1. Introduction to Macroeconomics

1.1. What is Macroeconomics?

Microeconomics studies the behavior of individual households and firms. Macroeconomics studies the economy as a whole – that is the sum of the individual behavior of households and firms.

As we will see: The macroeconomic "whole" is more than the sum of its microeconomic "parts"!

Famous example: The savings paradox!

For an individual household or company it is always possible to increase savings by reducing expenditure – since individual income stays constant if the household reduces expenditure:

\[ \text{Savings} = \text{Income} - \text{Expenditure} \]

For the economy as a whole it is (in the short run version of the Keynesian theory ...) not possible to increase savings by reducing expenditure – since total income falls if all households and companies reduce their expenditure:

\[ \text{Savings} = \text{Income} - \text{Expenditure} \]

The recommended literature typically includes more content than necessary for an understanding of this chapter. Relevant for the examination is the content of this chapter as presented in the lectures.

1.1. What is Macroeconomics?

1.2. The Basic Model: The Circular-Flow Model

1.3. The Basic Data: GDP and its Components

1.3.1. What is GDP?

1.3.2. Three Ways of Computing GDP

1.3.3. Nominal vs. real GDP and the GDP-Deflator

1.3.4. From GDP to Disposable Income of Households

1.3.5. GDP and Welfare

1.4. Questions for Review

Literature:


The Choice of Macroeconomic Aims (1):

Ad 1: The first question is a technical question: What aims are possible? As we will see, the answer depends on the macroeconomic theory, which we assume to be "correct" or "good enough". Different theories may tell us different stories about what aims are possible.

For example, Keynesian theory is much more optimistic about the effectiveness of fiscal policy than neoclassical theory (We will analyze the reasons in chapter 3). Furthermore, under neoclassical theory demand-side caused business cycle fluctuations are not possible. Hence according to Keynesian theory demand-side caused business cycle fluctuations can be smoothed by fiscal policy, while under neoclassical theory fiscal policy is not only ineffective but superfluous. So if you think that neoclassical theory describes reality better than Keynesian theory, the question, whether business cycle fluctuations should be a macroeconomic aim, does simply not emerge for you - whether you think that smoothing business cycle fluctuations is desirable or not.

Another example are economic growth theories: You may find high per capita income growth rates (say 10% of 20% per year) absolutely desirable – if this does not harm the environment or causes a consumption of exhaustible resources. However most economic growth theories tell us that income growth normally causes also a consumption of environmental goods or exhaustible production factors. In this case economic theories tell us that a trade-off exists between income growth and the protection of the environment.

Conflict of aims cannot be solved by „objective science“!

Political (normative) decisions are necessary!

Digression: The Choice of Macroeconomic Aims (1):

The choice of macroeconomic aims has to aspects:
1. What aims can be reached?
2. What aims are desirable?

Ad 1: The first question is a technical question: What aims are possible? As we will see, the answer depends on the macroeconomic theory, which we assume to be "correct" or "good enough". Different theories may tell us different stories about what aims are possible.

For example, Keynesian theory is much more optimistic about the effectiveness of fiscal policy than neoclassical theory (We will analyze the reasons in chapter 3). Furthermore, under neoclassical theory demand-side caused business cycle fluctuations are not possible. Hence according to Keynesian theory demand-side caused business cycle fluctuations can be smoothed by fiscal policy, while under neoclassical theory fiscal policy is not only ineffective but superfluous. So if you think that neoclassical theory describes reality better than Keynesian theory, the question, whether business cycle fluctuations should be a macroeconomic aim, does simply not emerge for you - whether you think that smoothing business cycle fluctuations is desirable or not.

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Conflict of aims cannot be solved by „objective science“!

Political (normative) decisions are necessary!

Digression: The Choice of Macroeconomic Aims (2):

This means that a choice has to be made: How much environment shall be sacrificed in order to increase per capita income? The answer to such type of questions depends on „how desirable an aim like “income growth” is compared to an aim like “environmental protection”. This leads to the second type of questions “What aims are desirable?”

Ad 2: The selection of an economic aim has to rely always on subjective preferences. Such choices can not be based on “objective science”. These questions have to be answered by the members of the society. It can not be decided by society as a whole is affected – the members of the society have to find a viable compromise based on their individual preferences. This is certainly no easy task. All that science can do in such “decision forming processes” is to explain what kind of trade-offs exist between desirable aims. The final choice must be made by society. Such choices are therefore very often called “political choices”.

It should be clear that the selection of an economic aim is always an “ethical decision”. Ethical decisions determine “aims of acting”. They are expressed in form of “shall-sentences”. To say “You shall not lie.” or “You shall treat others in the same way you want to be treated.” is of the same methodological nature as to say “Economic growth shall not cause lasting damages to the environment.” or “Business cycle fluctuations shall not be fought by the government”.

