Law and Econ Handout 3: Ownership and Law Enforcement as Solutions to Conflict, Commons, and Externality Problems.

I. The Productivity of Property Law

A. Ordinary economic exchange is in many respects an ideal model of interactions between individuals. Exchange only takes place when both parties expect to benefit--that is to say when each person values the thing received more than the thing given up.

i. In a pure barter economy, exchange requires what is called a coincidence of wants and well enforced property rights.
  - The usual diagrammatic representation of the mutual gains from trade is the Edgeworth box.
  - [Illustrate]
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ii. In the abstract models used by economists, the price system alone is often sufficient to generate efficient outcomes at which all potential gains from trade are realized.
  - That is prices induce sellers to bring supplies to the market in the pursuit of profit and causes buyers to arrive with the expectation of personal gains from trade (CS).
  - The traders in an "Edgeworth Box" simply maximizes their own utility by attempting to get the best combination of goods (the utility maximizing combination), given market prices.
  - The prices are often, in effect, simply called out by "the auctioneer" they make decisions about whether buying or selling most advances their interest.
  - However, in the real world the alternatives may not be limited to the simply "buy" or "sell" alternatives of an Edgeworth box.

iii. To limit choices to such "legal" choices implies that trades take place in a legal environment in which both modern Western property rights and contracts are enforced.
  - The existence of an external regime of laws is implicit in essentially all economic analysis.

B. In order to understand the contribution that property rights makes to economic development, let's consider first what might be called the **Hobbesian dilemma** (named after an English Philosopher from the 1600's, Thomas Hobbes).

i. Suppose that Al and Bob interact in a setting in which property rights are not enforced, so there is no penalty associated with attempting to steal property from one another.

ii. To simplify, suppose that each person controls several his or her own labor and can use that labor to either harvest nuts or to attempt to steal nuts gathered by the other person in the community and/or to protect his or her nuts from theft..
  - To simplify even further assume that there are 4 blocks of time and that the use of time to defend one's own nuts or steal from the other are equally productive.

iii. This setting can be represented with a game matrix that is very similar to a Prisoner's dilemma game, although it has more than two strategies.

	Hobbesian Dilemma			
	Bob's effort stealing or defending			
Al's effort	0 hours stealing	1 hour	2 hours	3 hours
0 hours	12, 12	6, 13	3, 14	0, 15
1 hour	13, 6	9, 9	4, 10	1, 12
2 hours	14, 3	10, 4	6, 6	2, 7
3 hours	15, 0	12, 1	7, 2	3, 3

Payoffs are in bags of nuts, net benefits, or utility.

iv. Since each person has an interest in maximizing their income (net benefits, utility), each person turns out to invest 3 hours in stealing nuts from the other or defending their nuts from the other.
   • The result is a dilemma because too little time is invested in harvesting nuts.
   • The total output at the Nash equilibrium is 3,3 which is far below that associated with no stealing.
v. The dilemma is that each would be better off if each had spent all of their time gathering nuts rather than protecting their stash or stealing from the other.
   • Many of the alternative payoff combinations are Pareto superior to the Nash equilibrium!
vi. Escape from this dilemma will require a change in incentives.
   • Note that simply agreeing not to steal is not credible, because each has strong incentives to cheat on the agreement.

C. One possible solution would be to "hire" a property right enforcer to punish persons whenever they spend time stealing.

i. Note that Al and Bob can afford to pay for the enforcer up to 14 bags of nuts for a solution to their Hobbesian dilemma. (Explain why.)
ii. Note also that a penalty for stealing of just **3 bags of nuts per hour** would be sufficient to discourage theft in most cases.
iii. To see this, assume for for now that every hour of theft is punished. This produces a new game with different payoffs and a new Nash equilibrium. At the new equilibrium no theft (or very little theft) takes place.
   • As an exercise write down the payoff matrix associated with this 3-bag penalty scheme.
   • Find the Nash equilibria (there may be more than one).
   • Determine whether the equilibria are Pareto efficient or not.
   • If they are, then the dilemma has been solved.
   • Is there a smaller fine that could have acheived the same result?
   • How is the smallest effective fine affected by imperfect enforcement?

D. This system effectively creates "ownership" in the bags of nuts that one produces, but not for bags of nuts that one steals.

  i. The enforcer does not really PREVENT Bob from stealing Al's nuts or vice versa, but rather imposes penalties that discourage theft. And so, protects both Al and Bob's property.

