Simon Fraser University
Department of Economics
ECON 302

8. Asymmetric Information and Adverse Selection

8. Self-selection and Market Failure

Asymmetric information happen when one of the two parties involved in a transaction as more information than the other party and where such information is relevant for that uniformed party. Examples:

- Used car: I know more about my car than potential buyers.
- Health status: I know more about my health than potential insurers.
- Employment: I know more about my job stability than potential insurers.
- Investment: I know more about my business prospect than an investors.
- Hiring: I know more about my qualifications than an potential employer.

Asymmetric information can make transactions more difficult or even impossible. Economists call this problem a market failure. Examples:

- Used cars, even if they are like new, sell far below their dealership price (car loses on average 35% of their value in the first year.)
- Private health care for the elderly is essentially unavailable.
- Unemployment Insurance is public in every countries.
- Initial public offerings (IPOs) are severely underpriced: first year average return are greater than 15%.
- Laid-off workers experience longer spells of unemployment than workers who lost their job because factory closure.

Market for Lemon

"In a market with asymmetric information bad quality is driving out good quality" (George Akerlof). In the presence of asymmetric information the party without information is unable to identify good from bad quality. The willingness-to-pay or the willingness-to-sell by the un-informed party is the base on average quality. However, average quality depends on who is willing to participate in the market. If all high quality agent leave the market, average quality drops.

Example: Market for used car

Imagine a market with two type of cars: the high quality car (nicknamed the peaches p) and the low quality car (nicknamed the lemons ℓ). Let say that half of the car are peaches and half are lemons. There is a large number of car owners and there is a large number of car buyers. For any given car quality car buyers are willing to pay $x\%$ more.

- Peaches are worth 20 to their owners;
- Lemons are worth 10 to their owners.

- Peaches are worth $20(1+x)$ to a buyer;
- Lemons are worth $10(1+x)$ to a buyer.

Under perfect information, as long as $x > 0$, you can always find a price at which the owner are willing to sell and the buyers are willing to buy.

- Peaches are worth 20 to their owners and to tho buyens $20(1+x)$. Any price P_p between 20 and $20(1+x)$ is acceptable for both party – Gains from trade is $20x$;
- Lemons are worth 10 to their owners and to the buyers $10(1+x)$. Any price P_ℓ between 10 and $10(1+x)$ is acceptable for both party – Gains from trade is $10x$;

Now imagine that all cars look exactly the same and only the owners knows the true quality. Question: is there a market price P where both types owners are willing to put their car for sale?

- If all owners were willing to sell their cars, the average quality of a car on the market would be $E(Q) = 0.5(20) + 0.5(10) = 15$.
- Since buyers cannot distinguish between peaches and lemons, they are only willing to pay up $P = 15(1 + x)$ for a random car.
- For any price P above 10, owners of a lemon are willing to sell their car.
- Owners of a peach are only willing to sell if the price P is above 20.
- If $15(1 + x) > 20$, there exist prices $P \in [20, 15(1 + x)]$ such that all sellers are willing to sell and all buyers are willing to buy. It requires that buyers value cars at 33% more than owners. $15(1+x) > 20$
- If $x < 1/3$, buyers are only willing to pay $15(1 + x) < 20$. Owners of a peaches prefer keeping their car. Only owner of lemons are putting their car on the market.
- Buyers anticipating a market with only lemons, are only willing to pay up to $10(1 + x)$. There exist a market price $P \in [10, 10(1 + x)]$.
- Only lemons are sold. All gains from trading peaches $(20x)$ are gone.

Summary: Market where some participants know more about "quality" of the good than buyers (examples: labor markets, credit markets, insurance markets, stock markets, dating) are subject to market failures.

- If sellers are not finding a buyer, they will want to lower their prices.
- If price falls, high quality sellers will drop out of the market (adverse selection).
- Average quality deteriorates as price falls and the market may disappear entirely.
- Adverse selection can lead to total market failure? if trade occurs, it can be less than efficient.

