Exchange Efficiency With Weak Ownership Rights

Oren Bar-Gill (Harvard Law School)
Nicola Persico (Northwestern Kellogg)

Econ 101: Ownership Rights + Exchange = Efficiency

- First welfare theorem (with transferable utility): if a good can be freely traded then, absent frictions, it will end up in the hands of the person who most values it.
- Proved under the assumption that the owner of a good can refrain from trading it, if she so chooses.
- Almost all "decentralized exchange" results in economics are built on the assumption that one can always hold on to one's endowment, or to what they buy.
- In this paper we relax this assumption – owner's interests are less protected.

Liability Rules: Less Than Full Ownership Rights

- **Property rule (full ownership rights)**: B cannot take from A without A's consent.

- **Liability rule**: B can take from A without A's consent, in exchange for a payment of $\$D$.

Example: Compulsory Licensing

Art. 36 of Swiss Patent Law:

"If a patented invention cannot be used without violating the prior patent, the owner of the more recent patent shall **have the right to the grant of a license** to the extent required for such use of his invention, provided that that invention serves a purpose entirely different from that of the prior patent, or that it involves a considerable technical advance.
[...]
Where both inventions serve the same economic purpose, [...] **the judge shall decide on the grant of the licenses, their extent and duration and on the compensation to be paid**.

But Liability Rule Is Rare. Why?

Two main explanations in the literature

- D (damages) may be "too low" and a the wrong agent will take (inherent flaw).

- Protection of investment (situation-specific, liability rule efficient when need to encourage non-owner investment)

Broad prevalence of property rule has led scholars to believe that there must be something inherently wrong with liability rule

Legal Literature: Why Liability Rule Is Inherently Flawed

- **Argument:** Suppose D is low. An agent with value $u_j > D$ will take and pay damages, even if current possessor values at $u_i > u_j$.
- This inefficiency is resolved by Coasian bargaining: possessor can "bribe" the taker into giving up the right to take (paying the taker $u_j - D + \varepsilon$ will suffice).
- Alleged difficulty arises under multi-party decentralized trading.

"Consider the situation of an owner and a particular taker who values the car less highly than does the owner (but above the level of damages). The owner would like to bargain with the taker and pay him not to take the car. However, it would be irrational for the owner to pay this taker not to take the car, and then another and another. Therefore, the potential taker will tend to take the car even though the owner values it more highly."

Why Liability Rule Is Inherently Flawed

- Quote was from Kaplow and Shavell (*Harv. L. R.*, 1995), the seminal paper in this literature.
- **Source of inefficiency**: Coasian bargaining does not apply in large economy insofar as not all relevant parties can enter into a global contract.
- **Implication**: strong property rights as the best rule for protecting entitlements in a large economy.
- Sounds like a blanket rationale!

This Paper: the Logic is Incorrect

- Fails to account for the recursive nature of the problem: the first taker is also herself subject to taking by the second taker. The second taker, in turn, is subject to taking herself by the third taker, and so on.
- After proper analysis, show that there is always an exchange-efficient equilibrium.

Efficient Equilibrium

Example

(Efficient equilibrium) Let $u_0 = 10$, $u_1 = 9$ and $u_2 = 9$. Weak ownership rights: $D = 2$. Owner has full bargaining power.
Concern: in order to keep the asset in periods 1 and 2 (efficient allocation), agent 0 needs to pay $(18 - 2) + (9 - 2) = 23 > 20$.
But, actually, consider the following equilibrium:
In period 2 agent 2 takes the asset from owner 1; or is offered (and accepts) a bribe of 7 from owner 0.
In period 1 taker 1 has a value of $9 + 2$ and needs to pay $D = 2$ to take. So he is offered by owner 0 (and accepts) a bribe of 9 and goes away.
Will owner 0 want to bribe taker 1? If not, get 2. If yes, get 1+3. So yes.
Agent 0 keeps the asset in all periods (efficient).

- Open questions: what if bargaining power is allocated differently? Different valuations? Different ownership rights (D)? Etc.

