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Final Exam Review: Efficiency - Criminal Law

I. Civil Law vs. Common Law

In lecture we discussed some differences between the Common Law and Civil Law traditions. In broad outline, here are some of the main differences, though this list is by no means comprehensive.

1. Common Law: "Spontaneous Order"

- **Origin:** 12^{th}-century England.
- **Location:** U.S., U.K., Australia, Canada, India, and other former-British colonies.
- **Basis of Law:** Existing practices and social norms.
- **Decision Making:** Based on interpretation of legislation and statutes, with judges constrained by precedent.
- **Communicating Law:** Legal outcomes and principles compiled. Two notable examples:
  1. Blackstone's *Commentaries on the Laws of England* was an influential treatise on English common law.
  2. The American Law Institute publishes "Restatements" of the Law to inform lawyers and judges about principles emerging in the common law.

2. Civil Law: "Planned Order"

- **Origin:** 18^{th}-century France.
- **Location:** Western Europe, South America, East Asia, and parts of Africa.
- **Basis of Law:** Ancient Roman Law and "pure reason."
- **Decision Making:** Based on interpretation of legislation and statutes.
- **Communicating Law:** Commentaries clarify the meaning of law.

II. Economic Efficiency

1. Welfare Criteria

(a) Pareto

- A *Pareto improvement* is any change to the economy which leaves everyone at least as well off, and someone strictly better off.
- An outcome *A Pareto dominates* outcome B, if there is Pareto improvement for moving from B to A.
- An allocation is *Pareto efficient* if there exist no Pareto improvements upon it.

(b) Kaldor-Hicks

- A *Kaldor-Hicks (K-H) improvement* is any change to the economy which increases the total value achieved by everyone in society. That is, a K-H improvement is a change that could be turned into a Pareto improvement by adding a set of monetary transfers.
- An outcome *A K-H dominates* outcome B, if there is K-H improvement for moving from B to A.
- An allocation is *K-H efficient* if there exist no K-H improvements upon it.

(c) Alternative Criteria

These are by no means the only welfare tests in the history of economic thought. Any book on Welfare Economics or Social Choice theory will explore these tests in more depth.

2. Pareto vs K-H

- A Pareto improvement implies a K-H improvement. But a K-H improvement doesn't imply a Pareto improvement.
- K-H efficiency implies Pareto efficiency, and when we allow transfers Pareto efficiency implies K-H efficiency.
- There is a sense in which checking for K-H improvements is more *informationally-demanding* than checking for Pareto improvements. After some change, a Pareto improvement requires a "thumbs-up" from all parties, but a K-H improvement requires that we know *how much* better- or worse-off all parties are.

3. Some "factors" that might lead to inefficiency:

- Non-competitive markets (monopoly or monopsony power).
- Public good and externalities.
- Private information.
- Government intervention.

Note: In the Pareto sense, inefficiencies arise when mutually beneficial exchanges don't occur. In the Kaldor-Hicks sense, inefficiencies arise when there exists untapped potential to make a change where net-benefits outweigh net-costs.

III. The Coase Theorem

Theorem. (The Coase Theorem) If property rights are well-defined and tradable, then in the absence of transaction costs voluntary negotiations will lead to efficiency.

Notice the conditions for achieving efficiency:

(a) Property rights must be well-defined.

(b) Property rights must be tradable.

(c) Transaction costs must be absent.

These conditions are stated as *sufficient conditions*, but not *necessary conditions*. So we can make the following observations:

- To the extent that we believe the Coase Theorem, if voluntary negotiations *do not* lead to efficient outcomes, then we should expect one of the three conditions to fail.
- If one or more of the conditions do not obtain, then voluntary negotiations *may not* lead to efficient outcomes (but this *does not* imply that voluntary negotiations *never* lead to efficient outcomes).

What might cause these conditions to fail, and how might these failures be remedied? Let's look at this through the lens of the noisy party example.

(a) Well-Defined Property Rights: Property rights are ill-defined if local noise ordinances fail to specify whether there is a right to create noise, or a right to enjoy peace and quiet. Essentially, law would need to specify a *default state*, so that parties come to the negotiating table with a mutual understanding of what happens if bargaining "fails."

(b) Tradable Property Rights: Property rights are not tradable in this situation if agreements reached through bargaining are unenforceable. If the law defines a right to create noise, but neighbors reach an agreement to *not* stay quiet, there ought to be a mechanism for holding the potential-noisemakers to their agreement.

(c) No Transaction Costs: Bargaining imposes transaction costs if negotiation is burdensome to either party. These burdens might be monetary (the cost of writing up a legally enforceable agreement), or non-monetary (the opportunity cost of time spent negotiating). A transaction-cost-minimizing law might enforce verbal agreements when money changes hands, even when a formal contract is not drafted.

Two quick notes about efficiency and the Coase Theorem:

- If the conditions of the Coase Theorem are met, then the law does not explicitly need to consider efficient possession. In the *Post* case discussed in lecture, the court did not consider which party valued the fox more, but instead considered which law would create efficient incentives for future cases.
- The Coase Theorem shows that the Law can still address distributional concerns, even if its primary goal is efficiency. Changing the initial allocation of property rights can have major distributional consequences.

The Coase Theorem gives conditions for bargaining to an efficient outcome, but what can we say about that outcome?

- First, the outcome must leave each player with a higher payoff than their threat point, where their threat point is defined as their expected value from the non-bargaining outcome.
- Second, we usually assume that some share of the surplus goes to each party. In this class we often take this split to be half-and-half, but in the "real world," this split may depend on bargaining power.

IV. Property Law Basics

1. Preliminaries:

- Property is often thought of in terms of physical possessions, but for this class we often adopt a wider view of property as a "bundle of rights," or a set of entitlements.
- One difficulty that plagues many discussions of efficiency in legal outcomes is nonmonetizability, the inability of parties in a dispute to assign monetary values to outcomes.

2. Types of transaction costs:

(a) Search Costs: Difficulties in finding a trading partner.

(b) Enforcement Costs: Difficulties in enforcing the agreement afterwards.

(c) Bargaining Costs: Difficulties in reaching an agreement.