$$Q = \begin{array}{ccc} 10 & 1/3 & 1/4 \\ 20 & 1/3 & 1/2 \\ 30 & 1/3 & 1/4 \end{array}$$

if All Sellers Are in the market

$$EQ = \frac{10}{3} + \frac{20}{3} + \frac{30}{3} = \frac{60}{3} = 20$$

20

$$\underbrace{20(1+x)}_{\text{willingness to pay for Buyers}} < 30$$

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if Only 10s And 20s Are in the market

$$EQ = \frac{10}{2} + \frac{20}{2} = 15$$

$$Q = 10 \rightarrow \frac{1/4}{1/4 + 1/2} = \frac{1}{1+2} = 1/3 = 33\%$$

$$20 \rightarrow \frac{1/2}{1/4 + 1/2} = \frac{2}{1+2} = 2/3 = 66\%$$

Example: Unemployment insurance

Imagine 2 risk averse workers A and B. They both make annual income of 60 thousand. Worker A face a 10% chance of loosing HER job and worker B face a 50% chance of losing his job. For simplicity assume that a laid off worker remained unemployed for a year. Define by r the risk premium individual are willing to pay to be fully insured.

What a competitive unemployment insurance market would look like? Imagine a large number of insurance companies all offering to insure workers' income. With free entry, expected profits are driven to zero. Define P as the price to insure 60 thousand of income.

- Expected profits if both workers buys insurance:

$$P - 0.5[0.5(60)] - 0.5[0.1(60)] = P - 0.5(0.6)60$$

- With free entry: $P = 18$.

- At $P = 18$, worker B buys insurance: expected loss plus risk premium is $\underbrace{30 + r}$, which is greater than 18.

- Worker A may not want to buy: expected loss plus risk premium is $6 + r$, which is large than the price only if $6 + r > 18$.

- If $r < 12$, the firm anticipates only worker B to buy and will charge $P = 0.5(60) = 30$.

Example: Private Health Insurance Same as above!!!

Institutions or Mechanisms to solve Adverse Selection problems

The market or government developed solutions to go around adverse selection problem. These solutions are not always perfect and often carries their own costs. We discuss some of the main solutions.

A. Mandatory coverage in the insurance market.

The central cause of adverse selection in the insurance market is that low risk individuals exit the market driving the price up. As the price increase, more and more individuals prefer not to buy. A brute force solution is for a government to take over the insurance system or to force **all** individuals to buy. Take the unemployment insurance example. If all individuals are force to pay 18$ in taxes and all are covered by the public insurance system.

Universal Heath Care in Canada works the same way. Another example is the Affordable Care Act in the US (Obamacare). If an individual can afford health insurance but choose not to buy, the individual pays a fee called the individual shared responsibility payment. The fee is sometimes called the "a penalty" or "the individual mandate". It is 2.5% of income.

There are also few examples of other goods or services where every individuals are force to buy, but it is rare. An example is the U-pass. With the no opt-out policy you get a bus pass at $41 per month ($164 per term) instead of the $172 per month for the general public.

Problem with this solution is that some individuals (low risk) are forced to buy something they would preferred not.

B. Standards and certification

In may case governments or even an industry itself imposes quality standards, or it requires sellers to hold a certification.

Examples:

- Bond credit rating (Moody's, Standard & Poor's and Fitch Ratings)
- Certified Pre-Owned cars (inspected used car)

Two problems with this option. Often the third party involved in rating, inspecting and certifying has market power. As a consequence cost will be high and can limit transactions. Second, the third party may no always have the incentive to reveal the information (watch the Big Short about the financial crisis).

C. Reputation and Brand names

Implicit contract as we talk about in the last section can do the job. I am willing to pay a high price for a good of higher quality. If you cheat once by providing a lower quality good, we never transact together again. Can only done if I transact with the same person or firm.

Brand name and chain stores or restaurant extends the reputation. One bad meal at one McDo diminishes the reputation for the entire brand.

Problems: i) diversity is good, ii) you don't buy a car everyday.

8.3 Signalling

Sellers with a products or a services of high quality may undertake actions that is only profitable to high quality provides and not to lower quality ones.

High quality sellers with private information undertake these actions to distinguish themselves form from lower quality agent.

We can divide the activities into two groups: i) actions that provides benefits to the other side of the transaction and ii) action that provides no benefit at all.


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With signalling (and screening that we will cover later) there are two type of equilibrium, pooling and seperating.

Pooling equilibriums

A pooling equilibrium is an equilibrium in which all types of sender send the same message by choosing the same action. In a pooling equilibrium no information is revealed. Compensations (price, wage, ect) are base on the expected quality.