    • Indeed, given rule and the enforcement, it could be said that the law establishes property. In this case, the law and its enforcement creates very basic property right system in which the producer of wealth controls it (net of required payments to the enforcer).

  ii. This law increases society's wealth, even though it is not an ordinary input into production, and even though law enforcement is costly.

    • GNP increases from 6 to 20 (less the fee to the enforcer).

    • And, personal wealth or income increases from 3 to 10 (less their share of the enforcer fees).

    • Note also that in equilibrium no fines are collected in the community in the case modeled.

    • (In more complicated games [non-symmetric ones] the same expected fine might not prevent all criminal activity. Explain why.)

E. This property right solution to the Hobbesian dilemma clearly solves the immediate problem.

  i. However, but there is unfortunately the problem of enforcing the contract with the enforcer.

    • An organization that is strong enough to enforce this law may be able to simply take Al and Bob's production for himself.

  ii. How does one avoid this problem?

    • This is a problem in Constitutional theory, which we will ignore until later in the course, but do keep it in mind.

    • Constitutions often include other procedures through which government agents are punished including fines, jail time, and simply losing office.

    • It is also possible that property systems may emerge even within fairly "nasty" enforcers, who create property right systems to profit from them. In such case, the controling the enforcer problem is not solved, but simply lived with.

F. A Digression on Pareto's norms: The normative theory developed by Vlfredo Pareto characterizes the PD problem very well. *The Pareto Criteria may be defined as:*

  i. Let A and B be "states" of the world (distributions of income, production, locations etc...) A is said to be *Pareto Superior* to B if and only if at least one person prefers A to B and no one prefers B to A. A Pareto superior move makes at least one person better off and no one worse off.

  ii. State A is said to be *Pareto Optimal* (or Pareto Efficient) if and only if no Pareto Superior moves are possible.   That is to say, a state of the world is Pareto efficient is there is no way to make one person better off without making someone else worse off.

  iii. Note that in the PD game, the PD solution (Nash equilibrium) is not Pareto Optimal. *The situation where neither testified (where they cooperated with each other) is Pareto Superior to the PD result.*

- Puzzle: how many Pareto efficient outcomes can there be to a two person three-strategy game?
- Depict a social opportunity set in utility terms for two persons. Identify the Pareto frontier, and choice a point from which Pareto superior moves are possible.

II. Property Rights as Solutions to Commons Problems

A. There are many other social dilemmas where the result of private optimization is less than the best that can be achieved by all affected parties. Many of these can also be solved by laws that establish "legal rights" of various kinds.

B. Another example of an externality problem that helps to explain the emergence of property rights (the right to exclude), is the commons problem ("tragedy of the commons")

i. The tragedy of the commons involves the excess use of a resource that is freely available to all who wish to use it.
- This is not the same problem analyzed in the Hobbesian example, because the resource of issue is initially used by all who wish to use it.
- For example, in medieval Europe there were often common pasture lands or forests that could be used by the peasants for their own cattle or firewood.
- Note that air and water supplies are often used as commons these days. They are freely available to all that wish to use them.
- The oceans largely remain "commons" for fishing firms.

C. The **commons problem** arises when a common resource is *over* utilized in equilibrium, that is used at a rate that diminishes its overall output.

i. This excess usage tends to happen because individual users bear only part of the cost of using the common.
ii. Each user's use reduces somewhat the reduced productivity other persons using the commons, but this cost can be ignored by all users when they make their decisions.
- That is to say, a negative externality problem occurs, and the result is over usage.

The Tragedy of the Commons		
Herd Size	Bob: Small Herd	Bob: Large Herd
	A, B	A, B
Al: Small Herd	3, 3	1, 4
Al: Large Herd	4, 1	2, 2

D. Analysis of the Illustration:

  i. Note that regardless of what Bob does, Al has an incentive to place a large herd on the commons. Note that 4>3 and 2>1. (Use vertical comparisons for Al)

  ii. Similarly, regardless of what Al does, Bob has an incentive to place a large herd on the commons. Again 4>3 and 2>1. (Use horizontal comparisons for Bob's payoffs.)

  iii. Thus both Bob and Al will graze large herds and the pastures output of beef falls to 4 (2+2) from 6 (3+3).

  iv. [The commons problem can be considered to be a special case of the "Prisoners Dilemma Game."]

  v. Note that there are potential gains to trade that both Al and Bob could realize if they could each agree to restrain themselves from placing larger herd sizes on the commons.

  vi. On the other hand, if they agree to place small herds on the commons, each may cheat--note that there remain incentives for each to graze large herds on the commons.

  vii. [Illustrate this with a total and average product table for the pasture as a whole.]

