



2 Economic growth in short-run and long-run

Ing. Helena Horská, Ph.D.

2011

ŠkodaAuto Vysoká škola



2.1 Economic growth

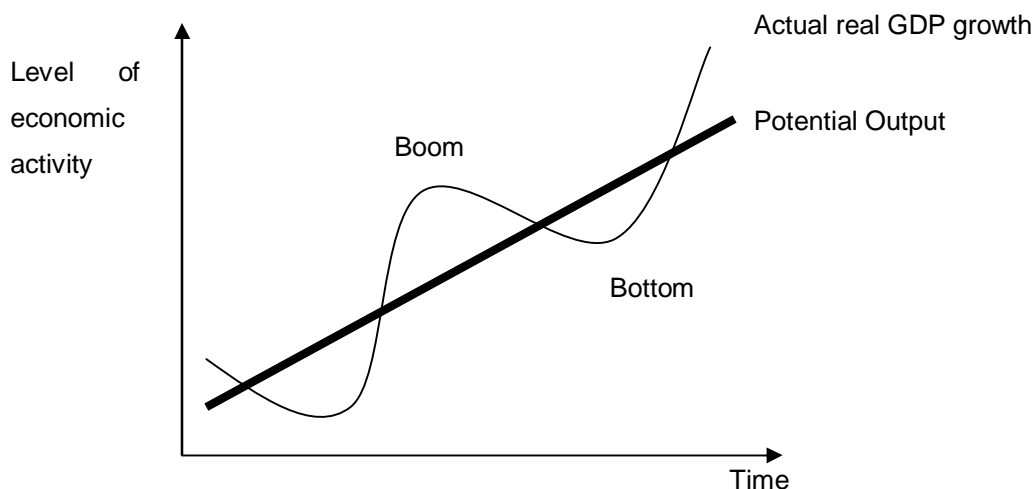
- Economic growth in long-run = potential output growth

Potential output is the highest level of production that could be produced by an economy if all its resources were fully employed including the current level of technology. Potential output can be described as a long-term real GDP trend net of short-term fluctuations (see Hodrick-Prescott filter).

- Economic growth in short-run = the real GDP growth

In short- and medium-term an economy fluctuates around the potential output. The short-term fluctuation in the level of economic activity represents **business cycle**.

Graph 1 Business cycle



Four phases of business cycle:

- Depression – the output reaches the bottom
- Recovery – upturn in economic activity
- Boom – the output reaches the peak
- Recession – the output starts falling



2.2 International Comparison

The GDP/GNP in national currency measures the total domestic product or the scale of the economy.

The **Gross National Product** (GNP) is GDP plus incomes received by residents from abroad minus incomes claimed by nonresidents. GDP measures the total product within a country's boundaries, incl. that of foreign citizens. The difference between GDP and GNP is that GDP defines its scope according to location, while GNP defines its scope according to ownership. In a global context, world GDP and world GNP are therefore equivalent terms. GDP is product produced within a country's borders; GNP is product produced by enterprises owned by a country's citizens. Production within a country's borders, but by an enterprise owned by somebody outside the country, counts as part of its GDP but not its GNP; on the other hand, production by an enterprise located outside the country, but owned by one of its citizens, counts as part of its GNP but not its GDP.

The **Gross National Income** (GNI) comprises the total added value produced within a country together with its income received from other countries (notably interest and dividends), less similar payments made to other countries, and the indirect business taxes (VAT,...) net of subsidies. The GNI is similar to the gross national product (GNP), except that in measuring the GNP one does not deduct the indirect business taxes.

Cross-border comparison

The level of GDP in different countries may be compared by converting their value in national currency according to either the current currency exchange rate, or the purchase power parity exchange rate. Current currency exchange rate is the exchange rate in the international currency market.

Purchasing power parity exchange rate is the exchange rate based on the purchasing power parity (PPP) of a currency relative to a selected standard (usually the United States dollar). This is a comparative (and theoretical) exchange rate, the only way to directly realize this rate is to sell an entire CPI basket in one country, convert the cash at the currency market rate & then rebuy that same basket of goods



in the other country (with the converted cash). Going from country to country, the distribution of prices within the basket will vary; typically, non-tradable purchases will consume a greater proportion of the basket's total cost in the more developed country, per so-called the Balassa-Samuelson effect.

The ranking of countries may differ significantly based on which method is used. However, the purchasing power parity method accounts for the relative effective domestic purchasing power of the average producer or consumer within an economy. The method can provide a better indicator of the living standards of less developed countries, because it compensates for the weakness of local currencies in the international markets. The PPP method of GDP conversion is more relevant to non-traded goods and services.