Separating equilibriums

A separating equilibrium is an equilibrium in which all types of sender send different messages by choosing different actions. In a seperating equilibrium all information is revealed. The agent without information learn the other agent type by observing his or her action. Compensations (price, wage, ect) can be based on individuals quality. In a separating equilibrium all agents must satisfied a self selection constraint.

Self Selection constraints

The self selection constraints ensure that each agent prefers to undertake an action that will reveal their true type as oppose to faking and picking an action intended for another types.

i) actions that provides benefits to the other side of the transaction:

- Warranties: High quality sellers provide better warranties and can then charge higher prices.
- Education: Talented workers acquires more education or training, firms are then willing to offer higher wages.
- Store offering money back guaranty.

Warranty example with market for lemon (pooling equilibrium)

In example bellow we will explore a pooling equilibrium when both high and low quality car owners will pick the same action by both offering a warranty. No information is revealed, but warranty will keep price high enough so the high quality car owners want to sell. The average quality of a car is still the same at $E[Q] = 0.5(20) + 0.5(10) = 15$, because no information is revealed. However, buyers will be willing to pay up to $40(1 + x)$ for a car because of the warranty. The warranty gives $40(1 + x)$ to the buyer when the car breaks down but only cost 40 to the owner to fix. Let's find a possible market clearing price.

Take the market for lemon and justify the difference in value between Peaches and Lemons by the probability of braking down. Assume all agents are risk neutral. Take the case where $x < 0.33$ so only lemons are on the market.

- Peaches are worth 20 to owners: $1/2$ chance of 40 and $1/2$ chance of 0
- Lemons are worth 10 to owners. $1/4$ chance of 40 and $3/4$ chance of 0

- Peaches without a warranty are worth $20(1 + x)$ to a buyer;
- Lemons without a warranty are worth $10(1 + x)$ to a buyer.

Imagine owners pay the 40 repairing cost if a car breaks down. Buyers would be willing to pay $40(1 + x)$. Peach vs lemon don't matter anymore.

Assume that car owners make take-or-leave offers to buyers. Car owners extract all surplus by asking for a price equal to buyers willingness to pay. Since all cars are worth $40(1 + x)$ to a buyer, the market price will be $P = 40(1 + x)$ for all cars.

Is $P = 40(1+x)$ with a warranty an equilibrium price?

Peach owners' payoff who sell with a warranty: $40(1+x) - 0.5(40) = 20 + 40x > 20$.

- Peaches owners want to sell with a warranty.

Lemon owners' payoff who sell with a warranty:: $40(1+x) - 0.75(40) = 10 + 40x > 10$.

- Lemons owners want to sell with a warranty.

All cars are sold!!! The price remains high and so it keeps high quality car in the market.

$$\underbrace{40(1+x)}_{\text{Price with waranty}} - \underbrace{10(1+x)}_{\text{Price if think it is a Lemon}} > \underbrace{0{,}75(40)}_{\text{Cost}}$$

Separating equilibrium

Same example with the following variation

- Cost to repair a peach 40
- Cost to repair a lemon 100

– The pooling equilibrium no longer exist

if all sell with warranty –

$$P = 40(1+x)$$

Peach owner's payoff

$$40(1+x) - 0.5\,40 = 20 + 40x > 20$$

Lemon owners' payoff

$$40(1+x) - 0.75(100) = -35 + 40x < 10$$

if

$x < 1{,}125$

Seperating Equilibrium

- Peachs' owners sell with warranty

→ value for consumers $40(1+\alpha)$

if owners make take or leave it offer at $p^P = 40(1+\alpha)$ with warranty

payoff $40(1+\alpha) - 40(0.5) = 20 + 40\alpha > 20$ ✓
want to sell

- Lemons' owners sell without warranty

→ value for consumers $10(1+\alpha)$

if owners make take or leave it offer at $p^L = 10(1+\alpha)$ without warranty

payoff $10(1+\alpha) > 10$ want to sell

Self Selection Constraint

- You need to verify that lemon owners don't want to sell with warranty

- without warranty $p^L = 10(1+r)$ - zero cost

- with warranty $p^P = 40(1+r)$
  → consumer then thinks it is a peach

  Payoff $40(1+r) - 0.75\ 100$

$$10(1+r) > 40(1+r) - 75$$

So lemon owner do not want to imitate a peach owner

$$\underbrace{\underset{p^P}{40(1+r)} - \underset{p^L}{10(1+r)}}_{\text{Benefit from imitation}} < \underset{\text{cost}}{75}$$

ii) action that provides no benefit at all

Often referred as signalling by burning money. High quality agents spend on non-productive activities. Buyers believe only high quality sellers would do this, and so they are willing to pay high prices. Spending on those activities must be sufficiently high, so only high quality sellers want to do it. The important component it that the cost for those activities is lower for high quality sellers than low quality ones.

