EFR summary

Applied Microeconomics, FEB12001X

2024-2025

Lectures 1 to 17

Weeks 1 to 7

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Details

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Applied microeconomics – IBEB – Lecture 1, week 1 (public 1) Perfect competition, public goods

Introduction

First fundamental theorem of welfare: In a perfectly competitive market, efficiency is maximised

- All possible gains from trade is exploited
- 'Invisible hand' automatically adjusts conditions to desired equilibrium (Adam Smith).

However, even under perfect competition, the government is needed to enforce property rights and sometimes to improve market outcomes.

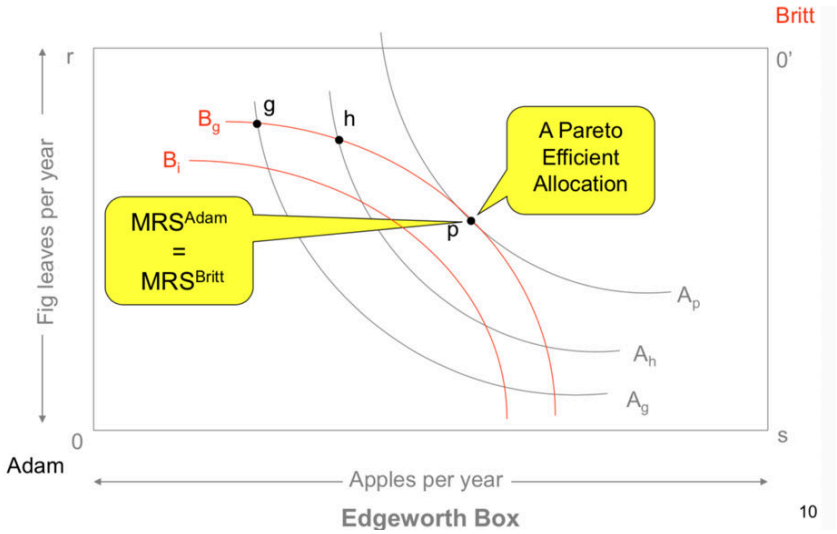
Some ways to intervene:
(1) **public provision** (e.g: education, infrastructure)
(2) **affecting prices by taxes, excises, and subsidies** (e.g: cigarettes, gasoline)
(3) **regulation** (e.g: fishing, car insurance)
(4) **public production** (e.g. defence, income insurance, prisons).

Perfect competition review

Condition for maximum efficiency:

$MRS^A = MRS^B$
If $MRS^A \neq MRS^B$, it is possible to make a **Pareto improvement** (an improvement without lowering anyone's utility).

For example, in the figure below, the movement from point g to point p is a Pareto improvement because Adam's utility is higher, and Britt's utility is not harmed.



Contract Curve: The locus point of all Pareto efficient outcomes. It represents the final allocations of two goods between two people that may occur from trading their initial endowments.

Production possibilities frontier

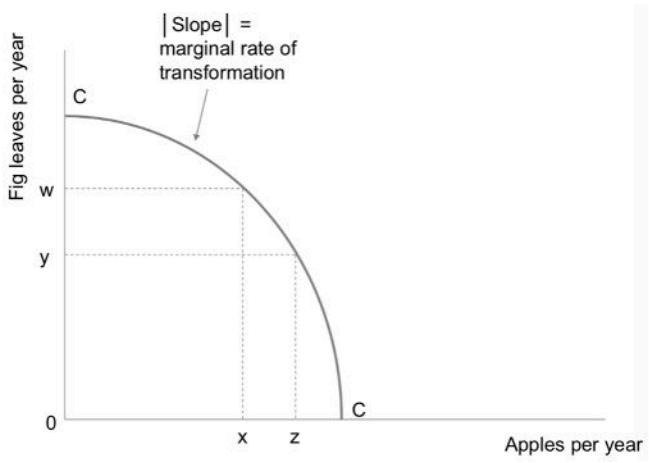
Production Possibilities Frontier:

- | Slope PPF | = Marginal Rate of Transformation (MRT)
- MRT: how much additional good Y can be produced when production of good X is reduced by 1
- $MRT = \frac{MC_x}{MC_y}$

Under perfect competition, prices adjust to get:

$MRS^A = MRS^B = MRT = \frac{P_x}{P_y}$

This again represents a **Pareto efficient equilibrium**.



Market failures

Four main reasons for market failures are:

1. **Market power:** Monopoly is a good example of this (high barriers to entry, prices above the marginal costs and general "consumer exploitation")
2. **Public goods:** These goods are usually not provided sufficiently without government intervention because of free-rider incentive.
3. **Externalities**
4. **Asymmetric information**

The last three market failures arise due to **missing markets**.

Government failure

Four main reasons for government failures:

1. **Lack of information** (on individuals' preferences and production processes)
2. **Imperfect political representation and problems in aggregating preferences** (Arrow's impossibility theorem)
3. **Rent-seeking and corruption**
4. **Limited or misaligned incentives**

Public goods

Characteristics of pure public goods:

1. **non-rival**: the consumption of the good by one party does not prevent the consumption of the good by another => MC of additional consumer = 0
2. **non-excludable:** it is impossible or extremely costly to prevent anyone from consuming the good (e.g. public roads)

Example 1: Lighthouse (market failure due to provision of public good)

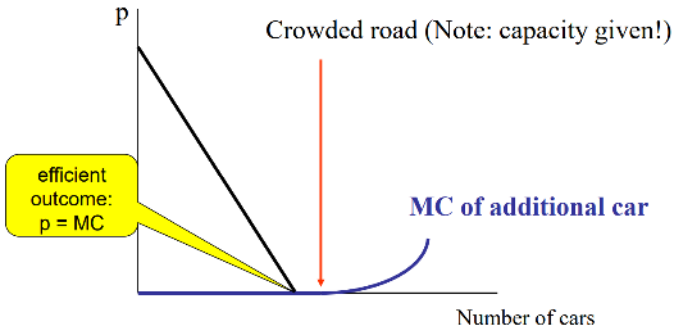
- Two harbours share one dangerous spot; no communication.
- Lighthouse: Construction cost: 15 (shared if both contribute).
  Benefit to each: 10 (non-excludable)

Question: In Nash equilibrium, will the lighthouse be constructed?
Answer: No because of the free rider problem (unless they find means to credibly commit to share construction cost role for government)

		H2	
		Construct	Do Not Construct
H1	Construct	(2.5, 2.5)	(-5, 10)
	Do Not Construct	(10, -5)	(0, 0)

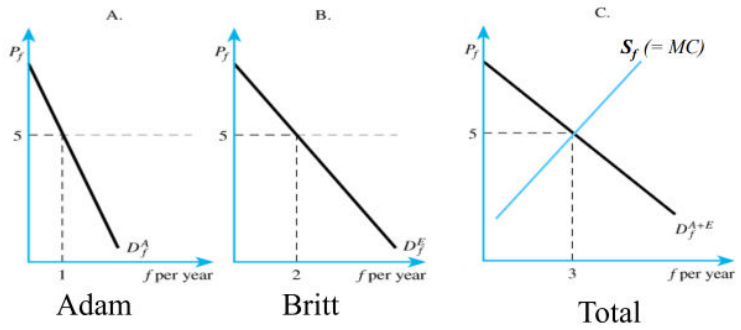
Nash equilibrium: Both do not construct
=> Free-rider behaviour due to non-excludability, since both parties automatically benefit from using the lighthouse, regardless of their contribution.

Example 2: Traffic jams
On most roads, usage is free: p = 0
Outside rush hour: road use non-rival: MC = 0



Here, since the MC of additional cars is larger than 0 when there's a traffic jam, road usage becomes rivalry.

Efficient provision of private goods



Total demand: Horizontal summation
Efficient provision: $MRS^A = MRS^B = MRT$

Private goods

- Quantity consumed differs among people
- Everyone pays the same price, and has the same marginal valuation (= MRS)
- Market generates Pareto-efficient equilibrium

Efficient provision of private goods

Total demand: Vertical summation
Efficient provision: $MRS^A + MRS^B = MRT$

Samuelson condition: the total marginal valuation of the last/marginal unit must be equal to the social cost of providing this last unit.
Public goods

- Everyone consumes the same quantity
- People have different marginal valuations
- Market does not provide efficient outcome (Market failure)

Problems in private provision of public goods

Non-excludability implies:

- People benefit from public goods even without contributing => everyone prefers that others pay for public good

Non-rivalness pimples:

- If someone contributes, others will benefit from the public good.
- However, when contributing, people may not take into account the benefit of their contribution to others => private provision results in **free rider behaviour**, which leads to **under provision** of the public good.

Example: Consider N identical individuals, who can all contribute max 1 unit of a public good.

- G is the number of units of the public good
- Marginal cost per unit is constant and equals p>0.
- Utility of individual *i* is $U_i = V\ln(G) - pg_i$ where V is a parameter and $g_i \in \{0,1\}$.
- Therefore, **$MU_i = V/G$.**

Calculate the socially efficient level of G

Solution:

$$\sum_i MU_i = p$$
$$\frac{NV}{G} = p \Rightarrow G = \frac{NV}{p}$$

Now suppose all individuals decide independently whether to buy one unit of the public good What is the Nash equilibrium outcome on this market?

Solution:
For any individual, it is optimal to buy one unit if
$MU_i \geq p \Rightarrow \frac{V}{G} \geq p$

Hence, the Nash equilibrium is $G = \frac{V}{p}$
This means that we will have a market failure as soon as N > 1
Generally, **efficiency loss is larger in larger populations**.

Efficient provision of public goods

Government provision is not a solution that can be made easily. This is because:

(1) to finance public goods provision, the government must raise taxes, which might lower efficiency through tax distortions

(2) the government does not know individuals' preferences.

Applied microeconomics – IBEB – Lecture 2, week 1 (personnel 1) Principal-agent model

The model is a simple yet profound approach to the economic relationships between two or more people. This problem's structure can be applied to a large number of situations (for example, the relationship between a politician (agent) and his voters (principals), but here we will study employer-worker relationship with this model.

The basics of the model

In a simple principal-agent model, we can define the principal as someone who hires the agent to work for her with the objective of maximising her profits. For the sake of simplicity, we assume that the sole goal of the principal is to maximise her profits, and the agent's is to maximise his utility (more income, less effort is preferred). In other words, we assume that both parties are rational economic actors who only care about maximising their own self-interest.

The basic timeline of this model is given as follows:

- The principal gives the agent an offer/**contract.**
- **Participation constraint:** The agent will then have to decide to either **accept or reject** the offer. In the case the agent rejects, the interaction of the two parties ends. In the other case:
- **The incentive-compatibility constraint:** The agent accepts and chooses how much **effort** he would spend working for the principal.
- The total output and the principal's **profit is realised**, the agent gets paid for the work according to the contract.

The principal's profits are given by $\pi = pQ - Y$, where Q is the agent's output and Y is what the principal pays him. The agent's utility is given by $U = Y - C(E)$, where C is the function of his cost of effort. In general, we assume C(E) is an increasing function

that also exhibits increasing marginal costs of effort (C'(E)>0; C''(E)>0). An example we often use is $C(E) = \Theta E^2/2$. It is also important to note that E is not verifiable, whereas Q and Y are more easily measured and visible.

We will assume that the contract indicates $Y = a + bQ$. In other words, the principal and agent agree on a linear contract, where the agent will receive *a* as the base salary, plus *b* for every unit of output the agent produces(bonus). The production function takes the form of **Q=kE**, where *k* is the factor of transformation from effort to output, i.e. **k indicates the worker's productivity** (all production capital taken into account).

Solving the agent's problem

Timeline of the principal agent problem

1. Principle offers employment contract (a,b)
2. Agent accepts or rejects the contract (participation constraint)
3. Agent picks effort, determining Q (incentive compatibility constraint)
4. Agent is paid and profits are realised

$$U = a + bQ - \frac{1}{2}\Theta E^2$$
$$U = a + bke - \frac{1}{2}\Theta E^2$$

As we assume, the agent's objective is to maximise his own utility with respect to the amount of effort units that he spends doing the work. We hence have to:
Maximise with respect to E:

$$MU = bk - \Theta E = 0$$
Optimal effort: $E = \frac{bk}{\Theta}$

Now we can determine profits:
$$\pi = pQ - y$$
$$\pi = pke - a - bke$$
$$\pi = pk(\frac{bk}{\Theta}) - a - bk(\frac{bk}{\Theta})$$

Maximise with respect to b:

$$\pi' = \left(\frac{pk2}{\Theta}\right) - \left(\frac{2bk^2}{\Theta}\right) = 0$$
$$p = 2b \Rightarrow b = \frac{1}{2}p$$

The production of Q:

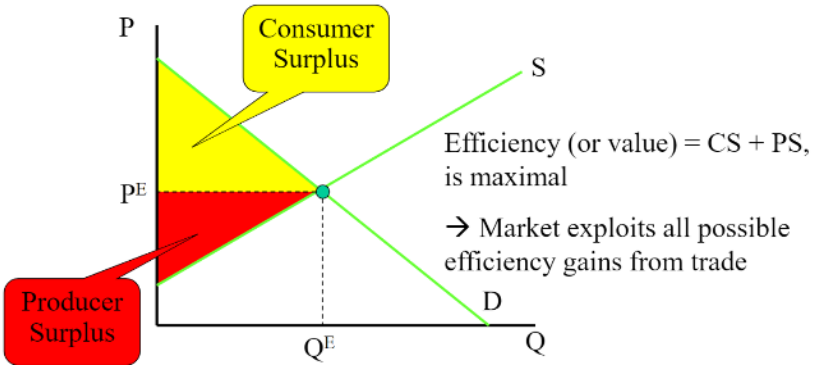
$$Q = ke$$
$$Q = k\frac{bk}{\Theta}$$
$$Q = \frac{pk^2}{2\,\Theta}$$

This implies that the base salary a does not influence the agent to spend more effort. The amount of effort spent increases along with the increase in the commission rate b and the productivity level k. This can be understood as the more productive a worker does his job (given that there is a commission per unit of output), the more effort he would spend doing it.

Applied microeconomics – IBEB – Lecture 3, week 1 (public 1.5) Perfect competition, more on public provision

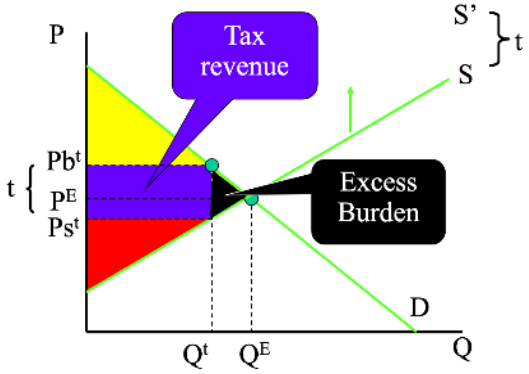
Market equilibrium

The “Invisible hand” sets prices such that demand equals supply.



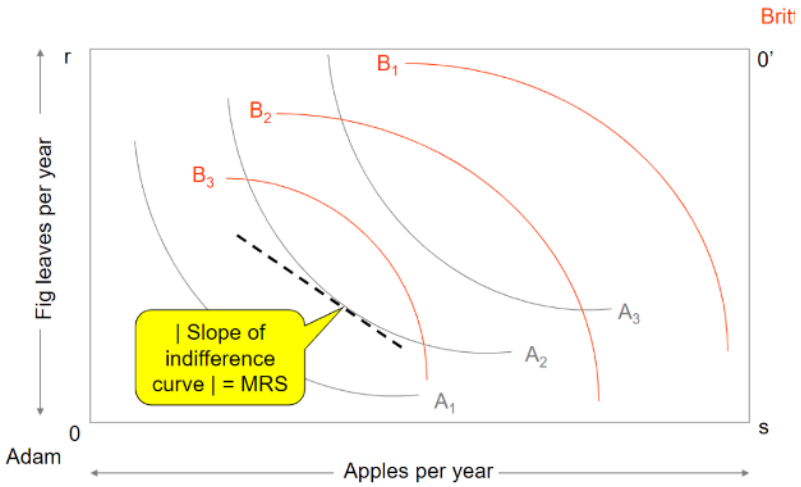
Tax

Taxes are distortionary as it reduces the total efficiency due to the excess burden (the benefit that now cannot be exploited by any party) created.

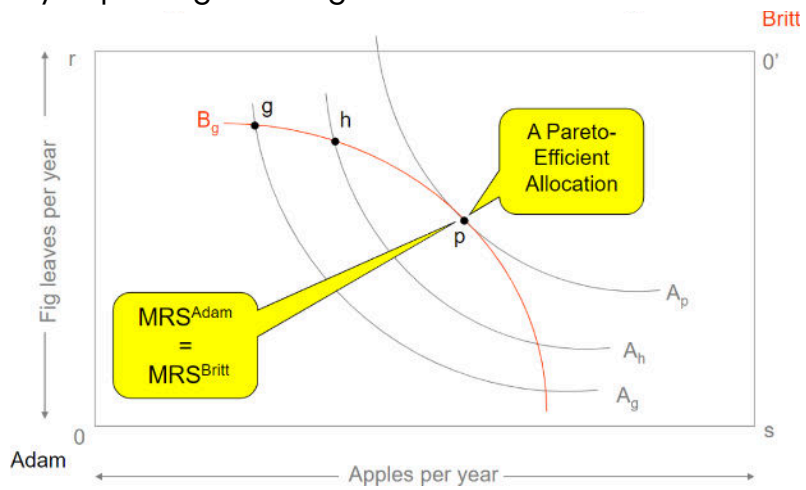


The exchange economy

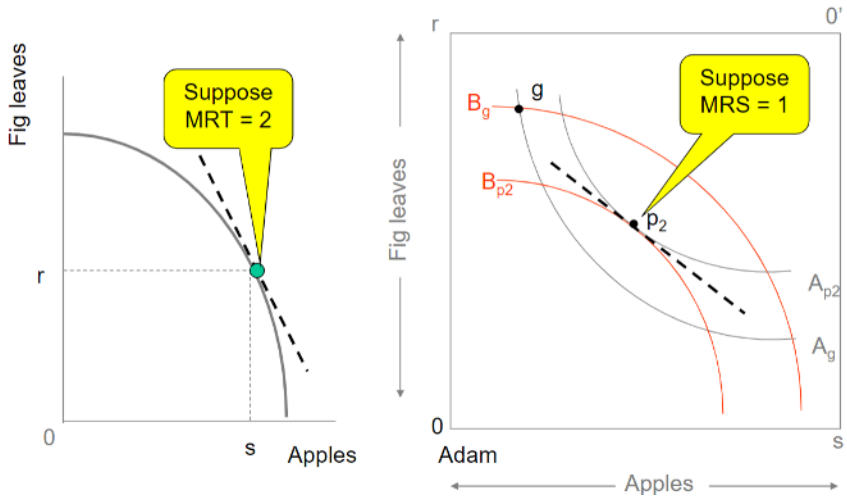
Indifference curves in Edgeworth box



Example: efficiency improving exchange



If $MRS \neq MRT$, equilibrium is not reached



Notes:

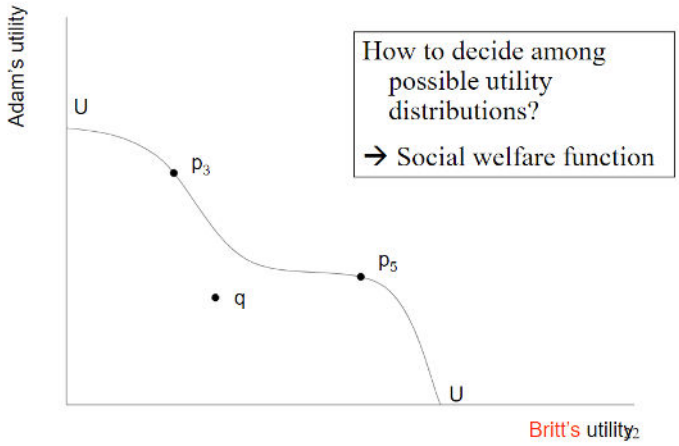
- Different product mix leads to different shape of Edgeworth Box
- This implies that, comparing the two figures, a given consumption bundle for Adam (like point g) gives different consumption bundles to Britt

Concluding remarks

The two fundamental theorems of welfare:

- **The first theorem**: Perfect competition always leads to a Pareto efficient equilibrium
- **The second theorem**: Given any endowment point, we can reach a Pareto efficient equilibrium by redistributing initial endowments

Utility possibility curve



Social welfare function

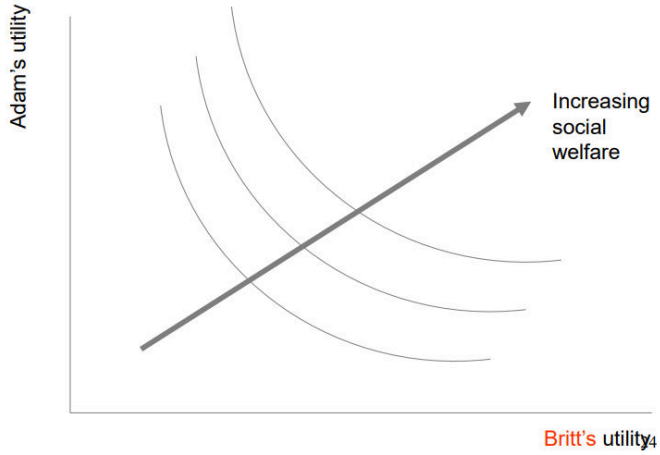
Social welfare function

$$W = F(U_{Adam}, U_{Britt})$$

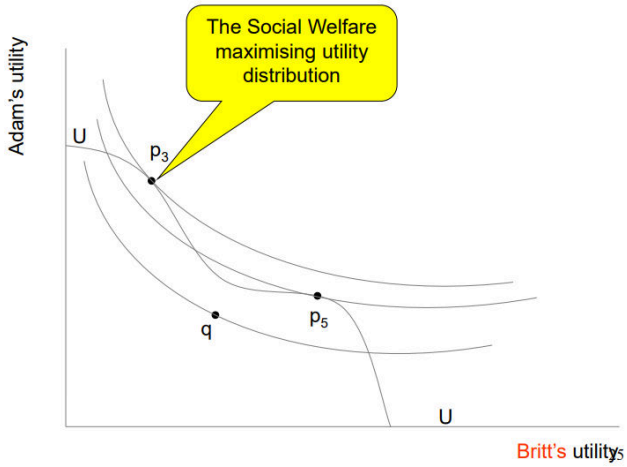
Examples of social welfare functions:

- Utilitarian or Additive: $W = U_{Adam} + U_{Britt}$
- Rawlsian: $W = min(U_{Adam}, U_{Britt})$

Social indifference curve



Maximising social welfare



Social welfare is maximised where the social indifference curve is tangent to the utility possibility curve

Second FTW: Redistribution of endowments can result in the social optimum. The outcome that maximises social welfare is also Pareto efficient.

Public versus private provision and production of public goods

Choosing which goods to provide to the public:

- The market leads to the **under provision** of goods, due to free-rider behaviour.

- The government supply often leads to **overprovision**, because people tend to exaggerate their valuation of the good in order to get more for free.

Other issues:
- Public provision involves input and administrative cost
- Private provision can better cater individual tastes, however, it may lead to undesirable differences in consumption (e.g. in health care; education)

Commodity egalitarianism: When a community is based on fairness, it may consider that some commodities should be available to everybody.

Cost-benefit analysis with intangibles

Invest when discounted benefits B > discounted cost C

In the case of public investment, several special issues arise:

Example:
Which discount factor should the government use?
- The "risk free rate" or a different rate because, for example, society values future generations more.
- How do we take non-monetary intangibles into account? Including the subjective feelings of pride and happiness for example.

A good example here is the value of a life; people will often answer priceless, yet we do not take every possible measure to protect our lives, since we often take risky jobs, or don't wear bike helmets.

Arguments for the provision authority

In some cases, the government not only finances the provision but also owns the factors of production. However, there is an ongoing debate whether the public or private sector should provide the goods. There are many arguments to consider, but here are some examples:
- Through competition, the private market may produce the goods at a cheaper price, however, they may also cut back on quality in order to do so and remain competitive.

- The private sector may better incorporate preferences because they more directly affect the firm's profitability and thus there would be consumer sovereignty.

Applied microeconomics – IBEB – Lecture 4, week 2 (public 2) Externalities

Externalities

Externalities arise when activity of a consumer or producer affects utility/payoff of other people, outside the market mechanism:

- Negative externality: production/consumption harms others
- Positive externality: production/consumption benefits others

For example, smoking or driving can result in air pollution, which may harm the other parties in the environment around you (negative externality). On the other hand, when you walk to work, you are benefiting others by not crowding the streets during rush hour (positive externality).

Characteristics

1. Arise due to the lack of an explicit price (Missing market)
2. Can be caused by consumers and producers
3. Can be positive or negative
4. Public good is special case

Market failure:

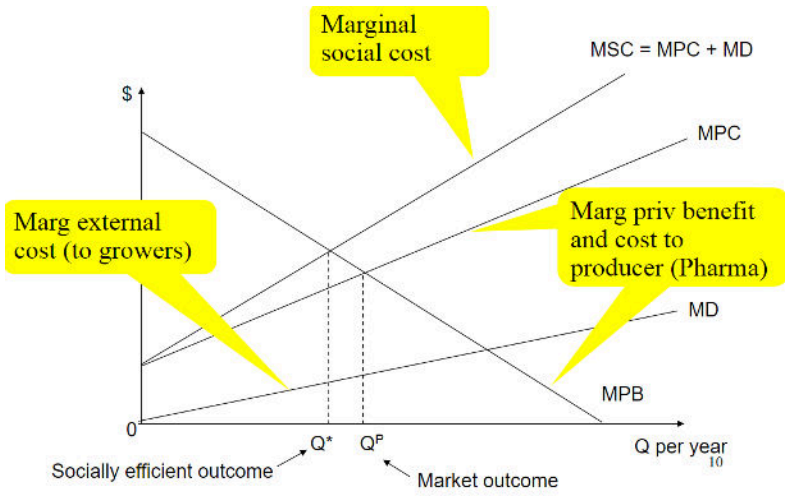
- Negative externality: overproduction / overconsumption
- Positive externality: underproduction / underconsumption

Market failure: Private and social optimum

Example: Negative production externality

- Pharma produces chemicals
- Production process pollutes river Rhine
- In Het Westland, water from the Rhine used to grow tomatoes and the pollution of the Rhine damages the tomatoes

=> Pharma's production affects the income of tomato growers. However, it does not take this damage into account as pollution is costless.
=> This results in the difference between the private and social optimum



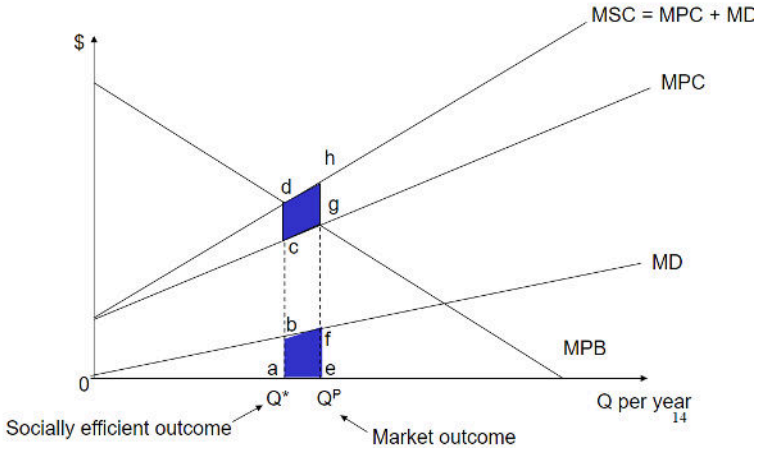
Market outcome:

- Pharma maximises profit at Qp where MPB = MPC
- Growers want Q = 0 (no damage)

Social optimum: MSB = MSC

- In this example, MSB = MPB and MSC = MPC + MD

=> Socially efficient production level = Q* (This is smaller than Qp)



Social gain in moving from Qp to Q*

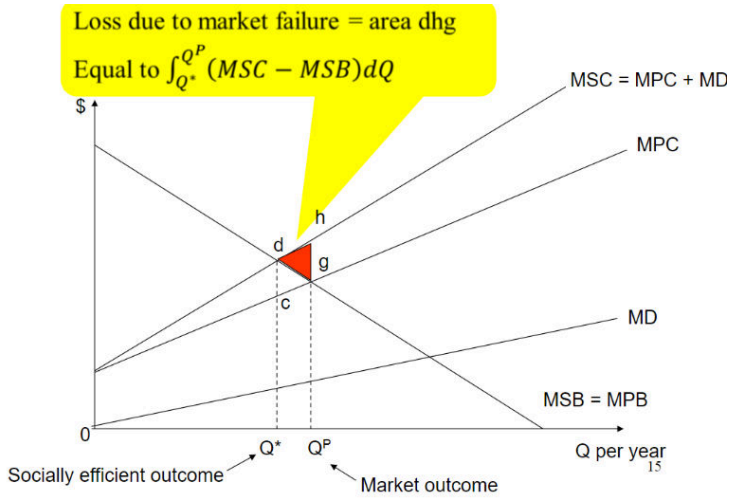
- Pharma loses profit: area dcg
- Growers gain from reduction in pollution: area abfe

(Note: area abfe is the area below the MD curve between Qp and Q*.

As MSC = MPC + MD, area abfe is equal to the area between the MSC and MPC curves between Qp and Q*
=> area abfe = area cdhg

It follows that area cdhg > area dcg
=> For each Q > Q*, MD > MPB – MPC

So, for each reduction in Q until Q*, gain growers > loss Pharma
Reverse holds for increase in Q up to Q* : Loss growers < gain Pharma



Result discussion:
With externalities, market outcome is not socially efficient:

- Overproduction / overconsumption with negative externality.
- Underproduction / underconsumption with positive externality

Main cause: Missing market for side-effect of production/consumption (side-effects are not priced and, hence, are not taken into account)

Missing markets arise when property rights are missing, for example

- Air (pollution)
- Public space (noise, filth, roads)
- Natural resources (rivers, forests, fish)

Solution via private bargaining/Coase theorem

Coase theorem: under some conditions, private parties may arrive at the social optimum through negotiation, without government intervention

2 conditions for Coase theorem:

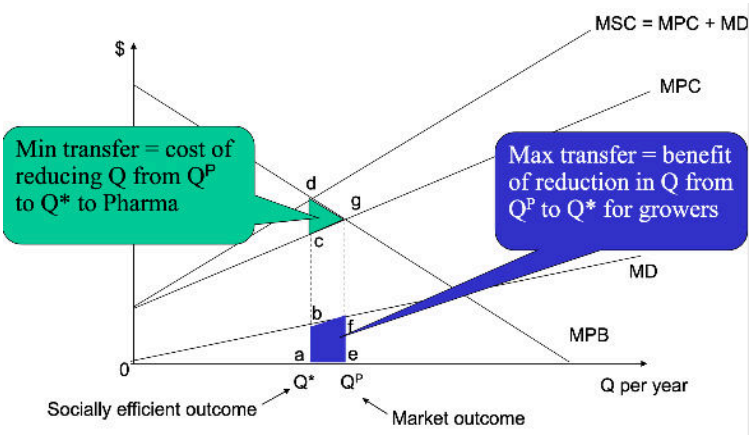
1. There are transferable **property rights** established and enforced (so that externalities can be internalised)
2. The transaction cost is sufficiently low (cost of arriving at a mutual agreement should be sufficiently low)

Note: Who owns property rights does not affect efficiency, this does affect distribution

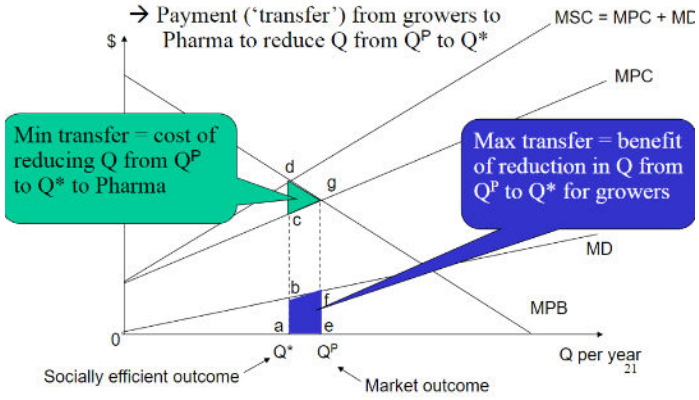
The outcome of Coase theorem is at the socially optimum Q*

- For a marginal reduction in Q, growers are maximally willing to pay marginal damage (MD)
- Pharma only accepts a marginal reduction in Q if the compensation is at least the loss in profit (MB – MPC)
- So, reduction in Q until MD = MB – MPC
- Hence, equilibrium has MD + MPC = MB, which only holds when Q = Q*

=> To make both Pharma and the growers accept, the growers should pay Pharma minimally area cdg (loss in profit to Pharma) and maximally area abfe (benefit of reducing the negative externality)



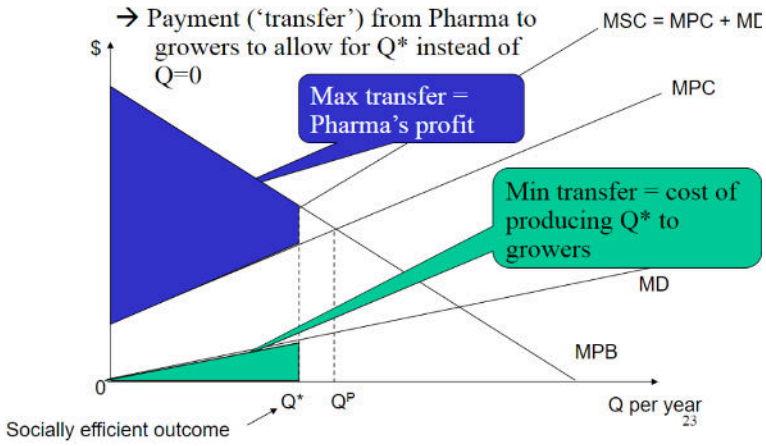
If Pharma owns property rights



If growers have property rights

The same argumentation holds (the same level of Q is resulted, only now transferred from Pharma to growers).

=> Who has property rights does not affect efficiency, but does affect distribution.



Negotiations require low transaction cost, meaning that agreements should be easy to arrive at and to enforce

- Few parties involved.
- No asymmetric information

If the transaction cost is too high, there would be no or limited negotiations. In this case, who owns property rights does affect efficiency

Overcoming market failure

How to ensure that private parties choose socially optimal level of production?
=> Let them internalise the externality:

- Through market (Merging)
- Coasian bargaining by private parties
- Through government intervention: Pigouvian taxes/subsidies, regulation, permit trade system (cap-and-trade)

Pigouvian tax/subsidy

Externality arises because prices do not reflect all social costs and benefits.
=> Solution: change prices faced by producer of externality using Pigouvian tax/ subsidy

Pigouvian tax = MEC at optimum quantity Q*
Pigouvian subsidy = MEb at optimum quantity Q*

Pigouvian tax versus subsidy

- Both yield socially efficient level Q*
- Both require that the government has (full) information on all costs and benefits.
- In practice, optimal level of tax/subsidy is a difficult but important question (Lots of room for government failure)

The main difference between them is the outcome distribution.

Regulation

- Restrict or even forbid production/consumption
- Enforcing production standards (safety, environmental)
- Affect property rights/decision rights

This requires lots of information

Cap and trade

- This system is a combination of regulation and Pigouvian tax
- Impose maximum on total emission (cap)
- Give/sell emission permits to producers
- Allow producers to trade permits
- Price of permit that arises on the market serves as an opportunity cost of emission
- Example: EU Emissions Trading System

Market options (Merging)

As a last note, there is the possibility for two companies to merge. If we are in a scenario where two companies are producing, and one has a negative externality effect on the other, then through a merger these two companies can avoid the externality and increase the profits they are making.

Applied microeconomics – IBEB – Lecture 5, week 2 (personnel 2) Efficiency and participation constraint

Why do we analyse models?

1. Answer practical questions => normative nature
2. Understanding the world better => positive nature
3. Social welfare => normative nature
4. Can we do better? From society's perspective

Now we still have the exact same factors as last week, however now we also look at agents who get other offers (V). This is something the principal needs to take into account. A high V means the agent has a lot of other options, a low V means he has less options.

From last week remember:

Agents Utility function

$$U = a + bke - \frac{1}{2}\Theta E^2$$

And optimal effort

$$E = \frac{bk}{\Theta}$$

The employer wants to keep the worker, but also keep the costs of the fixed wage as low as possible under the given circumstances. The alternative Utility equals V.

For the agent to accept the contract (not change company), U>V:

$$U = a + bk\frac{bk}{\Theta} - \frac{1}{2}\Theta\left(\frac{bk}{\Theta}\right)^2 > V$$

Solving for a yields:

$$a = V - \frac{1}{2} * \frac{b^2 k^2}{\Theta}$$

Therefore, we conclude:

- The higher the bonus, the lower the minimum wage
- The higher the cost of effort, the higher the minimum wage (compensation)
- The more productive the firm, the lower the minimum wage

We see that the fixed wage (a) increases in V and decreases in b and k. This means that when the utility of the worker at the outside option increases, the fixed wage will also increase because the employer still wants to make sure that the worker chooses his company.
Now with the optimal level of effort (E) and the optimal fixed wage (a), we can calculate the variable part of the wage to maximise profits.

Contract

$$\pi = pQ - y$$
$$\pi = pke - a - bke$$
$$\pi = pk(\frac{bk}{\Theta}) - (V - \frac{1}{2} * \frac{b^2 k^2}{\Theta}) - bk(\frac{bk}{\Theta})$$

Maximising with respect to b yields:

$$\pi' = (\frac{pk^2}{\Theta}) - (\frac{bk^2}{\Theta}) = 0$$
$$p - b = 0 \Rightarrow p = b$$

After maximising b, we know that it is equal to the price. This means that the employer achieves maximum profits when giving the entire marginal benefits of the product to the agent.

Social welfare and efficiency

We will now look at the efficiency of the previous model and make it more realistic by adding extensions. We will check whether the outcomes of this model maximise social benefits.

Social welfare function = SW = $U + \pi$

We then get:

$$pQ - y + y - \frac{1}{2}\Theta E^2$$

Plugging in the optimal effort:

$$SW = p(\frac{bk}{\Theta}) - \frac{1}{2}\Theta * \frac{b^2k^2}{\Theta^2}$$

Now maximising with respect to e:

$$pk = \Theta E = 0$$

$$E = \frac{bk}{\Theta}$$

From this, we can conclude that the social and private choices are aligned.

Applied microeconomics – IBEB – Lecture 6, week 3 (public 2.5) Education and common resource problem

Education

First, let us consider an important fact: education is NOT a public good. Education is in fact a private good. The reasons are the following:

- Education is a rival since the more students there are the higher the cost and the benefit is lower. Thus, the MC of an additional student is not equal to zero
- If legally permitted, education can be excludable by law, by entrance requirements or by cost

From the individuals' perspective, education is an investment, because:

- It has a cost of both the actual tuition fees and the earnings that the person foregoes (to pursue (higher) education)
- There are future benefits of education, which include a potential higher income and productivity and knowledge that is intrinsically valuable

Now the question we are investigating has really become: why is there so much public involvement in (the provision of) education? For this we have the three following reasons.

Reason 1: education has a large selection of positive externalities

The social benefits of the educated class are larger than the private benefits of this class. Here are several examples:

- Those with a higher education, on average, have a higher wage; therefore, they are also in a higher tax bracket and results in a higher income tax, making government's revenue significantly increase.
- When a bigger proportion of the population is highly educated, society as a whole is prone to making better informed and educated participation in public issues, which benefits all members of that society (for example in voting).
- There is also the Spillover effect of knowledge. For example, in a population, the highly educated will share their knowledge with the lower educated possibly in daily interactions (transmission of knowledge).

Reason 2: imperfect capital markets

While there are people that have sufficient wealth to finance their full cost of education, there are also people who need to find loans to pay for their tuition. If they attempt to acquire this loan from the market, they are charged very high-risk premiums (higher interest rates) and have much stricter requirements with the loan. The reason for this is the fact that to a profit seeking loan enterprise there is high risk in investing in human capital. This is because of asymmetric information and the fact that there is no collateral for human capital. This can result in the reduced enrolment for the less wealthy students, or (too) large student debt.

The government can on the other hand do better (this is a line of argumentation, not absolute truth) by providing student loans with lower interest rates and longer payback schedules. These can be paid off through higher income and productivity later (people are in a higher tax bracket implying government gain in revenues).

Reason 3: for the reasons of fairness, equality and paternalism

The **social norm** is that we desire equal opportunities based on forecasting independent of the subject's background, family, or wealth. The government can reach **Commodity Egalitarianism,** meaning that everyone has an equal amount and right to commodities such as education.

The way to implement this is to maximize efficiency at MSB=MC, which implies that more education should be provided for smart students. However, this creates unequal opportunities. To create equal opportunities, we would need to provide more education to the less educated and less to the smarter.

Should the public sector or private sector provide education?

Arguments for relying on the **private sector**: schools can decide on the quality/cost of education which would be optimal due to competition in the market. And if the cost is larger than the voucher (subsidy) then the parents would have to pay out of their own wealth.

Counter Arguments for private education:

(1) Parents may be unable to judge the quality of the education
(2) The market for education would potentially end up with the wealthy gaining a better education (distributional inequality).

On the other hand, the publicly provided schools may **crowd out** the private sector by simply not leaving any room for the private sector to derive profits and so potentially leaving the educational system at a lower rate of profit than with competition.

The common-pool problem

Common-pool problem: arises when resources are rival but non-excludable:

- The non-excludable property of these resources is due to insufficiently defined or unenforced property rights
- The rival property implies that the marginal cost of more producers or consumers is positive and not zero

This often leads to the overcrowding of the resources because the individual may fail to take into account the preferences or the costs of the other individuals using the resource (Tragedy of the Commons)

Tragedy of the commons is the inefficient use of a resource, which results from the failure of an individual to take into account the negative externality of his actions.

Applied microeconomics – IBEB – lecture 7, week 3 (public 3) Asymmetric information

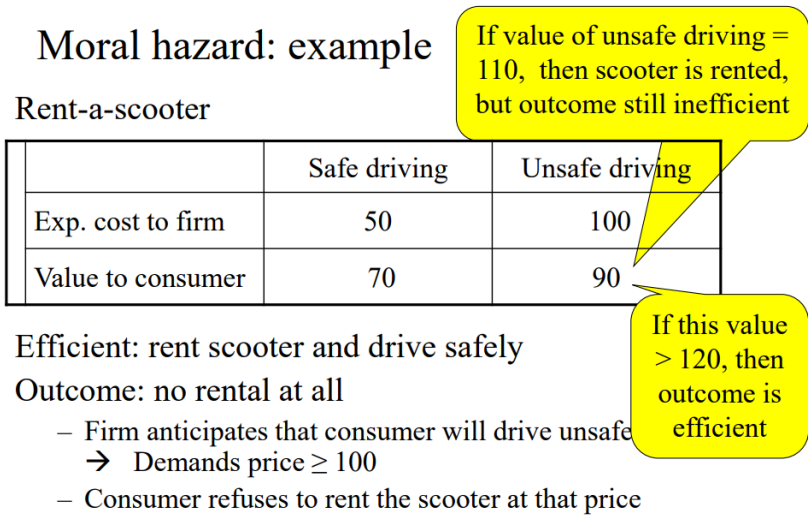
2 main types of asymmetric information

- Hidden actions = moral hazard: Non-verifiable actions that harm others in transaction (e.g: employee slacking off, unhealthy living by individuals with health insurance)
- Hidden characteristics = adverse selection: One party has better information on given aspect of transaction (e.g: Quality of second-hand items, probability of repaying loans)

Moral hazard

- Undertaking non-verifiable, socially inefficient actions
- Actions are beneficial to the person choosing them, but the cost it imposes on others in transaction are higher than this benefit (Individually rational but socially inefficient)

=> Leads to reduced efficiency of transaction, and may even completely obstruct transaction



Moral hazard can lead to market failure: As actions are not observable, market price does not reflect all cost and benefits

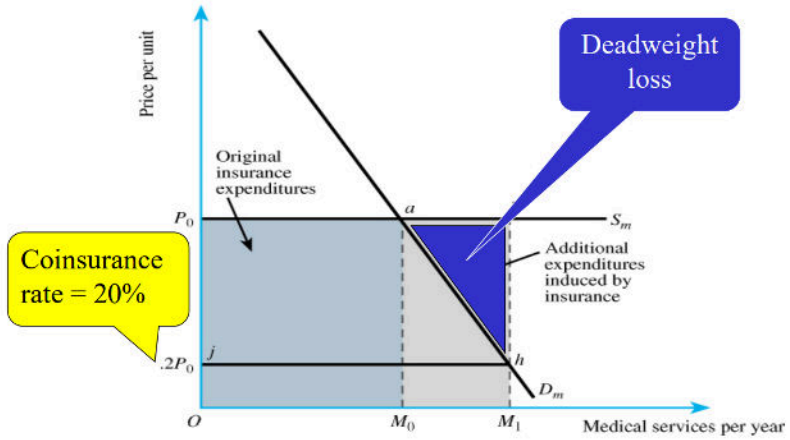
Note 1:

- If private gain > cost to others: Action is efficient, and price adjusts to cover cost
- If private gain < cost to others: Efficiency suffers. All parties involved could benefit from a commitment not to engage in socially inefficient actions. However, non-verifiability makes such a commitment impossible.

Note 2: Moral hazard implies hurting others for personal gain. In reality, not everyone always engages in moral hazard

Other examples of moral hazard (increasing consumption when the other party pays)

- More visits to physician by insured person
- Too much risk-taking by banks as they anticipate bailouts



Negotiating as in the Coase theorem does not apply for moral hazard as it does not meet the criteria "low transaction cost" (actions are non verifiable) => Contracts cannot provide commitment

How can private parties improve efficiency

- **Monitoring:** Random checks of activities, inspection. However, this is costly
- **Pay-for-performance:** Piece-rates. However, this may lead to inefficient risk-sharing or distortions, if there's no perfect link between the actions and measured performance
- **Regulation:** Limits to insurance coverage, rigid working hours. However, this restricts the value of of the transaction
- **Implicit contracts/reputation:** If you engage in moral hazard, I will never interact with you again. This requires that actions are observable and that the future sufficiently important
- **Professional ethics/social norms:** If I engage in moral hazard, I feel bad about myself.

Adverse selection

- Hidden characteristics: Some parties in a transaction have better information about characteristics that affect the value of the transaction than others
- Consequence: uninformed people cannot offer different prices for 'good types' and 'bad types' of trading partners
  => The informed parties self-select themselves into and out of transactions in such a way that the uninformed side gets the least valuable trading partners
  => Profitable transactions are not undertaken resulting in inefficiencies.

Adverse selection example

Rent-a-scooter
Two types of consumers: safe and unsafe.
Consumer knows its type, firm only knows p(safe) = ½

	Safe type	Unsafe type
Exp. cost to firm	50	100
Value to consumer	70	120

Efficient: both types rent scooter
Outcome: Only unsafe types rent scooter: adverse selection
→ If both type would rent, expected cost 75
→ But safe type would not rent the scooter at that price

Conclusion: Hidden characteristics harm efficiency, because:

1. Price/contract cannot depend on the type of informed party
2. The informed party self-selects into transactions such that the types that yield low value to the uninformed party are more likely to join
3. Uninformed parties are hesitant to engage in transactions

Note: The key assumption here is that the informed people are not honestly revealing their type

Possible solutions by private parties

- **Tests, expert opinions and peer reviews** (But this is costly)

- **Offer multiple contracts** where the uninformed party may induce the informed parties to self-select (additional insurance, offering fixed and variable wage)
- **High-quality informed parties signal their quality** (warrantees, diplomas and certificates) but this is costly
- **Implicit contracts/establishing a reputation for honesty:** If you ever lie to me, I will never interact with you again. This requires that information gets revealed later and that the future is sufficiently important.

Government intervention

Note that inefficiencies arise from private parties lacking information. However, the government also faces an identical lack of information!
=> Therefore, there is no easy solution through government intervention.

Some measures that may reduce inefficiency:
- Make some actions illegal, with penalties (fraud, speeding)
- Make participation mandatory (car & health insurance)
- Help to provide information (quality standards, inspection)
- Public production (poverty insurance)

Application: insurance

In many insurance markets, both **moral hazard** and **adverse selection** play a role. This is because risk-averse people dislike uncertainty in their income/wealth, which implies that risk-averse people prefer a certain income over an uncertain income with the same average.

Insurance works by pooling many uncorrelated risks, hence if everyone pays expected (= average) loss in advance, then by the law of large numbers, this should be about enough to compensate those who actually 'lose'. (One remark is that risks must be uncorrelated, otherwise actual pay-out is either very small or very large. Therefore, there is no private insurance for natural disasters.)

However, insurance can come with two main problems, namely:

1. **Moral hazard** → The probability and size of loss depend on choices/behaviour. After acquiring insurance, some individuals may alter their behaviour, increasing the anticipated loss.
2. **Adverse selection** → People may be better knowledgeable than insurance companies about the factors that influence projected loss, and insurance is more valuable for those who anticipate substantial losses.

As shown above, probability and/or level of loss may be affected by individuals' characteristics or behaviour, which leads to the case of adverse selection and moral hazard. This results in market failures:

- Markets do provide some insurance, but are not efficient
- Markets do not provide insurance at all

Risk selection

On average, groups of people differ in how much they claim from their insurance company. Therefore on efficiency grounds, **risk-selection reduces the adverse selection problem:**

- Charge higher insurance premiums to relatively high-risk groups.
- Young people and people in densely populated area pay higher car insurance premium
- Older people pay more for health insurance

Clearly, this is only possible with observable characteristics.

However, you get into **distributional and ethical issues:**

- Should overweight people pay more for health insurance?
- Should people be tested on HIV before a health insurance premium is being determined?

=> There is a trade-off between efficiency and distribution.

Concluding remarks

Asymmetric information may strongly reduce market efficiency

- Moral hazard: individuals take non-verifiable actions that are individually rational but socially inefficient

- Adverse selection: uninformed parties interact with the 'worst' fraction of the parties with better info on characteristics of transaction.

Potential private solutions to this market failure:

- Signalling and screening. But: costly
- Limiting possible choices/actions

Potential public solutions:

- Regulation (information disclosure; mandatory insurance)
- Public production (NHS in the UK;'poverty insurance)

Applied microeconomics – IBEB – lecture 8, week 3 (personnel 3) Pay for performance in practice

Optimal monitoring

Consider a simplified case of the principal-agent problem where the agent only has two choices on exerting efforts: working hard (with effort level E*) or shirking (with effort level 0).

1. The agent decides between effort E* and 0

Output: $Q(E) > Q(0) > 0$
Agent's utility: $Y - V(E)$ where $V(E^*) > V(0)$

If the worker is caught shirking, the marginal utility loss of agent = F

If the agent chooses E=0, the principle discover this with probability $0<p<1$
=> with cost c(p), the principle can increase p

2. The principal chooses p and F:

$p^*F = V(E^*) - V(0)$ => If F is big enough then the agent will work hard

$Q(E^*) - c(p^*) - y \geq Q(0) - y$
=> $c(p^*) \leq Q(E^*) - Q(0)$

Social welfare

To take into account social welfare, we consider both the principle profit and the agent's utility: $Q(E^*) - c(p^*) - y + y - V(E^*) \geq Q(0) - y + y - V(0)$

Hence, if shirking is not socially optimal, contracts must satisfy a non-shirking condition by which the fine for shirking (F) and the probability of getting caught (p) is high enough to deter all shirking.

Applied microeconomics – IBEB – lecture 9, week 4 (public 4) Redistribution

Redistribution

Redistribution: Altering the distribution of a good (e.g. income) over individuals (or households)

E.g: The rich being taxed and the poor being subsidised, redistribution from young to the old and the healthy to the sick.

Issues when interpreting data on income/wealth distribution:

- Unit of observation: Individuals or households?
- Before and after taxes, contributions, and benefit

- In-kind versus cash benefits: Many benefits from the government are not in cash, but in goods / services
- Data on wealth less reliable / complete than income data

Reasons for redistribution

Normative answer: Because 'society' prefers a different distribution than the market generates
=> Redistribution aims to "Promote Greatest Good for Greatest Number" (Bentham)

Recall the Second Fundamental Theorem: Any Pareto-efficient allocation of goods (and, hence, utility) can be obtained through reallocation of resources

Other theories of distributive justice:
- Rawls (minimax and 'veil of ignorance'): W = MIN (U1, U2, ..., Un)
- Egalitarianism
- Capabilities approach (Sen)
- Libertarianism

Reason for private redistribution: Altruism
$U_1 = F(I_1, U_2(I_2))$ => Pareto-efficient redistribution

Reason for government intervention
1. Welfare state as a public good
   - The rich also benefit from alleviating poverty, but there is a large free-rider problem
   - Government enforces contributions
   - Scale effects: defining who is poor and administration costs

2. Externalities of poverty
   - Effect of poverty on the well-being of others
   - Spillover effects

3. Incomplete information
   - People may be too positive about risk of becoming poor (Paternalism)

4. Redistribution as poverty insurance

- Prevent market failure due to asymmetric information: Large moral hazard and adverse selection problems in private poverty insurance (e.g: Government can impose fines for fraud, rules for job search)

Efficiency effects of redistribution

According to the second fundamental theorem of welfare, efficiency can be separated from redistribution. However in practice, redistribution affects efficiency, by affecting people's behaviour and choices.

Cash vs. in-kind benefits

The problem with these is that while there is a theoretical argument for the distribution of cash (people can use it more specifically to increase their utilities), the government is often seen distributing in kind benefits such as food stamps. The government in this case is engaging in paternal action (for example by making an alcoholic parent buy food for the family rather than alcohol). However, this is less efficient because the consumption choices of the individuals now are much more limited and potentially cannot reach the social optimum.

The crowding out of private redistribution

If, as is common, there is mandatory participation in these redistributive programmes via the government, then this may **crowd out** the private market. For example, the public social security program may discourage the saving of money for retirement. As well as the lower contributions to charity because we are already helping the poor through the government programmes.

The effect on the labour supply

Generally, the programs that are implemented are means-tested. This means that the eligibility of an individual to the programme is dependent upon their income. However, there is the potential of inefficiency here because if the benefit does not decrease at some point then there is low incentive to work. Essentially this has led to a decrease in benefits as income increases, which function similarly (in effect) to an income tax that starts out positively.

The effect on worker incentive

The implementation of the redistributive programme will often change a worker's choice between leisure and work because it effectively puts a kink into the budget constraint of the worker. This may lead to a higher utility level when working less (depends on the utility function).

Example: Consider the choice between working and leisure. Suppose utility U(y, L) increases in income y and in number of hours of leisure L.

Individuals have an hourly wage w and T hours to divide between work and leisure => Earnings E = w(T – L). Without redistribution, y = E

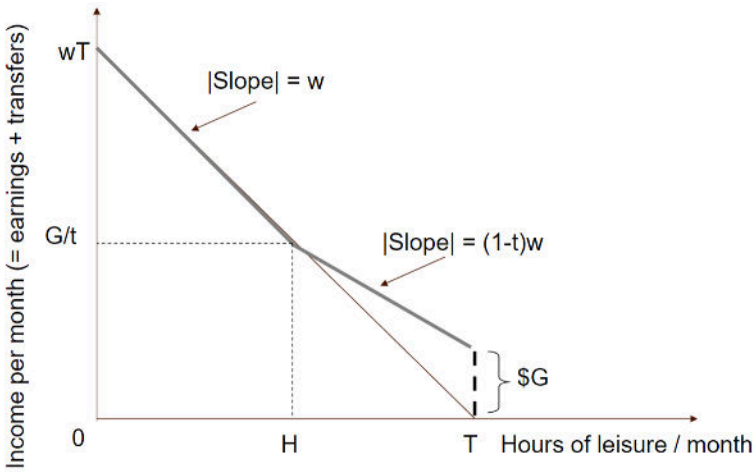
Basic structure of welfare program:

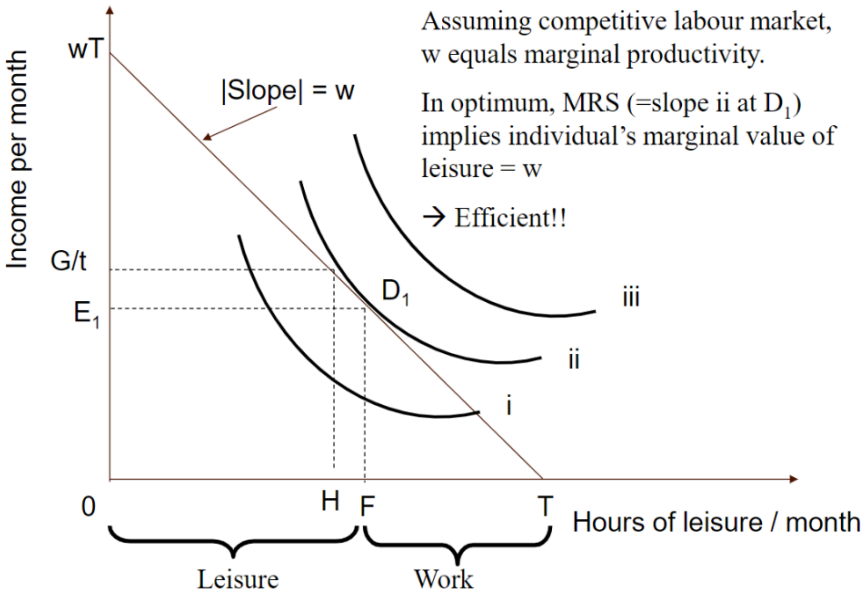
- Grant G in case of no earnings
- Rate t at which the grant is reduced per euro of recipients' earnings E
- Actual Benefit B received: B = G – tE => B = 0 if E ≥ G/t

Variations:

- First X euro of earnings are free
- Different t for different earnings brackets

Income y = E + B

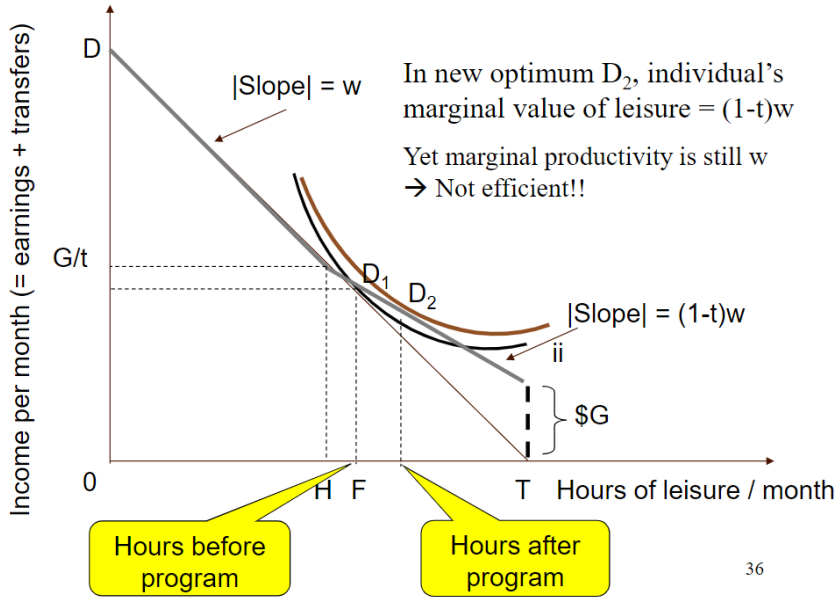




Assuming competitive labour market, w equals marginal productivity.

In optimum, MRS (=slope ii at D_1) implies individual's marginal value of leisure = w

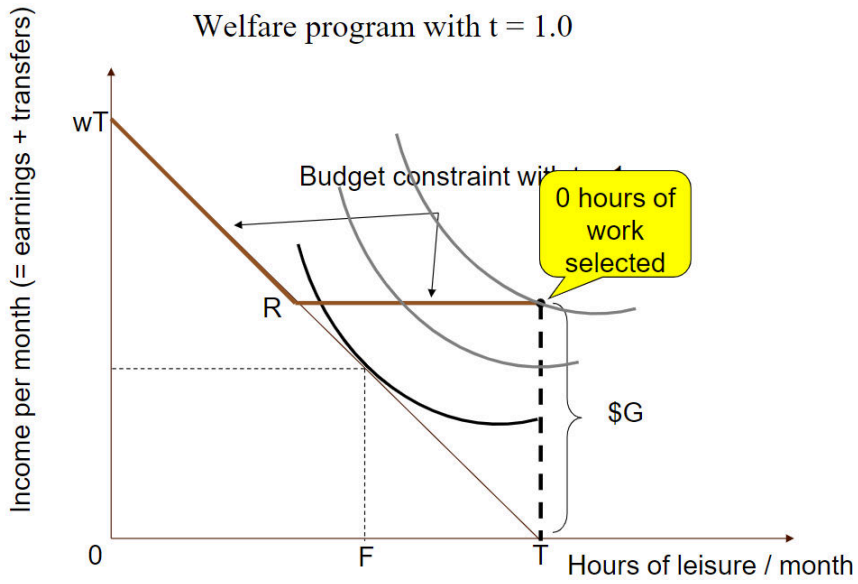
→ Efficient!!

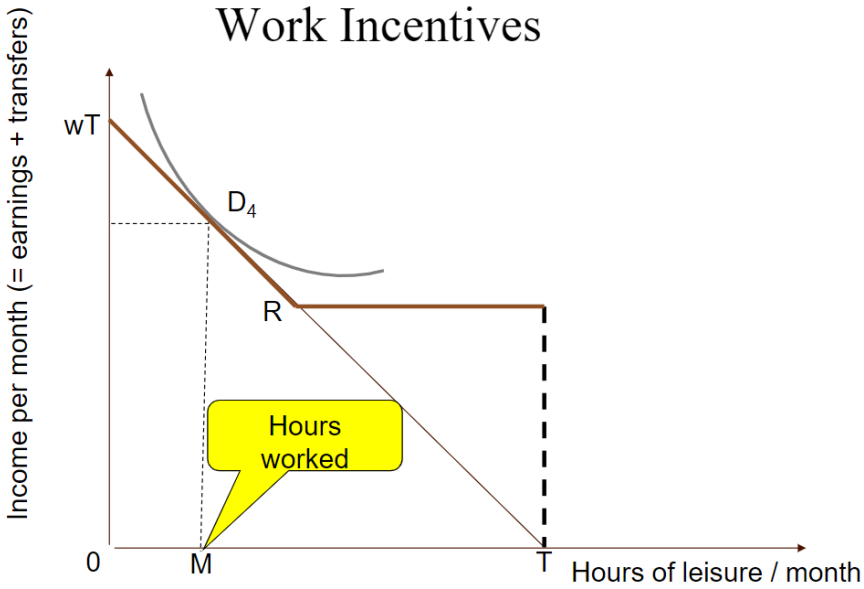


In new optimum D_2, individual's marginal value of leisure = (1-t)w

Yet marginal productivity is still w

→ Not efficient!!





The negative effect of redistribution on efficiency depends on how strongly people respond (substitution effect). This relates to the labour supply elasticity.

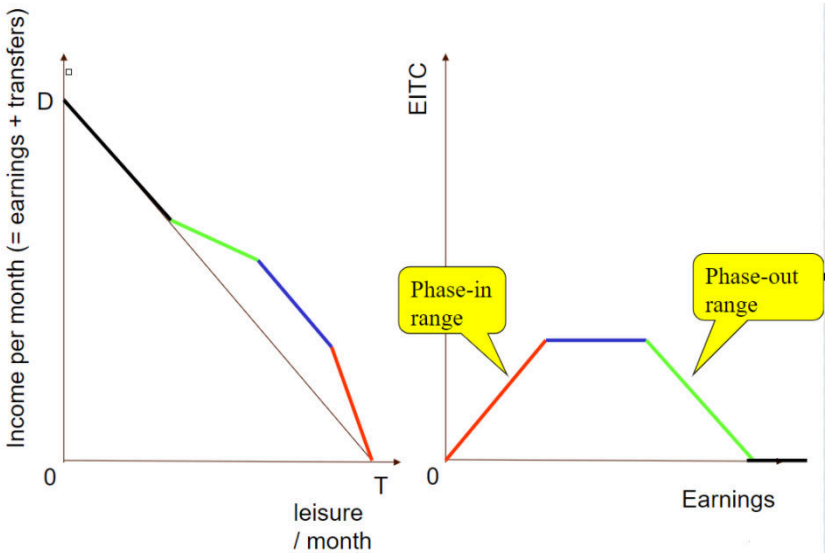
Subsiding earnings: earned income tax credit

EITC = Subsidy on income through reduction in income tax

- Result: Low-income workers 'pay' negative taxes!
- Used as an instrument to redistribute towards the working poor

- Efficiency effects: Subsidy is a negative marginal tax rate! Stronger incentive to increase earnings in phase-in range. However, in phase-out range, there is a high marginal tax rate

Work incentive and EITC



Applied microeconomics – IBEB – lecture 10, week 4 (personnel 4) Non-classical motivators

Pay enough or don't pay at all

In the experiments ***Pay enough or don't pay at all***, university students were invited to the lab to participate in an experiment, where they would have to answer a series of questions. Without them knowing, they are divided into four groups. The only difference between the groups is the incentive for them to attempt to answer these questions correctly.

Group	Incentive	Outcome (average number of questions answered correctly)
Control group	No incentive	28
T1	3 cents per correct answer	23
T2	30 cents per correct answer	35
T3	1 euro per correct answer	34

While it is expected that there is a significant increase in the outcome of T2 compared to T1, the fact that there is a significant decrease in the outcome with the introduction of the 3 cents per correct answer (T1 vs. Control group) and there is no significant increase when the incentive goes from 30 cents to 1 euro per correct answer is hard to understand with standard economics theories.

In the second part of the study, high school students were asked to work (with a base payment) for a charity. Their job is to go door to door, asking people to raise money for the charity. Again, without them knowing, they are divided into three groups with different treatments.

Group	Incentive	Outcome (average amount raised)
Control group	No bonus	80
T1	1% commission	50
T2	10% commission	73

Here, the observed result (that the outcome decreases with the introduction of bonus as incentive) is also difficult to understand from the classical theory's perspective.

These results raise two questions:

1. Why is it the case that people work (quite well) with no incentive?
2. Why do people sometimes respond to incentives in a negative way?

Possible explanation

When the monetary incentive is too low (the case of T1 in the first mentioned experiment), people might take the task less seriously than when there is no monetary incentive.

- Another example is when a (relatively) small fine applied for parents picking up their children late from kindergarten. When there is no fine, parents tend to feel sorry for the teacher having to stay late to wait for them to pick up their children, so they would try to come early. But when there is a low fine, they get it as a signal that it is not that bad to come late, and it turns out that more parents came late than before the fine was introduced.

As suggested by the study of Gneezy, U. (2003) – The W effect of incentives, to some extent, a small fine/reward would have a counter effect: people would perform worse when there is a small fine or reward associated with their performance. Fine and reward are only worth it when these are sufficiently high.

Non-monetary incentives

One of the intrinsic motivations that we must consider is **public image concerns** (*what would others think of me?*). The lecturer discusses an experimental study conducted by Ariely, Bracha and Meier. (2009) in ***Doing Good or Doing Well? Image Motivation and Monetary Incentives in Behaving Prosocially***. In this experiment, students are asked to do some tasks, where for each well-done task they have done, a small amount of money is transferred to a charity. The students are divided into four groups (without knowing about the groups other than their own). To study how public image motivation influences the participants' performance, the study varies the image motivation by varying observability and bonus given out of the outcome. The study results are as follows:

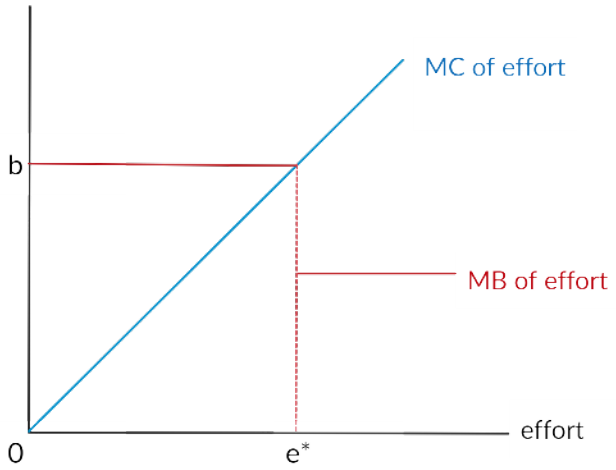
Group	Treatment	Outcome
1	Unobserved individual output, no bonus	517
2	Unobserved individual output, bonus	737
3	Observed individual output, no bonus	900
4	Observed individual output, bonus	814

It turns out that people perform better when their outcome is observed by the public. When not being observed, the result is as expected that a bonus increases the outcome. However, when being observed by other people, participants perform worse when they are given a bonus out of the total amount they made for the charity. The reason behind this is that the "image" motivation decreases when others can see that there is also some monetary incentive for the participants.

Prospect theory

According to **prospect theory**, people usually behave with their current **reference point** (of well-being) in mind. A loss of income decreases people's utility significantly more when their income is below their reference point than when their income is higher than their reference point. This is the **loss aversion** phenomenon.

Using graphical analysis, we can have a further look at this loss aversion phenomenon. Consider the case of a worker who has to decide on the level of effort exerted for the job. His marginal cost (MC) of effort is represented by the function MC = θe; his income is calculated by Y = a+be. It is observed that initially, the marginal benefit (MB) of the worker's effort is b. But at the point where MB=MC, the MB of the employee decreases significantly. The optimal outcome is that the worker chooses to exert e* units of effort, and get income Y* = a + be*.



The theory can explain the behaviour of taxi drivers. A study by Farber, H. (2014) suggests that taxi drivers tend to have a reference point of daily income, which they have much fear of not achieving, but do not care so much to earn more than that. This example illustrates loss aversion in reality.

Fryer et al. (2012) also illustrate loss aversion with a field experiment on incentivising teachers to perform better. Based on the idea of exploiting loss averse employees, the experiment divides the teachers into three groups. All else (relatively) equal, these groups of teachers are incentivized as follows: For groups 2 and 3, the expected value of the incentive is the same, but we observe different outcomes. This is explained that the teachers' performance is better when the incentive is framed as a loss rather than a gain. When the teachers get the $4000 upfront, their reference points apparently increase, and the utility loss from having to pay back this amount

would be larger than the utility gained with the $8000 bonus from the initial reference points.

Group	Incentive	Outcome
1	No incentive	-
2	$8000 bonus at the end of the year if they perform well.	Better than no incentive
3	$4000 bonus at the beginning of the year. At the end of the year, they would have to pay the $4000 back if they do not perform well.	Best in the three cases

Reciprocity

Reciprocity means that people tend to do something in return after getting something. This can be both positive and negative. A positive example would be gift-giving or doing someone a favor. Keep in mind that this also directly correlates to image concerns. If a person's behavior is visible to others, they are more likely to be reciprocal. A negative example would be revenge.

When we apply this to our principal-agent model, we can see that an agent might feel the need to do something for the principal (e.g. put in a lot of effort) to receive a high wage, even if the agent does not get a bonus on his high effort.

Applied microeconomics – IBEB – lecture 11, week 5 (public 5) Taxation: incidence and distortion

Purposes of tax revenue

Tax revenue is needed for financing:

- Public provision of goods
- Anti-poverty measures (redistribution)
- Pigouvian subsidies

- Input cost of government.

Evaluation of taxes can be done by looking at efficiency and distribution.

Efficiency goals:
- Minimising distortionary effects
- Correcting market failure in case of externalities

Distributions:
- Who suffers (and how much) in society. Such an evaluation determines whether tax is distributed through horizontal equity (equal people pay equal taxes) or through vertical differentiation (citizens who are better off pay more taxes)

Four general remarks on taxation:

1. Only people can bear the tax burden (Tax on firms or capital are paid by owners)

2. Two types of taxes: **unit tax** (fixed amount for every unit produced) and **ad valorem tax** (levied as a percentage of price)

3. Distinguish between average and marginal tax rate. For example
- No income tax for the first 5000 euro income, and a 25% tax on income Y for the amount over 5000 euro.
  => $T = 0.25(Y - 5000)$
- If income is 25.000 euro, then total tax paid is $T = 0.25(25000-5000) = 5000$
  => Average tax rate $=T/Y = 5000/25000 = 0.2$
  => Marginal tax rate = 0.25

4. Progressiveness of tax is measured by the **average** tax rate.
- Progressive tax: Average tax rate increases in income
- Regressive tax: Average tax rate decreases in income
- Proportional tax: Average tax rate is constant in income

Universal basic income: The public pension that doesn't depend on the individual's age (Everyone gets an amount B with no conditions).

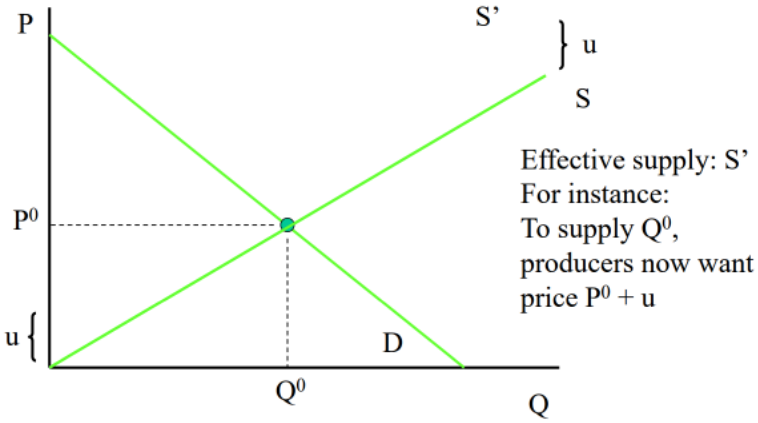
Incidence: distribution of tax burden

- **Statutory incidence:** Who pays? (legal incidence of the tax)
- **Economic incidence**: Who bears the tax burden? Which groups are made worse off by the tax

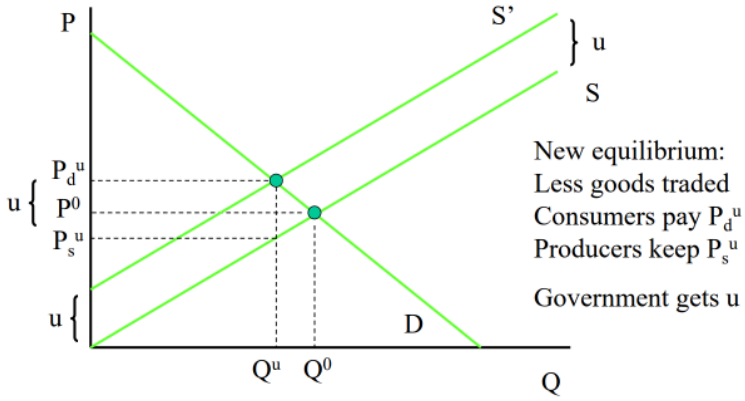
Economic incidence is completely independent of statutory incidence (**Tax shifting**)

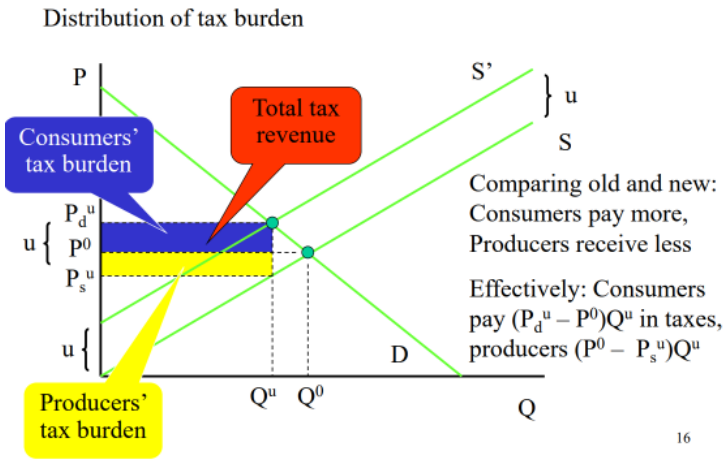
Tax in partial equilibrium

Suppose unit tax u levied on producers



New equilibrium with unit tax u levied on producers





Elasticity of demand and supply determines the distribution of tax burden

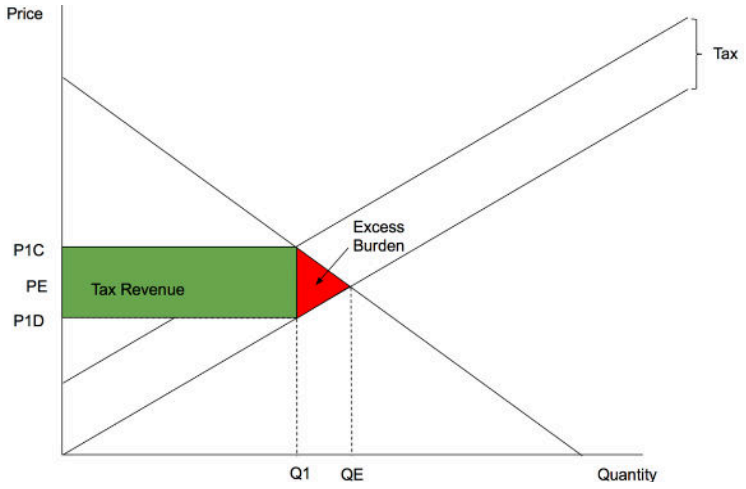
$$\varepsilon = \left|\frac{dQ}{dP}\frac{P}{Q}\right|$$

The more elastic, the lower the share of the tax burden.
Elasticities tend to be larger in long-run than in short-run

Efficiency effect of taxations

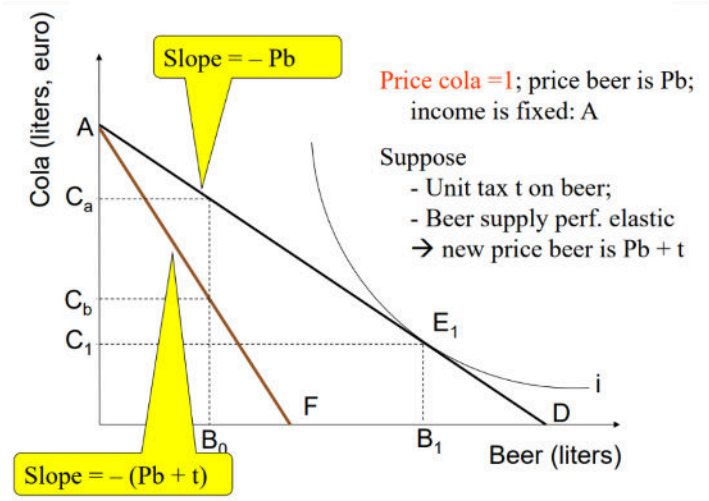
When the government imposes a tax, the taxes are not lost. They are transferred to the government.

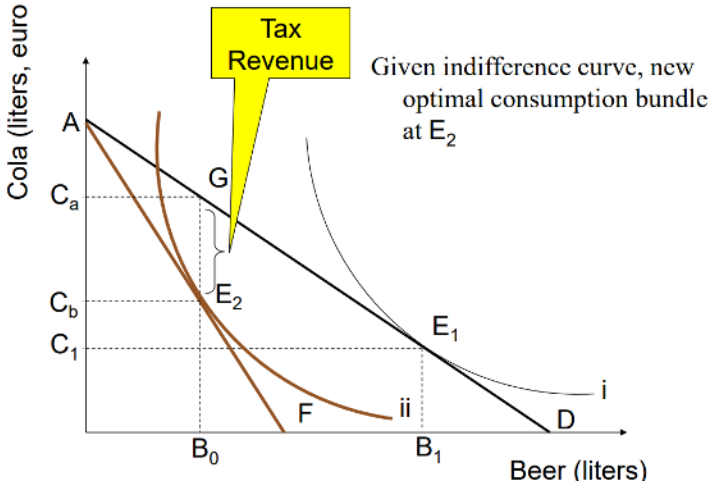
However, imposing a tax causes a loss to producer and consumer surplus (Excess burden).



- Original equilibrium: MRS = MRT = Px/Py.
- With unit tax: Consumer's MRS goes to (Px+t)/Py whereas the MRT remains at (Px-t)/Py => MRS no longer equals the MRT and we are not at an efficient equilibrium.

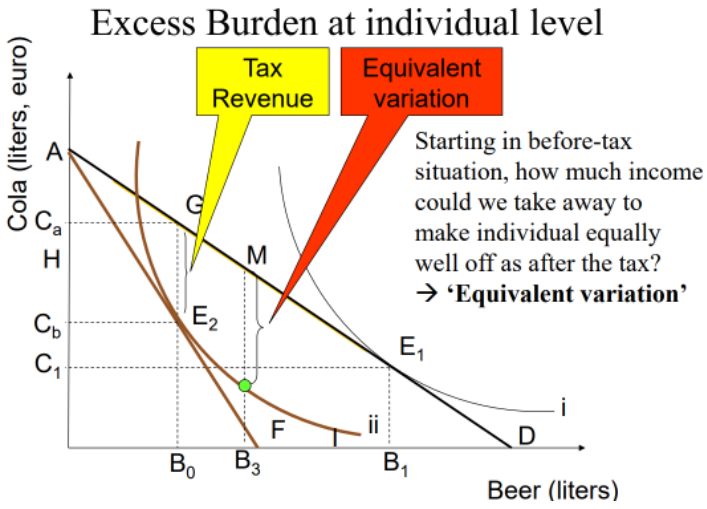
The efficiency effects on an individual level





Equivalent variation: Before the tax, how much money could we take away to make consumer equally well off as after the tax

If equivalent variation > tax revenue, we have an excess burden present.



Equivalent variation = income effect
Substitution effect causes the inefficiencies (excess burden)

Tax increases the price of goods. This has two effects

1. Consumers can buy less goods (income-effect)
2. Relative price of the goods increases => consumer shifts consumption away towards other, non-taxed goods (substitution-effect). This shift makes that tax revenue < utility loss

Lump sum tax

Lump Sum Taxes: A tax without excess burden

- They do not distort behaviour
- Substitution effect is 0.
- Example: "head tax", meaning that if you have a head, you pay this tax => Impossible to reduce taxes through change in behaviour.

Applied microeconomics – IBEB – lecture 12, week 5 (personnel 5) Monopsony and efficient wages

Monopsony

The case of monopsony is when the elasticity of labour supply to the firm is low, i.e. firms will not lose many workers when they cut wages.

We build a model of a firm's profit depending on the wage that it pays its workers.

$$\text{Profit} = Q*N(W) - W*N(W)$$

N = The number of the firm's workers, which is an increasing function of W.

Profit maximising wage level:

$$\text{FOC: } -N(W) + (Q - W)*N'(W) = 0$$

In this equation, we can interpret N(W) as the marginal cost of the workers that are already working there, and (Q-W)*N'(W) as the marginal revenue.

To rewrite the FOC in terms of an elasticity, we first multiply all the terms in the equation by W/N

$$-W + (Q - W)*N'(W)*W/N = 0 \quad (1)$$

We see the term N'(W)*W/N here in the equation. This is the wage elasticity of the labour supply (denoted by η), we would have the profit-maximising wage expressed as below:

$$W = Q * \eta/(1 + \eta)$$

Looking at the extremes: when η is extremely big (tends to infinity), $\eta/(1+ \eta)$ tends to 1, and therefore W is equal to Q (what a worker brings to the firm) in this case. This is when there is a lot of competition (perfect competition) where employers compete for workers. Consider another case when $\eta = 1$, then $W = 0.5Q$. This shows that the higher wage elasticity of workers is, the higher wages are in optimal state.

Hence, in extreme conditions:

(1) When labour supply is completely inelastic ($\eta = 0$) : Profit-maximising wage is also 0
   - Cutting the offered wage will not cause any workers to leave. Employees will stay even if wages are 0.

(2) When workers are paid their full productivity ($w = Q$) : labour supply is infinitely elastic.
   - Cutting wages by a little bit will cause ALL employees to quit. In this situation, firms will have to earn zero profits and pay employees their full profits.

Simple implication in reality:

- In small villages, there are not many employers, whereas in the city, there are often large numbers of employers.
- The competition for workers in the city is much more intense, and workers of a particular occupation would have much more choices of which employers to work for in the city. Therefore, companies in the city cannot pay low wages, otherwise no worker would work for them.

Reciprocity

Reciprocity can be explained by

1. Emotions
2. Inequality aversion
3. Conditional altruism

Applying this to our principal-agent model: If an agent values the principal highly, he might feel the need to put in a lot of effort for receiving a high wage, even if the agent does not get a bonus on his high effort.

Becker Model

The Efficiency wage effect can be seen with the Becker Model.

Determine when the agent chooses to work hard and when he chooses to shirk:

- Shirk: Detected with the chance *p,* in which case the worker will get fired and not get paid. He will then get the alternate Utility U(alt).

- There is also the chance that the worker shirks without getting caught and will thus receive wage w with a chance of (1-p).

The agent will choose to work hard if Utility of working hard > Utility of shirking.

$$W - V(E) \geq (1 - p)W + pU(alt) - V(0)$$

Where V(E) is the cost of high effort and V(0) the cost of low effort.
Rewriting this term for W, we get:

$$W \geq \frac{V(E) - V(0)}{p} + U(alt)$$

Looking at the extreme cases of
p = 1 => exerts high effort
p = 0 => exerts low effort

From this we can conclude that it pays off to pay a higher wage to the worker, as a higher wage means higher effort from the worker.

Applied microeconomics – IBEB – lecture 13, week 6 (public 6) - Optimal taxation

Minimising the excess burden

Main question: How to set rates on different commodities or input factors such that we raise R in tax revenue at minimal total Excess Burden?

Assume that we are in a world with the goods **X**, **Y** and leisure **L**, as well as a fixed number of hours available **T** and a wage **w**.

Budget constraint without tax: $wT = P_x X + P_Y Y + wL$

Budget constraint with tax: $wT = (1 + t)P_xX + (1 + t)P_YY + (1 + t)wL =>$
$w\frac{T}{1+t} = P_xX + P_YY + wL$
This is as if the tax reduces time endowment T

- Whatever the individual does, it is not possible to reduce amount of tax paid
- No change in relative prices, so no distortions (no substitution effects)
- Therefore, if we could tax all commodities including Leisure, there would be no excess burden

However, it is not possible to tax leisure => only tax good X and Y

=> Budget constraint: $wT = (1 + t)P_xX + (1 + t)P_YY + wL$
$=> \frac{w}{1+t}(T - L) = P_xX + P_YY$ (
=> This changes relative price and hence leads to excess burden

Conclusion
Hence, given our goal, we focus on taxing commodities
=> Now, the question becomes: Which commodities should we tax and at which rate?

The Ramsay rule

Excess burden can be minimised using the Ramsey Rule.

Simplifying assumptions:

1. Supply curves are perfectly elastic/horizontal (all effects on a market run through the demand and constant marginal costs).
2. Cross-price elasticities are 0, such that goods are neither substitutes nor complements (the effects of a certain tax on a good are contained in this good's market).

Excess burden =

$$EB = \frac{1}{2}\left(tP_0\right)(\Delta Q)$$

tP0 is the change in consumer price: ΔP
ΔQ is the change in equilibrium quantity

Elasticity of demand =

$$\varepsilon_D = \left| \frac{P_0}{Q_0} \frac{dQ}{dP} \right|$$

Using $tP_0 = \Delta P$, we rewrite this to $\Delta Q = \varepsilon_D t Q_0$

Substituting this into EB gives:

$$EB = \frac{1}{2} \varepsilon_D Q_0 P_0 t^2$$

Two important results:

1. EB increases in demand elasticity. The larger the elasticity of demand, the larger the distortion and excess burden
2. EB increases quadratically in tax rate. A higher tax rate implies a higher increase in the EB if the tax rate increases (The Marginal Excess Burden is increasing in t)

Therefore, we can minimise the excess burden (quadratic in tax) by spreading this tax across several markets (to keep the specific tax rates lower).

=> Ideal to tax high elasticity markets with a low tax, and low elasticity markets with a high tax.

Optimal tax rate: Marginal excess burden should be equal across commodities.

To get R_x on the market for good X, the ad valorem tax rate should be:

$$t_X = \frac{R_X}{P_X Q_X}$$

=> Marginal increase in R_x yields

$$\frac{\delta t_X}{\delta R_X} = \frac{1}{P_X Q_X}$$

So, marginal tax revenue raises tax by this amount

The effect of a marginal increase in t_X on EB_X is

$$\frac{\delta EB_X}{\delta t_X} = \varepsilon_X P_X Q_X t_X$$

We know that the Marginal Excess Burden is the change in the Excess burden for every change in the amount of revenue we wish to collect:

$$MEB = \frac{dEB_X}{dR_X} = \frac{1}{P_X Q_X} * \varepsilon_X P_X Q_X t_X = \varepsilon_X t_X$$

$$\Rightarrow MEB = \varepsilon_X t_X$$

So, MEB increases in elasticity and in the tax rate

Inverse elasticity rule (Ramsey rule)

Total excess burden is minimal when

$$MEB_x = MEB_y \quad \Rightarrow \quad \varepsilon_x t_x = \varepsilon_y t_y \quad \Rightarrow \quad \frac{t_x}{t_y} = \frac{\varepsilon_y}{\varepsilon_x}$$

So, the ratio of tax rates is inversely proportional to ratio in elasticities
=> The higher elasticity, the lower the tax rate

Ramsey rule can also be derived using Lagrange:

- Objective: Minimise total Excess Burden
- Constraint: Raise R in tax revenue

Government intervention and excess burden

Excess burden is a cost to society => Should be taken into account in a cost benefit analysis

Similarly: Level of subsidy on education

- Optimal level: marginal benefits of the last euro of a subsidy = marginal cost of the subsidy
- Marginal cost of the subsidy being the value in money in addition to the excess burden.
- The Marginal Cost of Public Funds (MCPF) is calculated by estimated labour elasticities and tax levels. It proves that there is a tradeoff between efficiency and distribution.
- In OECD countries, the Marginal Cost of Public Funds (MCPF) is approximately 1.2 to 1.3.

The evaluation of taxes

Gregory Mankiw's criteria for tax system evaluation:

1. **Efficiency:** is the distortion of individual choices through changes in relative price minimised?
2. **Egalitarianism:** Is the distribution of income more equal after taxes?
3. **Intergenerational Equity:** the revenue from the taxes should be such that the current generation does not burden the future generations with increased debt (currently a large problem with high government debt and an ageing population).
4. **Stabilisation:** is the dampening of the business cycle (Keynesian perspective) achieved through the taxes? (Timely increase and decrease of expenditure can dampen the business cycle. Usually, the government acts rather late though, and the business cycle ends up being more extreme).

Depending on which of these categories is prioritised, there is a trade-off in the taxes implemented (distribution vs. efficiency) as criteria 1, 2, and 3 demonstrate.

Applied microeconomics – IBEB – lecture 14, week 6 (personnel 6) - Competition in the workplace

Tournament theory

Assumptions

- Relative performance matters
- There is a given number of prizes

Promotion system
(relative performance-based system)

A simplified model

Consider a firm employing two identical employees (i and j) in 2 periods. Assume that in the second period, agents no longer exert effort. This assumption is for simplicity.

Timeline

- The principal designs the tournament.
- The agent decides whether to accept the job
- If they accept the job, each decides on their effort
- Promotion is designed

To create a competitive working environment, the firm promises to give a promotion (with value **Z**) in the second period for a worker based on the workers' performance in the first period.
=> Winner will receive salary **B = W + Z**
=> Loser will just receive **W**.

Promotion decisions of the firm are based on the workers' relative performance, which depends on effort exerted and on luck. When worker's luck follows a uniform distribution, the chance of worker **i** to be promoted can be described by:

$$p_i = 0.5 + \pi(e_i - e_j).$$

=> If the two workers work equally hard, both will have a promotion probability of 0.5. When worker i works harder than j ($e_i > e_j$), worker i has a higher chance (not certain).
=> Also, when π is too small (π=0), promotion decisions only depend on luck.

The optimal wage scheme of the model

Effort choice

Determine worker's effort for all wage schemes, taken as given willingness to participate.

The worker's function of utility is given by:

$$E(U_i) = W - 0.5\theta e_i^2 + p_i(W + Z) + (1 - p_i)W$$

As $p_i = 0.5 + \pi(e_i - e_j)$, we would have

$$E(U_i) = 2W + [0.5 + \pi(e_i - e_j)] * Z - 0.5\theta e_i^2$$

The worker would maximise his utility => Taking the FOC for optimal effort, we would obtain:

$$e_i = \frac{\pi Z}{\theta}$$

So, the smaller role of π, the higher the effort.

Participation constraint

Derive the level of the base salary necessary to attract workers for all wage schemes, using the result of effort.

Expected lifetime (two periods) utility from working for this firm is given by:

$$(0.5 + \pi(e_i - e_j))Z + 2W - 0.5\theta e_i^2$$

Let V denote the expected lifetime utility per period of the next best alternative to this job. The participation constraint is then:

$$(0.5 + \pi(e_i - e_j))Z + 2W - 0.5\theta e_i^2 = 2V$$

As we have found out earlier, the two workers' optimal choice of effort would be $e_i = e_j = \pi Z/\theta$. Plugging these in, we would have:

$$[0.5 + \pi(\pi Z/\theta - \pi Z/\theta)]Z + 2W - 0.5\theta(\pi Z/\theta)^2 = 2V$$

$$\mathbf{W = V - 0.25*Z + 0.25*(\pi Z)^2/\theta}$$

(the workers' participation constraint)

$$dW/dz = -0.25 + 0.5*\pi^2 Z/\theta$$

So, the derivative of W wrt z is negative for low Z and positive for high Z.

Principal chooses W and Z

Find the wage scheme that maximises profits, using the results on optimal effort and base salary.

Assume an unit of effort is worth R to the firm. The firm's profit would then be given by: $2Re - Z - 4W$.

Substituting worker participation constraint W and the worker's effort choice e into the profit function, we would have: $2R\pi Z/\theta - Z - 4[V - 0.25Z + 0.25*(\pi Z)^2 /\theta]$

FOC (maximising wrt Z): $2R\pi/\theta - 1 - 4[-0.25 + 0.5\pi^2 Z/\theta] = 0$

$\Leftrightarrow 2R\pi/\theta - 1 + 1 - 2\pi^2 Z/\theta] = 0$

$\Leftrightarrow$ **$Z = R/\pi$**

Optimal promotion bonus increases with the firm's value of effort (R) and increases with π (a lower π implies a higher Z).

Substitute $Z = R/\pi$ into $e = \pi Z/\theta$, we would have $e = R/\theta$.

=> Worker's effort increases with the firm's value of effort and decreases with the worker's cost of effort.

=> In the end, π has no effect on effort.

We also see that, in this situation, we would expect the principal to be indifferent between a tournament setup and a bonus or piece-rate scheme.

However, for example, if we include measurement costs, we would expect these to be higher in the piece-rate model (where everyone must be observed) than in the tournament model (only the middle performers are likely to be closely observed)
Common luck effect: Tournament model less affected by the common luck effect.

One downside of the internal competition model is that there is an incentive for workers to want their colleagues to fail, which may make the working environment worse and negatively affect profits.

Applied microeconomics – IBEB – lecture 15, week 7 (personnel 7)- Discrimination

Discrimination in the labour market can be tested by submitting multiple applications to a large number of similar companies with the same qualifications, CV and motivations, but only changing the name or picture or background of the applicant.

This kind of study is called a **correspondence study**.

Causes of discrimination

1. **Tastes based**
- When recruiters/managers prefer to surround themselves with certain types of people, and discriminate to satisfy their preference.
- Hiring managers may have preferences that favour people who they can easily identify with in a group, such as those who look like them or are of the same race and/or gender.

2. **Statistical discrimination**
- When someone is hired over another because that type of person is on average more productive at some job e.g. women on average have better fine motor skills than men (beliefs about the relative productivity of two groups)
- *Self-fulfilling prophecy*, because there is a lesser incentive for the discriminated group to invest in gaining the skills => magnifies the statistical differences over time.

3. **Biased beliefs**
- Beliefs based on false assumptions or untrue statistics.

To test whether discrimination is conscious or unconscious, we use an implicit association test.

Consequences of discrimination

Tastes based and incorrect beliefs: Lower profitability and productivity because it can lead to a suboptimal selection of workers. It also reduces the discriminated worker's productivity (because of lack of career prospects or other aspects), thus confirming the bias and enlarging the problem.

Statistical discrimination: Higher profitability and productivity, especially when there are a large number of employees and the trends are more evident

=> Discrimination can cause self-fulfilling prophecies (Taste biases can result in certain demographics not seeking the education or training that they would need for jobs that they are less likely to get due to discrimination).
=> Can then result in future statistical discrimination and unfulfilled potential.

How to reduce discrimination

1. Give sufficient time and resources to recruiters: biases are increased by time pressure and stress (which leads to relying on stereotypes)

2. Monitor/select recruiters through tests such as the implicit association test

3. Anonymous application: make certain parts of an application that shouldn't influence the outcome anonymous (e.g. name, ethnicity, religion, age, gender)

4. Make discrimination expensive: eg by imposing penalties if discriminate

5. Contact hypothesis: Contact creates a positive attitude towards people that are different from you

Applied microeconomics – IBEB – lecture 16, week 7 (public 7) - Collective decision-making

Four main reasons for government failure:

1. Imperfect political representation and problems with aggregating preferences
2. A lack of information about individuals' preferences and firms' production processes
3. Rent-seeking and corruption
4. Limited or misaligned incentives in case of public production (lack of profit motive makes public organisations less responsive)

Individual preferences in collective decisions

If there are n individuals who differ in income Y_i, and average income is Y_m then tax $t=G/(N*Y_m)$ where G is the public expenditure on public goods.

=> Individual tax increases in income: $tY_i=GY_i/(NY_m)$
=> Marginal effect of G increases in own income:

$$\frac{\partial tY_i}{\partial G} = \frac{Y_i}{NY_m}$$

2 completely identical individuals with different income: High-income individual has to pay more (proportional tax) but may have a lower demand for social security benefits

Collective decision-making procedures

Collective decision making methods

1. **Dictatorships** (social planning)
2. **Direct democracy** (unanimity and majority voting)

3. **Representative democracy** (politicians)
4. **Constitutional democracy** (rule of law)

Direct democracy

Everyone is involved
Unanimity rule: Everyone has to agree in order to implement a decision

- This can theoretically be done through **Lindahl prices** (individuals pay for public goods according to their marginal benefits.)
- Problems: Strategic misrepresentation of preferences and too costly to determine individual tax shares

Majority voting : The majority choice will be implemented.

Problems with majority voting:

- Repression of minorities
- Voting paradox (individually transitive preferences do not translate to collectively transitive preferences)

Example:

	Charles	Liz	Don
First	S	B	M
Second	B	M	S
Third	M	S	B

Majority voting:
- Bar vs Soccer: 1-2
- Soccer vs Movie: 1-2
- Movie vs Bar: 1-2

→ Collective ordering:
- Bar ≺ Soccer ≺Movie ≺ Bar ≺ Soccer ≺ ….

→Ordering *not transitive*!

- **Agenda setting power**: Outcome depends on order of voting
- **Sincere vs strategic voting**: since people know that someone is setting the agenda, the people might be incentivized to not vote sincerely in the first round in order to get a more desired outcome later.

Arrow's impossibility theorem

Five criteria for an ideal collective decision making procedure:

1. **Unrestricted domain** (all individual preferences allowed).

2. **Pareto-criterium** (if all prefer X to Y then the voting system should return X).
3. **Non-Dictatorship**
4. **Transitivity** (if X>Y and Y>Z then X>Z).
5. **Independence of Irrelevant Alternatives** (if for options [X,Y] X>Y then adding an option Z should not change X>Y).

Arrow's Impossibility Theorem: it is not possible to find a decision-making procedure that always fulfils all these criteria
=> Implies that a direct democracy cannot prevent "unreasonable outcomes".

Majority Voting does yield a stable outcome with **"single peaked" preferences**. This means that we can find an outcome such that each individual can have an ordering of preferences and always attempts to get as close to his preference as possible. This means if we vote between two alternatives we can put all individuals on a line (of how strongly their preference is for an alternative). This means that the median voter determines which of the choices will be made.

Representative democracy

In representative democracy, the voting is outsourced to professional politicians. This has several **benefits**:

- It is **too costly** to have a referendum for each decision
- Information collection may be too expensive for the individual, so having professionals makes it easier. They also have more expertise in the matter

However, there are several **problems** with this as well:

- Politicians may not know citizen's preferences.
- Politicians may also not be willing to inform themselves and end up misrepresenting information.
- Politicians may not make decisions in the interest of citizens but in their own interest instead

Applied microeconomics – IBEB – lecture 17, week 7 (personnel 8)- Teams

Workers' behaviour under team performance-based pay

Consider a simple model where two people work together, and they decide their exerted effort level independently.

Team output: $Q = e_1 + e_2$, where e_i is the effort level of worker i.
Reward for each worker: $W = 0.5pQ$, where p is the unit price of the output. Here we assume $p = 10$.

Each worker's utility function is $U = W - 0.5e^2$, where $0.5e^2$ is the cost of effort.

Maximising worker 1's utility $U = 0.5p(e1 + e2) - 0.5e1^2$
=> $0.5p - e1 = 0$
=> $e1 = e2 = 5$.
=> Each worker has utility = 37.5.

Simply have a look at the case where both of the workers work twice as hard, we can see that their utility level would be 50, which is clearly better for both of them. This can be explained by the fact that when deriving the optimal effort level previously, positive externality of the other worker's exerting effort has not been taken into account.

Social welfare is maximised when we jointly consider both of the workers' utility gain from the work. Social welfare = total utility = $p(e_1 + e_2) - 0.5\ e_1^2 - 0.5\ e_2^2$. Taking the FOCs, the optimal effort level will be $e_1 = e_2 = p = 10$.

An empirical study

Orange picking

Randomised controlled trial with 2 schemes

- Individual rewards (94kg)
- Team rewards (70kg)

Team rewards reduce productivity (free riding)

Possible solutions

1. Change the rule regarding workers' wages.
   - Worker 1 gets share ϕ of revenue
   - Worker 2 gets share 1 - ϕ of revenue

$U = \phi\, 10(e_1 + e_2) - \frac{1}{2}{e_1}^2$

$\Rightarrow \frac{\delta U_1}{\delta e_1} = 10\phi - e_1 = 0 \Rightarrow e_1 = 10\phi \; and \; e_2 = 10(1 - \phi)$

2. Introduce a very high bonus.

$U_1 = 10(e_1 + e_2) + a - \frac{1}{2}{e_1}^2$

Maximising this givens $e_1 = e_2 = 10$

3. Hierarchy

For example, if output is less than a certain number then there would be no reward

4. Fair share

$U_1 = \frac{e_1}{e_1 + e_2} p(e_1 + e_2) - \frac{1}{2}{e_1}^2$

Maximising this gives $e_1 = 10$

5. Altruism

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