There is a clear pattern of the purchasing power parity method decreasing the disparity in GDP between high and low income (GDP) countries, as compared to the current exchange rate method. This finding is called the Penn effect¹.

GDP is an aggregate figure which does not account for differing sizes of nations. Therefore, GDP can be stated as **GDP per capita** (per person) in which total GDP is divided by the resident population on a given date, GDP per citizen where total GDP is divided by the numbers of citizens residing in the country on a given date. The international institutions tend to use the **GNP per capita** instead of GDP per capita as a measures the economic level of a country.

In international comparison we might use:

- A) USD market exchange rate – disadvantage: volatility of market exchange rate and deviation from purchasing power of the national currency
- B) **Purchasing Power Parity** (PPP): shows the number of units of domestic country's currency required to buy the same amount of goods and services in

¹ The "Penn effect": the observation that consumer price levels in wealthier countries are systematically higher than in poorer ones.



the domestic market as one U.S. Dollar would buy in the US. It is based on the law of one price that states that the prices of internationally traded commodities must be the same in all locations if transportation cost is relatively small.

ERDI (Exchange Rate Deviation Index): is defined as the ratio of market exchange rate to PPP. If it is above 1, the national currency is undervalued against PPP. If $ERDI < 1$, the national currency is overvalued against PPP.

CPL (Comparative Price Levels): is defined as the ratio of purchasing power parity (PPP) to exchange rate.

So, we convert nominal GNP per capita expressed in U.S. Dollars into its real GNP per capita in PPP that is adjusted for price differences of goods and services between the country and the U.S., and independent of the fluctuations of the national currency exchange rate.

Table 1 Economy's scale and level

	Scale of the economy GDP bn USD (Atlas method, 2009)	Economic level GNI per capita in USD (Atlas method, 2009)
1. US	14,119	1. Norway 84,640
2. Japan	5,068	2. Luxembourg 76,710
4. China	4,985	3. Switzerland 65,430
3. Germany	3,330	4. Denmark 59,060

Source: World Bank: *World Development Indicators database*. Quick Reference Tables, Ranking tables. (1 July 2009), Aug 2009.

Note: GNI per capita (formerly GNP per capita) is the gross national income, converted to U.S. dollars using the World Bank Atlas method, divided by the mid-year population. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad. GNI is calculated in national currency. To smooth fluctuations in prices and exchange rates, a special Atlas method of conversion is used by the World Bank. This applies a conversion factor that averages the exchange rate for a given year and the two preceding years, adjusted for differences in rates of inflation between the country, and through 2000, the G-5 countries (France, Germany, Japan, the United Kingdom, and the United States). From 2001, these countries include the Euro area, Japan, the United Kingdom, and the United States.



Box 1 The Balassa–Samuelson effect

The Balassa–Samuelson effect, also known as Harrod–Balassa–Samuelson effect (Kravis and Lipsey 1983), the Ricardo–Viner–Harrod–Balassa–Samuelson–Penn–Bhagwati effect (Samuelson 1994, p. 201) reflects the observation that consumer price levels in wealthier countries are systematically higher than in poorer ones (the "Penn effect"). It assumes that productivity or productivity growth-rates vary more by country in the traded goods' sectors than in other sectors (the Balassa–Samuelson hypothesis).

The hypothesis includes the following features:

- Workers in some countries have higher productivity than in others and it is the ultimate source of the income and productivity growth differential.
- Certain labour-intensive jobs (mainly personal services performed locally) are less responsive to productivity innovations than others. These sectors are also the ones producing non-transportable goods (for instance haircuts).
- The local wages are set at the level of high productive jobs (mainly from sectors producing tradable goods)
- So the employees in rich countries are better paid than those from less developed countries.
- So with a same (world) price for tradable goods, the price of nontradable goods will be lower in the less productive country, resulting in an overall lower price level, since the CPI is made up of local goods (which are expensive relative to tradables in rich countries) and tradables, which have the same price everywhere (because of the law of one price).
- Only tradable goods follow PPP.



2.3 Standard of living and GDP

GDP per capita is not a measurement of the standard of living in an economy. However, it is often used as such an indicator, on the rationale that all citizens would benefit from their country's increased economic production. Similarly, GDP per capita is not a measure of personal income.

The major advantage of GDP per capita as an indicator of standard of living is that it is measured frequently, widely, and consistently. It is measured frequently in that most countries provide information on GDP on a quarterly basis, allowing trends to be seen quickly. It is measured widely in that some measure of GDP is available for almost every country in the world, allowing inter-country comparisons. It is measured consistently in that the technical definition of GDP is relatively consistent among countries.

The major disadvantage is that it is not a measure of standard of living. GDP is intended to be a measure of total national economic activity— a separate concept.