E. This land management problem can addressed by "privatizing" the commons.

  i. Privatizing gives complete control over a particular parcel of land, or other resource, to a single individual, group, or firm.

- The "owner" or "controller" will have the right to use the resource in a broad variety of ways and have the right to exclude others from that resource.
- In this way, the resource becomes that person's property.
- Note that this is another economic justification for an "ownership" type of rights system.
- Again, as in the Hobbesian case, that right will have to be enforced.
- That is, trespassers will have to be punished in some way to discourage "theft" or "theft of services" in this case.

  ii. The individual or firm given control has private reasons to maximize output from his/her resources (property). Increases in output normally increases wealth, which increases one's opportunity set and utility (net benefits).

- "Owners" will choose the herd size on their pasture that maximizes output.
- By dividing the commons up and granting control over the various pieces to individuals or small groups, the "commons externality" is eliminated in this case.
- And, output from the former commons (lake, field, forest, etc) is maximized.
- In cases where there are no other externalities, the result can be very efficient, although so far we have not provided an explanation for "tradable property rights.

  iii. (I believe this to be one of the main reason for property rights of this sort--whether they include the right to exchange those rights or not.

- For much of world history, the right to exchange such rights was far less common than the right to exclude others from a resource.

F. Underlying Economics: Maximizing Output from a Natural Resource

i. The "commons game" examined above is a simplifications of the actual structure of commons problems. Generally, more than two person are involved, and each person has more than two utilization rates. However, the main logic of the setting is illustrated in the simple 2x2 game.

ii. The payoffs in a common game are determined by the productivity of the common resource. For a given technology, any finite resource has a maximum output, and consequently an output-maximizing rate of use (heard size, annual timber harvest, catch, etc.).

  • A commons problem emerges when a communal resource (grazing area, wood lot, fishing area, river, lake, air ...) is over used in the sense that **equilibrium** total output from the resource **is lower than it can be**.

  • The above "commons" game illustrates that such over use can be individually rational, in the sense that no person has an incentive to alter their strategies (use rate) given the others.

iii. The connection between individual choices about use rates (herd size, timber harvest, catch, effluent removal, ...) **can be made sharper by specifying a production function** for the resource of interest, and then finding out the payoffs received from various combinations of use rates by individual herdsman, lumberjacks, fisherman, polluters, etc.

  • It is the production function for the commons that generates the payoffs for commons users.

  • (1) Assume a production function for a common resource (field, forest, lake, etc.) and further assume that it has a maximum output. (To keep your illustration manageable it should occur towards the middle of the game matrix that you will develop.)

  • (2) Use the production function to determine the average output from the commons with different numbers of inputs (head of cattle, fishing boats, etc)

  • (3) Calculate the payoffs for each player in each cell. Remember that every unit of input is average and that the total number of inputs is the sum of the inputs of both players for the cell of interest. The total number of inputs determines the average product for the cell, the payoffs are simply each player's own number of inputs time that average product.

  • (4) Determine the Nash equilibium (or equilibria) of the game.

  • Determine whether the result is Pareto optimal or not. If not, there is a commons problem.

  • [Note that note every commons produces a problem--especially in discrete forms of the game.]

iv. [**See the class notes or website for a matrix representation of this and/or class notes** for an example of this. Redo the example using a different production function. To develop a multi-strategy production-function-based version of a commons problem:

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v. Puzzles

  • Many economists advocate the privatization of all current communal resources, such as rivers and lakes. Discuss how such privatization can potentially solve commons problems.

  • Discuss other problems that might be associated with selling a major river, say the Monoga-hela to a single owner.

  • Are there cases where privatization will not solve a commons problem? Explain why?

G. These two examples demonstrate that societies that adopt legal systems in which (i) producers have rights to their output but not to items stolen and (ii) in which land use rights are assigned to individuals or small groups (to exclude and use) will tend to be more prosperous than societies without those rules.

  i. In societies that live at the margins of survival, long run prosperity is important, because it helps support healthier populations and provides a "surplus" that can be used to provide local services (such as enforcing these laws and defending their community from outside raiders).