- Asymmetric information/adverse selection
- Private information/not knowing each others' threat points
- Uncertainty about property rights/threat points
- Large numbers of buyers/sellers – holdout, freeriding
- Hostility

3. **Approaches to Property Law:**

   (a) **Normative Coase:** Structure the law to minimize transaction costs.
   - Optimal when transaction costs can be made low enough to lubricate bargaining, or when the costs to the regulatory body of obtaining information are high.

   (b) **Normative Hobbes:** Structure the law to allocate property rights to whoever values them the most.
   - Optimal when transaction costs can not be made low enough to lubricate bargaining, or when the costs to the regulatory body of obtaining information are low.

4. **Rules for Protecting an Entitlement:**

   (a) **Property Rule:** No one can take the entitlement to private property from the holder unless the holder sells it willingly and at the price at which she subjectively values it.
   - When transaction costs are low, a property rule is more efficient.
   - Remedy: Injunctive relief enforcing the property right (often under threat of punishment).

   (b) **Liability Rule:** An external, objective standard of value is used to facilitate the transfer of the entitlement from the holder to the nuisance.
   - When transaction costs are high, a liability rule is more efficient.
   - Remedy: Compensatory damages approximating the harm.

   (c) **Inalienability:** Barring the transfer of entitlements.
   - Inalienability is often considered an inefficient rule because it may prevent mutually beneficial trades.
   - Inalienability is often used when the following are present:
   - **Allocative Externalities:** When non-bargaining parties have a stake in the outcome.
   - **Indirect Externalities:** When complementary markets are affected by the trades in another market.
   - **Paternalism:** Regulating conduct if people aren't trusted to make optimal decisions.
   - **Repugnant Markets:** Transactions that some people would like to make, but to which other people object, even though they may not be directly harmed.
   - Notice that the first three reasons are actually reasons which can be expressed while still adhering to the efficiency norm.

   Note: These three protections are not mutually-exclusive. Calabresi and Melamed note:

   "It should be clear that most entitlements to most goods are mixed. Taney's house may be protected by a property rule in situations where Marshall wishes to purchase it, by a liability rule where the government decides to take it by eminent domain, and by a rule of inalienability in situations where Taney is drunk or incompetent."

V. Concepts in Property Law

1. Principles for Establishing Ownership

- **First Possession:** Property rights determined by order of arrival.
  - Pro: Relatively simple to determine who possessed property first.
  - Con: Creates an incentive to engage too much in preemptive possessory acts.
- **Tied Ownership:** Ambiguous property rights tied to clear property rights.
  - Pro: Encourages efficient use of the resource.
  - Con: Difficult to establish and verify ownership rights.

2. Temporary vs Permanent Damages

- **Temporary Damages:** Recurring damages for harm which has already occurred.
  - Create an incentive to reduce harm in the future when technology changes.
  - Efficient where damages are easy to measure and innovation occurs rapidly.
- **Permanent Damages:** One-time, permanent fix which tries to anticipate the value of future harm.
  - If bargaining is costly, then permanent damages provide no incentive to reduce harm as technology evolves.
  - Efficient where damages are costly to measure and innovation occurs slowly.

3. Intellectual Property: Property rights applying to ideas or information.

- **Patents:** Private monopolies which cover products or commercial processes.
  - A patent holder whose patent has been infringed can sue for both damages and an injunction against future violations.
  - Patents are property, and can be sold or licensed to others.
  - Transaction costs may be high. Uncertainty on whether a patent is valid (and breadth), uncertainty of outcome of research, and the fact that there might be many parties.
  - Patents make tradeoffs between providing positive dynamic incentives and static/dynamic costs.
  - *Limiting doctrines* which narrow the scope of patents to ideas that are novel, useful, and non-obvious, are used in patent law to reduce inefficiency.

  - Patents in the US are blunt instruments, and do not take into account the relative size of the innovation or rate of turnover across industries.
- **Copyrights:** Property rights over original expressions.
  - Original expressions are often non-rivalrous and non-excludable, and so tend to be underprovided.
  - Applied automatically to expressions without application.
  - Covers only exact text, not general ideas.
  - Copyright enforcement often relies on judgements of "substantial similarity," and whether the derivative work is likely to be seen as a substitute for the original work.
- **Trademarks:** Property rights over brand names or distinctive images/symbols.
  - Trademark law aims to reduce confusion between substitutable products, allowing companies to send a *credible signal of quality* and *reducing consumer search costs.*
  - Protecting trademarks incentivizes *quality-enhancing investments* in a product or product line.
  - *Trademark dilution* can be claimed even when confusion between products is unlikely if the use of a trademarked name is likely to create negative association.
  - Limited protection is given to *trade dress*, or the distinctive visual appearance or packaging of a branded item.
- **Trade Secrets:** information "used in one's business" that gives its owner "an opportunity to obtain an advantage over competitors who do not know or use it."
  - Protected under federal law against *misappropriation* if the trade secret was reasonably defended yet was acquired illegally or unfairly by a competitor.
  - Can be protected by companies through non-compete agreements, but courts can evaluate non-competes to balance dynamic incentives and costs. Courts generally do not protect non-compete agreements which claim protection for human capital gained at a job.

VI. Property Limitations

1. **Adverse Possession ("Squatter's Rights"):** If someone occupies another person's property for long enough, that person becomes the legal owner, provided the following conditions are met:

   (a) Adversarial Use: The occupation was adverse to the owner's interests.

   (b) Open Use: The occupation was not concealed or conducted in secret.

   (c) Uncontested Use: The owner did not object or take legal action.

   Adverse possession observations:

   - **Pro:** Reduces uncertainty over time, and allows land to be put to efficient use.
   - **Con:** Owners must incur *monitoring costs* to protect property.

2. **Private Necessity:** The law need not enforce property rights via injunctive relief in the case of an emergency.
   - We mentioned that the rules Calabresi and Melamed give for protecting property are not mutually exclusive. In this case, we often use injunctive relief to protect property (especially private possessions), but transition to damages relief in emergencies.
   - In emergencies, many of the standard bargaining costs are amplified. Private information, uncertainty, and the threat of holdout may all become more severe in extreme circumstances, making efficient bargaining less likely to occur.