Even though such decisions about things that „shall be“ (aims of acting) are inevitable and important for every human being, they cannot be based on objective science but are, in last analysis, always choices depending on subjective preferences. In ethics we talk of the “trilemma of substantiation” of ethical rules, which many modern philosophers hold to be inevitable, because – if you try to substantiate an ethical decision you always end up with one of three possible states:

1. Introduction to Macroeconomics
1.1. What is Macroeconomics?

Macroeconomics deals with three domains:

Macroeconomic Aims:

- Shall the average income growth of a country equal 2%, 0%, 2% or 10%? (Chapter 4)
- Shall business cycle fluctuations be prevented? (Chapter 2 & 3)
- Shall the inflation target equal 2%, 0%, 2% ... ? (Chapter 6)

Conflict of aims cannot be solved by „objective science“!

Political (normative) decisions are necessary!

Digression: The Choice of Macroeconomic Aims (3):

(1) Infinite regress: You substantiate one reason with another and so on.
(2) Logical circle: substantiate an argument with an argument you have already substantiated.
(3) Arbitrary stop: You end the process of substantiation with an argument you hold subjectively to be “sufficient” and without need for a further substantiation.

Many philosophers believe that state (3) is the only “acceptable”. If you agree (of course by your subjective decision), you agree that ethical decisions are in last instance of subjective nature and can therefore not be binding for others – who might have different subjective point of views.
1. Introduction to Macroeconomics

1.1. What is Macroeconomics?

- Macroeconomics deals with three domains:

  **Macroeconomic Strategies:**

  Derivation of strategies to reach the selected aims:

  How can income growth be influenced to reach a growth target if we postulate the neoclassical growth theory? (Chapter 2)

  How can business cycles be affected by macro policy if we postulate the neoclassical or the Keynesian macro model? (Chapter 3 & 4)

  How can the selected inflation rate be targeted under neoclassical or the Keynesian macro theory? (Chapter 6)

---

**The Circular Flow Model**

- The Circular-Flow model is a basic concept that appears in all macroeconomic models.
- It is also the backbone of macroeconomic statistics ("National Accounting").
- It is based on the idea that the economic exchange of goods and production factors between households and firms can be described as a circuit.
- Its inventor was the French medic François Quesnay (1694 - 1774), who took the idea from the discovery of the blood circuit in those times.

---

**Per-Capita Gross Domestic Product in PPP-Dollar of the Year 2005**

(1950=100)

- Theory: Why is per capita income in some countries higher as in others?
- Target selection: What growth rate shall a country target? -2%, 0%, 2%...?
- Strategy: How can a selected growth target be realized, if we assume a certain theory to be correct?

---

**Development of German GDP in Prices of 1995**

These “small” deviations of actual GDP (=green line) from its long-run trend (=black line) are the “business cycle fluctuations”.

---

**The Circular Flow Model - Neoclassical Version**

- Prices are flexible and adjust until supply equals demand!
The Circular Flow Model

- Keynesian Version -

Firms

*Prices are rigid, therefore supply quantities adjust to demand quantities.*

Households

*... are Suppliers of Goods on Goods Markets.*

*... are Buyer of Goods on Goods Markets.*

Market Equilibrium Quantities

Market Equilibrium Quantities

Production Factors

Goods

Digression: Comments to this Simple Circular-Flow Model:

For the sake of clearness, this circular flow model is a bold simplification:

- Government and foreign countries are omitted.
- Business relations between firms (selling and buying of intermediate inputs) are set off and do therefore not appear.
- Business relations between households (e.g. granting and taking of credits) are set off and do therefore not appear.
- In chapter 2 we will develop a more realistic version of the circular-flow model.

1. Introduction to Macroeconomics

1.1. What is Macroeconomics?

1.2. The Basic Model: The Circular-Flow Model

1.3. The Basic Data: GDP and its Components

1.3.1. What is GDP?

1.1. What is Macroeconomics?

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1.3.1. What is GDP?

- 19 -

- 20 -

- 21 -

- 22 -

- 23 -

- 24 -
Official definition of Gross Domestic Product (GDP):

"Market value of all final products produced within a country in a given period of time."

Some Comments on the Definition:

What means „market value“?

- As is well known, you can't compare apples and oranges. Consequently, what is needed is a kind of measure that makes these different products comparable.
- Therefore, the market price of each product is taken and multiplied by the quantity of each product.
- This makes sense, because the market price contains the information, what value a product has in the eyes of the producers and consumers.
- Hence the market price can be taken to evaluate a product.

What means „products“?

- GDP measures not only tangible products, but also intangible products – i.e. services.
- Unofficial Definition: „Services are all those products, which cannot drop on your feet.”
- Examples for services: Hair cuts, management consultancy, music concerts, foot care, medical treatment, insurance, home help, bank transfer, building design, movies, hotel accommodation, flights, bus rides, trade with goods (!), granting of credits and so on…

What means „all final products“?

- Really all? There are products, whose coverage is difficult:
  - Housing stock: Houses are “machines”, which produce the service “dwelling”.
  - While the services of rental apartments are easily measures by their rent payments, the services provided by self-owned condominiums and houses have to be estimated.
  - To do so, statistical offices use an estimated “market-equivalent” rent for self-owned condominiums and houses. Hence the assumption is made that owners pay rents to themselves.

