Information

Lecture 10

Reading: Perloff Chapter 18

August 2017

Introduction

- In the course so far, by assumption, buyers and sellers were both perfectly informed about the quality of goods being sold in the market.
- Sometimes it is easy to tell what goods are low quality and which are high quality.
- Sometimes, it is not so easy.

- I know an apple is good or bad from its look and texture.
- The price of goods will just reflect their relative quality in this case... bad apples will be cheap and good apples will be expensive.

Introduction

- But sometimes information about quality is costly to obtain.
- If this is the case, we can't assume both sides of the market have the same information.
- A person interviewing for a job knows how hard of a worker she is, but the employer does not.
- The seller of a used car knows whether or not it is good, but the buyer might not.

Introduction

- When one side of the market has more information that the other, this is **asymmetric information**
- Asymmetric information can lead to significant problems in the function of a market.
- When qualities are hard to tell, **opportunistic behavior** might occur.
- This is when the informed party takes advantage of the uninformed.
- This can lead to a complete market collapse.

Problems Due to Asymmetric Information - Informed parties take advantage of uninformed parties.

Responses to Adverse Selection - There are many ways in which adverse selection can be avoided.

Market Power from Price Ignorance - When consumers are unaware of prices, firms have market power.

Application to the Labor Market - The most interesting application of adverse selection is to the labour market.

Problems Due to Asymmetric Information

- Suppose there are 100 people who want to sell their used cars and 100 people who want to buy a used car.
- Everybody knows that half the cars are "lemons" and half are "plums."
- Sellers know the quality of the car, buyers do not.

- The owner of a lemon is willing to part with it for $1000 and the owner of a plum will part with it for $2000.
- The buyers of the car are willing to pay $2400 for a plum and $1200 for a lemon

Problems Due to Asymmetric Information

- If the quality of the car is easy to verify, we can answer what will happen from an earlier lecture.
- The lemon will sell at some price between \$1000 and \$1200 and the plums will sell at a price between \$2000 and \$2400.

- But what if we *can't* observe quality
- The buyer (if risk neutral) will be willing to pay the expected value of a car

$$P = \frac{1}{2}\$1200 + \frac{1}{2}\$2400 = \$1800$$

Problems Due to Asymmetric Information

- The market price under asymmetric information is $1800.
- No seller of the high quality car will sell his car. They won't part with it for less that $2000
- Only lemons are left, and a buyer certainly wont pay $1800 for a lemon
- The equilibrium price must be somewhere between $1000 and $1200

Problems Due to Asymmetric Information

- No plum will get sold
- This market fails
- Akerlof won a Nobel Prize for this

Problems Due to Asymmetric Information

- **Adverse selection** occurs when the low-quality item drives out the high-quality items.
- Adverse selection can occur in many markets
- Insurance, labor markets etc...

EXAMPLE

- Suppose 1/4 of the population smokes and 3/4 don't.
- Smokers value life insurance at $1100 and non-smokers value it at $500
- To make a profit, insurance companies will charge no less than $1000 for a smoker's policy and no less than $400 for a non-smoker's
- What will the price of insurance be if there is perfect information?
- What happens if the insurance company doesn't know who smokes?

Problems Due to Asymmetric Information

- Adverse selection is opportunism characterized by unobserved characteristics. It is a hidden information problem
- **Moral hazard** is another result of asymmetric information, but through an unobserved action.
- That is, the informed party takes advantage of the uniformed party through hidden actions

- I am scared my bike will get stolen, so I buy insurance on it.
- Now that I have insurance, I have less of an incentive to take care of it.
- The presence of insurance against some risky occurrence increases the likelihood of that occurrence.

Problems Due to Asymmetric Information

- Some more examples of moral hazard.
- If I wear a helmet, I am more likely to wreck my bike.
- If I have car insurance, I am more likely to wreck my car.
- If I have health insurance, I am more likely to break a bone.

EXAMPLE

- Apply the concept of moral hazard to the recent government bail outs to banks that provided bad loans.