The argument for using GDP as a standard-of-living proxy is not that it is a good indicator of the absolute level of standard of living, but that living standards tend to move with per-capita GDP, so that changes in living standards are readily detected through changes in GDP.

Limitations of GDP to judge the health of an economy

- GDP is widely used by economists to gauge the health of an economy, as its variations are relatively quickly identified. However, its value as an indicator for the standard of living is considered to be limited. For example, GDP doesn't reflect the impact of production on ecosystem.
- GDP does not take disparity in incomes between the rich and poor into account (wealth distribution).
- Non-market transactions - GDP excludes activities that are not provided through the market, such as household production and volunteer or unpaid services. As a result, GDP is understated.



- Official GDP estimates may not take into account the underground economy, in which transactions contributing to production, such as illegal trade and tax-avoiding activities, are unreported, causing GDP to be underestimated.
- Non-monetary economy - GDP omits economies where no money comes into play at all, resulting in inaccurate or abnormally low GDP figures. For example, in countries with major business transactions occurring informally, portions of local economy are not easily registered.
- GDP also ignores quality improvements and inclusion of new products. By not adjusting for quality improvements and new products, GDP understates true economic growth.
- GDP counts work that produces no net change or that results from repairing harm. For example, rebuilding after a natural disaster or war may produce a considerable amount of economic activity and thus boost GDP.
- GDP ignores externalities or economic bads such as damage to the environment. So GDP might overstate economic welfare.
- GDP is not a tool of economic projections, which would make it subjective, That is why it does not measure what is considered the sustainability of growth. A country may achieve a temporarily high GDP by over-exploiting natural resources or by misallocating investment. GDP is just a measurement of economic activity.
- GDP figure is deflated over time, so the GDP growth can vary greatly depending on the basket of goods used and the relative proportions used to deflate the GDP figure. For this reason, economists comparing multiple countries usually use a varied basket of goods.
- Cross-border comparisons of GDP can be inaccurate as they do not take into account local differences in the quality of goods, even when adjusted for purchasing power parity because of the difficulties of finding comparable baskets of goods to compare purchasing power across countries. This is especially true for goods that are not traded globally, such as housing.
- Transfer pricing on cross-border trades between associated companies may distort import and export measures.



- As a measure of actual sale prices, GDP does not capture the economic surplus between the price paid and subjective value received, and can therefore underestimate aggregate utility.

Distinctions must be kept in mind between quantity and quality of growth, between cost and returns, and between the short and long run. Goals for more growth should specify more growth of what and for what.

2.4 Alternatives to GDP

Human development index (HDI) uses GDP as a part of its calculation and then factors in indicators of life expectancy and education levels.

Genuine progress indicator (GPI) or Index of Sustainable Economic Welfare (ISEW) - The GPI and the ISEW attempt to address many of the above criticisms by taking the same raw information supplied for GDP and then adjust for income distribution, add for the value of household and volunteer work, and subtract for crime and pollution.

Gross national happiness (GNH) measures quality of life or social progress in more holistic and psychological terms than GDP. It tries to incorporate a complex set of subjective and objective indicators to measure 'national happiness' in various domains (living standards, health, education, eco-system diversity and resilience, cultural vitality and diversity, time use and balance, good governance, community vitality and psychological well-being). This set of indicators would be used to assess progress towards gross national happiness, which they have already identified as being the nation's priority, above GDP.

Gini coefficient measures the disparity of income within a nation.

Wealth estimates - The World Bank has developed a system for combining monetary wealth with intangible wealth (institutions and human capital) and environmental capital.

Private Product Remaining - Murray Newton Rothbard and other Austrian economists argue as if government spending is taken from productive sectors and produces goods that consumers do not want, it is a burden on the economy and thus should be deducted. In his book, *America's Great Depression*, Rothbard argues that



even government surpluses from taxation could be deducted to create an estimate of PPR.

European Quality of Life Survey - The survey, first published in 2005, assessed quality of life across European countries through a series of questions on overall subjective life satisfaction, satisfaction with different aspects of life, and sets of questions used to calculate deficits of time, loving, being and having.

Happy Planet Index (HPI) is an index of human well-being and environmental impact, introduced by the New Economics Foundation (NEF) in 2006. It measures the environmental efficiency with which human well-being is achieved within a given country or group. Human well-being is defined in terms of subjective life satisfaction and life expectancy while environmental impact is defined by the Ecological Footprint.

Defense of GDP

GDP is a value-neutral-measure and expresses, what we can do, not what we should do. This is compatible with the fact that different people have different preferences and different opinions on what is well-being. Competing measures like GPI define well-being to mean things that the definers ideologically support. Therefore, they cannot function as the goals of a plural society. Moreover, they are more vulnerable to political manipulation.