3. **Unbundling Restrictions:** Restrictions on how a property right can be subdivided.
   - **Con:** To the extent that we buy the Principle of Maximum Liberty, efficiency favors more complete property rights, under the theory that people choose to unbundle when doing so benefits both parties.
   - **Pro:** Unbundling might increase transaction costs, as it increases uncertainty about rights and may increase number of parties involved in future transactions (doing so increases search costs and risk of holdouts).

4. **Government Takings (Eminent Domain):** The right of the government to seize property for public use (at fair market value).
   - Public goods tend to be underprovided in the market, but transaction costs may be too high for efficient bargaining between the government and (often numerous) property owners.
   - Requiring compensation at fair market value encourages efficient behavior on the part of governments by fully internalizing the costs of land acquisition.
   - Fair compensation is insufficient to guarantee efficiency, as property owners tend to value their property above market value (if not, they could sell when transaction costs are low).
   - Normative Hobbes may support using eminent domain to transfer property between private parties when transaction costs are high, while Normative Coase suggests that this is inefficient when transaction costs are low.

5. **Regulation:** Exercising public control by imposing usage restrictions.
   - Middle ground between *open access* and *unanimous consent*.
   - Regulatory takings: When regulation exacts significant costs on property owners, the law may require the government to pay compensation as in a standard takings case.
   - Zoning Laws: Cities and municipalities may place restrictions on construction in a given area to steer development.

VII. Contract Law Basics

1. The Language of Contracts

- **Contract:** A *contract* is a specification of actions to be taken by the contracting parties under various conditions.
- **Complete Contract:** A contract is *complete* when it account for every condition which can possibly be realized.
- **Incomplete Contract:** A contract which is not complete is called *incomplete*.
- **Gaps:** Contingencies not accounted for in a contract are called *gaps*.
- **Promisor:** The party which makes a promise in a contract is called the *promisor*.
- **Promisee:** The party which receives a promise in a contract is called the *promisee*.

2. **The Bargain Theory:** An early theory of contract enforcement which states: "A promise should be enforced if it was given as part of a bargain, otherwise it should not."
   - **Components of an Enforceable Bargain:**
     (i) Offer: One side offers a contract.
     (ii) Acceptance: The other side accepts the contract.
     (iii) Consideration: The legal term for the thing the promisee gives the promisor to induce the promise
   - **Reciprocal Inducement:** If the promisee gives consideration, we have *reciprocal inducement*, or an exchange between the two parties.
   - **Expectation Damages:** The remedy prescribed by the bargaining theory is damages which leave the promisee as well-off as if the promise had been kept.
   - This theory leads to inefficiency (i) by failing to enforce promises which both sides would have wanted to be enforceable when they were made, and (ii) by enforcing promises which should not be enforced.
3. **Breach of Contract:** When a party fails to perform the action specified in a contract.
   - **Efficient Breach:** Breach is efficient when the cost of performance to the promisor is greater that the promisee's benefit. Performance is efficient when the cost of performance to the promisor is less that the promisee's benefit.
   - However, the promisor will choose to breach only when the promisor's cost to perform exceeds their liability.
   - Expectation damages would (i) internalize the externality imposed on the promisee by the promisor's breach, (ii) result in efficient breach when negotiations are impossible, and (iii) lead to the promisor investing efficiently in performance.
4. **Reliance:** Actions which are value-enhancing to the promisee, conditional on the promisor's performance.
   - **Efficient Reliance:** A reliance investment is efficient when the expected value of that investment is positive.
   - **Two Approaches to Reliance Damages:**
     (i) Efficient Reliance Damages: In the view of Cooter and Ulen, damages should include only efficient reliance.
     (ii) Foreseeable Reliance: In practice, damages usually include foreseeable reliance.
5. **Default Rules:** Rules that tell the court what to do with gaps in a contract.
   - **Majoritarian Default Rule:** An attempt to will a gap with the terms that most parties would have agreed to.
   - **Efficient Default Rule:** An attempt to fill a gap with the rule the parties would have wanted, had they thought to specify it. Such rules work well when gaps exist due to a high transaction cost of filling them, and not due to strategic omission.
   - **Penalty Default Rule:** An attempt to fill a gap with a rule the parties would not have wanted in order to encourage the parties to disclose information and fill the gap with something efficient. Such rules may work well when gaps are left for strategic reasons.
   - **Immutable Rule:** An immutable rule is like a default rule, but it can't be negotiated around.
6. **Invalid Contracts:** Contracts are usually upheld by law, but may be invalidated to either (i) protect parties inside a contract (from exploitative terms) or (ii) protect parties outside a contract (from externalities arising from the contracted action). Contracts may be invalidated if the following can be convincingly demonstrated:
   (a) Formation Defense: A claim that the requirements for a valid contract are not met.

(i) **Derogation of Public Policy:** Performance of the contract violates or circumvents the law.
- When either (i) both parties are informed about the illegality of the contracted action or (ii) when only the promisee is informed about the illegality of the contracted action, the promisor cannot be held liable for breach.
- When only the promisor is informed about the illegality of the contracted action, the promisor may still be held liable for breach.

(ii) **Incompetence:** Individuals agreeing to the contract were not rational at the time.
- Parties are often not held liable for decisions made by "irrational/incompetent" agents (e.g. children), both for reasons of paternalism and of efficiency.
- Irrationality/incompetence resulting from personal choice (e.g. drinking) is generally not protected. Doing so would encourage inefficient contract formation (e.g. inefficiently high monitoring expenses).

(iii) **Dire Constraints:** A contract was signed under *necessity* or *duress*.
- **Necessity:** Applies when the contracting party *is not* responsible for for the dire situation. When incentives for efficient activity are misaligned for parties making a contract, ex-ante optimal terms are more likely to achieve efficiency than terms negotiated under necessity.
- **Duress:** Applies when the contracting party *is* responsible for for the dire situation. Enforcing contracts made under duress would (dynamically) incentivize activity which places parties in dire situations.

(b) Performance Excuses: A claim that a properly-formed contract should not be enforced due to changed circumstances.

(i) **Impossibility:** Circumstances make it impossible to perform on the contract.
- Usually contract specifies liability. Otherwise uses default rule.
- Efficiency requires assigning liability to the party that bears the risk at least cost.

(ii) **Frustration of Purpose:** A change in circumstances made the contract pointless.

