Dis 3: Property Law [†]

1 Review: Property Law Concepts

- How to design an efficient property law system?

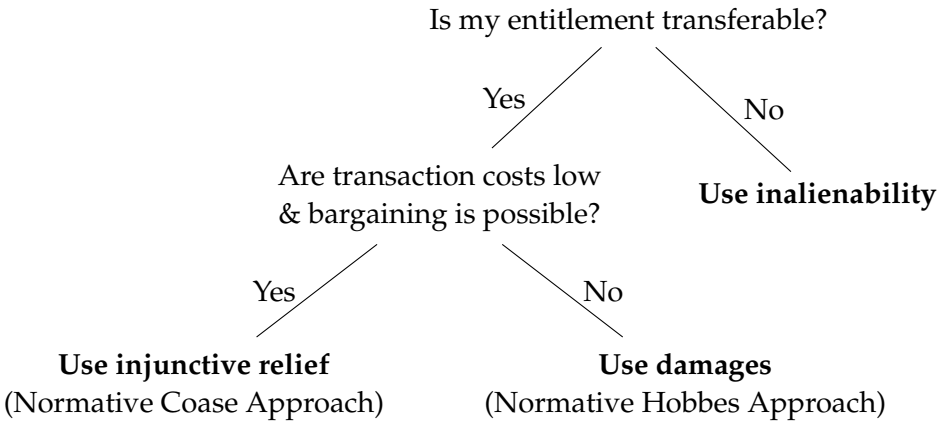
Goal	How To
Assign the ownership of rights efficiently	Private goods are privately owned; public goods are publicly owned
Allow owners to do efficient amount of things within their rights	Maximum liberty
Establish property rights efficiently	First possession vs. Tied ownership
When rights are violated, give out efficient remedies	Property rule vs. Liability rule vs. Inalienability

- Principles of establishing ownership
  - **First possession:** First person to capture a resource owns it (ex. Whoever kills a fox owns it)
    - Pro: Relatively simple to determine who possessed the property first.
    - Con: Incentivize people to enegage in preemptive possessory acts.
  - **Tied ownership:** Ownership is tied to something else to clear the property rights (ex. Whoever started chasing the fox first owns it)
    - Pro: Encourage efficient use of the resource.
    - Con: Difficult to establish and verify ownership rights (i.e. Costly to administer)
- Remedies for violation of entitlement
  - **Property rule / injunctive relief:** Violation of my entitlement is punished as a crime, but my entitlement can be transfered
  - **Liability rule / damages:** Violation of my entitlement is compensated, in the amount approximating the harm
  - **Inalienability:** Violation of my entitlement is punished as a crime, and my entitlement cannot be transfered

    Why do we want to use inalienability? Because the following exists:
    - **Allocative externalities:** Wrongfully allocated items incurs externalities to non-bargaining parties (ex. Selling enriched uranium leftover from experiments to a terrorist)
    - **Indirect externalities:** Some complementary markets are affected by the trades in another market (ex. Human organs)
    - **Paternalism:** Regulating conduct when people cannot be trusted to make optimal decisions (ex. Child selling kidney for an iPad)
    - **Repugnant markets:** markets that are illegal because people think they are repugnant

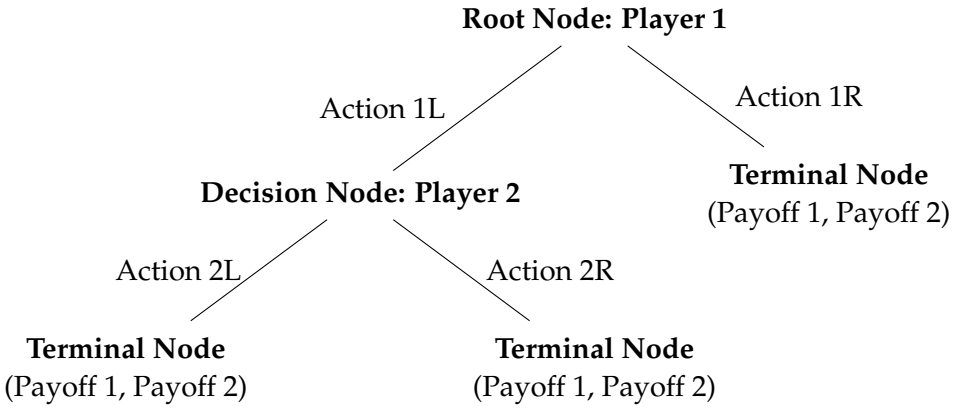
[†] Adapted from Jonathan Becker's Fall 2018 handout

