren't negligent), unless the victim was negligent.
- Comparing efficient precaution and efficient level of activity for liability rules:

	Injurer's Precaution	**Victim's Precaution**	**Injurer's Activity**	**Victim's Activity**
No liability	**None**	Efficient	**Too high**	Efficient
Strict liability	Efficient	**None**	Efficient	**Too high**
Simple negligence	Efficient	Efficient	**Too high**	Efficient
Negligence with a defense of contributory negligence	Efficient	Efficient	**Too high**	Efficient
Comparative negligence	Efficient	Efficient	**Too high**	Efficient
Strict liability with defense of contributory negligence	Efficient	Efficient	Efficient	**Too high**

The above results follow from the following four principles:

1. If you don't bear any of the cost of accidents, you have no incentive to prevent them.
2. If you do bear the cost of accidents, you'll do whatever you can to prevent them.
3. If you can avoid liability by exercising due care, you'll do it, but then you won't reduce activity.
4. If the other party can avoid liability through due care, you're the residual risk bearer, and you therefore exercise efficient precaution and engage in the efficient level of activity.

3 Problems

1. Suppose that I own a house, and it is my duty to shovel the sidewalk when it snows. Shoveling reduces the risk of a bike accident on the sidewalk from 1/10 to 1/100, but it costs me $5. A biker can choose to wear a helmet or not wear a helmet. Wearing a helmet costs a biker $3, but reduces the cost of a bike accident from $1000 to $500.

   (a) What is the efficient level of precaution for me and the biker to take?

   For efficiency, we look at the social value in each scenario. I can choose either to shovel (S) or not to shovel (NS) snow, and the biker could choose either to wear a helmet (H) or not to wear a helmet (NH), so there are four scenarios we need to think about.

   Let 0 be the normalized social surplus under no accident. Hence,

   - (S,H): Social surplus = -5 (cost of shoveling) -3 (cost of helmet) – 1/100 * 500 (expected loss from accident) = -13
   - (S,NH): Social surplus = -5 (cost of shoveling) – 1/100 * 1000 (expected loss from accident) = -15
   - (NS,H): Social surplus = -3 (cost of helmet) – 1/10 * 500 (expected loss from accident) = -53
   - (NS,NH): Social surplus = -1/10 * 1000 (expected loss from accident) = -100

   Clearly, the first scenario has the highest social surplus, so it is efficient for both I and the biker to take precaution.

   (b) What levels of precaution will the biker and I choose to take under:

   i. A rule of no liability?
   ii. Strict liability?
   iii. Simple negligence?
   iv. Negligence with a defense of contributory negligence?
   v. Comparative negligence?
   vi. Strict liability with defense of contributory negligence?

   i. Under a rule of no liability, I am not liable to pay the expected loss from accident in any of the four scenarios. The payoff table is:

	Helmet	No Helmet
Shovel	-5,-8	-5,-10
Not Shovel	0,-53	0,-100

   The unique Nash Equilibrium is (NS, H), which is inefficient.

   ii. Under strict liability, I am liable to pay the expected loss in all four scenarios.

	Helmet	No Helmet
Shovel	-10,-3	-15,-0
Not Shovel	-50,-3	-100,0

   The unique Nash Equilibrium is (S, NH), which is inefficient.

   iii. Under simple negligence, I am liable if NS.

	Helmet	No Helmet
Shovel	-5,-8	-5,-10
Not Shovel	-50,-3	-100,0

   The unique Nash Equilibrium is (S, H), the efficient outcome.

iv. Negligence with a defense of contributory negligence means that I am only liable in the scenario of (NS, H).

	Helmet	No Helmet
Shovel	-5,-8	-5,-10
Not Shovel	-50,-3	0,-100

The unique Nash Equilibrium is (S, H), the efficient outcome.

v. With comparative negligence, I am liable if NS, but in if the biker is also negligent (i.e. in the case of (NS, NH)), then my liability is reduced (say by half).

	Helmet	No Helmet
Shovel	-5,-8	-5,-10
Not Shovel	-50,-3	-50,-50

The unique Nash Equilibrium is (S, H), the efficient outcome.

vi. Strict liability with contributory negligence means that I am only liable if the biker chooses H.

	Helmet	No Helmet
Shovel	-10,-3	-5,-10
Not Shovel	-50,-3	0,-100

The unique Nash Equilibrium is (S, H), the efficient outcome.

2. (From Summer 2019 Final Exam)

In June, Madison BCycle starting renting electric-assist bicycles instead of regular pedal-powered bicycles. Consider a new e-bike rental service planning to enter the market. They are choosing between three models of electric bikes, with different top speeds: model A is the slowest, model B is faster, and model C is even faster. Faster, more powerful e-bikes are more expensive and more dangerous, but also more valuable to customers: if a customer gets value of X per month from a bike rental service offering model A, they get $X + \$7$ in value from model B, and $X + \$20$ from model C, before accounting for the higher risk of an accident. (Different customers have "different X" – different values of any bike service – but agree on the relative values of the different bike models.)