Responses to Adverse Selection

- Let's return to adverse selection.
- We saw that low quality goods can cause a market to fail.
- There are many ways, however, to prevent this problem.

Responses to Adverse Selection

- Universal coverage can solve this problem.
- Bad drivers raise auto insurance premiums, unhealthy people raise health insurance premiums.
- The good quality people are driven out of these markets and don't buy insurance.
- Mandatory health insurance and mandatory auto insurance will prevent only "lemons" from being in the market.

Responses to Adverse Selection

- The problem can also be solved through the equalization of information.
- The informed or uniformed side of the market can try and reduce information asymmetries
- This is done through screening or signalling
- Screening is an action taken by and uniformed person
- Signalling is an action by the informed person

Responses to Adverse Selection

- **Screening** is the method of gathering information about the hidden characteristics of the informed people.
- For example a health insurance company might require medical exams.
- Employers might require employees to take a drug test.
- This informational gathering can be costly.
- Companies will collect information only until the marginal benefit of extra information equals the cost of obtaining it.

Responses to Adverse Selection

- **Signalling** is used by informed parties to show they are high quality.
- It is important that the low quality goods cannot imitate it.
- Education is a signalling mechanism.
- Companies offer warranties on their goods to signal they are high quality.

Responses to Adverse Selection

- If you go on a first date, your date does not know what kind of person you are.
- Examples of screening in this case would be to dress well so they think you have good social awareness or to go to an expensive restaurant to signal you are rich.
- We will return to screening and signalling in the last section.

Market Power from Price Ignorance

- We have seen that consumer ignorance about quality can keep high-quality goods out of markets.
- We now see that consumer ignorance about price variation across firms gives firms market power.

Market Power from Price Ignorance

- Remember one of our assumptions in perfect competition was perfect information.
- If consumers have perfect information, a competitive firm cannot charge more than her competitors and will set $p = MC$.
- If consumers have limited information, a firm can get away with $p > MC$.

Market Power from Price Ignorance

- Suppose you get off the bus in a small town in the Highlands.
- You want to buy one or several kilts, but you don't know all the prices in all the shops.
- In terms of your opportunity, it costs you an amount c to visit a shop and check the price.
- If p is the price of a kilt, it costs you $p + c$ to buy the kilt at the first shop, $p + 2c$ to buy at the second shop you visit etc...

Market Power from Price Ignorance

- Lets call the full information, competitive price, p^*.
- You see in your guidebook that this is the price of a kilt in this town.
- If it costs people to check prices, however, p^* cannot be an equilibrium price.

Market Power from Price Ignorance

- Suppose you are a firm in this town, will you want to charge a price of p'?
- Let $p' > p^*$ be the price you sell.
- If a customer walks into your shop, she will still buy a kilt from you so long as $p' < p^* + c$ because it is not worth their while to keep shopping.
- But all firms will want to do this.

Market Power from Price Ignorance

- Now all firms are setting a price p'.
- You as a firm can raise your price a bit more to $p'' < p' + c$ because it will not be worth a customer's while to keep shopping.
- This spirals up until (under some conditions) all firms set the monopoly price.
- What role do you think advertising plays in this? If you are a firm would you like advertising to be banned?

EXAMPLE

- Suppose the full information competitive price of a pint of beer is £5. It is advertised that in our town, this is the price.
- It costs the person (in terms of opportunity cost) £1 to go to a different pub.
- What happens?

Applications to the Labor Market

- We will now apply the concept of asymmetric information to the labor market.
- Asymmetric information is a huge source of inefficiency in these markets.
- Asymmetric information occurs here because...
  - Some firms are better to work for
  - Some workers are harder workers
- We will first consider the case in which workers are the uninformed party and then when firms are the uninformed party.

Applications to the Labor Market

- Firms have more information about job safety than workers do.
- Employees don't know the injury rates at individual firms, but they know average injury rates of an industry.
- Employees will still work in an unsafe industry (such as Alaska crab fishing) if they are appropriately compensated.