Solution: To determine the “value added” by the firm, take the sales of the firm and subtract the payments for all intermediate goods bought by the firm. The result is called “gross value added” of the firm, because it is the “market value” the firm has added to the “market value” of the intermediate inputs.

This leads to the formula

\[
\text{Sales of Firm} \quad \text{minus} \quad \text{Intermediate Inputs} \quad \text{from other Firms} = \text{Gross Value Added of the Firm}
\]

\[
\text{Gross Value Added of the Firm} \quad \text{minus} \quad \text{Intermediate Inputs} \quad \text{from other Firms} = \text{Contribution of the Firm to GDP}
\]
1. Introduction to Macroeconomics
1.3.1. What Is GDP?

- Some Comments on the Definition:
  - **What means „all final products“?**
    - **Home production:**
      - If you prepare a meal in your apartment the value added created by your work does not enter GDP. If you buy the meal in a restaurant, the value added created by the cook of this restaurant enters GDP.
      - If a working woman pays a professional cleaner to tidy her apartment, these services are completely accounted for in GDP. If the women and her cleaner marry however, the cleaner’s services are no longer paid for and GDP shrinks.
      - ➤ Only production, that reaches the final consumer via a market transaction, is accounted for in GDP.
      - ➤ Only home production undertaken by officially registered employees is accounted for by GDP.

1. Introduction to Macroeconomics
1.3.1. What Is GDP?

- Some Comments on the Definition:
  - **What means „all final products“?**
    - **Funeral industry:**
      - If a woman pays a professional cleaner to tidy her apartment, these services are completely accounted for in GDP. If the women and her cleaner marry however, the cleaner’s services are no longer paid for and GDP shrinks.
      - ➤ Only production, that reaches the final consumer via a market transaction, is accounted for in GDP.
      - ➤ Only home production undertaken by officially registered employees is accounted for by GDP.

Proposal in the latest System of National Accounts Revision (SNA 2008) by the UN Statistical Commission for the coverage of goods and services not sold over markets (“non-monetary sectors”). This includes i.a. subsistence farming and barter trade. Problem: Many developing countries still have not the financial means to make the necessary estimations...

1. Introduction to Macroeconomics
1.3.1. What Is GDP?

- Some Comments on the Definition:
  - **What means „all final products“?**
    - **Drugs:**
      - Based on the „Epidemiological Survey of Substance Abuse“ by the Munich „Institut für Therapieforschung“ the FSO calculates value added for 5 different drugs: Heroin, Cocaine, Ecstasy, Amphetamine and Cannabis.
      - Since, with exception of Cannabis, production takes typically not place in Germany, the value added created by these sectors results mostly from the „trade margin“, i.e. the difference between „street prices“ and import prices. These prices are regularly gathered and published by the Federal Office of Criminal Investigation (Bundeskriminalamt).

1. Introduction to Macroeconomics
1.3.1. What Is GDP?

- Some Comments on the Definition:
  - **What means „all final products“?**
    - **Drugs:**
      - Smuggled goods: Here the FSO focuses on the estimation of smuggled cigarettes. Information is provided by the „Waste Disposal Study“ of the German cigarette industry. The cigarette industry draws a sample of the tax strips from trashed cigarette packages found in the „Yellow Bags“.
      - Packages with tax strips from countries not known as typical „holiday countries“ and where cigarette prices are significantly lower as in Germany, are regarded as „smuggled“. Here too, the value added mostly results from the „trade margin“, i.e. the difference between „street prices“ and import prices.
Some Comments on the Definition:

- What means „all final products“?
- Another area, where the coverage of GDP is incomplete, are the services provided by the government, parties, trade unions, churches and other non-profit organizations.
- These organizations provide the largest part of their services for free to their clients, i.e. without measurable payments. Hence no market prices exist to evaluate their services.
- Therefore, statistical offices estimate the production value of non-profit organizations by (essentially) their payroll costs. Thereby they assume that the value of goods and services produced by the employees of these organizations equals the value of their wages and salaries.

To sum up:

- Definition of GDP: Market value of all final goods and services produced within a country in a given period of time
- "Market Value" = Evaluation with Market Prices
- Adjustment for intermediate inputs to prevent multiple counting.
- "all Final Goods and Services" => Accounting Problems:
  - Self Owned Condominiums and Houses,
  - Home Production,
  - Non-profit Organizations
  - Shadow Economy
- Accounting for domestically produced goods and services only.

The measurement of GDP is internationally standardized by the UN. Standardized numbers are available at the Statistical Office of the UN:


Within the EU more detailed subaggregates of GDP are available (ESVG 1995) at the Statistical Office of the European Commission:


...and from the statistical office of the EU (EUROSTAT):

1. Introduction to Macroeconomics
1.3.2. Three Ways of Computing GDP

GDP is defined according to the way it is produced ("production account"). However, following the circular flow model, there are three ways how GDP can be calculated:

1. Production Account: "Making of the Cake"
2. Distribution Account: "Distribution of the Cake"
3. Expenditure Account: "Consumption of the Cake"

The same cake is subdivided by three different kind of criteria:

1. Production Account: What is the contribution of a certain industry to GDP?
2. Distribution Account: What kind of economic units receive how much of GDP?
3. Expenditure Account: For what kind of purposes is GDP used?