   • The success of such communities will be copied by many others, which causes effective rules to spread throughout a region--or throughout the world.

  ii. It is interesting to note that such rights are very widely used, but in many places the right to use and exclude were not always combined with the right to sell.

  iii. These rights were more common for things that were produced (agricultural products, pottery, etc) than for land. We will provide a possible explanation such rules in the next section of the course.

   • A classic example of land "ownership" without the right to sell is the strip farms of medieval society.

   • Another is the manner in which rights to offices in business operate, in which the person with his or her name on the door has the right to use and exclude, but not to sell the office.

   • Similar rights packages are also obtained by renters.

   • The models that we explored above provide an economic rational for such rights systems.

H. We will next turn to an economic explanation of tradable rights and begin discussion problems associated with enforcing rights systems.

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III. Appendix A: Laws and Law Enforcement as a Basis for Forming a "Productive States"

A. Regional governments can be thought of as an organization with the ability to create and enforce rules within a given territory.

B. One common theory of the emergence of government is based on the above sorts of conflict, commons and externality problems.

  i. People recognize that independent private decision making is not generating as good a result as they can imagine.

  ii. So they band together and coordinate their activities.

  iii. Such individuals might voluntarily agree to create an organization with the power to coerce certain forms of behavior to solve various PD-like problems of life in a community.

   • As shown above, collective enforcement of property rights can mitigate "the Hobbesian dilemma" and the "tragedy of the commons."

   • Other basically similar problems can also be solved through such organizations. Many of these can be solved by establishing general rights.

C. Obviously, if a group undertakes to form a government, they must also make some decisions about how collective choices will be made.

  i. Even if there is unanimous agreement to provide a particular service, or enforce some property right or rule, there may not be unanimous agreement about the level of service or enforcment that is appropriate, or best.

  ii. Appointing one person, a "czar" or dictator, to make decisions in a particular area is one solution to this, but still the person appointed needs to be chosen, and some method for replacing him or her would, in most cases, be another collective concern.

  iii. Majority rule is one possible rule for making such choices or for selecting government officials. We will analyze such constitutional issues later in the course.

  iv. The *social contract* theory of the state argues that individuals may agree to be coerced (fined or otherwise penalized for free riding) as a necessary part of over coming free riding problems in the team production and in the production of public goods.

- In such cases, a government (law enforcing institution) is created as productive joint enterprise, through the voluntary agreement of all affected parties.
- That is, there is a sense in which submiting to coercion can be a voluntary act.
- Such governments are said to be formed by social contract.
- (Note that private clubs usually operate on a voluntary basis, but have rules and procedures for enforcing them.)

D. Some Quotes on the Emergence of a Productive State through a Social Contract:

On the nature of anarchy: from Thomas Hobbes, *Leviathan* (1651)

"Whatsoever therefore is consequent to time of Warre, where every man is Enemy to every man; the same is consequent to the time wherein men live without other security than what their own strength, and invention shall furnish them withal. In such condition .. the live of man [will be] solitary, poor, nasty, brutish and short.

From James Buchanan, *Limits to Liberty*, 1975.

"The state serves a double role, that of enforcing constitutional order and that of providing "public goods." This duality generates its own confusions and misunderstandings. "Law," in itself, is a "public good," with all the familiar problems in securing voluntary compliance. Enforcement is essential, but the unwillingness of those who abide by law to punish those who violate it, and to do so effectively, must portend erosion and ultimate destruction of the order that we observe. These problems emerge in modern society even when government is ideally responsive to the demands of citizens. When government takes on an independent live of its own, when Leviathan lives and breathes, a whole set of additional control issues cone into being. "Ordered anarchy" remains the objective, but ordered by whom? Neither the state nor the savage is noble, and this reality must be squarely faced.

IV. APPENDIX B: The Extractive State: an Alternative Model of the Emergence of Property Rights

A. Before moving on, it is worth considering another theory of the emergence of the state and state services.

B. Mancur Olson notes that a good deal of what we have historically observed as governments have been significantly different than the voluntary model noted above. Many do not appear to have a contractual basis, but rather seem to "extract" revenues from their citizens to advance their own purposes.