(c) Bad Information: Contracts signed when one or both parties possess bad information *may* be invalidated.

(i) **Fraud:** One party deliberately tricked the other.

(ii) **Failure to Disclose:** One party failed to disclose critical information to the other.
- Under civil law, parties have a duty to disclose important information.
- Under common law, generally only safety risks need be disclosed. Exceptions include new products which come with an "implied warranty of fitness," and (some) large transactions where full disclosure is often necessary for efficient contract formation.

(iii) **Mutual Mistake:** Both parties made a mistake, without which the contract would not have been signed.

(iv) **Unilateral Mistake:** One party has mistaken information.
- These contracts are typically upheld, as they incentivize the efficient collection of information.

(v) **Vague Contract Terms:** Ambiguity in the terms of a contract.
- Similar to penalty defaults, refusing to enforce vague contracts incentivizes careful contract formation.

Notes:
- Efficiency generally requires "uniting knowledge and control," putting control in the hands of the party with the most efficiency-enhancing information.
- Cooter and Ulen argue that contracts based on one party's knowledge of *productive* (wealth-increasing) information should be enforced, while contracts based on one party's *redistributive* (wealth-shifting) information should not.

(d) Monopoly Defenses: A monopolist is the only seller of a product for which no close substitutes exist and can dictate the price and nonprice terms of the contract offered to many buyers. The buyer must respond by accepting the monopolist's offer or doing without the good. Some extreme contract terms (often arising from monopoly power) may be invalidated.

(i) **Contract of Adhesion:** Contracts offered as "take-it-or-leave-it" deals, where terms are non-negotiable, are generally upheld.
- Some states void terms of a contract which would not have been agreed to had they been noticed.

(ii) **Unconscionability/Lesion:** Overly one-sided contracts may not be upheld.
- "Absence of meaningful choice" on the part of one party may be grounds for invalidation in the presence of unequal bargaining power.

Note: Contracts are generally not binding if one party had *no opportunity* to review it.

VIII. Contracts Continued

1. **Remedies for Breaching Contract:** Damages awarded when contracts are breached may either be specified within contracts or issued by courts.

(a) Party-Designed Remedies: Damages are specified in a contract for particular scenarios.

- **Liquidated Damages:** Damages which reasonably approximate actual harm done by breach.
  - Typically upheld by courts on efficiency grounds.
- **Penalty Damages:** Damages imposed are greater than the value of actual harm.
  - Often not upheld by courts.
  - Penalty damages *may* approximate subjective harm in such a way that the contract would not have been signed without it.
  - However, the dynamic incentives created by penalty damages can be matched by performance bonuses, which are upheld by courts.

(b) Court-Imposed Damages: Damages are not specified in a contract, but are issued by a court.

- **Expectation Damages ("Positive Damages"):** Makes the promisee indifferent between performance and breach.
- **Reliance Damages ("Negative Damages"):** Restores the promisee to the same level of well-being they had before signing the contract.
- **Opportunity Cost Damages:** Makes the promisee indifferent between breach and performance of the next-best alternative.
  - Rational agents should always choose the option which maximizes utility first.

Note: Ranking Damages

$$\text{Expectation Damages} > \text{Opportunity Cost Damages} > \text{Reliance Damages}$$

(c) Other Remedies: Other court-mandated damages are less-common and situation-specific.

- **Restitution:** A party must return money that was already received.
- **Disgorgement:** A party must give up wrongfully-gained profits.
- **Specific performance:** Forces the breaching party to live up to the terms specified in the contract.
  - Routinely used in Civil Law courts.
  - Often not upheld by Common Law courts, even when Specific Performance is explicitly written into the contract.

2. The Paradox of Compensation: Contracts between two parties generally cannot incentivize efficient reliance, efficient investment in performance, and efficient breach simultaneously.

- If expected damages increase with reliance investments, this creates an incentive to over-rely.
- If expected damages do not increase with reliance investments, this creates an incentive to under-invest in performance and an incentive to breach more than the efficient amount.

Note: The fundamental problem in the Paradox of Compensation is the existence of a single price. "Anti-Insurance" can solve the Paradox of Compensation by driving a wedge between the amount paid by the promisor and the amount received by the promisee.

3. Overview: The Purposes of Contract Law

(a) Encourage cooperation
(b) Encourage efficient disclosure of information
(c) Secure optimal commitment to performance
(d) Secure efficient reliance
(e) Provide efficient default rules and regulations
(f) Foster enduring relationships

IX. Tort Law Basics

1. The Language of Tort Law

(a) Tort: A wrongful act other than a breach of contract for which relief may be obtained in the form of damages or an injunction.
(b) Plaintiff: The party bringing a lawsuit. (Also a *victim*)
(c) Defendant: The party being sued in a lawsuit. (Also an *injurer* or *tortfeasor*)

2. Components of Tort Law

(a) Harm: The victim must suffer some actual harm for tort law to apply. Mere exposure to risk is not sufficient grounds for a Tort Law claim.

- *Safety Regulations* are used by government agencies to deal with exposure to risk of low-probability harms.
- *Perfect Compensation* restores victims to the level of utility experienced before harm. Perfect compensation encourages efficient risktaking, but can also lead to unpredictability.
- Harm can be *tangible* (damage to property) or *intangible* (emotional damages), although courts are often hesitant to award damages for intangible harms.

(b) Causation: The defendant needs to have caused the harm to the plaintiff.

- *Cause-in-Fact* (or *but-for Causality*): "But for the defendant's actions, would the harm have occurred?"
- *Proximate* (or *immediate*) *Cause*: Actions by the defendant cannot be too in the past.

(c) Breach of Duty: It must be shown that the defendant breached a duty he owed to the defendant, and that this breach led to the harm.

- Requisite standards of care may be explicitly specified by the law, or they may be vague (e.g. *reasonable care*).

Note: Tort Law covers situations where transaction costs are too high to agree to anything in advance.

3. Rules for Tort Liability

(a) 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.

(b) Observations

- Under a strict liability rule, all that is necessary for liability is harm and causation.
- Negligence rules require all three elements – harm, causation, and fault.
- *Precaution*: Anything either injurer or victim could do to reduce likelihood of an accident (or damage done).
- All liability rules create incentives for activity levels as well as precaution. Activity levels are functionally just *unobserved precaution*, but its difficult to calculate optimal levels of activity, whereas optimal levels of observed precaution are easier to calculate.