2.5 Economic growth theory

Growth theory – the study of economic growth across nations and over time – asks whether we produced more because we had used more inputs, or whether the inputs had become more productive over time, or both. It also asks what is the contribution of each factor.

Table 2 Economic growth (annual real GDP growth)

Real GDP growth	1961-1973	1974-1979	1980-1989	1990-1999	2000-2007
High income countries	5,3	3,1	3,0	2,6	2,5
EMU	5,6	2,9	2,3	2,2	2,0
Czech Republic				0,0	4,3
Middle income	5,4	5,0	3,4	3,5	6,0
Low income	4,1	3,5	2,9	3,2	5,3
Least developed			2,4	3,1	6,1

Source: World Bank, WDI, Sep 2008.

2.5.1 The Aggregate Production Function

The Aggregate Production Function describes how an economy's capital stock K and employed labour N (*number of workers time average working hours*) produce the total output of an economy, given available technology:

$$Y = f(K, N, t). \quad (2.1)$$

Neoclassical theory assumes that the technology equally effects marginal product of capital and labor (or we assume Neutral technological progress), so we can extract technology t from brackets and at the same time assume that it is a function of time:

$$Y = t F(K, N), \quad (2.2)$$

It is the standard neoclassical production function where the technology is a function of time. While we know how much the total product (Y) has increased, and how much of this increase is explain by capital and hours worked, the input of the productivity has to be deduced. Remaining input of the productivity, or the unexplained part of the production growth is called **multifactor (or total factor) productivity** or **Solow residual**:



Solow residual = $\Delta Y/Y$ – contribution of capital accumulation and man-hours worked.

The contribution of capital and labour depends on their growth and income share on product (Y):

$$\frac{\Delta Y^*}{Y} = t + w \cdot \frac{\Delta K}{K} + (1 - w) \cdot \frac{\Delta N}{N}, \quad (2.3)$$

where w is the share of capital and $(1-w)$ is the share of labour; w or $(1-w)$ is moreover equal to the marginal product of the relevant input and in the perfect competition to the reward per unit (rate of profit or hourly wages). And if we assume **constant return to scale** (if the inputs were doubled, the output doubles), then the sum of w and $(1-w) = 1$. This formula is known as **the basic equation of growth accounting**.

Table 3 Solow residual

	1985-1995				1995-2005			
	GDP	N	K	MFP	GDP	N	K	MFP
US	2,8	1,3	0,8	0,7	3,1	0,7	0,9	1,5
Japan	3,0	-0,1	1,1	2,1	1,1	-0,7	0,7	1,2
France	2,1	-0,1	0,7	1,6	2,2	0,3	0,7	1,0

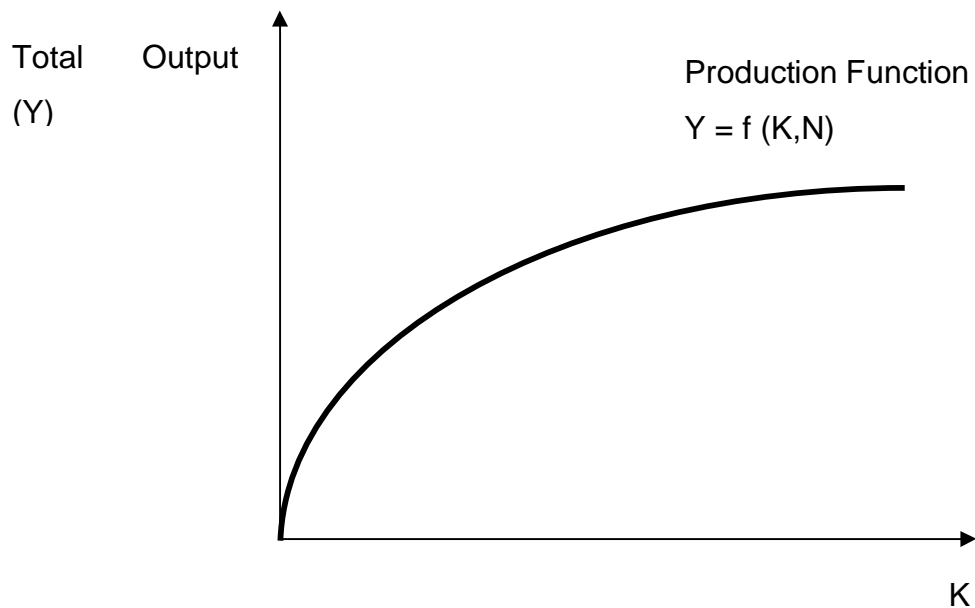
Notes: There are annual figures. MFP... multifactor productivity or total factor productivity.