1. GDP by Production Account:
   - The production account of GDP follows directly the above definition of GDP, i.e. the "Market value of all final goods and services produced within a country in a given period of time" is calculated.
   - In a world with firms only (and no government, non-profit organizations, private households and black market activities), GDP would equal the sum of gross value added of all firms:

   \[ \text{Value Added of all Firms} = \frac{\text{Sales of all Firms}}{\text{Sum of Intermediate Inputs of Firms}} + \text{Value Added Tax Paid by Firms} + \text{Subsidies received by Firms} \]

   In the following we will neglect this peculiarity for the sake of simplicity!

2. GDP by Production Account:
   - In a world with only firms, value added calculated by this formula would actually equal GDP.
   - And in fact, value added by firms does count for about 80% of all GDP in most countries.
   - However, as already mentioned in section 1.3.1., we have to take care that beside firms there are governments, non-profit organizations, private households and illegal production activities, where value added is created.
   - Since these entities do not sell most of their production over (legal) markets, their value added are estimated.
   - The resulting number is then added to the value added of firms to finally yield GDP.
1. Introduction to Macroeconomics

1.3.2. Three Ways of Computing GDP

2. GDP by Distribution Account:

GDP by distribution account explains how GDP is distributed between workers, capital owners and the government. The standard definition is:

\[
\text{GDP} = \text{Net Compensation of Domestic and Foreign Employees (salaries and wages) and Self-Employed Working within the Country} + \text{Net Income from Wealth held within the Country (Interest Payments, Dividends, Profits, Rents...)} + \text{Net Tax Burden} + \text{Depreciation}.
\]

- Net Tax Burden include: 1) Value Added Tax; 2) Subsidies to firms; 3) Taxes on Salaries & Capital Income, Wealth, Car Tax, Social Security Contributions of Employees and Employers, Direct Taxes of Incorporated Enterprises; 4) Social Aid, Housing Subsidies, Governmental Allowances to Unemployment Compensation etc.

- Depreciation is the annual loss due to wear and tear or obsolescence of fixed capital assets.
3. GDP by Expenditure Account:

GDP by expenditure account explains how the GDP is used. The standard definition is:

\[
\text{GDP} = \text{Consumption of Households} (= C) + \text{Government Consumption} (= G) + \text{Depreciation} (= \lambda*K) + \text{Net Investment} (= NI) + \text{Exports} (= X) - \text{Imports} (= M)
\]

The standard definition is:

\[
\text{GDP} = \text{Consumption of Households} (= C) + \text{Government Consumption} (= G) + \text{Depreciation} (= \lambda*K) + \text{Net Investment} (= NI) + \text{Exports} (= X) - \text{Imports} (= M)
\]

"Gross Investment"

1. Introduction to Macroeconomics
1.3.2. Three Ways of Computing GDP

GDP at Market Value by...

<table>
<thead>
<tr>
<th>Production</th>
<th>Distribution</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Value Added of Firms, Government(1), Non-profit Organizations(1), and Private Households</td>
<td>Net Compensation of Domestic and Foreign Employees and Self-Employed Working within the Country</td>
<td>Consumption of Households</td>
</tr>
<tr>
<td>Net Income from Wealth within the Country by Nationals &amp; Foreigners</td>
<td>Exports / Imports</td>
<td>Government Consumption</td>
</tr>
<tr>
<td>T + Direct Taxes / Social Transfers + Indirect Taxes / Subsidies</td>
<td>Net Investment of Firms</td>
<td>Gross Investment</td>
</tr>
<tr>
<td>Depreciation</td>
<td>Depreciation</td>
<td></td>
</tr>
</tbody>
</table>

1. Introduction to Macroeconomics
1.3.3. Nominal vs. real GDP and the GDP-Deflator

Once again – the definition of GDP:

- "Market value of all final goods and services produced within a country in a given period of time."

- "Market value" means that the quantities of all goods and services are multiplied with their market prices before they are added up (apples and oranges – problem...).

- This means however:
  - If the prices of all goods and services, grew with a rate of nearly 2% per year (= target inflation rate of the European Central Bank), GDP as defined above would grow by 2% - even if the actual (real) production of goods was constant!
  - In order to eliminate this effect of inflation on GDP statistical offices calculate "real GDP".

GDP by expenditure account explains how the GDP is used. The standard definition is:

\[
\text{GDP} = \text{Consumption of Households} (= C) + \text{Government Consumption} (= G) + \text{Depreciation} (= \lambda*K) + \text{Net Investment} (= NI) + \text{Exports} (= X) - \text{Imports} (= M)
\]

"Gross Investment"

1. Introduction to Macroeconomics
1.3.2. Three Ways of Computing GDP

1.1. What is Macroeconomics?
1.2. The Basic Model: The Circular-Flow Model
1.3. The Basic Data: GDP and Its Components
1.3.1. What Is GDP?
1.3.2. Three Ways of Computing GDP
1.3.3. Nominal vs. real GDP and the GDP-Deflator

Determination of "real GDP":

- Instead of evaluating apples and oranges with their current prices ( = nominal GDP), they are evaluated with their prices in an (arbitrarily) fixed year.