- Investment in publicity for new products: a 100M blockbuster movies spends an additional 50M on promotion.
- Realtor agents drive fancy cars: If I was not good, I could not afford that car!!
- Traditionally banks spent a lot on buildings; showing they are not going to run away with you money!!

Burning money example with market for lemon (separating equilibrium

Take the market for lemon and justify the difference in value between Peaches and Lemons by the probability of braking down. Assume all agents are risk neutral. Take the case where $x = 0.3$ so only lemons are on the market.

- Peaches are worth 20 to owners: 0.8 chance of 25 and 0.2 chance of 0
- Lemons are worth 10 to owners. 0.4 chance of 25 and 0.6 chance of 0

- Peaches are worth 26 to a buyer;
- Lemons are worth 13 to a buyer.

Imagine owner of a peach car burns Y dollars if a car breaks down. Buyer would be willing to pay 26 if they know it is a peach.

Assume that car owners make take-or-leave offers to buyers. Car owners extract all surplus by asking for a price equal to buyers willingness to pay. Buyers believe that cars with a burning money contract are peaches so they are willing to pay up to 26. Buyers believe that cars without a burning money contract are lemons so they are willing to pay up to 13. Consequently, the cars without a burning contract is $P^{n\$} = 13$ and the cars with a burning contract is $P^{\$} = 26$.

Peach owners' payoff if sell with burning money: $P^{\$} - 0.2Y = 26 - 0.2Y$.

Peach owners' payoff if sell without burning money: $P^{n\$} = 13$.

Self-selection constraint: Sell with burning money if $26 - 0.2Y > 13$

$\underbrace{26-13}_{MB} > \underbrace{0.2Y}_{MC}$

- Peach owners sell with burning money if $Y < 65$

Lemon owners' payoff if sell without burning money: $P^{n\$} = 13$.

Lemon owners' payoff if sell with burning money: $P^{\$} - 0.6Y = 26 - 0.6Y$.

Self-selection constraint: Sell without burning money if $13 > 26 - 0.6Y$

- Lemon owners sell without burning money if $Y > 21.67$

$\underbrace{26-13}_{MB} < \underbrace{0.6Y}_{MC}$

Benefits and costs of signalling

We can also see the self selection constraint as benefits and costs.

- By burning money any car owner would signal they are a peaches so the benefit is $P^{\$} - P^{n\$} = 13$
- The cost of signalling for a peach owner is $0.2Y$
- The cost of signalling for a lemon owner is $0.6Y$
- The cost to signal is larger for a lemon owners.
- The peach owner have to pick Y such that the cost for the lemon owner just exceed the benefit.

Separating equilibrium

- Lemon owners sell car without burning money at price $P^{n\$} = 13$.

* • Peach owners sell car with promising to burning $Y = 21.68$ at price $P^{n\$} = 26$.
  - Any amount of $Y \in [21.68, 65]$ works, but why burn more than needed!!!
- All cars are sold but $0.2(21.68) = 4.336$ is waisted on average per peaches.

Spence's Education Model

Imagine two individuals: High ability h and low ability ℓ. Ability is not observable before hiring a worker.

Firms compete to attract workers by paying them their expected productivity.

Each individuals can decide to undertake training $T - T = 0$ if not and $T = 1$ if does.

- Certification
- Undergraduate degree
- Graduate degree

Cost to undertaking the training:

- c^h for the high ability,
- $c^\ell > c^h$ for the low ability.

Productivity in the labour market

- 4 for a high ability individual with training;
- 3 for a high ability individual without training;
- 2 for a low ability individual with training;
- 1 for a low ability individual without training;

Note: If two individuals have the same training, firm would be offered the same, wage.

No training equilibrium – Pooling equilibrium

Imagine c^{ℓ} and c^{h} are high enough so both individuals pick $T = 0$.

Firms would offer to untrained workers $w_0 = 0.5(3) + 0.5(1) = 2$.

You get this equilibrium when c^{ℓ} and c^{h} and both types of individual prefer not investing in training.