Source: Own calculations based on World Banks' data, WDI, Sep 2008.

In the below chapter we will assume **the diminishing marginal physical product**. The marginal (physical) product (MPP) is the derivative of the production function, or it measures the amount of new output per unit of incremental input. In the case of the diminishing MPP the additional input allows an economy to produce more, but in smaller and smaller increments. As a result, the total production function has a declining slope.



Graph 2 Agregate Production Function



2.5.2 Stylized Facts

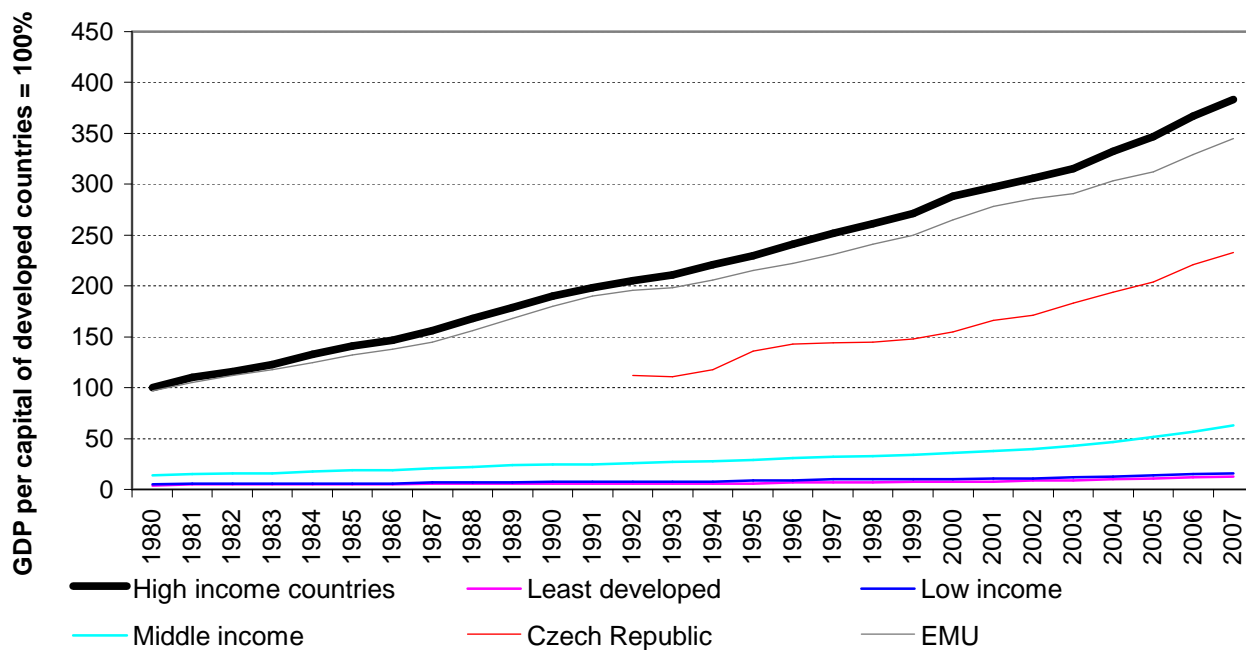
The British economist Nicholas Kaldor (1961) identified several stylized facts or empirical regularities that capture some important features of the economic growth generally.

I.) Output per capita and capital intensity keep increasing

The output tends to increase faster than labour input. So the output per capita keeps rising. Higher output demands more capital and thus the production process becomes increasingly more capital-intensive.



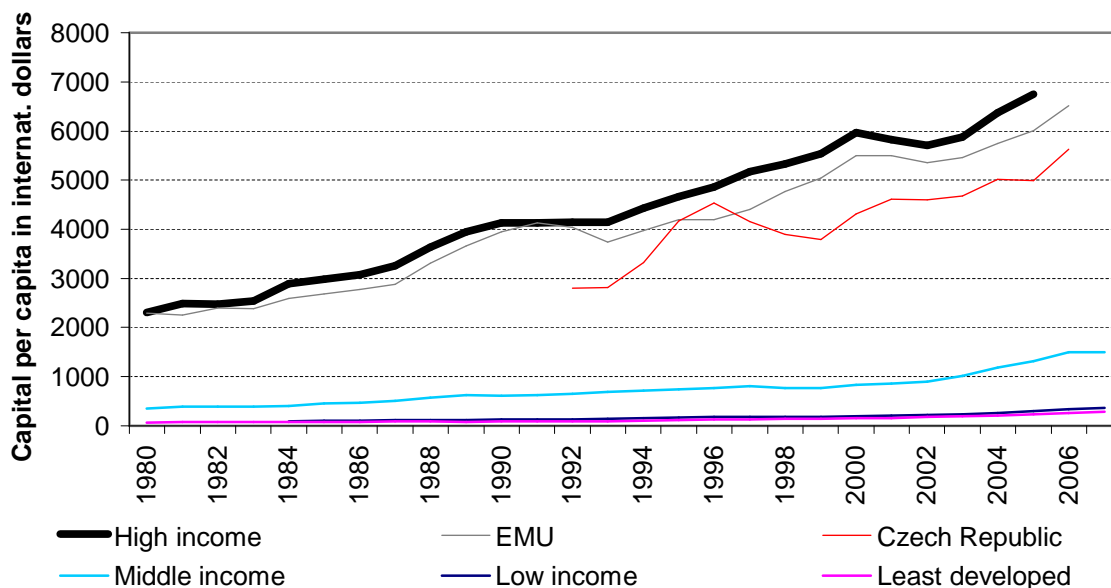
Graph 3 GDP per capita in developed and developing countries