When are each of these remedies efficient? (as a general rule of thumb)



2 Review: Extensive Form Games

- Components in an extensive form game:



- Assumptions:
  - **Common knowledge of rationality:** Players are rational. All players know that all players are rational. All players know that all players know that all players are rational ...
  - **Principle of sequential rationality:** When a player can count on the other players to behave rationally from any point forward.
- Solution:
  - **Subgame-Perfect Equilibrium (SPE):** When an equilibrium satisfies sequential rationality, we call it Subgame-Perfect.

    SPE require that all players play best-responses (Nash Equilibria) in each subgame.
  - **Backwards Induction:** Using rational belief about opponents' actions in future subgames to determine actions in the current subgame.

    That is, going from the last-stage subgame, figure out player's action based on payoff, then going backwards to see what the player would do one more stage before.

    Iteratively going backward gets us to the SPE.

3 Problems

1. (Adam the heavy smoker, continued)

   Adam is a heavy smoker. He obtains utility as a function of the number of cigarettes (X) he smokes and the amount of money (m_A) he has:

   $$U_A = 36X - 2X^2 + m_A$$

   The costs of smoking X cigarettes are $C(X) = X^2$.

   Bob, who is Adam's roommate, detests smoking. His utility is a decreasing function in the number of cigarettes Adam smokes:

   $$U_B = 128 - X^2 + m_B$$

   where m_B represents the amount of money Bob has.

   Assume that Adam and Bob each starts with a sufficiently large amount of money M, such that their budget constraints never bind.

   From last week's discussion, we learned the following:

	Adam has property rights, Bob attempts bargaining	Bob has property rights, Adam attempts bargaining
Pre-bargaining X	$X = 6$	$X = 0$
After-bargaining X	$X = 4.5$	$X = 4.5$
Adam's threat point	$U_A(X = 6, M - C(6))$ $= 108 + M$	$U_A(X = 0, M - C(0))$ $= M$
Bob's threat point	$U_B(X = 6, M)$ $= 92 + M$	$U_B(X = 0, M)$ $= 128 + M$
U_A after bargaining	$U_A(X = 4.5, M - C(4.5) + S)$ $= 101.25 + M + S$	$U_A(X = 4.5, M - C(4.5) - S)$ $= 101.25 + M - S$
U_B after bargaining	$U_B(X = 4.5, M - S)$ $= 107.75 + M - S$	$U_B(X = 4.5, M + S)$ $= 107.75 + M + S$
Range of transfers S	$6.75 \leq S \leq 15.75$	$20.25 \leq S \leq 101.25$
If gains split evenly	$S = 11.25$ $U_A = 112.5 + M$ $U_B = 96.5 + M$	$S = 60.75$ $U_A = 40.5 + M$ $U_B = 168.5 + M$

   (a) What happens when Bob has the property rights, and there is no impediment to bargaining? Fill in the blanks.

Bob has the exclusive property rights to the apartment. If Adam does not bribe him, Bob will naturally choose to let Adam smoke zero cigarettes. This way, Bob gains a utility of $128 + M$, and Adam gains a utility of M. So Bob's threat point is $(128 + M)$, and Adam's threat point is M.

By Coase Theorem, bargaining should lead to the efficient outcome in this case, which is Adam smoking 4.5 cigarettes.

