Lecture 6

Asymmetric information

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Introduction

- Asymmetric information arises when the two parties to a transaction have different knowledge about the goods and services being traded. In particular, sellers typically know more about what they are selling than buyers do.
- This can lead to adverse selection where bad-quality goods drive out good-quality goods, at least if other actions are not taken.
- ***Adverse selection*** is the process by which buyers or sellers with ''unfavorable'' traits are more likely to participate in the exchange.

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Introduction

- Revealing the information will resolve the problem
- But there can be strategic incentives for concealing the truth
- This can lead to some beneficial trades not taking place
- The consequences of asymmetric information depend on how markets are organized

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Introduction

- A fundamental feature is that ***actions convey information***
  - The purchase of an insurance contract reveals the likelihood of an accident
  - The quality of a guarantee offered by a firm conveys information about the quality of its products as only firms with reliable products are willing to offer a good guarantee.
  - The willingness of an investor to self-finance a large fraction of the cost of a project conveys information about his belief in the project.
  - The number of years of schooling may also convey information about the ability of an individual.

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Introduction

- The process by which individuals reveal information about themselves through the choices that they make is called ***self-selection.***

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Introduction

- Upon recognizing that actions convey information, two important results follow ***self selection***
  - First, when making decisions, agents will not only think about what they prefer, but they will also think about how their choice will affect others' beliefs about them.(e.g more years of study)
  - Second, it may be possible to design a set of choices that would induce those with different characteristics to effectively reveal their characteristics through their choices. (e.g. insurance companies offer different menus)

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Introduction

- If the uninformed side of the market moves first a ***screening*** process will be initiated
  - An employer offers a contract (e.g. a wage and an output target) that ensures self-selection of high skill workers
- If the informed side of the market moves first then ***signalling*** will occur to identify types
  - Workers invest in education as a signal of skill
- So the difference between ***screening*** and ***signaling*** lies in whether the informed or uninformed side of the market moves first.

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Introduction

- Whatever the actions taken, the theory predicts that the types of transactions that will arise in practice are different from those that would emerge in a perfect information context.
- The fact that actions convey information affects equilibrium outcomes in a profound way. Since quality increases with price, it may be profitable to pay a price in excess of the market-clearing price.
  - In credit markets, the supply of loans may be rationed.
  - In the labor market, the wage rate may be higher than the market-clearing wage, leading to unemployment.

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Introduction

- There may exist multiple equilibria.
- Two forms of equilibria are possible:
  - ***Pooling equilibria*** in which the market cannot distinguish among the types, and
  - ***Separating equilibria*** in which the different types separate out by taking different actions.
- On the other hand, under plausible conditions, equilibrium might not exist (in particular, if the cost of separation is too great).

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Introduction

- Another set of issues arise ***when actions*** are not easily observable.
  - An employer would like to know how hard his employee is working; a lender would like to know the actions the borrower will undertake that might affect the chance of reimbursement.
- These asymmetries of information lead to what is referred to as the ***moral hazard*** problem.
- One way to solve this problem is to try to induce desired behavior through the setting of contract terms.
  - A borrower's risk-taking behavior may be controlled by the interest rate charged by the lender.
  - The insured will exert more care when facing contracts with large deductibles.

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Hidden Knowledge and Hidden Actions

- There are two basic forms of asymmetric information that can be distinguished.
- ***Hidden knowledge*** refers to one party having more information on quality (or "type")
  - Workers are informed about abilities
  - Drivers are informed about their driving ability
  - A borrower knows more about the riskiness of a project
- Hidden knowledge leads to ***adverse selection***
  - The "bad" types will drive out the "good" types
  - A high wage will attract both high- and low-productivity workers
- This restricts the contracts that can be offered

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Hidden Knowledge and Hidden Actions

- ***Hidden action*** arises when one party can take an unobserved action that affects the quality of a trade
  - Firms may make unsafe products
  - Employees may choose to shirk
  - The insured may not take precautions
- Hidden actions lead to the ***moral hazard*** problem
  - This is the inefficiency that arises due to the difficulty of designing incentive to ensure the right action is taken

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Actions or Knowledge?

- It is not always easy to distinguish between adverse selection and moral hazard.
- A radio story reported that Volvo cars were more likely to run stop signs
- This seems surprising given the typical customer of Volvo (middle class, middle aged)
- One possibility is that owners feel safe driving the Volvo
  - They are hence willing to take risks
  - This is a moral hazard explanation

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Actions or Knowledge?

- A second possibility is that purchasers of Volvos are bad drivers
  - These drivers choose the Volvo for protection
  - This is a self-selection explanation
- Self-selection need not be adverse selection
  - It only becomes ***adverse selection if it is bad for Volvo***
  - Self-selection may be profitable for Volvo
- Similar difficulties in ***distinguishing moral hazard and adverse selection*** arise in antipoverty programs
  - It is difficult to decide whether poverty is due to a lack of productive skill (adverse selection) or rather to a lack of effort from the poor themselves who know they will get welfare assistance anyway (moral hazard).

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Example with Full Information

- Imagine that there are two groups, each with 100 persons.
- One group is careless and absentminded and doesn't pay attention when crossing the street. As a result, members of this group have a 5% chance of being hit by a car each year.
- The other group is careful and always looks both ways before crossing the street. Members of this group have only a 0.5% chance of being hit by a car each year.
- What effect would the existence of these two different types of pedestrians have on the insurance market?
- The effect depends on what we assume about the relative information available to the individuals and to the insurance company.

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Example with Full Information

- Suppose that the insurance company and the street crossers have full information about who is careful and who is not. In this case, the insurance company would charge different actuarially fair prices to the careless and careful groups.
- The people in the careless group would each pay 5c per euro insurance coverage, while those in the careful group would each pay only 0.5c per euro of insurance coverage. Suppose that injuries will result in € 30,000 in medical expenses.
- At these actuarially fair prices, individuals in both groups would choose to be fully insured, with the careless paying €30,000 x 0.05 =€1500 per year in premiums and the careful paying € 30,000x0.005 =€150 per year in premiums. The insurance company would earn zero profit, and society would achieve the optimal outcome (each group is fully insured).