Source: World Bank, WDI, Sep 2008.

Notes The base is the GDP per capita of high income countries in 1980.

Graph 4 Capital intensity keeps rising



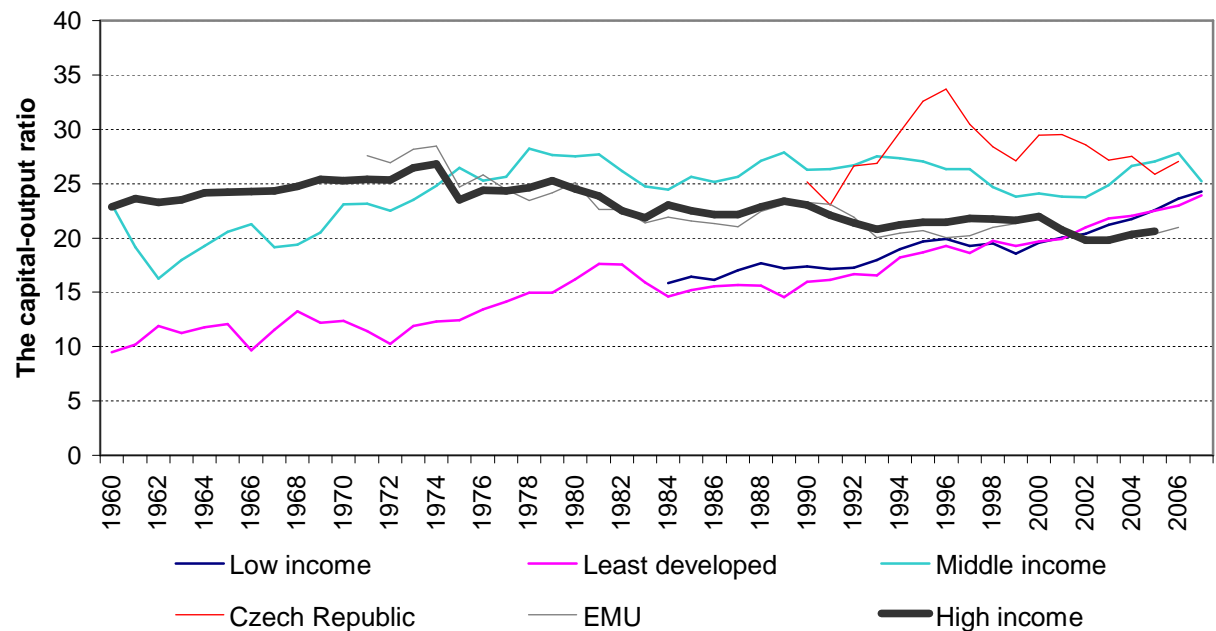
Source: Own calculations based on World Banks' data, WDI, Sep 2008.



II.) The capital-output ratio is trendless

Output and capital grow secularly, so they tend to track each other. So the capital-output ratio shows no systematic trend.

Graph 5 The capital-output ratio trendless?



Source: World Bank, WDI, Sep 2008.

III.) Hourly wages keep rising

The ratio of output and capital to labour increases over time. It means that the workers become productive and their hourly wages rise.

IV.) The rate of profit is trendless

Since the capital-output ratio is trendless, the rate of profit should be also trendless.

V.) The relative shares of GDP going to labour and capital are trendless

Total incomes deriving from labour and capital have increased secularly and at about the same rate, so the distribution of total income between capital and labour has been relatively stable.



The stylized facts identify a few empirical regularities that we can observe in the long-term horizon (overlooking short-term fluctuations). So we know already some facts about the economic growth in the long-term horizon where no business cycle occurs. Such a situation is called a **steady state**.