- This year is called the "base year".

- Consequently, "real GDP" of the year 2008 at prices of the year 1995, informs about the level of GDP in the year 2008, if prices since 1995 had stayed constant.

- As a result, the yearly increase in all prices, which has taken place form 1995 to 2008 ( = the rate of inflation) is eliminated from real GDP!

- The following simplified example illustrates this method.
### 1. Introduction to Macroeconomics

#### 1.3.3. Nominal vs. real GDP and the GDP-Deflator

<table>
<thead>
<tr>
<th>Year</th>
<th>Produced Apples</th>
<th>Produced Oranges</th>
<th>GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity kg</td>
<td>Price €</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>100</td>
<td>10</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>150</td>
<td>20</td>
<td>4000</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>300</td>
<td>30</td>
<td>7000</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

#### Nominal and Real GDP

- **Nominal GDP** (GDP with inflation)
- **Real GDP** (GDP without inflation)

<table>
<thead>
<tr>
<th>Year</th>
<th>Nominal GDP</th>
<th>Real GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2500</td>
<td>4000</td>
</tr>
<tr>
<td>2001</td>
<td>7000</td>
<td>7000</td>
</tr>
<tr>
<td>2002</td>
<td>16500</td>
<td>12000</td>
</tr>
</tbody>
</table>

#### GDP-Deflator

- **Nominal GDP** (GDP with inflation)
- **Real GDP** (GDP without inflation)

<table>
<thead>
<tr>
<th>Year</th>
<th>Nominal GDP</th>
<th>Real GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2500</td>
<td>4000</td>
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<tr>
<td>2001</td>
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<td>7000</td>
</tr>
<tr>
<td>2002</td>
<td>16500</td>
<td>12000</td>
</tr>
</tbody>
</table>

### Determination of `real GDP`:

- This calculation of real GDP shows:
  - If positive inflation was prevalent from the past to the present, real GDP before the base year is always larger than nominal GDP.
  - While real GDP after the base year is always smaller than nominal GDP.

### A comparison of real and nominal GDP shows this:

- The elimination of inflation also implies that in times of positive inflation – the growth rate of nominal GDP is always larger than the growth rate of real GDP.

### A Useful Side-Effect:

- The calculation of real GDP also delivers an indicator for the rate of inflation.
  - To do so, first the value of nominal GDP of each year is divided by the value of each year’s real GDP.
  - The result is a times series called “GDP-Deflator”
  - Then, the growth rate of this GDP-Deflator corresponds to the rate of inflation of all goods and services – since GDP embraces the value of all goods and services.
  - Applied to our numerical example, the following results:
1. Introduction to Macroeconomics

1.3.3. Nominal vs. real GDP and the GDP-Deflator

Definition of GDP-Deflator:

\[
\text{Nominal GDP} \over \text{Real GDP} = \text{GDP-Deflator}
\]

Memory hook:

\[
\text{Nominal GDP} \propto Y \times P
\]

\[
\text{Real GDP} \propto Y
\]

\[
\Rightarrow \frac{\text{Nominal GDP}}{\text{Real GDP}} \propto \frac{P}{Y} \propto \text{GDP-Deflator}
\]

Digression: From GDP-Deflator to GDP-Chain Price Index

Verbal Definition of GDP - Deflator: Nominal GDP
Real GDP

Formal Definition of GDP - Deflator:

\[
\frac{\sum p_j x_j}{\sum p_{0j} x_j} = \frac{\text{GDP - Price Index}}{\text{Base Year} = 0}
\]

\[
p_j = \text{Current Price of good j}
\]

\[
p_{0j} = \text{Price of good j in Base Year} = 0
\]

\[
x_j = \text{Current Quantity of good j}
\]

Explanation:

If GDP consisted only of good j with \(1 \leq j \leq 1\), the formula would equal:

\[
\frac{p_j x_j}{p_{0j} x_j} = 1
\]

The GDP-Deflator measures the percentage change of good j's price.
If \(j > 1\), quantities \(x_j\) serve as weights. The larger the quantity \(x_j\), the stronger is the weight attached to \(p_j\).