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Example with Asymmetric Information

- Now suppose that the insurance company knows that there are 100 careless consumers and 100 careful consumers, but it doesn't know which category any given individual belongs in. In this case, the insurance company could do one of two things.
- First, the insurance company could ask individuals if they are careful or careless, and then offer insurance at separate premiums, the premium would be only €150 if you say you are careful when you cross the street, and €1,500 if you say you are careless.
- In this case, however, *all consumers* will say that they are careful so that they can buy insurance for €150 per year:

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Example with Asymmetric Information

- Why voluntarily pay ten times as much for insurance?
- From the consumers' perspective this is a fine outcome, because everyone is fully insured and paying a low premium. But what about the insurer?
- The company is collecting €30,000 in total premium payments (200 persons × €150 per person). It is, however, expecting to pay out 5 claims to the careless and 0.5 claims to the careful, for a total cost of 5.5 × 30,000, or €165,000.
- So the insurance company, in this example, loses €135,000 per year.

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Example with Asymmetric Information

- Companies will clearly not offer *any* insurance under these conditions.
- Thus, the *market will fail:* consumers will not be able to obtain the optimal amount of insurance because the insurance will not be offered for sale.
- This outcome is summarized in the second row of the following Table.

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Insurance Pricing with Separate Groups of Consumers						
Information	Pricing Approach	Premium per Careless (100 people)	Premium per careful (100 people)	Total Premiums Paid	Total Benefits Paid Out	Net Profits to Insurers
Full	Separate	€1,500	€150	€165,000 (100 x €1,500 +100 x €150)	€165,000	0
Asymmetric	Separate	€1,500	€150	€30,000 (0 x €1,500 + 200 x€150)	€165,000	- €135,000
Asymmetric	Average	€825	€825	€82,500 (100x €825 + 0 x €825)	€150,000	- €67,500

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Example with Asymmetric Information

- Alternatively, the insurance company could admit that it has no idea who is careful and who is not, and then offer insurance at a *pooled,* or average, cost.
- That is, on average, the insurer knows that there are 100 careless and 100 careful consumers, so that on average in any year the insurer will pay out €165,000 in claims.
- If it charges each of those 200 persons €825 per year, then, in theory, the insurance company will break even.

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Example with Asymmetric Information

- Consider the careful consumers, who are faced with the decision to buy insurance at a cost of €825 or to not buy insurance at all.
- Careful consumers would view this as a bad deal, given that they have only a 0.5% chance of being hit. So they would not buy insurance.
- Meanwhile, however, all of the careless consumers view this as a great deal, and they would all buy insurance. The insurance company ends up collecting €82,500 in premium payments (from the 100 careless customers), but paying out €30,000 5 x €150,000 in benefits to those careless customers.

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Example with Asymmetric Information

- So the insurance company again loses money. Moreover, half the consumers (the careful ones), who would ideally choose to fully insure themselves against getting hit by a car, end up with no insurance.
- Once again, the *market has failed* to provide the optimal amount of insurance to both types of consumers. This outcome is shown in the third row of Table.

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The Problem of Adverse Selection

- The careful/careless pedestrian example in the previous section is an example of an asymmetric information problem that plagues insurance markets, the problem of **adverse selection:**
- The fact that insured individuals know more about their risk level than does the insurer, might cause those most likely to have the adverse outcome to select insurance, leading insurers to lose money if they offer insurance. The general operation of the adverse selection problem is illustrated by our example.

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The Problem of Adverse Selection

- Only those for whom the insurance is a fair deal will buy that insurance. With one price that averages the high - and low - expense groups, only those in the high - expense group will find the insurance to be a fair deal. (For them it's actually better than a fair deal.)
- If only the high - expense (highest risk of adverse outcome) group buys (selects) the insurance, the insurance company loses money because it charges the average price but has to pay out the high expected expenses of careless individuals.
- If the insurance company knows that it will lose money when it offers insurance, it won't offer that insurance. As a result, in this case no insurance will be available to consumers of any type.

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The Problem of Adverse Selection

- Adverse selection can therefore lead to failure in the insurance market, and perhaps the eventual collapse of the market.
- This might occur because it may not be in the interest of any individual company to offer insurance at a single, pooled price, so that no companies offer the insurance.

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Does Asymmetric Information Necessarily Lead to Market Failure?

- Are insurance companies destined to fail whenever there is asymmetric information? Not necessarily.
- First of all, most individuals are fairly risk averse. Risk-averse individuals so value being insured against bad outcomes that they are willing to pay *more* than the actuarially fair premium to buy insurance:
- They are willing to pay a **risk premium** above and beyond the actuarially fair premium. In our example, it is possible that the careful individuals are so risk averse, and therefore so afraid of being uninsured, that they are willing to buy insurance even at the average price.

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Does Asymmetric Information Necessarily Lead to Market Failure?

- That is, even if the actuarially fair price for the careful is €150, and the market is charging €825, so that their risk premium is €675 (€825 - €150), they will still buy insurance.
- This situation is technically called a ***pooling equilibrium*****,** a market equilibrium in which all types buy full insurance even though it is not fairly priced to all individuals.
- The pooling equilibrium is an efficient outcome: both types are fully insured and the insurer is willing to provide insurance.

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Does Asymmetric Information Necessarily Lead to Market Failure?

- Even if there is no pooling equilibrium, the insurance company can address adverse selection by offering ***separate products at separate prices*****.**
- Think about the source of the adverse selection problem in our example: careless individuals are pretending to be careful in order to get cheap insurance.
- The insurance company would like to get individuals to reveal their true types (careless or careful), but the company faces the type of preference revelation problem we saw with public goods.
- Even if individuals aren't willing to voluntarily reveal their types, however, they might make choices that involuntarily reveal their types.

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Does Asymmetric Information Necessarily Lead to Market Failure?

- Suppose that the insurance company offered two polices: full coverage for the €30,000 of medical costs associated with accidents, at €1,500 (the actuarially fair price for the careless), and coverage of up to €10,000 of medical expenses, at a price of €50 (the actuarially fair price for that level of coverage for the careful).
- If these two products were offered, it is possible the careless would purchase the more expensive coverage and the careful would purchase the less expensive coverage.

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Does Asymmetric Information Necessarily Lead to Market Failure?

- This outcome occurs because the careless don't want to bear the risk of having only €10,000 of coverage, given their relatively high odds of having an accident; they would rather pay a high price to make sure they have full coverage.
- The careful can take that risk, however, because of their very low odds of having an accident. By offering different products at different prices, the insurance company has caused consumers to reveal their true types.
- This market equilibrium is called a ***separating equilibrium*.**

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Does Asymmetric Information Necessarily Lead to Market Failure?