(c) Comparing efficient precaution and efficient activity for liability rules.

	Injurer Precaution	Victim Precaution	Injurer Activity	Victim 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 a defense of Contributory Negligence	Efficient	Efficient	Efficient	**Too High**

(d) Four General Principles: The above results follow from the following principles:

(i) If you don't bear any of the cost of accidents, you have no incentive to prevent them.

(ii) If you do bear the cost of accidents, you'll do whatever you can to prevent them.

(iii) If you can avoid liability by exercising due care, you'll do it, but then you won't reduce activity.

(iv) 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.

4. Accidents Involving Businesses

(a) Accidents Between Sellers and Strangers: The injurer is a competitive business but does not do business with the victim.

- We often make the assumption of perfect competition, which implies that the cost of accidents is included in prices.

	Injurer Precaution	Injurer Activity
Strict Liability	Efficient	Efficient
Simple Negligence	Efficient	**Too High**

(b) Accidents Between Sellers and Customers

- Efficiency of precaution and activity depend on how accurately customers perceive risks. Customers may either (i) be able to accurately assess risks of all businesses, (ii) be able to assess average risks in an industry, or (iii) be unable to assess risks entirely.

	Risk Perception?	Seller Precaution	Buyer Activity
Strict Liability	**Yes**	Efficient	Efficient
	No	Efficient	Efficient
Negligence	**Yes**	Efficient	Efficient
	No	Efficient	**Too High**
No Liability	**Yes**	Efficient	Efficient
	Average	**None**	Efficient
	No	**None**	**Too High**

X. Tort Law Continued

1. The Calculus of Negligence

- Precaution is about tradeoffs: Namely, the tradeoff between the *deterministic* costs of taking precaution and the *expected value* of harm when precaution is not taken.
- Efficiency requires us to take precaution when the cost of doing so is less than the expected value of harm averted.
- In 1947, Judge Learned Hand used this logic to say that a party should be considered negligent whenever:

$$\underbrace{B}_{\text{Cost of Precaution}} < \underbrace{L}_{\text{Cost of an Accident}} \times \underbrace{P}_{\text{Probability of an Accident}}$$

  This has come to be known as "The Hand Rule."
- If agents are risk-neutral (that is, if they only care about the expected cost of an action), the Hand Rule encourages agents to take precaution exactly when it is efficient to do so.
- Two problems with applying the Hand Rule:
  (a) Courts tend to include only risk to others when calculating negligence, but it should *also* include risk to self.
  (b) *Hindsight Bias*: Subjective assessment of risk is often overinflated by proximate harms.
  Fortunately these two problems work in opposite directions.

2. Relaxing Assumptions: Our models often correctly predict the direction of effects in law, but poorly predict the magnitude of effects. This is partially due to the following unrealistic assumptions we've made about how the legal system works:

(a) Rationality: Agents act to maximize their expected utility (subject to consistent risk-preferences) based on accurate assessments of risks.

Objection: Two objections to rationality:
1. *Risk Perception:* People systematically misperceive the value of probabilistic events: overestimating exotic risks and underestimating mundane risks.
2. *Risk Preferences:* People are willing to take small-probability gambles, but not proportional larger-probability gambles.

(b) Full Damage Payment: Damages are paid in full, and so injurers fully internalize the value of all harms.

Objection: Agents are often liquidity-constrained and incapable of paying damages in full.

(c) No Regulations: There are no regulations in place aside from liability rules.

Objection: Regulations are ubiquitous, and often function better than tort liability (e.g. judgement-proof injurers; small harms to many parties).

(d) No Insurance: Insurance cannot be purchased to protect from risks, and so involved parties bear the cost of accidents.

Objection: Insurance partially protects involved parties from the cost of accidents, but this can reduce the incentives to take precaution created by liability rules (*moral hazard*).

(e) Costless Litigation: There are no costs (explicit or opportunity-costs from taking claims to court.)

Objection: Costly litigation reduces victims' incentives to bring suits and increases expected costs to potential injurers. Further, the rules about who bears the cost of litigation creates incentives of its own (e.g. the incentive to bring "frivolous" suits designed to elicit out-of-court settlement).

(f) Informed Citizens: Parties have perfect knowledge of the laws which affect them.

Objection: There are numerous laws and parties are often unaware of them, and instead act in accordance with social norms.

3. Errors

- Strict Liability vs. Negligence:
  - Negligence is difficult to prove relative to harm and causation, and so strict liability is increasingly common.
  - When court can assess damages more accurately than standard of care, strict liability is more efficient.
  - When court can better assess standards, negligence rules are more efficient because they lead to fewer trials.
- Mistakes in Assessing Damages: Mistaken damages can be either random or systematic.
  - *Random Mistakes* (or *uncertainty*): Damages may be incorrect in specific cases, but are correct on average. These mistakes have no effect on the incentives of expected-wealth-maximizing agents.
  - *Systematic Mistakes* (or *errors*): Damages are skewed either too high or too low on average.

4. Compensatory Damages and Death

- Perfect compensatory damage returns victims to original level of well-being; this is impossible when the victim dies.
- Compensatory damages are often higher for extreme harm than for causing death.
- For fatal accidents, the value of life is imputed from day-to-day choices involving death risks. Studies estimate the value of a life as being somewhere between 3-7 million dollars.

5. Punitive Damages: Damages that exceed the amount required to compensate victims.

- When an injurer expects to face liability for only some fraction $\alpha < 1$ of harm caused, courts can award victims compensatory damages of $D(x)$ plus punitive damages of R to achieve efficient care. When we do this, the injurer's overall expected liability equal to

$$p(x)\alpha[D(x) + R]$$

  Incentives for efficient care are achieved when the injurer's expected liability equals the full expected damages of the victim, or when $p(x)\alpha[D(x) + R^*] = p(x)D(x)$. Solving this equation for R yields

$$R^* = \frac{1-\alpha}{\alpha} D(x)$$

  The coefficient $\frac{1-\alpha}{\alpha}$ is sometimes called the *punitive multiplier*.
- Courts typically impose punitive damages that are less than ten times the value of compensatory damages.