Special problem of the Pascue index: The goods bundle of the previous period biases the calculation of inflation:

\[
\frac{\sum p_j x_j}{\sum p_{0j} x_j} \neq \frac{\sum p_{0j} x_j}{\sum p_{0j} x_j}
\]

comparative to

\[
\frac{\sum p_j x_j}{\sum p_{0j} x_j}
\]

Therefore, statistical offices around the world agreed to calculate a so called "chain price index":

\[
p_{0j} = \frac{100}{\sum p_j \frac{x_j}{x_j_{-1}}} \times \sum p_{0j} \frac{x_j}{x_j_{-1}} \text{ (Last Year)}
\]

\[
p_{0j} = 100 \times \frac{\sum p_j \frac{x_j}{x_j_{-1}}}{\sum p_{0j} \frac{x_j}{x_j_{-1}}} \text{ (Previous Period)}
\]

This calculation leads to the weighted formula:

\[
\frac{p_j x_j}{p_{0j} x_j} = \frac{\sum p_{0j} x_j}{\sum p_{0j} x_j}
\]

\[
\frac{p_{0j}}{p_{0j}} - 1 = \frac{\sum p_{0j} x_j}{\sum p_{0j} x_j} - 1 = \frac{\sum p_{0j} x_j - \sum p_{0j} x_j}{\sum p_{0j} x_j}
\]

\[
\frac{\sum p_{0j} x_j}{\sum p_{0j} x_j} - 1
\]
1.1. What is Macroeconomics?

1.2. The Basic Model: The Circular-Flow Model

1.3. The Basic Data: GDP and its Components

1.3.1. What Is GDP?

1.3.2. Three Ways of Computing GDP

1.3.3. Nominal vs. real GDP and the GDP-Deflator

1.3.4. From GDP to „Disposable Income of Households”

➤ The purchasing power of the population of a country depends of course primarily on the income of the population. The income of the population differs in several points from GDP:

1. GDP does not include income of inhabitants earned abroad and GDP does include income of foreigners earned within the country.
2. GDP does include capital depreciation. Since depreciation corresponds to capital goods that are consumed in production of other goods, it cannot be part of household income.
3. A part of GDP flows to the government in form of taxes. Hence this part of GDP too cannot be part of household income.

➤ Therefore the following adjustment of GDP does make sense:

From GDP at market prices to national income: Gross Domestic Product at Market Prices / Depreciation = Net Domestic Product at Market Prices / indirect Taxes + Subsidies = Net Domestic Product at Factor Prices / Income of Inhabitants Abroad / Income of Foreigners Within the Country / Net National Income at Factor Prices / Direct Taxes (Taxes on Labor & Wealth Income etc.) / Social Transfers (=Social Benefits, Child Benefits etc.) / Interest on Consumer Credits = Disposable Income of Households

➤ As this decomposition shows, „disposable income of households” is the aggregate that should be used for “market potential analysis”.

➤ It is therefore often simply called “purchasing power”.

➤ In many countries, it is available on the regional level. In Germany for example on the level of districts („Kreise”).

➤ Only if other numbers are not available, GDP should be used for such kind of analysis.

➤ If however possible, one should try to correct GDP towards an aggregate that comes closer to disposable income.

1.3.5. GDP and „Welfare”

2. Pforzheim

1) These interest payments are subtracted by the statistical offices, because they are „in the short term” not available for purchases. This is a little bit arbitrary, since the same holds for rents, insurance fees etc., which are not subtracted!
Should GDP be used as an indicator of welfare?

Certainly, economic well-being depends strongly on disposable income but GDP. Therefore, disposable income is a better indicator for welfare.

There are, however, other objections against the explanatory power of GDP – and also disposable income – as an indicator of welfare!

1. Introduction to Macroeconomics
1.3.5. GDP and „Welfare“

Should GDP be used as an indicator of welfare?

- Non-market production: As already seen, GDP measures only goods and services, which are traded over markets. Home production (education of children, cooking, housekeeping, subsistence agriculture,…) is not captured, even though it does of course affect the welfare of people too.

- Leisure time: In a country where people have a strong preference for consumption (and hence for a high income that makes high consumption possible) GDP will be larger than the GDP of a country where people have a strong preference for leisure time. Nevertheless, people of both countries may have the subjective impression that they share the same level of welfare.

- Environment: Environmental protection consumes intermediate products (air cleaner, clarification plants…), which can therefore not be used to produce final goods. The benefits from environmental production are not sold over markets and therefore not captured by GDP. If instead final products, which are sold over markets, were produced, this would be captured by GDP. Hence, environmental protection reduces measured GDP, even though the positive effect of environmental protection on welfare can be larger than the negative effect of a lower GDP on welfare.

- Income distribution: A high GDP might come along with a very uneven distribution of income. Therefore, an analysis of economic welfare should not only reflect the level of GDP and the like, but also take care about measures of income distribution.

- Capabilities: Disposable income measures only purchasing power available to people. What people can do with this purchasing power does also depend on other factors like:
  - personal health,
  - personal education,
  - access to information,
  - legal framework,
  - political freedom
and so on. Therefore, the same level of income can grant a person more or less implementation options (or in the words of Amartya Sen „capabilities“) depending on these factors. For example: (1) A severely handicapped or sick person can enjoy a high income level not in the same way as a healthy person. (2) A person with a low education level or restricted access to information will typically know less options, how to spend income, than a well-educated person or a person with full access to all relevant information.

- Consequently, the same income level can go along with quite different levels of attainable „capabilities“. „Capabilities“ are however hard to measure, since they depend on „soft factors“, which lack statistical coverage.