The value, costs, and risks associated with each model (for "customer X") are summarized here:

Bike model	Top speed	Value to consumer, per month (X varies across customers)	Average cost to company (per customer per month)	Risk of an accident (per customer per month)
A	17 mph	X	\$3	1 in 150
B	25 mph	$X + 7$	\$5	1 in 50
C	34 mph	$X + 20$	\$7	1 in 10

Suppose that the average e-bike accident does \$300 worth of harm to the rider (and no harm to anyone else), and that the e-bike rental market will be perfectly competitive. For now, suppose the company will be liable (under a strict liability rule) for any accidents their riders get into.

(a) What is the efficient bike model for the rental company to offer? Why?

Efficiency requires us to maximize social surplus. Here, let's start off considering that the society only has one individual X. This means that social surplus

- For choosing model A $= X - 3 - \frac{1}{150} \times 300 = X - 5$
- For choosing model B $= (X + 7) - 5 - \frac{1}{50} \times 300 = X - 4$
- For choosing model C $= (X + 20) - 7 - \frac{1}{10} \times 300 = X - 17$

So when we have one consumer in the society, choosing model B is clearly efficient.

Now, what about us having more than one consumers (say, n in total) in the society? To calculate social surplus at this scale, notice that the social surplus we calculated for one individual's scenario now basically has units of "per customer per month". Meaning that we can simply integrate the individual surplus to find the social surplus level:

$$\text{social surplus} = \sum_{i=1}^{n} (\text{surplus per customer per month})$$

Hence,

- For choosing model A $= \sum_{i=1}^{n} (X_i - 5) = (\sum_{i=1}^{n} X_i) - 5n$
- For choosing model B $= \sum_{i=1}^{n} (X_i - 4) = (\sum_{i=1}^{n} X_i) - 4n$
- For choosing model C $= \sum_{i=1}^{n} (X_i - 17) = (\sum_{i=1}^{n} X_i) - 17n$

With all first terms being the same, it's clear that $-4n > -5n > -17n$, so model B is the efficient bike model for the rental company to offer.

(Intuitively, without going through the additive argument for social surplus, you can instead state that the individual surplus we calculate is "for every customer". So, if producing model B yields the highest surplus for every single customer, then surely model B will be the efficient option.)

(b) Which model bike would the company choose to offer? Why?

Under a strict liability rule, the company's private costs for each model match the social costs, so the company will choose efficiently. That is, the company will choose model B.

(c) What would be the monthly price of an e-bike rental service under perfect competition? Would the demand for e-bike rentals be the efficient level, higher, or lower? Why?

Under a strict liability rule, the firm is liable for any accidents. Now, the expected cost of accidents under model B is $\frac{1}{50} \times 300 = 6$. Since the industry is perfectly competitive, the price charged by the firm should equal to its marginal costs. Here,

$$\begin{aligned}\text{Marginal costs} &= \text{Marginal operational costs} + \text{Marginal costs of expected liability} \\ &= 5 + 6 = 11\end{aligned}$$

So the monthly price that would be charged by the firm is \$11.

Demand would be the efficient level, since customers whose value of a Model B rental is above \$11 would choose to rent, which is exactly the efficient level of demand. (Since price equals the firm's cost equals social cost, customers internalize the full social cost when deciding whether to rent, so they rent efficiently!)

(d) Would your answers to (b) and (c) change if each e-bike accident did \$300 worth of harm to random pedestrians (non-customers) instead of to the riders (customers) themselves? Explain.

The answers would not change. The company would still bear the cost of accidents, and would therefore still build them into prices, so customers would still internalize the full social cost of renting, leading to the efficient bike model and the efficient level of demand.

Now suppose instead that bike rental companies will not be liable for accidents that riders get into, but that customers correctly understand the risks of riding the different e-bikes.

(e) What is the efficient bike model for the rental company to offer? Why?

Model B would still be efficient; who bears the cost of accidents does not affect what's efficient.

(f) Which model bike would the company choose to offer? Why?

Firm will choose whichever model that customers demand. Here, customers bear the costs of accidents, so per customer per month, we can calculate customer's surplus

- For model A $= X - \frac{1}{150} \times 300 - 3 = X - 5$
- For model B $= (X + 7) - \frac{1}{50} \times 300 - 5 = X - 4$
- For model C $= (X + 20) - \frac{1}{10} \times 300 - 7 = X - 17$

which is exactly the calculation we did in (a)!

This makes sense, since now customers fully internalize all costs, so their costs equal to social costs. Based on customer's surplus, they will demand model B, which means the firm will offer model B.

(g) What would be the price of the bike rental service? Would demand be the efficient level, higher, or lower? Why?

\$5, since now the company doesn't have to pay for accidents.

Demand would still be efficient, however, since the cost to the customer (including the risk they bear) matches the social cost.

(h) Would your answers to (f) and (g) change if each e-bike accident did \$300 worth of harm to random pedestrians (non-customers) instead of to the riders (customers) themselves, and neither the bike rental company nor the customer was liable for the harm? Explain.

Yes, these would change. If neither the company nor the rider bore the cost of accidents, then customer's surplus are

- For model A $= X - 3$
- For model B $= (X + 7) - 5 = X + 2$
- For model C $= (X + 20) - 7 = X + 13$

Customer will then demand model C, and the company would only charge \$7. Here, demand would be above the efficient level, because customers would not internalize the externality they were imposing on pedestrians.