6. Vicarious Liability: One party is held liable for the harm caused by another.

- *Respondeat Superior*: Employer liable for torts of employee if employee was acting within the scope of employment. Gives employers incentive to hire and supervise more carefully. Can be implemented via either a liability or negligence rule, but neither is strictly better.
- Accidents involving multiple injurers:
  - *Joint Liability*: Sue all injurers together.
  - *Several Liability*: Sue each one separately.
  - *Joint and Several Liability*: Sue one of the injurers for the full amount.

7. The Legal System

- Broadly speaking there are two costs associated with the legal system:
  (i) Administrative Costs: Direct costs of running the legal system.
  (ii) Error Costs: Indirect costs of errors arising from imperfect implementation.
- *Filing fees* are set lower than administrative costs and deter lawsuits that would not provide benefits (in expectation) exceeding the cost of making a claim. As we raise filing fees, we lower the sum total of administrative costs, but increase the sum of error costs.
- *Class-Action Lawsuits* can provide incentives for injurers to avoid causing low-value harms, but can lead to "nuisance suits" or "blackmail settlements."

8. Torts vs. Regulation

- Regulations partially get around the problem of judgement-proofness and liquidity constrained injurers.
- *Regulatory Capture:* When a regulatory body is captured by the industry it is in charge of regulating, often leading to regulations which protect entrenched interests.
- Liability systems also come with an incentive to avoid paying fines. Under a regulatory system, the incentive to dodge fines is lower than in a liability system, since regulations impose small costs whereas liability systems impose large costs *when* they happen.

XI. Criminal Law Basics

1. Differences from Civil Law

- Crime requires intent (guilty mind, *mens rea*) except for cases of criminal negligence.

- Criminal cases are brought by the government, so don't require a living victim.
- Crime harms society as a whole in addition to private citizens, allowing for the possibility of "victimless crimes."
- Criminal law requires a higher standard of proof:

$$\underbrace{\text{Beyond a Reasonable Doubt}}_{\text{Criminal Cases}} > \underbrace{\text{Clear and Convincing Evidence}}_{\text{Punitive Damages}} > \underbrace{\text{Preponderence of the Evidence}}_{\text{Civil Cases}}$$

  This is because the costs of errors are likely much higher in criminal cases.
- Punishment can be punitive and destructive (instead of compensatory): This is "ex-post inefficient."
- Purpose of criminal law is to prevent all crimes, not just the inefficient ones.

2. Why Criminal Law?

- Cooter and Ulen give the following guide for determining punishment:
  - Acts should be punished when our aim is deterrence and priced when our aim is internalization.
  - Aim should be deterrence when (1) perfect compensation is impossible, (2) people want law to protect rights instead of interests, or (3) enforcement errors undermine liability.
- So Criminal Law works better than tort law to deter crime because (1) perfect compensation may be impossible, (2) not all criminals are caught, and (3) criminals may be judgment proof.

3. Deterrence

- Marginal social cost of increased enforcement may be positive (by increasing the number of criminals punished) or negative (by reducing crimes committed and number of criminals punished)
- Optimal punishment sets:

$$\text{(expected punishment)} = \text{(harm to victim)} - \text{(marginal cost of deterrence)}$$

- Two effects of harsher punishments: deterrence (less crime because it is more costly to commit) and incapacitation (less crime because criminals are already locked up) make it difficult to test the deterrence hypothesis.
- Empirically, increased probability of being caught has a greater deterrence effect than increased severity of punishment

4. Punishment

- In the U.S., the most common punishment is imprisonment. In addition to deterrence, this has the effect of incapacitating criminals; this added effect is only effective when the supply of criminals is inelastic. Imprisonment tends to be inefficient: putting someone in prison is costly and makes them worse off.
- In Europe, many crimes are punished by fines. Fines are efficient, but create the potential for abuse, since the money must go somewhere.
- In the U.S. the death penalty is extremely expensive due to additional legal safeguards; it's currently more expensive in the United States to execute someone than to imprison them for life.
- Additional punishment for crime: Stigma
  – People don't want to hire convicted criminals; having a conviction on your record is an extra punishment
  – In the absence of wrongful conviction, stigma has negative social cost, since it gives people information about criminals' proclivity to commit crime.
  – However, stigma increases the cost of wrongful conviction, since in this case it gives people bad information. This suggests that criminal cases should have a higher burden of proof than civil ones.

I. Calculating Expectations

1. Discrete Expectations: Consider the following scenario with N possible outcomes:

- N possible outcomes: $\{X_1, \ldots, X_N\}$
- Each outcome X_i is associated with a probability, $P(X_i)$, where these probabilities add up to 1. That is:

$$\sum_{i=1}^{N} P(X_i) = 1.$$

- Each outcome X_i gives a utility payoff, u_i.

Then the expected utility is:

$$\mathbb{E}[u] = \sum_{i=1}^{N} P(X_i)u_i$$

2. Continuous Expectations: Now consider the scenario where there is a continuum of possible outcomes:

- An outcome x can take any value on the interval: $[a, b]$.
- There is a probability density function $\rho(x)$, which assigns an instantaneous density to every $x \in [a, b]$. This density integrates to 1. That is:

$$\int_a^b \rho(x)dx = 1.$$

- There is a utility function $u(x)$ which assigns a utility to every $x \in [a, b]$.

Then the expected utility is:

$$\mathbb{E}[u(x)] = \int_a^b u(x)\rho(x)dx$$

Notes:

- When your possible outcomes are indivisible (e.g. how many parties your neighbor holds this year), use the discrete expectation.
- When your possible outcomes are divisible (e.g. how loud is the music at the party in decibels), use the continuous expectation.
- Often our probability density function will be a constant. That means that all outcomes are "equally likely." In this case we say that outcomes are *uniformly distributed*, and the constant density will always have to be $\frac{1}{b-a}$ to integrate to 1. To see this, let $\rho(x) = c$ for all $x \in [a, b]$. Then we have:

$$\int_a^b \rho(x)dx = \int_a^b c\ dx = c(b-a) = 1 \quad \Longrightarrow \quad c = \frac{1}{b-a}$$

- The discrete analogue to this is when each of the N options is equally likely. That is, $P(S_i) = 1/N$ for all S_i. We can say that outcomes are *discretely uniformly distributed*.