- Consider what happened in health insurance markets 25 years ago. At that time, insurance companies were offering very generous insurance to all consumers at one high price. As health insurance costs began to escalate, however, companies could no longer make profits with this strategy.
- In response to the higher costs they faced, insurance companies began to offer two products: a traditional insurance plan, and a new product that was much more tightly monitored, typically featuring much less access to medical specialists, for example, but that also had a much lower premium. The result, was a major shift by largely healthy consumers to this new, relatively low-cost/low-benefit option: a classic separating equilibrium.

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Does Asymmetric Information Necessarily Lead to Market Failure?

- Unlike the pooling equilibrium, however, the **separating equilibrium *still represents a market failure.***
- The careless are getting what they would get in a model of full information: full coverage at a high price, which they are willing to pay.
- The careful are not getting their first choice, however, which would be full coverage at a lower, actuarially fair price.
- To address this market failure, insurers have forced the careful to choose between full coverage at a very high price and partial coverage at a lower price.
- Since many of the careful will choose the partial coverage, this is not the optimal solution: ***the optimum is full coverage*** for both groups, at different prices that reflect each group's relative risks of injury. Thus, even with separate products, adverse selection can still impede markets from achieving the efficient outcome.

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How Does the Government Address Adverse Selection?

- There are many potential government interventions that can address this problem of adverse selection.
- Suppose that, in the careful/careless pedestrian example, the government mandated that everyone buy full insurance at the average price of €825 per year. This plan would lead to the efficient outcome, with both types of pedestrians having full insurance.
- This would not be a very attractive plan to careful consumers, however, who could view themselves as essentially being taxed in order to support this market, by paying higher premiums than they should based on their risk.
- That is, at a premium of €825, many careful consumers would prefer to be uninsured rather than being mandated to buy full insurance, so the government is making them worse off.

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How Does the Government Address Adverse Selection?

- Another option is public provision:
- The government could just provide full insurance to both types of consumers, so that all consumers have the optimal full insurance level.
- Alternatively, the government could offer everyone subsidies toward the private purchase of full insurance to try to induce (optimal) full coverage. These government interventions would have to be financed, however.
- If the interventions were financed by charging all consumers equally, then the situation would be the same as that with the mandate: careful consumers would be paying more than they would voluntarily choose to pay for the full insurance (now in the form of tax bills rather than insurance premiums).
- Thus, the government can address adverse selection, and improve market efficiency, in a number of ways, but they involve redistribution from the healthy to the sick, which may be quite unpopular.

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Moral Hazard

- When governments intervene in insurance markets, the analysis, as we have seen is more complicated because of another asymmetric information problem called **moral hazard,** which is the adverse behavior that is encouraged by insuring against an adverse event.
- Moral hazard is a central feature of insurance markets: if families buy fire insurance for their homes, they may be less likely to keep fire extinguishers handy;
- If individuals have health insurance, they may be less likely to take precautions against getting ill;
- If workers have unemployment insurance, they may be less likely to search hard for a new job.

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Moral Hazard

- The existence of moral hazard means that it may not be optimal for the government to provide the full insurance that is demanded by risk-averse consumers.
- Consider the example of workers' compensation insurance, program that insures workers against injury on the job. Clearly, getting injured on the job is a bad thing, and individuals would like to insure against it.
- There is a big problem with workers' compensation insurance, however: it is difficult to determine whether individuals are really injured, and whether that injury occurred on the job. Many injuries are impossible to precisely diagnose, particularly chronic problems like back pain or mental impairment, and it is hard to tell whether injuries, particularly chronic injuries, have occurred on the job or during a weekend football game.

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Moral Hazard

- The difficulty of assessing injuries is a problem because it can be quite attractive to qualify for the workers' compensation program.
- Workers' compensation benefits include payment of the medical costs of treating an injury, and cash compensation for lost wages, which can amount to two -thirds or more of a worker's pre -injury wages.
- Recall that in standard economic models we assume that leisure is a normal good and that, all else equal, individuals would rather be home than at work.

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Moral Hazard

- If you can claim that you have an on-the-job injury, even if you really don't, you can stay home from work and continue to take home two -thirds of what you earned when working.
- Thus, the existence of this program may actually encourage individuals to fake injury.
- By trying to insure against an adverse event (true injury), the insurer may encourage individuals to pretend that the adverse event has happened to them when it actually hasn't. This scenario is a primary example of moral hazard.

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What Determines Moral Hazard?

- The extent of moral hazard varies with two factors.
- **The first factor** is how easy it is to observe whether the adverse event has happened. If an employer truly knows whether a worker has been injured on the job, the moral hazard problem with workers' compensation is greatly diminished.
- **The second factor** is how easy it is to change behavior in order to establish the adverse event.
- When it is neither easy nor attractive to change behavior in order to qualify for insurance, such as in the case for insurance against death, moral hazard is unlikely to be a problem.
- When the insurance is for an adverse event that is easily and costlessly attained (or faked), however, moral hazard may be a larger problem.

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What Determines Moral Hazard?

- Moral hazard can arise along many dimensions. In examining the effects of social insurance, four types of moral hazard play a particularly important role:
- ***Reduced precaution against entering the adverse state*.** Examples: because you have medical insurance that covers illness, you reduce preventive activities to protect your health, or because you have workers' compensation insurance, you aren't as careful at work.
- ***Increased odds of entering the adverse state***. Examples: because you have workers' compensation, you are more likely to claim that you were injured on the job, or because you have unemployment insurance, you are more likely to become unemployed.

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What Determines Moral Hazard?

- ***Increased expenditures when in the adverse state***. Examples: because you have medical insurance, you use more medical care than you otherwise would, or because you have workers' compensation, you don't work hard to rehabilitate your injury.
- ***Supplier responses to insurance against the adverse state***. Examples: because you have medical insurance, physicians provide too much care to you, or because you have workers' compensation, firms aren't as careful about protecting you against workplace accidents

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The Consequences of Moral Hazard

- ***Why is moral hazard a problem?***
- Even if social insurance encourages individuals to, for example, spend more time at home pretending to be injured than being at work, why is that an important cost of social insurance?
- ***Moral hazard is costly for two reasons.***
- **First,** the adverse behavior encouraged by insurance lowers social efficiency, for example, because it reduces the provisions of socially efficient labor supply. In a perfectly competitive labor market, a worker's wage equals his marginal product, the value of the goods he is producing for society. With no workers' compensation, workers will supply labor until their wage (their marginal product) equals their marginal valuation of the next hour of leisure time. If the wage is above the value of leisure time, it is socially efficient for individuals to work, since the benefit of work (the marginal product of that labor) exceeds the cost (the value of the foregone TV).