Let S be the amount of bribe that Adam pays Bob. After the bargaining, Adam has utility $36 \times 4.5 - 2 \times 4.5^2 + M - S - 4.5^2 = 101.25 + M - S$, and Bob has utility $128 - 4.5^2 + M + S = 107.75 + M + S$. Each person's utility must exceed his threat point. So we need:

$$101.25 + M - S > M$$
$$107.75 + M + S > 128 + M$$

Or $20.25 < S < 101.25$. The value of the total surplus is $101.25 - 20.25 = 81$. Assuming that the surplus is split evenly, $S = (101.25 + 20.25)/2 = 60.75$. Adam gets utility $40.5 + M$. Bob gets utility $168.5 + M$.

(b) Who should have property rights to the apartment according to Normative Coase approach? Who should have property rights to the apartment per Normative Hobbes approach?

Normative Coase approach requires the law to minimize transaction costs and to "lubricate" bargaining. Under this approach, it does not matter who owns the apartment, since bargaining between Adam and Bob will always lead to the efficient outcome by the Coase Theorem.

Normative Hobbes approach assumes that transaction costs are so high that bargaining is impossible. In this case, the law should be structured to allocate property rights to whoever values them the most.

Assuming no bargaining, Adam's utility gain from owning the apartment is $(108 + M) - M = 108$, while Bob's utility gain from owning the apartment is $(128 + M) - (92 + M) = 36$. Clear, it is better to award the property rights to Adam.

Another way is to think in terms of efficiency. If Adam has the property rights, then $X = 6$, and the total utility of Adam and Bob is $(108 + M) + (92 + M) = 200 + 2M$.

If Bob has property rights, then $X = 0$, and the total utility is $M + (128 + M) = 128 + 2M$. It is clearly more efficient to let Adam have the property rights ($X = 6$), even though it is not the most efficient outcome ($X = 4.5$).

Bob sues Adam to the court. The judge could give out one of the three rulings: injunction relief, damages, or ruling in favor of Adam.

(c) Suppose that Adam and Bob can negotiate. Which ruling is efficient? What happens under each ruling scenario? (Assuming that all surpluses are evenly split.)

If Adam and Bob can bargain, then by Coase Theorem every ruling will reach the efficient outcome $(X = 4.5)$.

Injunction relief: this ruling says that Bob has property rights, and Adam cannot smoke unless Bob is willing to give up his rights. Essentially, this is the case in the second column of the table above (Bob has property rights; Adam attempts bargaining). So the money transfer would be \$60.75. $U_A = 40.5 + M$. $U_B = 168.5 + M$. Bob clearly prefers this scenario.

In favor of Adam: the court gives the property rights to Adam (smoker's rights). This is the case in the first column of the table above (Adam has property rights; Bob attempts bargaining). So

the money transfer would be \$11.25. $U_A = 112.5 + M$. $U_B = 96.5 + M$. Adam clearly favors this scenario.

Damages: the court says that Adam can smoke as much as he wants $(X = 6)$, but he must compensate Bob for the damage caused.

To figure out the amount of damages Adam should pay to Bob, notice that damages should make Bob as well off as if his rights are not violated:

$$\begin{aligned} U_B(X, m_B = M + D) &= U_B(X = 0, m_B = M) \\ 128 - X^2 + M + D &= 128 + M \\ D(X) &= X^2 \end{aligned}$$

Notice that the amount of damages also depends on X. In this case, Adam can choose X and so choose the amount of damaged paid to Bob. Adam's individual utility maximization question thus becomes:

$$\max_X \left\{ U_A = 36X - 2X^2 + M - C(X) - D(X) \right\}$$

Solving for this maximization problem, we have the optimal choice of $X = 4.5$, which is the efficient quantity. Essentially, the damage rule causes Adam to internalize the negative externality of smoking.

In conclusion, all measures will result in the efficient outcome.