→ if firms think only high type would take $T = 1$

→ would pay $w = 4$ if $T = 1$

- payoff for type H if

Training $4 - c^h$

No training 2

$$2 > 4 - c^h$$

$$\underset{\substack{\uparrow \\ \text{cost}}}{c^h} > \underbrace{4 - 2}_{\text{Benefit from training}}$$

All training equilibrium – pooling equilibrium

Imagine c^ℓ and c^h are low enough so both individuals pick $T = 1$.

Firms would offer to trained workers $w_1 = 0.5(4) + 0.5(2) = 3$.

IF individual show up with no training

Firm will think it is a low individual

wage offered is 1

Low Ability if $T=1$ Get $3 - c^\ell$

$T=0$ Get 1

$3 - c^\ell > 1$ you pick $T=1$

$\underbrace{3-1}_{MB} > \underbrace{c^\ell}_{MC}$

High Ability

$\underset{MB}{3-1} > c^h < c^\ell$

Signalling equilibrium – separating equilibrium

Imagine c^h is low enough so high ability individual picks $T = 1$.

Imagine c^ℓ is high enough so low ability individual picks $T = 0$.

Firms would offer to trained workers $w_1 = 4$ because they believe only high type pick $T = 1$.

Firms would offer to untrained workers $w_0 = 1$ because they believe only Low type pick $T = 0$

For this to be an equilibrium, it must be the case that:

High ability worker's payoff if trained: $w_1 - c^h = 4 - c^h$.

High ability worker's payoff if not trained: $w_0 = 1$.

Self-selection constraint: Will train if $4 - c^h > 1$

- High ability worker trains if $c^h < 3$

or $\underbrace{4-1}_{MB} > \underbrace{c^h}_{MC}$

Low ability worker's payoff if not trained: $w_0 = 1$.

Low ability worker's payoff if trained: $w_1 - c^\ell = 4 - c^\ell$.

Self-selection constraint: Will not train if $1 > 4 - c^\ell$

- Low ability worker does not train if $c^\ell > 3$

$\underbrace{4-1}_{MB} < \underbrace{c^\ell}_{MC}$

Separating equilibrium

- High ability workers train and get wage $w_1 = 4$.
- Low ability workers do not train and get wage $w_0 = 1$.
- For the separating equilibrium to exist need $c^\ell > 3 > c^h$.

Benefits and Costs

- If the high ability individual was untrained, she will be perceived as a low ability individual and would get $w_0 = 1$.
- If the low ability individual was to be trained, she will be perceived as a high ability individual and would get the high wage $w_1 = 4$.
- The benefit of signalling by training for both types is $w_1 - w_0 = 3$.
- The cost of signalling their true type for high ability individuals are $c^\ell > c^h$
- The cost of signalling a fake type for low ability individuals are $c^\ell > c^h$
- You have a separating equilibrium when the cost of training is bigger than the benefit for the low type are smaller that the benefit for the high type.

8.2 Screening

A mechanism developed by agents without private information to separate "good" types from "bad" types. They offer two options such that only the "good" types want to take one and only "bad" types want to take the other.

An agent without the private information exploit the cost incurred by different types to select an option.

- Insurance companies offers contract with high and low deductible: high risks take low deducible and low risk take high one.
- Plea bargain: guilty individuals take the plea and innocents go to court

Requiring inspection in the market for lemon separating

Take the market for lemon and justify the difference in value between Peaches and Lemons by the probability of braking down. Assume all agent are risk neutral. Take the case where $x = 0.3$ so only lemons are on the market.

- Peaches are worth 20 to owners:
- Lemons are worth 10 to owners.

- Peaches are worth 26 to a buyer;
- Lemons are worth 13 to a buyer.

Assume that car owners have all the bargaining power. A peach owner will never sell for less than 26 and a lemon owners never sell for less than 13. Buyers announce they will pay $P^i = 26$ for a car with inspection and $P^{ni} = 13$ for car without inspection.

INSPECTION

FOR PEACHES PAY 0

FOR LEMONS PAY Z

Peach owners' payoff if sell with inspection: $P^i - 0 = 26$.

Peach owners' payoff if sell without inspection: $P^{ni} = 13$.

Self-selection constraint: Sell with inspection if $26 > 13$.

$MB = 26 - 13$
$MC = 0$

- Peach owners sell with inspection.

Lemon owners' payoff if sell without inspection: $P^{ni} = 13$.