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The Consequences of Moral Hazard

- When workers' compensation is introduced, the value of leisure rises: each hour of leisure not only provides one hour of TV, but also a workers' compensation payment. Thus, individuals will supply labor only until the wage equals their marginal value of leisure *plus* the workers' compensation income they can receive by pretending to be injured.
- This will lead individuals to work less than is socially efficient: even if the wage (and therefore the marginal product) is above the value of watching TV, individuals may still choose not to work because of the promise of workers' compensation benefits.

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The Consequences of Moral Hazard

- This moral hazard cost arises in any insurance context, such as health insurance.
- In the case of health insurance, individuals should use medical care only until the point where the marginal benefit to them (in terms of improved health) equals the marginal cost of the service.
- If individuals are completely insured, however, and don't pay any costs for their medical care, they will use that medical care until the marginal benefit to them is zero (their marginal cost, which is zero with full insurance).
- This will lead to an inefficiently high level of medical care if the true marginal cost is greater than zero.

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The Consequences of Moral Hazard

- **The second** cost for social insurance due to moral hazard is revenue raising.
- Whenever the government increases its expenditures, it must raise taxes to compensate (at least in the long run). As we know, there are efficiency costs associated with government taxation through the negative impacts it has on work effort, savings, and other behaviors.
- Thus, when social insurance encourages adverse events, which raise the cost of the social insurance program, it increases taxes and lowers social efficiency further.

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Conclusion

- Asymmetric information in insurance markets has two important implications.
- First, it can cause ***adverse selection,*** which makes it difficult for insurance markets to provide actuarially fair insurance to those who would demand it if it were available to them.
- Second, it can cause ***moral hazard,*** whereby the provision of insurance encourages adverse behavior in those purchasing the insurance.
- The ironic feature of asymmetric information is therefore that it simultaneously motivates ***and*** undercuts the rationale for government intervention through social insurance.

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Market failures:

Imperfect competition

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Market failures: Imperfect competition

- Competitive price-taking supports economic efficiency
- Imperfect competition arises when a large economic agent can affect prices
  - An advantage will be gained by exploiting this ability
  - This must be detrimental to other economic agents
- Imperfect competition violates the assumptions of the efficiency theorems

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Concepts of Competition

- *Monopoly* power occurs when the seller of a product can influence prices
  - A single seller is a monopolist
  - There is oligopoly if there are several sellers
- *Monopsony* power occurs when the buyer of a product can influence price
  - A single buyer is a monopsonist
- Either price or quantity can be chosen
  - Cournot oligopoly has quantity as strategic variable
  - Bertrand oligopoly has price as strategic variable

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Market failures: Imperfect competition

- Competitive price-taking supports economic efficiency
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  - An advantage will be gained by exploiting this ability
  - This must be detrimental to other economic agents
- Imperfect competition violates the assumptions of the efficiency theorems

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Concepts of Competition

- Products can be homogeneous or differentiated
- Product differentiation can be vertical (products differ in quality) or horizontal (products differ in specification)
- Non-price competition can accompany product differentiation
  - Advertising
  - Investment
  - Specification of product

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Market Structure

- *Market structure* refers to:
  - The number of firms
  - The size of firms
  - Intensity of competition
- Firms are in the same market if their products are close substitutes
  - This arises if the cross-price elasticity of demand is positive
- Empirical analysis invariably uses standard industry classification
  - This does not always guarantee close substitutability

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Market Structure

- Three dimensions are widely used to measure intensity of competition
- *Contestability* represents the freedom of rivals to enter an industry
  - There can be legal monopoly rights
  - Or entry barriers (economies of scale, entry-deterrence)
- If a market is contestable the incumbent is constrained
  - The threat of entry prevents market power being exploited

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Market Structure

- *Collusiveness* relates to the degree of independence of firms' strategies
  - Sellers may agree to raise prices or reduce quantities in unison
- A cartel agreement between firms is an explicit form of collusion
- Collusion can also be tacit through the reluctance to engage in competition
- Explicit collusion is illegal but more easily detected than tacit collusion

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Natural monopoly

- If we have a market with the production function exhibiting increasing returns to scale, then the competitive market is not sustainable under the rule price = marginal cost.
- Since all firms in a competitive market will be making loss, there will be an exit of the firms until only one firm survives, but the market then becomes a monopoly.

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Natural monopoly

- Average cost continues to fall as output increases
  - Permanent natural monopoly
    - AC continues to fall indefinitely
  - Temporary natural monopoly
    - AC flattens out (may even rise) above some Q
- Costs are minimised with just one supplier
  - competition is not desirable
  - depending on demand, competition may not be feasible

This can be made clearer with the use of the following diagram.

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Figure 1: Permanent natural monopoly

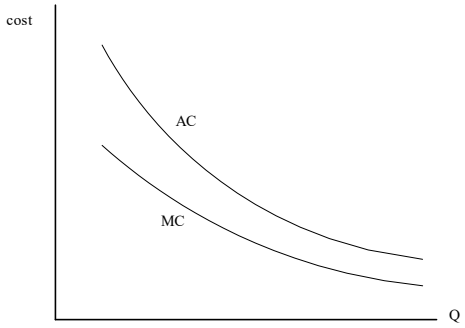

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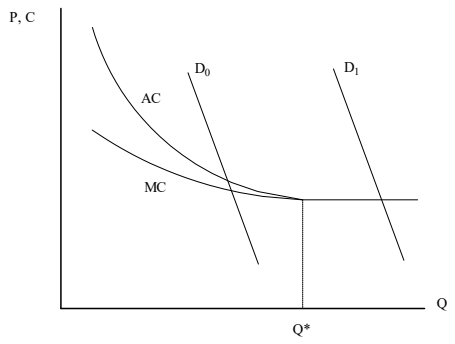
Figure 2: Temporary natural monopoly



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How to improve social welfare in Natural Monopoly Industries