> From Mancur Olson, "Anarchy, Autocracy and Democracy" (1991)
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> "The conqueror of a well defined territory has an encompassing interest in that domain given by the share of any increase in the territorial income that he collects in taxes. This encompassing interest gives him an incentive to maintain law and order and to encourage creativity and production in his domain. Much of the economic progress since the discovery of settled agriculture is explained by this "incentive."

C. He proposes an alternative model of the emergence of regional governments, based on the quite different incentives of "roving" and "stationary" bandits. His argument is the following:

i. Suppose that initially, there are a several roving bandits, each with sufficient power to sweep through a farm, village, or town, and steal what ever they want to.

ii. (This may be thought of as a pleasant life for the traveling bandit: of considerable riches travel and camaraderie.)

iii. Obviously, the problem is not the lifestyle of the roving thieves but with the impact of these thieves on their victims.

  a. The victims might organize for their own defense. That is to say they may form a productive state, to build high walls, and guard the gates, to keep the bandits out.

  b. But if they do not, obviously incentives for investment and saving are limited. Why save if you know that whatever you put aside for the future will be taken by a roving bandit before you get to use it?

  c. Thus, farmers, merchants, and other productive people, would produce and save less than they would have in the absence of some form of protection from the roving bandits.

  d. (Show this with an expected benefit expected cost diagram.)

iv. Another possible escape from the roving bandit dilemma is suggested by Mancur Olson.

- If no productive state or defense organization can be put together by the victims, it is possible that a very clever Bandit might realize that if he were to take over an area and exclude other thieves from that area he might be wealthier.

- The *advantage of being a stationary bandit* comes partly from reducing the number of thieves who are trying to steal from the same group of potential victims. Rather than ten bandits "sharing" the "take" from a village in say different months of the year, a stationary victim can take it all.

v. There are two significant sources of wealth for a stationary bandit. First, if he can exclude roving bandits from "his community" he can maximize his take from the community. (In effect he is privatizing a commons.) Second, to maximizing his net revenues from his territory, he should encourage growth and development in his territory. The latter will involve creating property rights within the community of various sorts--as for example the excludable forms developed above to solve internal conflict and commons problems.

   a. Steal-able property is, in effect, a commons as far as roving bandits are concerned. In a "den of thieves game" they have incentives to take all the wealth that they can lay their hands on (which is transportable). Anything left behind simply goes to the next bandit that comes through the village.

   b. A stationary bandit can take less than that amount "now," because he can always collect it at a later time if he wants to. This lower "tax rate" has a very important incentive affect.

- Letting potential "victims" keep part of their harvest, livestock, gold, and so forth, of course has an effect on their incentives to accumulate such capital.

- Instead of expecting to lose all of their wealth to roving bandits, they now expect to be able to keep *and enjoy* at least part of it (at least for a longer time period than before).

- This encourages them to be more productive, to make more long term investments, to work harder, etc. etc. which increases the "tax revenue" that the stationary bandit can obtain.

   c. A stationary bandit becomes richer because his potential victims become richer.

- (Show figure of a Laffer curve, linking tax/take rates with work and output level.)

D. A stationary bandit, has what Mancur Olson calls an **encompassing interest** in the welfare (at least wealth) of his potential victims because he can profit by making them wealthier.

  i. Mancur Olson, "Anarchy, Autocracy and Democracy" (1991) argues that:

> "The conqueror of a well defined territory has an encompassing interest in that domain given by the share of any increase in the territorial income that he collects in taxes. This encompassing interest gives him an incentive to maintain law and order and to encourage creativity and production in his domain. Much of the economic progress since the discovery of settled agriculture is explained by this "incentive."

  ii. The incentive to provide law enforcement and other public services can be characterized in a *diagram* that shows the "profit" or "rent" maximizing service level and extraction rate.

- The optimal service level varies with the tax rate.

- The greater the tax rate at the margin, the greater is the "encompassing interest" of the dictator in the wealth of his domain.

E. (One problem with the Olsonian model of dictatorship is that it ignores the security problems that dictators face. Sometimes there is a trade off between increasing the wealth and welfare of "his" citizenry, and the risk that "he" will be over thrown.)

F. The idea of an **encompassing interest** is very important in other applications as well. Clearly, a person whose own direct interest is advanced whenever "your" welfare improves will be a better representative/czar/agent than one whose interest runs at cross purposes.