II. Infinite Series

Note: Not all of the examples in this math review are strictly necessary for this class, but you should be familiar with the geometric series. For people who haven't taken Calculus II (or who took it a long time ago), it's often difficult to think about infinite sums. This is designed to help ease you into things!

Sometimes we want to add up an infinite number of terms. But not all infinite sums add up to a finite value. A few examples:

(a) An obvious example:

$$\sum_{i=1}^{\infty} 1 = 1 + 1 + 1 + \ldots = \infty$$

(b) A not-so-obvious example (The *Harmonic Series*):

$$\sum_{i=1}^{\infty} \frac{1}{n} = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \ldots = \infty$$

Proof.

$$\sum_{i=1}^{\infty} \frac{1}{n} = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \ldots > 1 + \frac{1}{2} + \left(\frac{1}{4} + \frac{1}{4}\right) + \left(\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8}\right) + \ldots = 1 + \frac{1}{2} + \frac{1}{2} + \ldots = \infty$$

□

But sometimes infinite sums are finite. Some examples:

(a) The first(?) example (Zeno's Arrow Paradox): Suppose you shoot an arrow at a target. Before reaching the target, the arrow would first half to travel half the distance. But then it would have to travel half the remaining distance. But then...

Zeno thought this meant motion was impossible, but he was dumb. What it *does* mean is that the sum:

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \ldots$$

is finite. In fact, it is exactly equal to one!

(b) A more general example (The *Geometric Series*): Suppose $\delta < 1$. Then we have:

$$\sum_{n=0}^{\infty} \delta^n = \frac{1}{1-\delta}$$

Proof. (Sort of...)

$$\sum_{n=0}^{\infty} \delta^n = 1 + \sum_{n=1}^{\infty} \delta^n = 1 + \sum_{n=0}^{\infty} \delta^{n+1} = 1 + \delta \sum_{n=0}^{\infty} \delta^n \quad \Longrightarrow \quad 1 = (1-\delta) \sum_{n=0}^{\infty} \delta^n \quad \Longrightarrow \quad \sum_{n=0}^{\infty} \delta^n = \frac{1}{1-\delta}$$

□

Zeno's paradox is just a special case of this.

(c) An interesting case (The Basel Problem):

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

Note:

- A very useful fact (The *Hyperharmonic Series* or *p-Series*):

$$\sum_{n=1}^{\infty} \frac{1}{n^p} < \infty \quad \text{if } p > 1 \qquad \text{and} \qquad \sum_{n=1}^{\infty} \frac{1}{n^p} = \infty \quad \text{if } p \leq 1$$

This gives us the convergence/divergence of both the Harmonic series and the Basel Problem.

III. Normal Form Games

1. Components

- **Normal Form Game:** A strategic interaction in which moves occur simultaneously.
- **Payoff:** The utility of each player defined for every pair of actions.
- **Game Matrix:** A visual representation of a normal form game as a two-dimensional matrix (usually with player 1 on the side and player 2 on the top).

2. Solution Concepts

- **Strategy:** A strategy for a given player specifies a specific action (pure strategy) or set of probabilities over actions (mixed-strategy).
- **Best Response:** The strategy for each player which maximizes that player's payoff, taking as given the strategy of their opponent.
- **Strictly Dominant Strategy:** A strategy for a player is *strictly dominant* if it results in higher payoffs than all other strategies when played against all strategies of the opponent.
- **Nash Equilibrium:** A Nash Equilibrium is a set of strategies where both players are playing best responses to the other player. Nash Equilibria may not be unique. A normal form game may have one, multiple, or zero pure-strategy Nash Equilibria.

	Player 2: Action 1	**Player 2: Action 2**
Player 1: Action 1	(Payoff 1, Payoff 2)	(Payoff 1, Payoff 2)
Player 1: Action 2	(Payoff 1, Payoff 2)	(Payoff 1, Payoff 2)

IV. Extensive Form Games

1. Components

- **Extensive Form Game:** A strategic interaction in which moves may occur sequentially.
- **Player:** Participants in the game.
- **Node:** Point in the game.
- **Edge:** Directed connections between certain nodes.
- **Tree:** A set of nodes and directed edges connecting them.
- **Decision Node:** A node with outgoing edges.
- **Root:** The first node in the game tree. A decision node with only outgoing edges.
- **Terminal Node:** A node with only incoming edges.
- **Action:** Describes what occurs along a given edge.
- **Payoff:** The utility of each player defined at every terminal node.

2. Assumptions

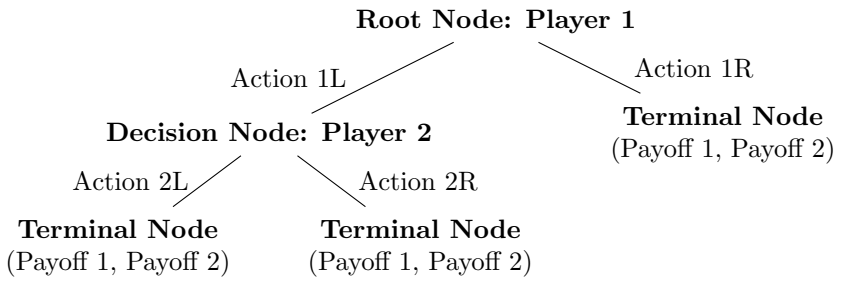
- **Common Knowledge of Rationality:** Players are rational. All players know that all players are rational. All players know that all players know that all players are rational...
- **Principle of Sequential Rationality:** When a player can count on the other players to behave rationally from that point forward.

3. Solution Concepts

- **Pure Strategy:** A pure strategy for a given player specifies what that player would do at each decision node.
- **Subgame:** The portion of an extensive form game which starts from one of the decision nodes and includes all subsequent nodes.
- **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. Backwards induction proceeds systematically by determining Nash equilibria in the smallest subgame, and reducing that subgame to a terminal node with the Nash Equilibrium payoffs. Iteratively applying this procedure gets us to the Subgame-Perfect Equilibrium.