- Government ownership
- Regulation of prices e.g. Electric Utilities
- Franchising e.g. Cable TV
- Introduction of competition e.g. Telephony

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Optimal pricing in natural monopoly

- [assume complete information]
- Price = marginal cost
- But MC < AC
  - total revenue does not cover total cost
- Lump sum subsidy from govt
  - does total benefit > total cost?
  - poor incentives
  - lobbying
  - excess burden of taxation

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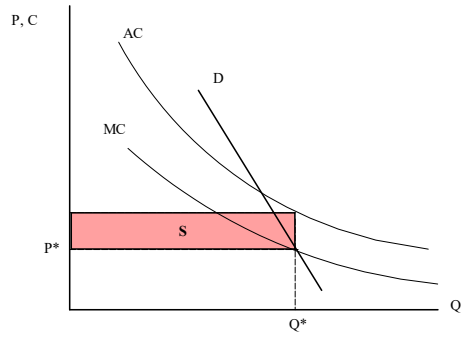
Figure 5: Marginal cost pricing



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Numerical example

- Suppose firm is a natural monopoly
  - total cost C = 500 + 20Q
  - demand Q = 100 – P
- Firm is required to set P = MC
  - P = 20
  - Q = 80
  - π = PQ – C(Q) = –500: subsidy required
  - no deadweight loss

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Figure 6: Average cost pricing

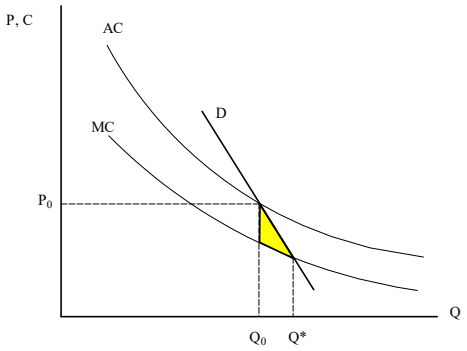

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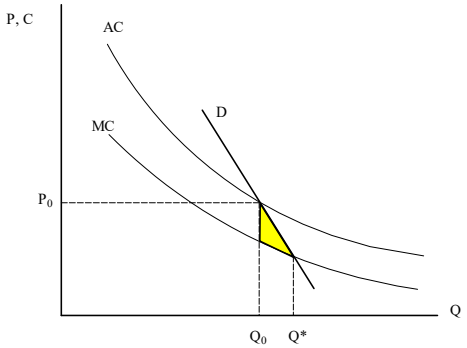
Figure 6: Average cost pricing



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Numerical example

- Total cost C = 511 + 20Q; demand Q = 100 – P
- Firm is required to set P = AC
  - TR = TC: PQ = C (or, equivalently, P = C/Q)
  - (100 – Q)Q = 511 + 20Q
  - quadratic: $Q^2 – 80Q + 511 = 0$
  - solution (taking larger root): Q = 73
  - P = 27
  - π = PQ – C(Q) = 0: no subsidy required
  - deadweight loss = ½(80–73)(27–20) = 24.5

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Non-linear pricing

- Two-part tariff (form of 2nd degree price discrimination)
  - per-unit charge = MC
  - fixed fee F = S/N
    - where S = loss under MC pricing (= subsidy required)
    - and N = number of consumers
  - consumption is efficient (if consumers are homogenous)
- Problems
  - heterogeneous consumers
    - some consumers have surplus < S/N: will exit market
    - fairness and distributional concerns
  - resale could undermine charging

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Numerical example

- Suppose
  - total cost C = 500 + 20Q
  - demand Q = 100 – P; consists of 10 identical consumers
- Two-part pricing
  - P = MC = 20, Q = 80
  - subsidy required: S = 500
  - fixed fee F = 500/10 = 50
  - check willingness to pay: is $F \leq CS_i$ when P=20?
  - total CS = ½(80)(100–20) = 3200
  - individual CS = 3200/10 = 320

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Franchising

(Δικαιοχρησία)

- Competition *for* the market
  - bidders compete for right to operate
  - single winner (franchisee)
  - operates as a monopoly
- Possible bidding mechanisms
  - bid amount of payment to (or subsidy from) govt
    - price may be specified in advance, or freely chosen
  - bid price at which consumers will be supplied
  - quality of service may also need to be specified

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Advantages and drawbacks

- Bidding competition between well-informed firms
  - selection benefit of competition
  - reduces (or extracts) rents accruing to monopoly operator
- Drawbacks
  - no competition *in* the market
  - complexity (of contract or bids)
    - especially if quality of service is important
  - risk of renegotiation
    - especially if costly to switch franchisees

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Auction mechanism

- Suppose bidders have different valuations
  - e.g. 3 bidders with $V_1 = 100$, $V_2 = 80$, $V_3 = 50$ (monopoly profits with different costs)
- English auction (a type of *second-price* auction)
  - auctioneer raises price until all but one bidder drop out
  - bidder with highest valuation wins
  - at fee = valuation of **second** highest bidder
- Outcome
  - bidder 1 wins (highest V_i)
  - pays franchise fee equal to $V_2 = 80$

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Numerical example

- English auction with 2 bidders; no price cap
  - demand Q = 100 – P
  - bidder 1's cost function: $C_1 = 100 + 2Q$
  - bidder 2's cost function: $C_2 = 12Q$
- Calculate monopoly profits
  - bidder 1: $P_1 = 51$; $Q_1 = 49$; $\pi_1 = 2301$
  - bidder 2: $P_2 = 56$; $Q_2 = 44$; $\pi_2 = 1936$
- Auction outcome
  - bidder 1 wins at bidder 2's valuation = 1936

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Welfare

- Imperfect competition is a form of market failure
- Firms with monopoly power restrict output to raise price above marginal cost
- Consider a monopoly choosing output y given inverse demand $p(y)$ and marginal cost c
- Profit is $\pi = p(y)y - c$ so the necessary condition for maximization is

$$p + y\frac{dp}{dy} - c = 0$$

- Since $dp/dy < 0$ it follows that $p > c$ so price exceeds marginal cost

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Welfare

- Using the elasticity of demand $\varepsilon = pdy/ydp$

$$\frac{p-c}{p} = \frac{1}{|\varepsilon|}$$

- $(p - c)/p$ is the Lerner index with value between 0 (competition) and 1 (maximum market power)
- The index provides a measure of market power
- When there is Cournot oligopoly with a homogeneous product and m firms

$$\frac{p-c}{p} = \frac{1}{m}\frac{1}{|\varepsilon|}$$

- The Lerner index is deflated by market share

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Welfare

- The welfare loss due to monopoly is shown in Fig. 8.2
- The competitive price is $p = c$ with quantity y^c and consumer surplus ADC
- The monopoly price is p^m and quantity y^m
- Consumer surplus falls to ABp^m, profit is p^mBEc
- BDE is the deadweight loss of monopoly