(d) Suppose that Adam and Bob refuse to talk to each other and will simply carry out the court rulings. Which ruling is then more efficient?

Injunction relief: Bob has property rights, and Adam is forbidden to smoke. Essentially, we have $X = 0$, and the total utility is $M + 128 + M = 128 + 2M$.

In favor of Adam: Adam has property rights, and $X = 6$. The total utility is $108 + M + 92 + M = 200 + 2M$.

Damages: We know that damages to Bob is X^2. But suppose that the court might not be fully aware of this information, and decided on damages $D = \alpha X^2$ (i.e. The court knows that harm to Bob grows quadratically, but doesn't know the exact scale of the harm).

Once we plug these damages into Adam's utility function, we get:

$$\begin{aligned} U_A &= 36X - 2X^2 + M - X^2 - \alpha X^2 \\ &= 36X - (3 + \alpha)X^2 + M \end{aligned}$$

Taking the first order condition gives $X = \frac{36}{6+2\alpha}$ which is only efficient when $\alpha = 1$, but always yields a *more efficient* result than injunction relief.

Clearly, smoker's rights and damages are more efficient than an injunction relief ruling, even when damages are poorly estimated. As we saw in class, injunction reliefs are rarely very efficient when bargaining is not possible.

2. (Adapted from Pedro Guinsburg's Fall 2016 handout)

   Gary owns the only bar in a village, and he makes about $2000 a month. One of his workers, Amy, is not happy with her $300 wage, and is thinking about leaving and opening her own bar.

   If Amy stays, Gary has two choices:

   - Give her a $200 raise, or
   - Pay her the same

   On the other hand, if Amy decides to leave, Gary can choose between:

   - Fight: compete with Amy and lower prices, in this case Gary will get $600, and Amy gets $200.
   - Share: share the market with Amy, in this case Gary will get $1200, and Amy gets $1000.

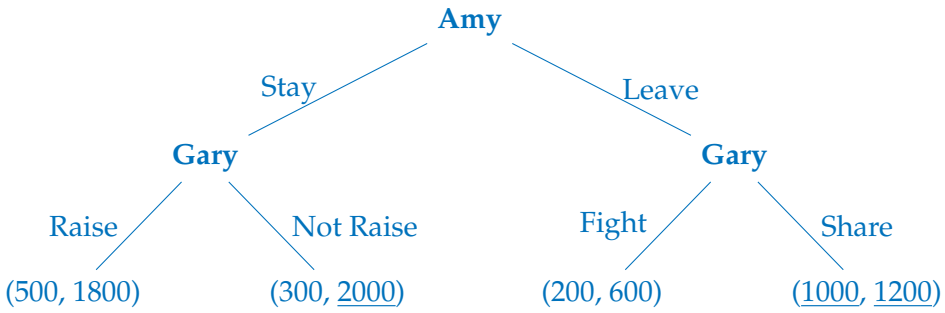
   (a) Find all (pure strategy) Nash equilibria.

   Let Amy be player 1, Gary be player 2. Amy has two pure strategies (stay, leave). Gary has four pure strategies (raise-fight, raise-share, not raise-fight, not raise-share)

	Raise-Fight	Raise-Share	Not Raise-Fight	Not Raise-Share
Stay	(500,1800)	(500,1800)	(300,2000)	(300,2000)
Leave	(200,600)	(1000,1200)	(200,600)	(1000,1200)

   So there are three equilibria: (Stay, Not raise-fight), (Leave, Raise-share), (Leave, Not Raise-share).

   (b) Find all (pure strategy) Subgame-Perfect Equilibria.



   Use backward induction, we see that

   - Gary will raise Amy's wage if Amy stays ($2000 > 1800$)
   - Gary will share the market if Amy leaves ($1200 > 600$)
   - Going back one more level, Amy knows that if she stays, she will get a payoff of 300; if she leaves, she will get a payoff of 1000. So she will choose to leave.

   Thus, the unique SPE is (Leave, Not Raise-Share).