This paper: Strong Ownership Rights Not Necessary for Exchange Efficiency

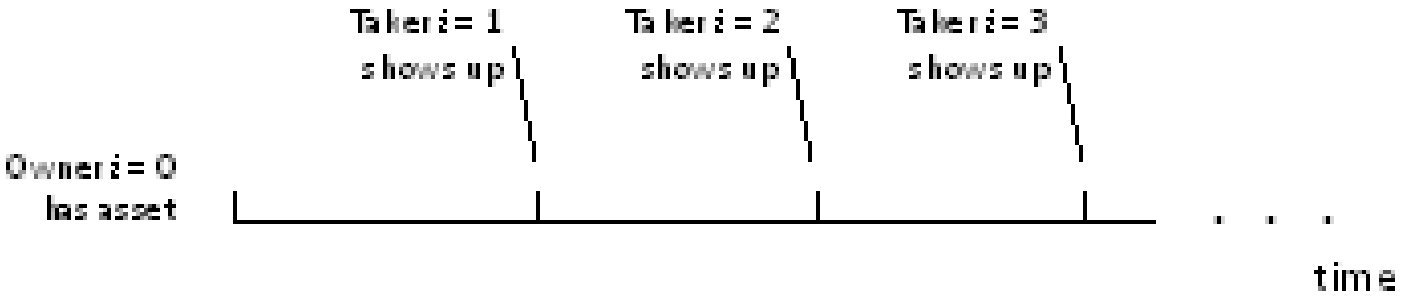
- Exchange economy in which an agent may temporarily possess a good, and for a period enjoy the benefits of consumption.
- But the good may be taken away without the agent's consent.
- If the good is taken by another agent the possessor receives a court-ordered monetary compensation D (damages), which may be very low.
  - "Property rule" when $D = \infty$.
  - "Liability rule" in legal parlance when $D < \infty$.
- We show that efficiency need not fail in decentralized trading.
- Hence, strong ownership rights is orthogonal to exchange efficiency.

Finding Is Provocative, but Not Too Provocative

- The State is not irrelevant: it plays a crucial role in the efficiency result, by enforcing the (possibly small) damages awards and the bilateral contracts which need to be executed in equilibrium.
- Therefore a system with weak ownership rights is quite different from a system with a weak enforcement of rights (compare with Piccione and Rubinstein 2004, 2007).

The Economy

- Finite number of periods $t = 0, 1, 2, ...T$.
- Single asset which is owned by agent 0 at the beginning of period 1.
- In each period t a different potential taker shows up and a bargaining game takes place between the beginning-of-period owner and the potential taker which determines who owns the asset in that period. The party who is not the owner at the end of the period exits the game forever.
- Parties are indexed by the period in which they show up to take.



- If party i owns the asset for three periods then her discounted value from owning the asset will be $u_i\left(1+\delta+\delta^2\right)$.
- Notational convention: $i<j$. Therefore, when i and j meet, the first will necessarily be the owner, and the second will be that period j's taker.
  - One of the two will be beginning-of-period $j+1$'s owner.

The Law

- Entitlements are protected by a "generalized liability rule:" right for taker j to take the asset from previous owner i and pay damages.
  - When damages are very small, property rights are protected only weakly.
  - Note: very general formulation of damages, later place some restrictions.
- The taker can relinquish his right to take in exchange for money m.
- Also, the taker can offer to buy the asset, at a price p, instead of taking it.
- Note: law only enforces bilateral contracts of this type.

- Exchange takes place through a series of bilateral bargains between each period's owner i and taker j.

- The taker's choices are:
  (a) take and pay damages $D_{j,i}$ (exogenous, set by law)
  (b) purchase at a price of $p_{j,i}$, which only makes sense if damages are very expensive, that is, if there is a price $p_{j,i} < D_{j,i}$ which the owner will accept in lieu of damages;
  (c) go away in exchange for $m_{j,i}$.

- We think for now of $p_{j,i}$, and $m_{j,i}$ as given exogenously. Presently we will say more on where they come from.