- Nevertheless, some factors, which are likely to have a significant impact on „capabilities“, are available, e.g.:
  - life expectancy
  - average education level
- Therefore, the United Nations have started a project, where every year since 1990 a so called „Human Development Index“ (HDI) is calculated for 169 member countries.
- The HDI is calculated according to the following definition:
1. Introduction to Macroeconomics
1.3.5. GDP and „Welfare“

Should GDP be used as an indicator of welfare?

Capabilities:
- Definition of Human Development Index:
  - HDI = \( \frac{1}{3} \text{GNP} \times \text{LE} \times \text{EDU} \)
  - HDI: An index number between 1 and 100
  - GNP: Gross National Product scaled between 1 and 100
  - LE: Live Expectancy scaled between 1 and 100
  - EDU: Education Index scaled between 1 and 100

HDI = GDP + Income of inhabitants abroad / Income of foreigners within

A ranking of countries according to the HDI yields a difference of only 5% compared to a ranking based on Per-Capita GNP.

Digression: Rank Correlation Coefficient

Example 1:

<table>
<thead>
<tr>
<th>Country List 1</th>
<th>Country Name</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country_1</td>
<td>Country_A</td>
<td>1</td>
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</tr>
<tr>
<td>Country_3</td>
<td>Country_C</td>
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Example List 2:

<table>
<thead>
<tr>
<th>Country List 2</th>
<th>Country Name</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1</td>
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<td>Country_B</td>
<td>2</td>
</tr>
<tr>
<td>Country_3</td>
<td>Country_C</td>
<td>3</td>
</tr>
</tbody>
</table>

Definition: Rank Correlation Coefficient:

\[
\text{Correlation (List 1 \& List 2)} = \frac{\text{Variances (List 1) \times Variances (List 2)}}{\text{Sum of Squared Ranks (List 1)} \times \text{Sum of Squared Ranks (List 2)}}
\]

Example 2:

<table>
<thead>
<tr>
<th>Country List 1</th>
<th>Country Name</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country_1</td>
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<td>Country_C</td>
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<table>
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<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Country_3</td>
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</table>

Digression: Rank Correlation Coefficient

Example 3:

<table>
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<tr>
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<th>Country Name</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country_1</td>
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<td>2</td>
</tr>
<tr>
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<td>Country_C</td>
<td>3</td>
</tr>
</tbody>
</table>

Example List 2:

<table>
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<th>Rank</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>Country_2</td>
<td>Country_B</td>
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</tr>
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<td>Country_C</td>
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</tr>
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\]

A ranking of countries according to life expectancy yields a difference of 15% compared to a ranking based on Per-Capita GNP.

Digression: Rank Correlation Coefficient

Example 4:

<table>
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<td>Country_A</td>
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<td>Country_2</td>
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<tr>
<td>Country_3</td>
<td>Country_C</td>
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</table>

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</thead>
<tbody>
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</tr>
<tr>
<td>Country_2</td>
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<td>1</td>
</tr>
<tr>
<td>Country_3</td>
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<td>3</td>
</tr>
</tbody>
</table>

Definition: Rank Correlation Coefficient:

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\]

A ranking of countries according to the HDI yields a difference of only 5% compared to a ranking based on Per-Capita GNP.

Digression: Rank Correlation Coefficient

Example 5:

<table>
<thead>
<tr>
<th>Country List 1</th>
<th>Country Name</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country_1</td>
<td>Country_A</td>
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<tr>
<td>Country_2</td>
<td>Country_B</td>
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<td>Country_3</td>
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</tr>
</tbody>
</table>

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<thead>
<tr>
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</tr>
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<td>Country_B</td>
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</tr>
<tr>
<td>Country_3</td>
<td>Country_C</td>
<td>1</td>
</tr>
</tbody>
</table>

Definition: Rank Correlation Coefficient:

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\]
A ranking of countries according to mean years of schooling yields a difference of only 24% compared to a ranking based on Per-Capita GNP.

1. Introduction to Macroeconomics
1.3.5. GDP and „Welfare“

Should GDP be used as an indicator of welfare?

Capabilities:

- As these diagrams show, GNP contains a lot of information about life expectancy and the education level.
- As we will see, it also contains valuable information about the relationship between the business cycle and the labor market in each country.
- Taken together, one can come to the conclusion that GNP contains a lot of very different information which is quite useful for the discussion of macroeconomics questions.

1.4. Questions for Review

You should be able to answer the following questions at the end of this chapter. All of the questions can be answered with the help of the lecture notes. If you have difficulties in answering a question, discuss this question with me at the end of the lecture, attend my colloquium or send me an E-Mail.

1. What is the difference between micro- and macroeconomics?
2. What is the relation between macroeconomic theories, aims and strategies?
3. What kind of questions are typical for macroeconomic theory, what for the discussion of macroeconomic aims?
4. Explain the circular flow model of an economy.
5. What kind of conclusions can be drawn from this model?
6. Who owns the production factors of an economy?
7. Explain the fundamental equation of the circular-flow model.
8. Define GDP.

11. How does the calculation of GDP take care of the “apples and oranges” problem?
12. What kind of information contains the market price of a good?
13. What are services?
14. Are services covered by the calculation of GDP?
15. You buy a CD player. Do you buy a service or a good?
16. You visit a music concert. Do you buy a service or a good?
17. What kind of products are not correctly captured by GDP?
18. You decide to take your meals further on in restaurants only. What is the effect of your decision on GDP?
19. A household aid marries his former employer. What effect has this marriage on GDP?
20. What difficulty emerges in interpreting the GDP of countries with a large sector of agricultural subsistence?
21. What are “non-profit organizations”? 
22. How does the production of institutions, which grant their products and services for free to their customers, enter the calculation of GDP?
23. Why does adding up the sales of firms does not lead to GDP?
24. Explain the problem of “multiple count” based on an example.
25. What role play “intermediary goods” in the calculation of GDP?
1.4. Questions for Review

26. Does a Swiss citizen working in the town of Konstanz affect the German GDP?
27. Does a German citizen, who runs a firm in Austria, affect the German GDP?
28. Does a German citizen, who works in a bank in Luxembourg, affect the German national income?
29. You sell your two years old Maserati at eBay. How does this transaction affect the current GDP?
30. What are the three ways of calculating GDP?
31. Specify the components of GDP following the three ways of calculating GDP.

---

1.4. Questions for Review

32. How is value added of firms, of the government and private Households computed?
33. What kind of aggregate should be the base of an analysis of market potential of a country or a region?
34. What is the definition of “depreciations” as contained in GDP?
35. How is the aggregate called that results, if you subtract depreciation form GDP?
36. Explain the derivation of disposable income starting with GDP.
37. Specify four reasons that reduce the appropriateness of GDP as a measure of wealth.

---

1.4. Questions for Review

38. What factor has to be considered, if the GDP of 1994 has to be compared with the GDP of 2002?
39. The nominal GDP of country A was 100,000 € in the year 1950 and 130,000,000 € in the year 2000. In the same span of time the BIP-Deflator has grown with an annual rate of 5% per year. The nominal GDP of country B was 250,000 € in the year 1950 and 120,000,000 € in the year 2000. In the same span of time the GDP-Deflator has grown with an annual rate of 2%. Which country has experienced the strongest growth of real GDP?
40. What is the difference between nominal and real GDP?
41. What is the definition of the GDP-Deflator?
42. How is the GDP-Deflator affected, if all prices stay constant compared to the base year and only the real production quantities of goods change?
43. What is the relationship between GDP-Deflator and the rate of inflation?

---

1.4. Questions for Review

46. Use the number in the following table to determine real GDP at prices of the year 2000 and at prices of the year 2002.

<table>
<thead>
<tr>
<th>Year</th>
<th>Apples</th>
<th>Oranges</th>
<th>GDP real (Prices = 2000)</th>
<th>GDP real (Prices = 2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight</td>
<td>Weight</td>
<td>Price</td>
<td>Weight</td>
</tr>
<tr>
<td>2000</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>2001</td>
<td>150</td>
<td>100</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>2002</td>
<td>300</td>
<td>150</td>
<td>150</td>
<td>30</td>
</tr>
</tbody>
</table>

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1.4. Questions for Review

48. Calculate the missing numbers.

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal GDP</td>
<td>2063</td>
<td>2113</td>
<td>2143</td>
<td>2162</td>
<td>2207</td>
<td>2241</td>
<td>2307</td>
</tr>
<tr>
<td>Real GDP (Base 2000)</td>
<td>2063</td>
<td>2088</td>
<td>2088</td>
<td>2084</td>
<td>2110</td>
<td>2129</td>
<td>2186</td>
</tr>
<tr>
<td>Nominal GDP Growth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real GDP Growth</td>
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<tr>
<td>GDP Deflator</td>
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<td></td>
</tr>
<tr>
<td>Rate of Inflation</td>
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</tr>
</tbody>
</table>

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1.4. Questions for Review

49. Find the value of “Net Income from Wealth within the Country” by Nationals & Foreigners from the following numbers of the National Accounts:

- Net Taxes (T) = Direct Taxes ./ Social Transfers + Indirect Taxes ./ Subsidies = 250 €.
- Consumption of Households = 500 €.
- Net Investment of Firms = 100 €.
- Exports = 300 €.
- Gross Investment = 150 €.
- New Indebtedness of Government (D_G) = 100 €.
- Imports = 200 €.
- Net Compensation of Domestic and Foreign Employees and Self-Employed Working within the Country = 600 €.
### 1.4. Questions for Review

50. Which of the following statements are normative statements and which are descriptive statements?

- (a) Thou shalt not bear false witness against thy neighbour.
- (b) The color of snow is white.
- (c) The color of snow is black.
- (d) Your black pullover is much more beautiful as your green pullover.
- (e) The central bank is best advised to stabilize the inflation rate at a yearly rate of 3% of the consumer price index.
- (f) She does not like green pullovers.
- (g) If the German GDP growth falls below a rate of 1.7%, the unemployment rate will start rising.
- (h) An unemployment rate larger than 8% leads to unacceptable social hardship.
- (i) If money supply growth equals 5% and real GDP growth equals 2%, inflation rate will equal 3%.