Note: In this class we will deal mostly with games of perfect information. Our definitions would change slightly in a game with imperfect information, but this is outside the scope of this course.

Example: An example of an extensive form game is given by the following simple game tree.

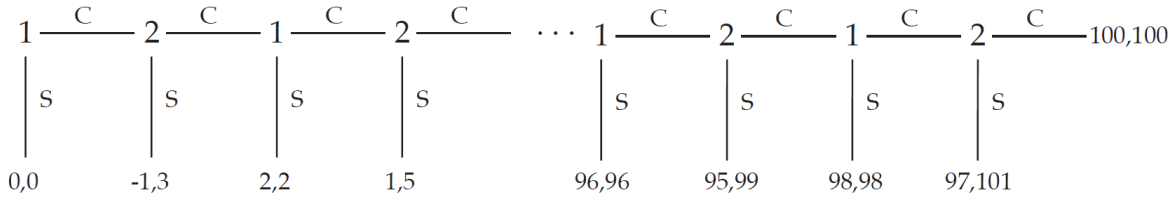


V. Repeated Games

We are often interested in analyzing relationships that involve more than one interaction between the same two parties. When these interactions only occur finitely many times, subgame perfection predicts that cooperative behavior breaks down due to the *endgame problem*, which says that misaligned incentives in the final (smallest) subgame lead to a cascading breakdown of trust in each larger subgame.

Example: The Centipede Game (Revisited)

Recall the centipede game we talked about a few discussions back:



Here, the fact that Player 2 has incentives in the smallest subgame which are misaligned with those of Player 1 in the second-smallest subgame leads us to predict that the game ends in the first period. That is, trust breaks down immediately!

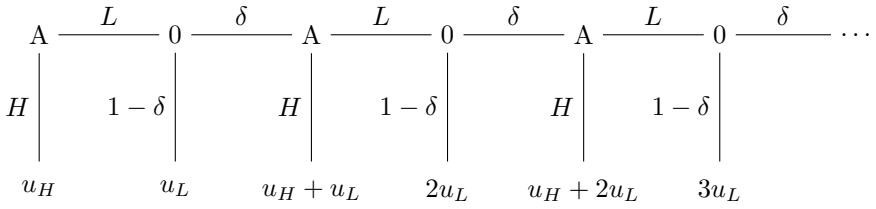
However, if we treat these interactions as occurring infinitely-many times, the endgame problem no longer applies since there is no deterministic final stage. To analyze infinitely-repeated interactions we use *repeated games*.

In the real world we know that interactions don't happen infinitely often. So to make our model more realistic we suppose that an interaction occurs once in each period of time, but that there is always a given chance $1-\delta$ that the relationship comes to an end. This is nice because it allows us to assign some (finite) value to a relationship which continues indefinitely.

An Instructive Example

Consider a repeated interaction between two players, A and B. At each decision node, Player A chooses between a high payoff u_H (which is unfavorable to Player B) and a low payoff u_L (which is favorable to Player B). If Player A chooses the high payoff, the relationship ends immediately (trust breaks down). If Player A chooses the low payoff, the relationship ends with probability $1-\delta$. That is, there is some probability δ that the interaction occurs again next period.

The game tree can be written as a series of alternating moves between Player A and "Player 0" (often called *Nature*) where Player 0's move represents the probability that the game ends at any given point. Payoffs are those of Player A.



Now we can write the (infinite discrete) expected value to Player A of choosing u_L in every period as:

$$\mathbb{E}_A[u|L,L,L,\ldots] = \sum_{n=0}^{\infty} \delta^n u_L = \frac{u_L}{1-\delta}$$

As long as this expected value is greater than the one-time payoff of choosing u_H and ending the relationship, Player A will choose u_L and maintain the relationship.

Note:

- There are a number of equilibrium concepts for repeated games. We're not going to go into much depth with these equilibrium concepts, as they can be pretty complicated. For this class the key is to be able to calculate the expected value of a continuing relationship and weigh it against one-time benefits of breaking trust.

VI. Risk

Up to this point, we haven't really cared about the risk preferences of the agents in our models. We've already suggested that risk is important in criminal law, because criminals treat probabilities of punishment and amount of punishment asymmetrically.

Definition. An agent is *risk averse* (*risk-loving*) if for any gamble over potential outcomes —levels of wealth, x— receiving the amount $\mathbb{E}[x]$ with certainty is at least as good as (no better than) the gamble itself. If a decision maker is always indifferent between these two lotteries, we say that they are *risk neutral*. Finally, we say that they are *strictly risk averse* (*strictly risk loving*) if the indifference holds only when the two lotteries are the same.

Mathematically, this is written as:

$$\text{Risk Averse}: \quad \mathbb{E}[u(x)] \leq u(\mathbb{E}[x])$$

$$\text{Risk Loving}: \quad \mathbb{E}[u(x)] \geq u(\mathbb{E}[x])$$

where $u(\cdot)$ is the utility function over wealth.

These two inequalities are well-known properties of certain expectations given by *Jensen's Inequality*, and they have the following implications:

(a) An agent is risk-averse if and only if their utility function $u(\cdot)$ is concave in wealth.

(b) An agent is risk-loving if and only if their utility function $u(\cdot)$ is convex in wealth.

These inequalities naturally suggests that for a given gamble, there is some amount that the agent is willing to accept with certainty that would make them indifferent between the gamble.

Definition. The *certainty equivalent* of a gamble, denoted c, is the amount of money for which the individual is indifferent between the gamble and the certain amount c; that is,

$$u(c) = \mathbb{E}[u(x)].$$

Since utility is increasing in wealth, it only makes sense that the certainty equivalent for a risk-averse agent is no greater than the expected wealth level, and the certainty equivalent for a risk-loving agent is no less than the expected wealth level.

We mentioned above that we have been assuming risk neutral agents. That is, we've been assuming that all agents in our models that have utility functions that satisfy:

$$\mathbb{E}[u(x)] = u(\mathbb{E}[x])$$

But this is only the case when our agents have utility functions that look like:

$$u(x) = a + bx$$

So you can see just how restrictive the assumptions of our model are.

Example: Suppose that for a certain gamble there are two equally likely wealth levels. The following are graphs of the utility functions and certainty equivalents for the gamble for agents with various risk preferences: