

Gwinnett School of Math, Science, and Technology

Macroeconomics Yearlong Notes

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1st Period

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1 Types of Goods (01/08)

1.1 Characteristics of the Four Types of Goods

- **Rivalrous** goods are those that can only be consumed by one person at a time.
- **Non-rivalrous** goods are those that can be consumed by multiple people at the same time.
- **Excludable** goods are those that can be restricted to certain people.
- **Non-excludable** goods are those that cannot be restricted to certain people.
- If a public good is overcrowded enough, it can become a common resource

1.2 The Four Types of Goods

| | Non-rivalrous | Rivalrous |
|-----------------------|--|---|
| Non-excludable | *Public Goods*\ (e.g. Sunset, Common Knowledge) | <i>Common-Pool/Common Resources</i> (e.g. Irrigation Systems, Libraries) |
| Excludable | <i>(Toll/Club/Artificially Scarce Goods/Natural monopolies</i> (e.g. Day-Care Centers, Country Clubs) | <i>Private Goods</i> (e.g. Donuts, Personal Computers) |

1.3 Examples

| Case Scenario | Type of Good/Service |
|---|----------------------|
| A college education | Artificially scarce |
| A manicure or pedicure | Private good |
| Stone Mountain park | Artificially scarce |
| State park campgrounds | Artificially scarce |
| National defense | Public good |
| Peach Pass lane on I-85 | Artificially scarce |
| Fish in the ocean | Common resource |
| Street lights | Public good |
| Netflix/Hulu | Artificially scarce |
| Flu shot | Private good |
| Tornado safety shelter | Public good |
| Bottled water in a tornado safety shelter | Common resource |
| Hearing a tornado siren | Public good |
| Going to an almost empty public beach | Public good |
| Going to an overcrowded public beach | Common resource |
| St. Lawrence SeaWay | Natural monopoly |
| Flying on a commercial airplane | Natural monopoly |
| Flying a single seat private airplane | Private good |
| Wedding guests eating a slice of the wedding-cake | Common resource |
| Cake sold at a bakery | Private good |

2 Introduction to Externalities (01/09-01/10)

2.1 Overview

- An **externality** is a cost/benefit that affects a *third party* who did not choose to incur that cost/benefit.
- They are a type of **market failure** because they are *not* accounted for in the price of the good/service.
- The deadweight loss (DWL) of positive externalities will point to the right and vice-versa for negative externalities.
 - Which means the DWL triangle always points to the social optimum quantity.

2.2 Internalizing an Externality (aka *how to fix an externality*)

2.2.1 Problems with externalities

- 1) Private individuals won't take into account the external costs/benefits
- 2) Public goods and common pool resources tend to lack property rights

2.2.2 Coase Theorem (the fix!)

"We can fix externalities without the government if we..."

- 1) Give property rights to people
- 2) Minimize transaction costs

2.2.3 Examples

Methods the government can employ to internalize an externality in a free market:

- Pollution or emission limits
- "Pollution credits" for private firms to buy and sell in the market

2.3 Positive Externality in Consumption

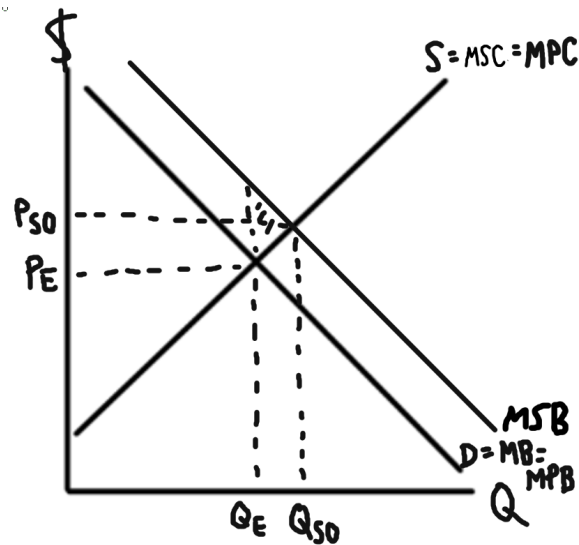


Figure 1: Positive Externality in Consumption

2.3.1 Examples

- Consumption of education
- Consumption of health care
- Advertisement can lead to an increase of demand in the free market \therefore MPB goes up and moves the market toward MSB .

2.3.2 Spillover Effect

- The spillover effect is $MEB = MSB - MPB$.
- $MPB < MSB$
- $MPC = MSC$

2.3.3 Internalizing the Spillover Effect

- The external **benefits** can be internalized by **subsidizing** the product/service to the consumers of the good/service.
- The government intervention will move the private market to **social optimum** where $MSB = MSC$.

2.4 Negative Externality in Consumption

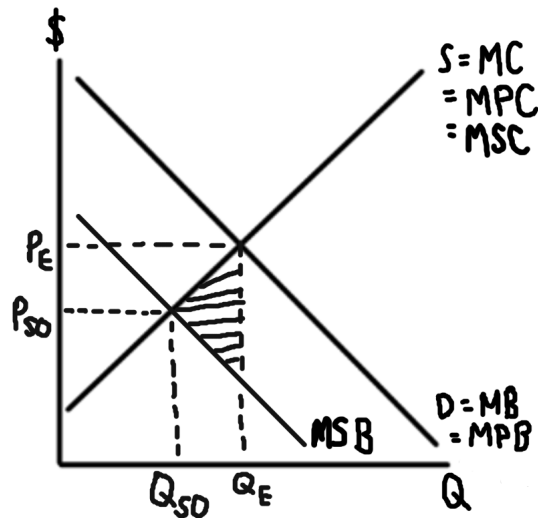


Figure 2: Negative Externality in Consumption

2.4.1 Examples

- Smoking in public/passive smoking
- Pollution due to fossil fuels
- Playing loud music
- Discarding garbage in public places

2.4.2 Spillover Effect

- The spillover effect is $MEB = MSB - MPB$.
- $MPB > MSB$
- $MPC = MSC$

2.4.3 Internalizing the Spillover Effect

- The external **benefits** can be internalized by **imposing a tax** on the product/service to the consumers of the good/service.
- The government intervention will move the private market to **social optimum** where $MSB = MSC$.

2.5 Positive Externality in Production

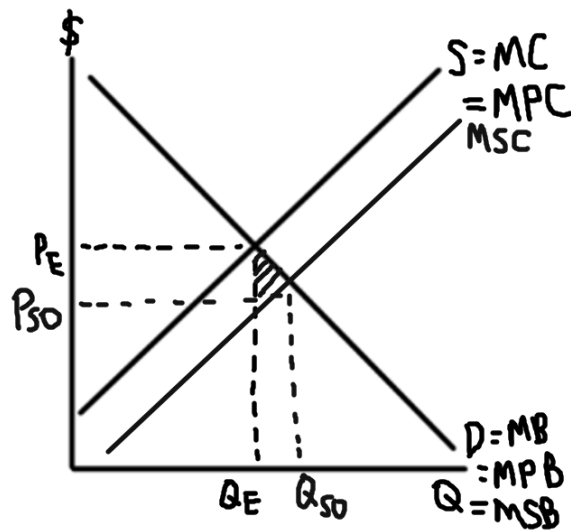


Figure 3: Positive Externality in Production

2.5.1 Examples

- Companies invest in training/professional development of their employees.
- Firms invest in research and development (R&D).

2.5.2 Spillover Effect

- The spillover effect is $MEC = MSC - MPC$.
- $MPB = MSB$
- $MPC > MSC$

2.5.3 Internalizing the Spillover Effect

- The external **costs** can be internalized by **subsidizing** the product/service to the producers of the good/service.
- The government intervention will move the private market to **social optimum** where $MSB = MSC$.

2.6 Negative Externality in Production

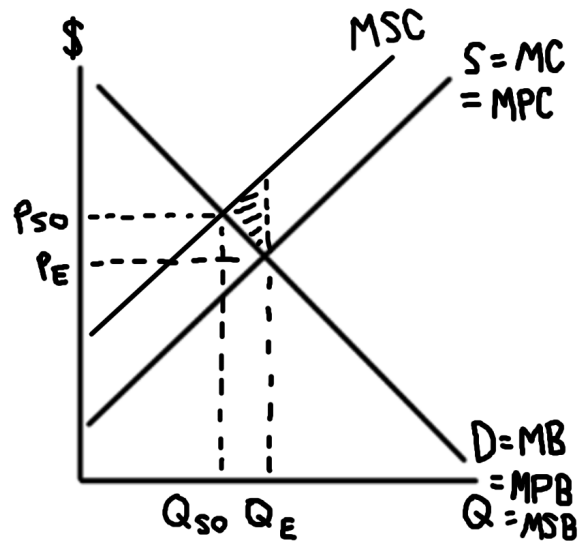


Figure 4: Negative Externality in Production

2.6.1 Examples

- Firms produce chemicals that cause pollution \therefore local fisherman cannot catch fish.
- Construction of roads lead to change of landscape and parks
- Coal fired power plants

2.6.2 Spillover Effect

- The spillover effect is $MEC = MSC - MPC$.
- $MPB = MSB$
- $MPC < MSC$

2.6.3 Internalizing the Spillover Effect

- The external **costs** can be internalized by **imposing a tax** on the product/service to the producers of the good/service.
- The government intervention will move the private market to **social optimum** where $MSB = MSC$.

3 Income Inequality (01/12)

3.1 The Lorenz Curve and Gini Coefficient

- The **Lorenz Curve** $L(x)$ is a graphical representation of the distribution of income in a country.
 - The x-axis is the cumulative percentage of the population (0%-100%).
 - The y-axis is the cumulative percentage of income (0%-100%).
 - It is always accompanied by the line $y = x$ which represents **perfect equality**.
- The **Gini Coefficient** G is a numerical representation of the Lorenz Curve.
 - It is the ratio of the area between the Lorenz Curve and the line $y = x$ to the area under the line $y = x$.
 - * $G = \frac{A}{A+B}$ where $A = \int_0^1 [x - L(x)] dx$ and $B = \int_0^1 L(x) dx$.
 - The closer G is to 1, the more unequal the distribution of income is.

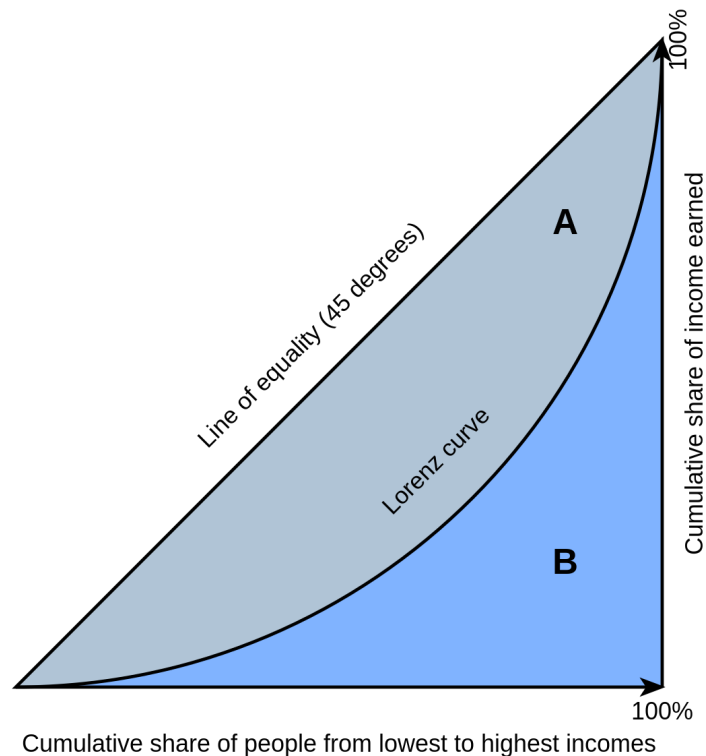


Figure 5: Visual depiction of the Lorenz Curve

As demonstrated in *Figure 6* below:

- If G is 0, then the Lorenz Curve is **also** the line $y = x$ because the area between both curves A is 0.
- If G is 1, then the Lorenz Curve is the x -axis ($y = 0$) because $A + B$ must also equal the area under $y = x$, or $\frac{1}{2}$.

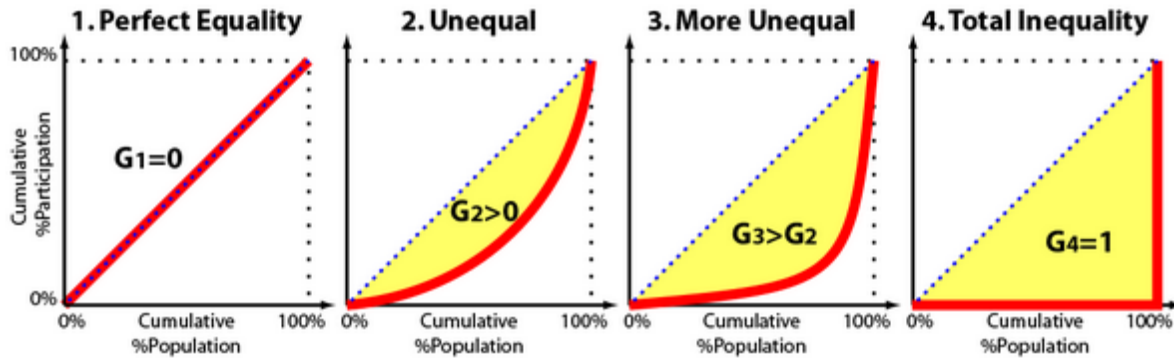


Figure 6: Varying Gini Coefficients and their corresponding Lorenz Curves

3.2 Deriving Simpler Expressions for the Gini Coefficient

Since we know that $A + B = \int_0^1 x \, dx = \frac{x^2}{2} \Big|_0^1 = \frac{1}{2}$, we can derive “easier” expressions to calculate the Gini Coefficient G .

3.2.1 Deriving $G = 2A$

$$G = \frac{A}{A + B} \quad \text{(Initial Gini Coefficient formula)}$$

$$\frac{1}{G} = \frac{A + B}{A} \quad \text{(Reciprocate)}$$

$$\frac{A}{G} = A + B \quad \text{(Multiply by A)}$$

$$\frac{A}{G} - A = B \quad \text{(Subtract A)}$$

Now we can substitute B into the original area formula:

$$\begin{aligned}
 A + B &= \frac{1}{2} && \text{(Area under } y = x \text{)} \\
 A + \left(\frac{A}{G} - A \right) &= \frac{1}{2} && \text{(Substitute } B \text{)} \\
 \frac{A}{G} &= \frac{1}{2} && \text{(Simplify)} \\
 \frac{A}{\frac{1}{2}} &= G && \text{(Simplify)} \\
 2A &= G && \text{(Multiply by 2)}
 \end{aligned}$$

3.2.2 Deriving $G = 1 - 2B$

Since we've already expressed B in terms of A , we just need to get A in terms of B .

$$\begin{aligned}
 G &= 2A && \text{(Previous derivation)} \\
 \frac{G}{2} &= A && \text{(Divide by 2)} \\
 \frac{G}{2} &= \frac{1}{2} - B && \text{(Substitute } A \text{ using the expression } A = \frac{1}{2} - B \text{)} \\
 G &= 1 - 2B && \text{(Multiply by 2)}
 \end{aligned}$$

Therefore, two **alternate expressions** for the Gini Coefficient are:

$$G = 2A \quad (1)$$

$$G = 1 - 2B \quad (2)$$

3.3 Negative Externalities: Public vs. Private Resolution and More on the Coase Theorem (01/16)

3.3.1 Conditions

Recall that the **Coase Theorem** states market failures will always be resolved by the free market. Here are all the conditions for Coase Theorem to hold true:

- Both sides are rational and willing to negotiate to maximize their own utility.
- Low to no transaction costs
- Private property rights are well-defined
- Perfect information is available to both sides and they have the same leverage

3.3.2 Miscellaneous Market Failures

There are a couple of other market failures that the government should try to combat, based on the types of markets we learned about *in previous units*:

- **Monopoly**: A single firm controls the entire market.
 - This will cause the firm to produce *less* than the social optimum and still charge a *greater price*.
- **Monopsony**: A single firm controls the entire labor market.
 - This will cause the firm to hire *less* than optimum and for a *lower wage*.