Definition of Equilibrium

- Why do we need a new equilibrium notion?

Definition of Equilibrium

- Why do we need a new equilibrium notion?
- Why not simply write down a bargaining protocol?

Definition of Equilibrium

- Why do we need a new equilibrium notion?
- Why not simply write down a bargaining protocol?
- Because doing so would pre-judge allocation of bargaining power.

Definition of Equilibrium

- Why do we need a new equilibrium notion?
- Why not simply write down a bargaining protocol?
- Because doing so would pre-judge allocation of bargaining power.
- Instead, introduce a "competitive" notion where the terms of trade are given exogenously, capture bargaining power

Equilibrium Definition, Easy Version

One-shot bargaining game between two players, an owner i and a taker j. Strong ownership rights, bargaining protocol left unspecified.

The equilibrium outcome of any bargaining game is expressed by the following set of conditions.

$$V_{j,i} = \max\{u_j - p_{j,i}, 0\}$$
$$p_{j,i} \geq u_i$$

$p_{j,i}$ is an *exogenously specified* price, corresponding to the non-cooperative equilibrium transfer under a specific bargaining protocol.
No trade: $p_{j,i} > u_j$
Efficiency: $p_{j,i} \in (u_i, u_j)$

Level of $p_{j,i}$ captures bargaining power.

Equilibrium Definition, Full Version

Taker j's value at the beginning of period j, given that the asset is held by party i.

$$V_{j,i} = \max\left\{u_j + \delta V_{j,j+1} - \min\left[D_{j,i}, p_{j,i}\right], m_{j,i}\right\}. \tag{1}$$

Owner i's value is given by

$$V_{i,j} = \begin{cases} u_i + \delta V_{i,j+1} - m_{j,i} & \text{if } V_{j,i} = m_{j,i} \\ \min\left[D_{j,i}, p_{ji}\right] & \text{otherwise} \end{cases} \tag{2}$$

$p_{j,i}$ and $m_{j,i}$ subject to two constraints. First,

$$p_{j,i} \geq u_i + \delta V_{i,j+1}. \tag{3}$$

And, second,

$$u_i + \delta V_{i,j+1} - m_{j,i} \geq \min\left[D_{j,i}, p_{j,i}\right]. \tag{4}$$

This condition must hold because $m_{j,i}$ represents the bribe which owner i is willing to pay taker j to go away, and so owner i must prefer this option to the alternative which is $\min\left[D_{j,i}, p_{j,i}\right]$.

Finally, terminal condition: whoever i is the owner in period $T+1$ gets:

$$V_{i,T+1} = f\left(u_i\right), \tag{5}$$

where $f\left(\cdot\right)$ is any nondecreasing function.

- Note: setup does not pre-determine the allocation of bargaining power.

Definition

Fix $\{D_{j,i}\}_{\substack{j=1,\ldots,T \\ i<j}}$, $\{u_j\}_{j=0}^{T}$, δ. A **sequential bargaining equilibrium** is a bi-vector of prices and bribes $\{p_{j,i}, m_{j,i}\}_{\substack{j=1,\ldots,T \\ i<j}}$ which satisfy conditions (1) through (5). The associated asset allocation is that the asset changes hands at the beginning of period j if $V_{j,i} = u_j + \delta V_{j,j+1} - \min[D_{j,i}, p_{j,i}]$, and it does not change hands if $V_{j,i} = m_{j,i}$.

- Note that in the bi-vector $\{p_{j,i}, m_{j,i}\}_{\substack{j=1,\ldots,T \\ i<j}}$, prices are "off equilibrium" when the allocation involves unilateral taking or bribing, and bribes are "off equilibrium" when the allocation involves a unilateral taking or a bilaterally-agreed sale of the asset.

Definition of Efficiency

Definition

An efficient asset allocation is one in which period j's taker consumes the asset in period j if and only if his valuation exceeds that of the beginning-of-period owner.

- The efficient allocation is for the asset to be owned by the party with the highest per-period value among those who have shown up so far.