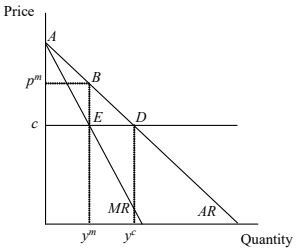

Figure 8.2: Deadweight loss with monopoly

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Welfare

- If the demand function is linear then deadweight loss (BDE) is one half monopoly profit (p^mBEc)
- Using the monopoly pricing condition relating price and elasticity gives

$$\text{Deadweight loss} = -\frac{p^m y^m}{2\varepsilon}$$

- Several estimates are reported in Tab. 8.2
- These range from small (Harberger) to significant (Masson and Shaanan)
- The larger estimates include the cost of defending monopoly position

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Welfare

Author	Sector	Welfare loss (%)
Harberger	US Manufacturing	0.08
Gisser	US Manufacturing	0.11 – 1.82
Peterson and Connor	US Food Manufacturing	0.16 – 5.15
Masson and Shaanan	37 US Industries	3
		16
McCorriston	UK Agricultural Inputs	1.6 – 2.5
		20 – 40
Cowling and Mueller	US	4 – 13
	UK	3.9 – 7.2

Table 8.2: Monopoly welfare loss

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Introduction to theory of regulation

- Monopoly regulation is a principal-agent problem
  - regulator (P) wants welfare-maximising outcomes
  - firm (A) has superior information: costs, own effort, etc.
- Decision-making is delegated to firm
  - prices, outputs; cost-reducing effort; product selection, etc.
- 2 types of informational problem
  - hidden information: firm's (intrinsic) cost efficiency
    - results in *adverse selection*
  - hidden action: firm's cost-reducing effort
    - generates *moral hazard*

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Regulatory objectives

- 1. Allocative efficiency
  - price = cost (MC; AC; non-linear pricing)
  - optimal product selection: variety and quality
- 2. Productive efficiency
  - costs are minimised
  - dynamic as well as static
- 3. Distribution (if consumerist regulator)
  - minimise excess profit
- 4. Regulatory burden
  - informational requirements; monitoring
  - regulatory costs; lobbying

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Other types of market structure with deadweight losses

- Monopsony – where a single buyer drives down the price it pays and the quantity it buys.
- Oligopoly – the intermediate case between perfect competition and monopoly where a small number of firms operate in a market with some ability to raise prices and reduce industry output.
- Oligopsony – where small groups of buyers drive down price paid and quantity bought.
- Oligopoly and oligopsony and their detection and control are more the concern of anti-trust authorities rather than economic regulatory agencies.

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Oligopoly

- Competition between small number of firms (e.g. 2)
- Static models: strategies chosen simultaneously
  - Cournot (1838): firms compete in quantities
  - Bertrand (1883): firms compete in prices

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Cournot: firms compete in quantities

- 2 firms, 1 & 2, simultaneously choose quantities q_1 and q_2
- Linear inverse demand fn: $p = a - b(q_1+q_2)$
- Constant marginal cost c
- Nash equilibrium: firm i chooses q_i given choice of its rival
  - Set q_i to max $\pi_i = (a - bq_i - bq_j - c)\, q_i$ for i = 1, 2, $i \neq j$
  - FOC: $(a - bq_i - bq_j - c) - bq_i = 0$
  - Rearrange: $q_i = \frac{a-c}{2b} - \frac{1}{2} q_j$ Reaction function for firm i
- Solve simultaneous equations: $q_1^* = q_2^* = \frac{a-c}{3b}$
- Price $p = \frac{a+2c}{3}$ Profit $\pi_i = \frac{(a-c)^2}{9b}$

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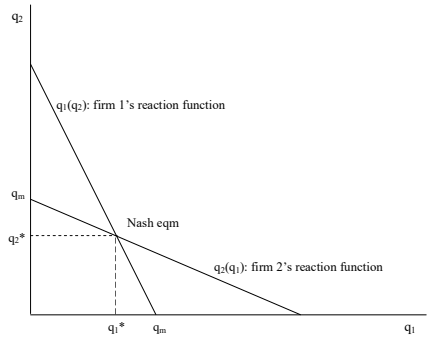
Figure 3: Cournot equilibrium



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n-firm Cournot oligopoly

- Suppose n identical firms, each has cost c
- Cournot outcomes
  - Quantity per firm $q_i = \frac{a-c}{(n+1)b}$ Industry $Q = \frac{n}{(n+1)} \frac{(a-c)}{b}$
  - Price $p = \frac{a+nc}{n+1}$
  - Profit per firm $\pi_i = \frac{(a-c)^2}{(n+1)^2 b}$
- As $n \to \infty$: $q_i \to 0$, $Q \to \frac{(a-c)}{b}$, $p \to c$, $\pi \to 0$
  - competitive outcomes

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X-Inefficiency

- X-inefficiency (Leibenstein, 1966) occurs when firms do not minimise the costs of producing their output.
- X-inefficiency occurs due to lack of competition or incentive to minimise costs within firms.
- Monopolies may be particularly prone to such inefficiency.
- Thus a reason why de-regulation might be favoured is because the static cost efficiency of monopoly is outweighed in the long run by rising X-inefficiency.

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Technical Progress

- Schumpeter famously argued that monopoly was good for innovation because the competition for monopoly encouraged investment in innovation.
- Research and Development expenditure can take a number of different forms and involves different stages:
- – Basic and applied research
- – Invention
- – Development
- – Diffusion

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Regulatory approaches to innovation

- Patents
- – These give companies a monopoly right to exploit an invention for a limited period. This increases producer surplus in the short run.
- • Copyright
- – This gives copyright holders the right to benefit from reproduction of intellectual property for a period. This similarly increases producer surplus in the short run.
- The impact of these arrangements on consumer surplus in the short run is uncertain. There may be more innovations which quickly benefit consumers even though they are expensive.