- Each firm must decide on a safety level, but extra safety is costly.
- If a firm invests in safety equipment, the industry becomes safer and firms can pay a lower wage.

Applications to the Labor Market

- But workers might not know exactly which firm is the one that invested in the safety equipment.
- A firm that invests in safety equipment will bear the full costs but will only get some of the benefits (and every other firm will reap these benefits).
- This is a prisoner's dilemma and firms will underinvest in safety (and they all have to pay a higher wage).

EXAMPLE

- Suppose there are 10 fishing boats. If one fishing boat installs life jackets at a price of £10, the whole industry becomes safer and firms can cut their wages by £2.
- What happens?
- What do fishing boats want to happen?
- Think of some solutions.

Applications to the Labor Market

- Now lets look at what happens when firms are uninformed about the quality of workers.
- Some workers are really hard working and clever.
- The firms want these workers.
- But only the worker knows whether or not they are high or low quality.

Applications to the Labor Market

- Remember signalling is when the informed party tries to show the uninformed party they are high quality.
- Showing up early to an interview, combing your hair, good eye contact etc.. are all signals a worker sends
- But remember, an effective signal is one in which low quality people cannot imitate.
- One important signal is education.

Applications to the Labor Market

- Let's make the very extreme assumption that education has no intrinsic value (not hard to relax this).
- It only serves as showing the firm that you are a hard worker and adds nothing to your worth.

Applications to the Labor Market

- Suppose the marginal product of a hard worker is $40,000, and the marginal product of a lazy worker is $20,000
- Let's assume the labor market is perfectly competitive so workers will earn their marginal products.
- The value of output to a firm is $w_h = \$40,000$ if high quality and $w_l = \$20,000$ for low quality
- Suppose a fraction θ of people are high quality and $1-\theta$ are low quality

Applications to the Labor Market

- If firms know the types, good workers will get paid w_h and bad workers will get w_l.
- If employers cannot distinguish, we have a **pooling equilibrium** where nobody signals.
- The wage in a pooling equilibrium is

$$\overline{w} = \theta w_h + (1 - \theta) w_l$$

- A risk neutral firm will just break even.

EXAMPLE

- Half of the workers will only watch football and half of the workers will work hard.
- The marginal product of a football watcher is $10,000 and the marginal product of a hard workers is $30,000
- If firms can tell types, what will the wages be? If firms cannot tell types, what will the wages be?

Applications to the Labor Market

- High quality workers clearly want to show they are good so they can get a wage $w_h > \overline{w}$.
- Assume, for simplicity, that only high-quality workers are able to graduate from college because low-quality workers are lazy and the cost is prohibitively high.
- If a firm sees an intervewee graduated college, they get the high wage.

- If high quality people only go to school and low quality people don't, the outcome is a **separating equilibrium.**
- Under what conditions do high quality workers want to go to college?

- Assume that high ability individuals can get a degree at a cost c
- Suppose for exposition $c = \$15,000$

Applications to the Labor Market

- Remember if we are in an equilibrium, we must ask does anybody want to deviate?
- Lets say we are *initially in a separating equilibrium* where all the high quality people are educated.
- With a college degree, a high quality person will get w_h.
- With no degree, a high quality person will get w_l as the firm treats them as low.

Applications to the Labor Market

- With a degree, they earn $w_h - c$
- A high quality person will go to school if

$$
\begin{aligned}
w_h - c &> w_l \\
&\Leftrightarrow w_h - w_l > c
\end{aligned}
$$

- A separating equilibrium will be sustained if this condition is held
- In our example $\$40,000 - \$15,000 > \$20,000$
- No high quality worker can gain from *not* getting an education

Applications to the Labor Market

- In a pooling equilibrium, all workers are paid the average wage $\overline{w}$ because firms can't distinguish.
- A high quality person must decide to go to school and get $w_h - c$ or not go to school and get $\overline{w}$.