2.5.3 Solow growth model

(self-study)

Solow's model is the neoclassical growth model assuming following:

- a) perfect competition (marginal labour product = real wages, marginal capital product = the rate of profit)
- b) Wages and prices are flexible
- c) Marginal product of labour and capital is diminishing
- d) Constant return to scale
- e) The population growth rate = the rate of labour force growth
- f) The economy is closed
- g) Neutral technological progress
- h) Technological progress is linear or the rate of progress is constant.

Key terms and issues:

The production function in intensive form: $Y^*/N = f(K/N)$, or $y = f(k)$. (2.4)

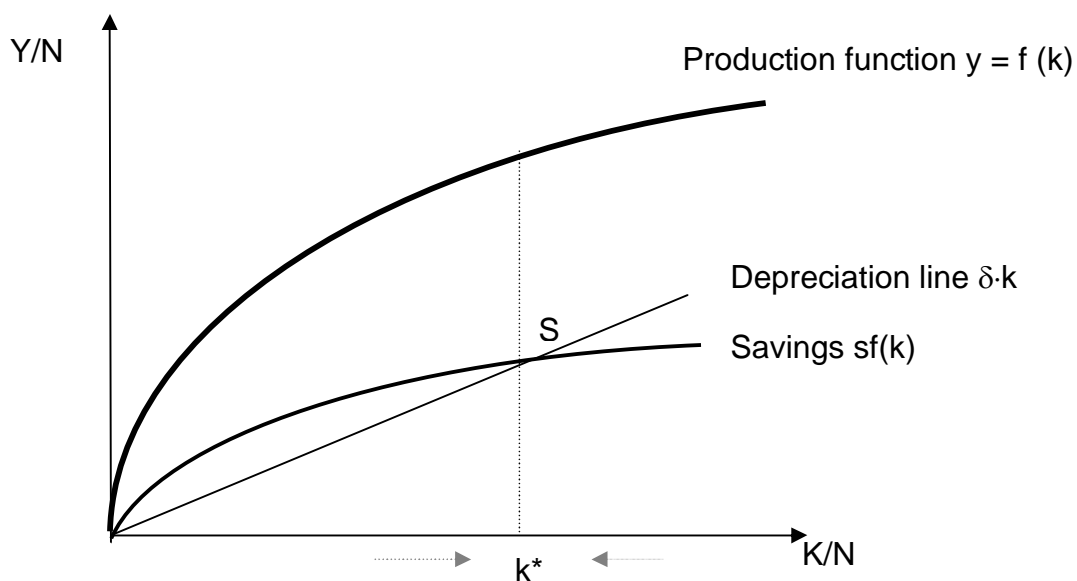
Savings as a source of capital: $i = s \cdot f(k)$ (2.5)

Increase in k (K/N): $k = s \cdot f(k) - \delta \cdot k$. (2.6)

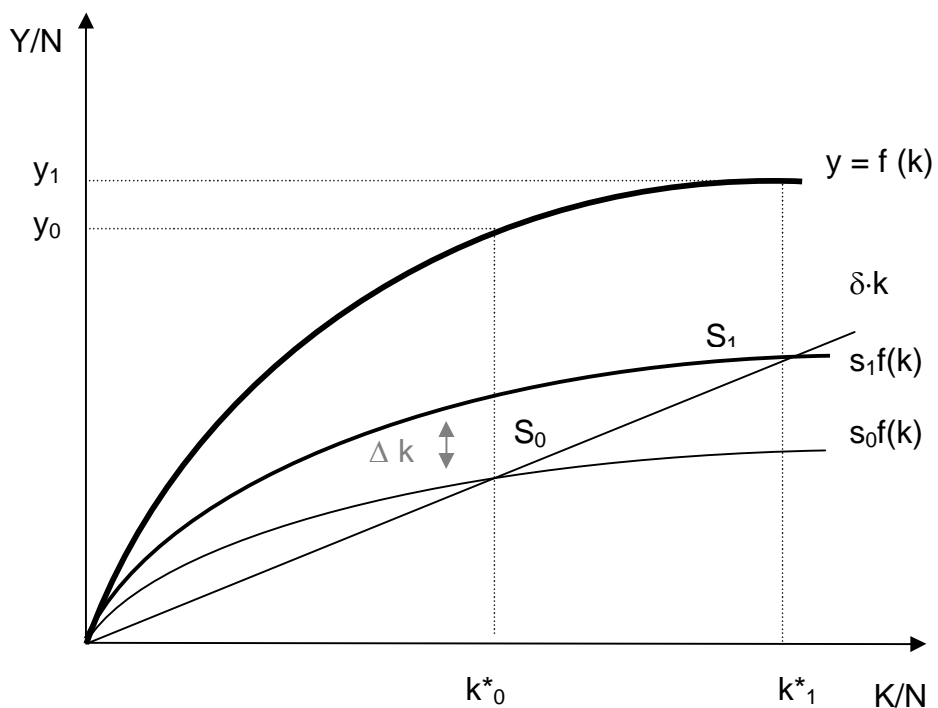
The steady state: intersection between the saving schedule and the depreciation line. When the economy is away from that point, it moves towards its steady state, where k is constant.