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What is regulation?

- Regulation is the use of the government's power to coerce for the purpose of restricting the decisions of economic agents. There are two main forms of regulation: economic regulation and social regulation.
- ***Economic regulation***
- Economic regulation refers to government control of firms' decisions over price, quantity and other strategic variables, and over entry and exit into markets. For example, when governments intervene to set rates for electricity service or to impose restrictions on entry into airline markets, they are exerting control over firms' decisions and engaging in economic regulation.
- ***Social regulation***
- Social regulation refers to government control of individual and firm behavior with respect to environmental and health/safety consequences of the production and consumption of goods/services. For example, when governments set quality standards for automobile seat belts, or speed limits for highways, they are controlling individual behavior.

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OECD indices of regulation

- The basic idea of the OECD system of economy-wide and sectoral indicators of product market regulation is to turn qualitative data on laws and regulations that may affect competition into quantitative indicators. What distinguishes these indicators from indicators that have been developed by other organisations is primarily their bottom-up approach based on raw information about existing laws and regulations. Furthermore, the data on which the indicators are based are mainly derived from a survey of member countries, with only a small fraction being based on external data sets, thereby guaranteeing a high level of comparability across countries.

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OECD indices of regulation

- The OECD Indicators of ***Product Market Regulation*** (PMR) are a comprehensive and internationally-comparable set of indicators that measure the degree to which policies promote or inhibit competition in areas of the product market where competition is viable. They measure the economy-wide regulatory and market environments in 30 OECD countries in (or around) 1998, 2003 and 2008, they are consistent across time and countries. The indicators cover formal regulations in the following areas:
- state control of business enterprises;
- legal and administrative barriers to entrepreneurship;
- barriers to international trade and investment.

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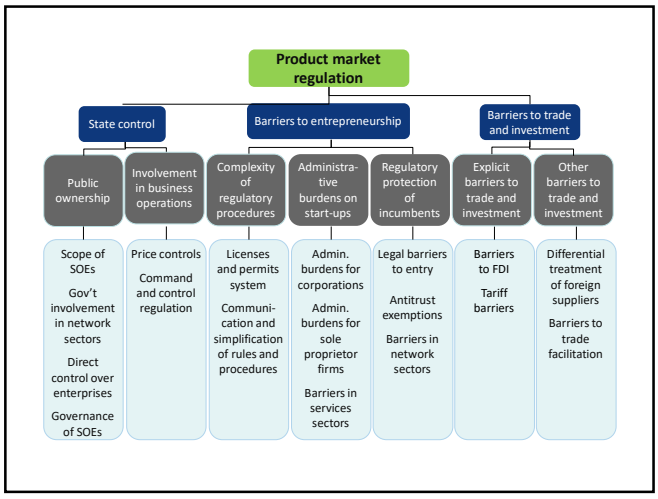

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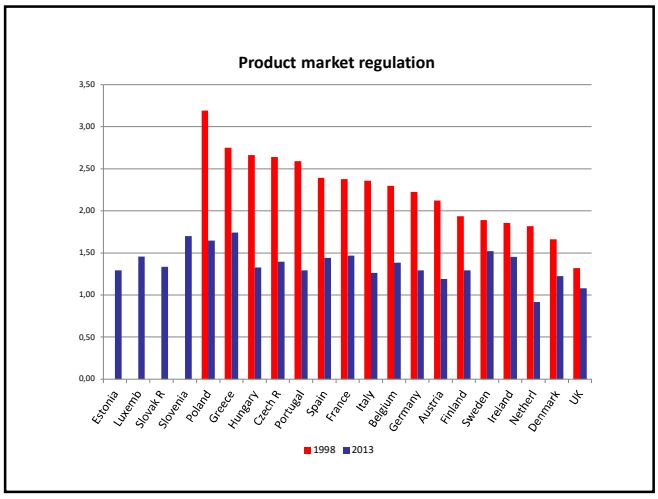

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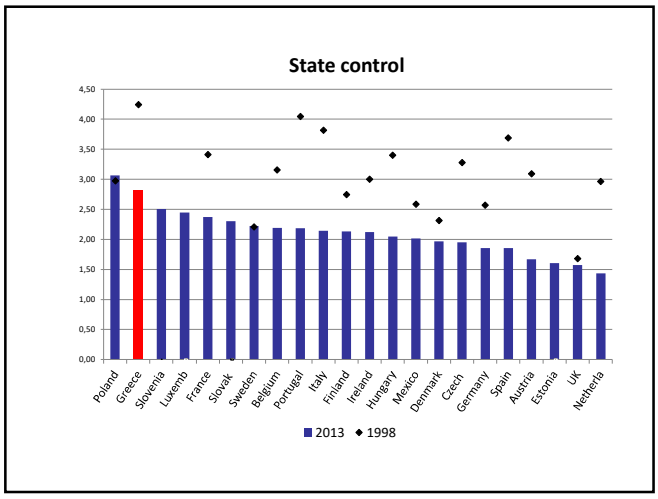

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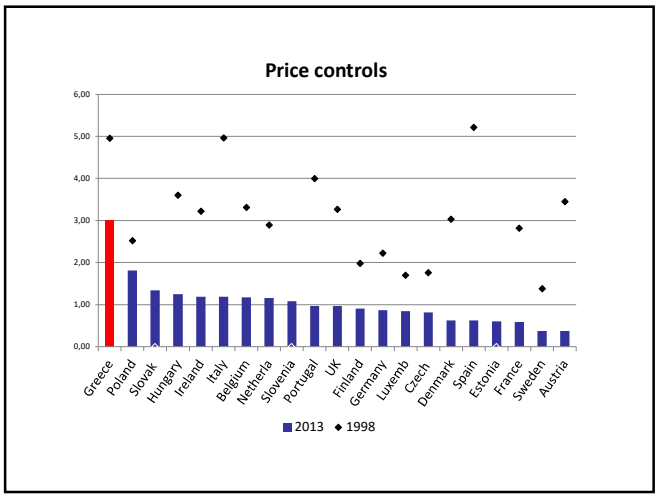

