Problem Set 2

Law and Economics - Fall 2022

Submit before Monday, Dec 19.

Question 1: Bilateral Breach Model

Consider the efficient breach model from class but where both parties make non salvageable investments. Let $v \in \{2, 4\}$ be the random variable that indicates the value for the buyer and $c \in \{1, 3\}$ the cost of production for the seller. c and v are independent random variables with a distribution that is chosen by the respective agent: if the seller chooses a probability q of a low cost, this has an associated cost $C_S(q) = q^2$. If the buyer chooses a probability p of a high value, this has an associated cost $C_B(p) = p^2$.

The timing is as follows:

- Parties contract for a price P.
- Parties choose the probabilities p, q simultaneously.
- The values v and c are realized and publicly observable.
- Each party decides whether to breach the contract or not.
  - Rule 1: If at least one of the parties prefers to breach, the transaction does not happen.
  - Rule 2: The transaction does not happen only if both parties decide to breach the contract.
- If the transaction does not happen, the Buyer pays the Seller a compensation amount ψ.

1. When is **efficient** to breach the contract?

2. Assume that the contract is breached whenever is efficient to do so. What is the **total welfare** in that case and the efficient levels of investment?

3. Suppose that $P = 2.5$.

   (a) Do parties breach efficiently in equilibrium for Rule 1?

   (b) Do parties breach efficiently in equilibrium for Rule 2?

   (c) For Rule 2, write down the objective function of the seller and the buyer. Show that $p = q = 0$ is an equilibrium for $\psi = 0$.

4. Suppose again that $P = 2.5$ and that, when the transaction does not occur, each party pays the costs of the other party (i.e. $\psi = C_S(q) - C_B(p)$). Show that, with Rule 2, $p = 0$ and $q = 0$ is not an equilibrium.

Question 2: Product Liability and Information Acquisition

In this exercise, we have a seller that can acquire information about the risks involved in a product and a market that buys the product.

- Seller can pay a cost c to perfectly learn whether there is risk ($y = 1$) or not ($y = 0$). The probability of a risk is r for the uninformed seller.
- The seller invests x in precautions. The probability of an accident is zero if there is no risk, and $p(x)$ if there is a risk, where p is decreasing and convex.
- The seller sells the product to the buyer at price P that we are going to take as exogenous for now.
- If there is an accident, this generates a total damage D to the consumers. In the case of accident, the seller compensates the buyer with ψ, also exogenous.

1. Efficiency:

   (a) What is the efficient investment in precautions when it is known that there is no risk? When it is known that there is a risk?

   (b) What is the efficient investment in precautions when the information was not acquired?

(c) When is it efficient to acquire information?

2. Seller's Problem:

   (a) Write down the problem of the uninformed seller.

   (b) When would the seller acquire information? Compare this with the efficient information acquisition from point (1.c).

3. Suppose now that the price is endogenous: $P = V - \gamma(D - \psi)$ where V is the intrinsic value of the product for the market and γ is the probability of damage that the market expects. Moreover, suppose that the market observes x and whether information was acquired ($d = 1$) or not ($d = 0$) (so γ is sensitive to these variables).

   (a) What is γ as a function of x and d?

   (b) Write the new problem of the uninformed seller.

   (c) When would the seller acquire information?

4. As before, suppose that the price is endogenous: $P = V - \gamma(D - \psi)$. However, the market observes x and whether information was acquired ($d = 1$) or not ($d = 0$) (so γ is sensitive to these variables). Suppose that the market expects the seller to always acquire information and that:

$$\gamma = \begin{cases} 0 & \text{if } x = 0 \\ p(x) & \text{if } x > 0 \end{cases}$$

   (a) Write the new problem of the uninformed seller.

   (b) When would the seller acquire information?

5. Finally, suppose again that the price is endogenous: $P = V - \gamma(D - \psi)$. But now the market expects the seller to not acquire information: $\gamma(x) = rp(x)$.

   (a) Write the new problem of the uninformed seller.

   (b) When would the seller acquire information?