Existence of an Efficient Equilibrium

Assumption

For all takers j, and for any two owners $h, i < j$ such that $u_i > u_h$ it must be $D_{j,i} - D_{j,h} > u_h - u_i$.

Mild assumption: damages cannot be "too negatively" correlated with owner's valuation.

- Note: no restriction on whether damages grow or shrink over time.

Theorem

Assume Assumption 1 holds. An efficient sequential bargaining equilibrium exists.

- Technical note: the equilibrium we find is efficient not only on the equilibrium path, but also off equilibrium.

Existence of Inefficient Equilibria

Example

(Inefficient equilibrium) Let $u_0 = 10$, $u_1 = 9$ and $u_2 = 15$. No discounting ($\delta = 1$). Property rule, i.e., $D_{j,i} = \infty$.
Equilibrium construction:
In period 2 agent 2 gains possession of the asset.
Pick equilibrium in which agent 0 has no bargaining power vis-a-vis agent 2, and agent 1 has full bargaining power vis-a-vis agent 2.
Therefore, resale value much higher for agent 1 than for agent 0.
Agent 1 ends up owning the asset in period 1 (inefficient).

- Problem: bargaining power varies in ways that is adverse to high value agent.

Implementability of Efficient Equilibrium

- How weirdly must bargaining power vary in order to get efficient equilibrium?
- Relatedly: is there a reasonable bargaining game that implements an efficient equilibrium?

Assumption

For all takers j, and for any two owners $h, i < j$ such that $u_i > u_h$ it must be $D_{j,i} \geq D_{j,h}$.

This assumption, though stronger than 1, is still reasonably mild. It says that damages are non-decreasing in user value.

Theorem

Assume Assumption 2 holds. Fix any $\alpha_1, \alpha_2 \in [0, 1]$. The set of prices and bribes in Table 1 is an efficient sequential bargaining equilibrium.

Case $u_i < u_j$	$\widehat{p}_{j,i} = \alpha_1 \left[u_i + \delta V_{i,j+1}\right] + (1-\alpha_1)\left[u_j + \delta V_{j,j+1}\right]$ $m_{j,i} \in \left[0, \max\left\{0, u_i + \delta V_{i,j+1} - D_{j,i}\right\}\right]$ $V_{i,j} = \min\left[D_{j,i}, \widehat{p}_{j,i}\right]$
Case $u_i > u_j$	$p_{j,i} \in \left[u_i + \delta V_{i,j+1}, \infty\right)$ $\widehat{m}_{j,i} = \alpha_2 \max\left[0, u_j + \delta V_{j,j+1} - D_{j,i}\right] + (1-\alpha_2)\max\left[0, u_i + \delta V_{i,j+}\right.$ $V_{i,j} = u_i + \delta V_{i,j+1} - \widehat{m}_{j,i}$

Table: Equilibrium Quantities

- Note: $\widehat{p}_{j,i}, \widehat{m}_{j,i}$, are defined as convex combinations of quantities which express the possessory value for the two parties.
- Interpretation:We can think of $\widehat{p}_{j,i}, \widehat{m}_{j,i}$ as arising from an alternating offers game a' la Rubinstein which is played in period j between owner i and taker j.
- Bottom line: "plain vanilla" bargaining game decentralizes efficient allocation.

Other Efficiency Criteria: Investment Efficiency

- Property rules not always investment-efficient.
- Provide sufficient conditions for a liability rule with very small damages to be fully efficient, that is, investment- and exchange-efficient.
- Intuition: if damages are set independent of actual use values, then transfers among agents are independent of both agent's use value—a "lump sum" from the investment perspective.

Conclusion

- Some thinkers equate ownership rights with "economic freedom." (It's what puts the "free" in free markets!)
- But we have shown that the **level** of ownership rights are **does not matter** for exchange efficiency (though **correlation with valuations** does).
- So we've proved the welfare-equivalence of ownership rights protection in an exchange economy. Liability rules has no inherent flaws.
- So what discriminates among the different rules? Should the level of ownership protection be tailored to ancillary incentive problems?