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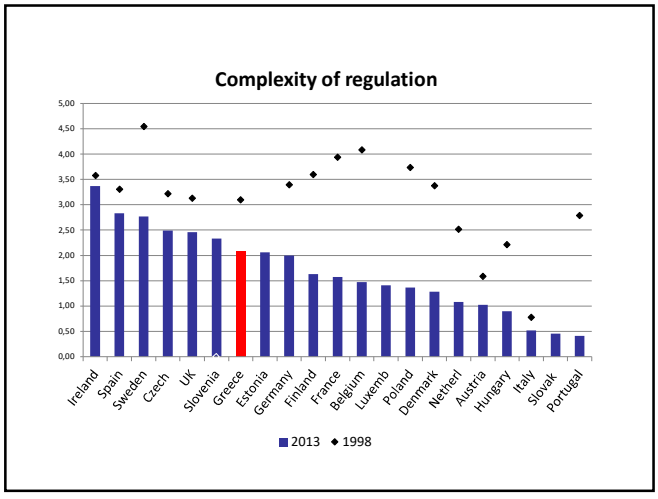

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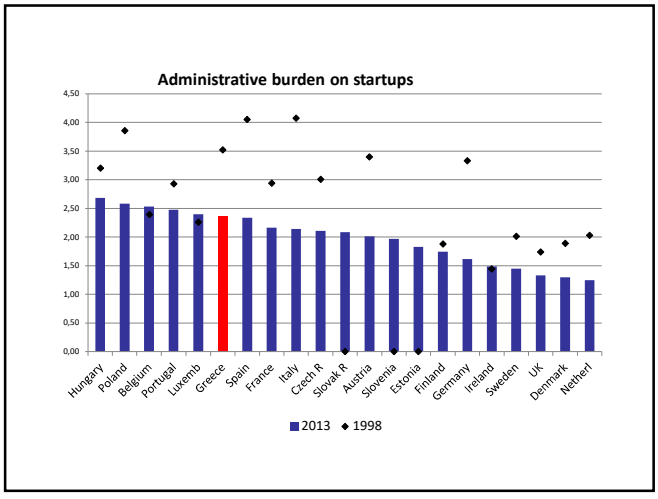

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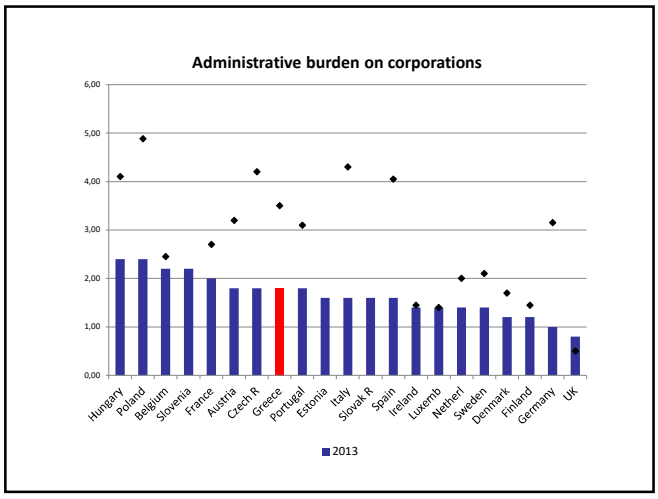
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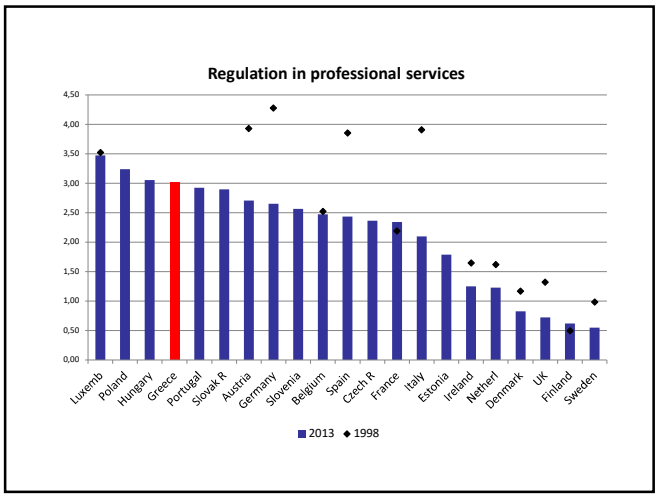
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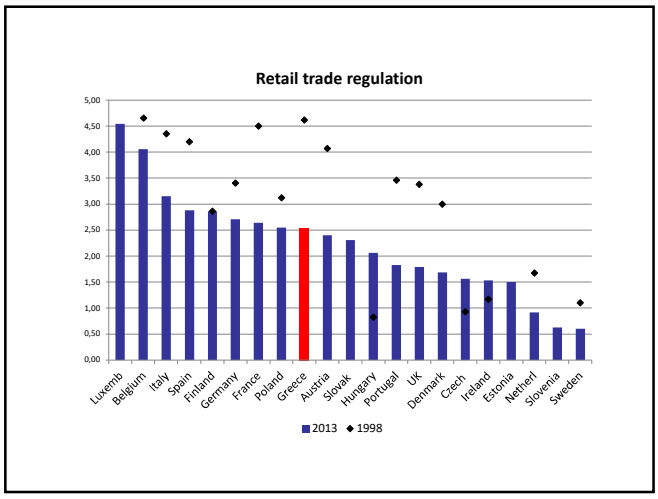
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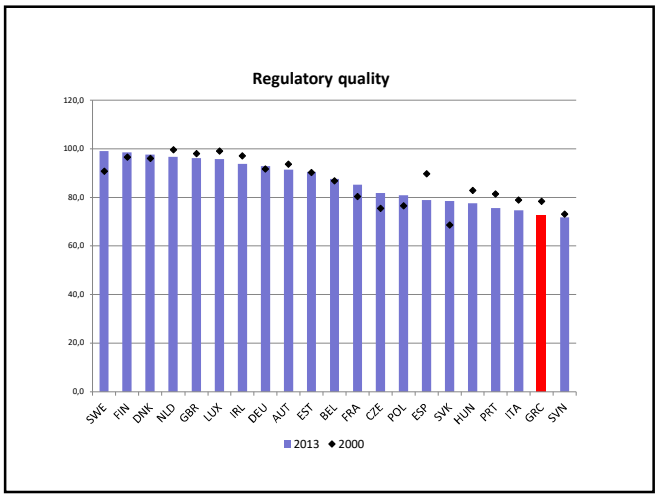
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ITA
GRC
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