Lemon owners' payoff if sell with inspection: $P^i - Z = 26 - Z$.

Self-selection constraint: Sell without inspection if $13 > 26 - Z$

- Lemon owners sell without burning money if $Z > 13$

$MB = 26 - 13$
$MC = Z$

As long as $Z > 13$, owners of lemons will sell without inspection. The market will separate the peaches from the lemons. Again inspection is not providing any information by itself. Both car can pass, but owners lemons don't want to pay the cost. It is call self selection constraint.

Benefits and costs of picking a contract

We can also see the self selection constraint as benefits and costs.

- By choosing a contract with inspection any owner gains $P^i - P^{ni} = 13$
- The cost of the inspection for a peach owner is 0.
- The cost of the inspection for a lemon owner is Z
- The cost of the inspection is larger for a lemon owners.
- As long as $Z > 13$, the cost for the lemon owner exceed the benefit.

Screening with deductible

Imagine two drivers: A low risk individual and a high risk individual.

- Low risk individual has a 10% chance of an accident.
- High risk individual has a 20% chance of an accident.

An accident cause a 100$ worth of damage to a car.

FREE BENEFIT

Because individual are risk averse, assume a risk n of r per covered INCOME

* YOU HAVE INCOME FOR CERTAIN YOU GOT r PER $

If competitive insurance companies were to offer full insurance contracts only, then only the high risk individual would buy.

- The price of the unique contract is P;
- If everyone buy insurance, insurance companies profits:

$$P - 0.5[0.1(100)] - 0.5[0.2(100)] = 0$$

.

- With the zero profits condition, $P = 15$ when everyone buy.
- High risk individual wants to buy: $P = 15 < 0.2(100)(1+r) = 20(1+r)$.
- Low risk individual does not want to buy if: $P = 15 > 0.1[100(1+r)] = 10(1+r)$.

Classic lemon problem if $r < 0.5$: only the high risk buys and $P = 20$.

Separating equilibrium contract

Let's fix $r = 0.4$

Now imagine insurance companies offers two contract:

- A full insurance contract at price P_f, which pays 100 if an accident;
- An insurance contract with deductible at price P_d, which pays $100 - D$ if an accident;

The insurance companies design D so that only the low risk wants to buy the insurance contract with deductible. In that case, the zero profit conditions give the following prices:

- $P_f = 0.2(100) = 20$
- $P_d = 0.1(100 - D) = 10 - 0.1D$

The insurance companies want to make sure the low risk individual wants to buy the contract with deductible:

Low risk individual's payoff if buys with deductible: $0.1(100-D)1.4-P_d$.

Low risk individual's payoff if buys full insurance: $0.1(100)1.4 - P_f$.

Self-selection constraint: Will buy with deductible if $0.1(100-D)1.4-P_d > 0.1(100)1.4 - P_f$

- Low risk individuals buy with deductible if $\underbrace{P_f - P_d}_{MC} > \underbrace{0.1D1.4}_{MB}$

- Low risk individuals buy with deductible if $0.2(100) - 0.1(100 - D) > 0.1D1.4$, this condition is satisfied for any deductible.

The insurance companies want to make sure the high risk individual wants to buy the full insurance contract:

High risk individual's payoff if buys full insurance: $0.2(100)1.4 - P_f$.

High risk individual's payoff if buys with deductible: $0.2(100-D)1.4 - P_d$.

Self-selection constraint: Will buy full insurance if $0.2(100)1.4 - P_f > 0.2(100 - D)1.4 - P_d$

- High risk individuals buy with deductible if $\underbrace{P_f - P_d}_{MC} < 0.2D1.4$

- High risk individuals buy full insurance if $0.2(100) - 0.1(100 - D) > 0.2(100)1.4$, this condition is satisfied for any deductible $D > 55.6$.

Benefits and costs of picking a contract

We can also see the self selection constraint as benefits and costs.

- By choosing a contract with deductible any agent gains $P^f - P^d = 0.2(100) - 0.1(100 - D) = 10 - 0.1D$

- The cost of having a deductible for the low risk is just $0.1D1.4 = 0.14D$

  .

- The cost of having a deductible for the high risk is $0.2D1.4 = 0.28D$.

- The cost of having a deductible is higher for the high risk individual.

- As long as $D > 55.5$, only the low risk wants a contract with deductible.

The insurance companies succeeded to separate the high and the low risk.