Applications to the Labor Market

- When θ (the percentage of high quality workers) is really high, the average wage is really high and school might not be worth it

- High quality workers *won't* go to school if

$$
\begin{aligned}
\theta w_h + (1 - \theta)\, w_l &> w_h - c \\
w_h - [\theta w_h + (1 - \theta)\, w_l] &< c \\
\theta &> 1 - \frac{c}{w_h - w_l}
\end{aligned}
$$

Pooling Equilibrium

- If the cost of education is $\$15,000$ and $w_h = \$40,000$ and $w_l = \$20,000$
- What must θ be for a pooling equilibrium to be sustained?

- $w_h - w_l$, θ and c determine which equilibrium we will be in.
- We have two equilibria to consider. A pooling equilibrium in which nobody gets educated and a separating equilibrium where smart people get educated.
- It is possible to have multiple equilibria.
  - That is, pooling will be an equilibrium if we start out pooling and separating will be an equilibrium if we start out separating.

Applications to the Labor Market

- If education is really costly, we will always pool of course.

$$w_l > w_h - c$$

- If $w_h - c > w_l$, a separating equilibrium can be sustained.
- If $\theta w_h + (1 - \theta) w_l > w_h - c$ then pooling can be sustained.
- There is a range of parameter values in which both these conditions are met and we have multiple equilibria.
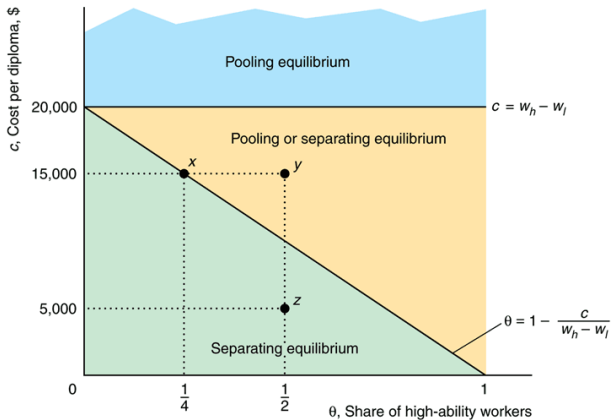
- For example let $\theta = \frac{1}{2}$ and $c = 15,000$
- The pooling wage is $\overline{w} = \$30,000$. If a worker gets educated she will get $\$40,000 - \$15,000 = \$25,000$ so pooling is supported.
- If we are in a separating equilibria,
  $\$40,000 - \$15,000 = \$25,000 > w_l$ so separating is also supported.

EXAMPLE

- What will the equilibrium (equilibria) be if $\theta = \frac{1}{4}$ and $c = \$15,000$?
- What will the equilibrium be if $\theta = \frac{1}{4}$ and $c = \$25,000$?

Applications to the Labor Market

- An education in this model is privately useful to high-type workers as it earns them a higher wage.
- But it is socially inefficient because it is costly and adds nothing to productivity.
- Signalling just changes the distribution of wages.
- The firms pay the same amount and total output is unchanged.

Applications to the Labor Market

- It is possible that education can make high quality people worse off as well
- Remember point y where the cost of education is $15,000 and half the people are high quality
- In a pooling equilibrium everybody would earn $30,000
- In a separating equilibrium, high quality people will earn $25,000. But
- this is an equilibrium, so no high-type worker can deviate as he will get the low wage of $20,000
- Everybody is worse off!

- **THE GOVERNMENT SHOULD BAN EDUCATION TO INCREASE SOCIAL WELFARE!**

Applications to the Labor Market

- But not really, education serves an intrinsic purpose in reality.
- It raises productivity and better matches workers with jobs (I don't want an uneducated "medical doctor" operating on me).
- But it is still a possibility that people overinvest in education just so they aren't confused with a low-type even if it has intrinsic value.
- The point *is total social output falls with signaling if signaling is socially unproductive.*

Summary

- What is asymmetric information?
- What is adverse selection?
- What is moral hazard?
- What are some ways we can combat adverse selection?

- How might ignorance about pricing lead to deviations from perfect competition?
- Why do firms underinvest in safety?
- What is a pooling equilibrium?
- What is a separating equilibrium?
- When do we get multiple equilibria?