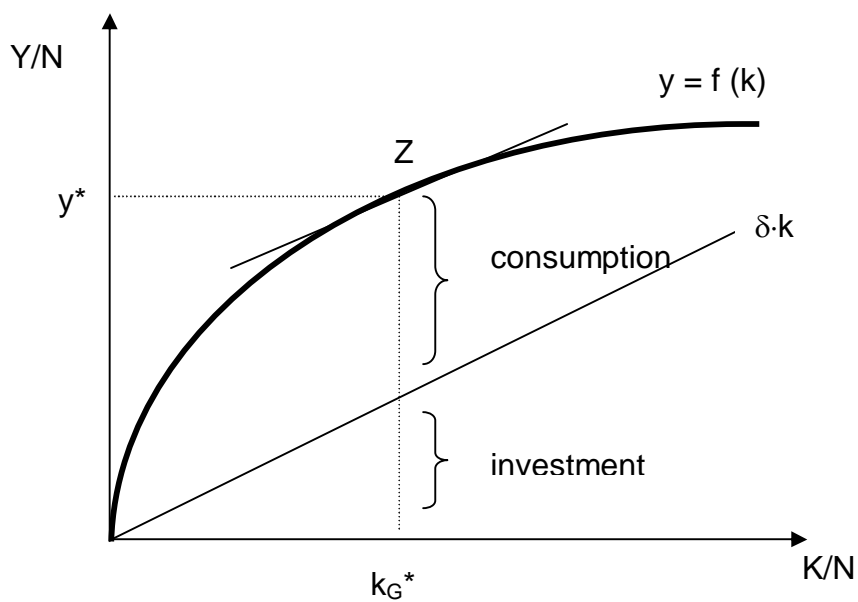
Graph 6 The Steady State



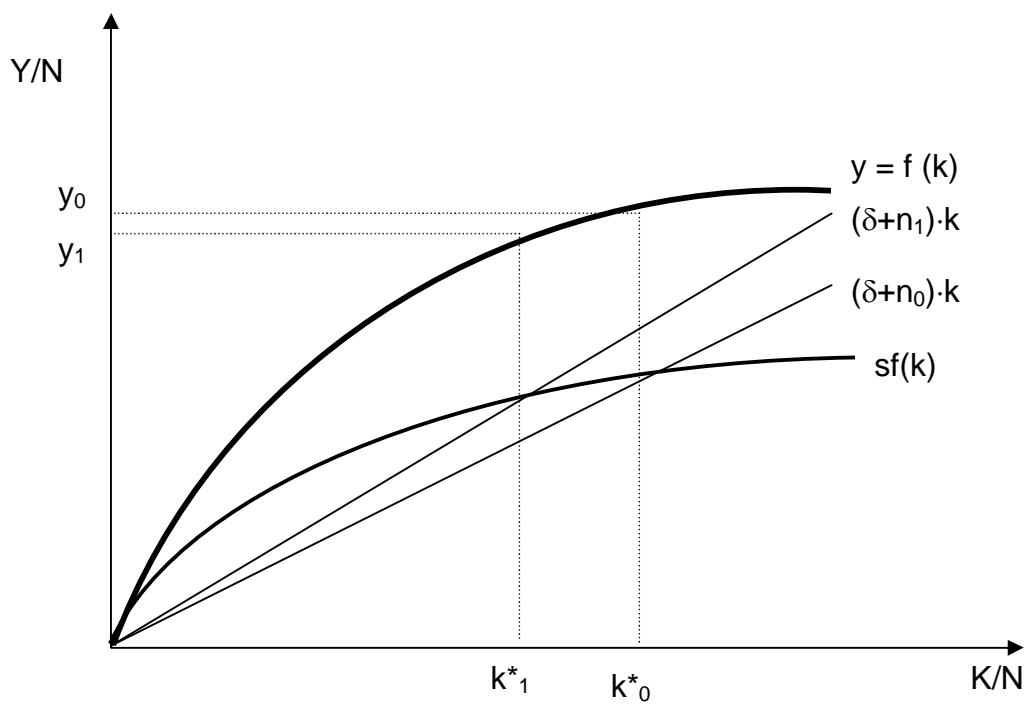
Graph 7 Higher Savings Rate



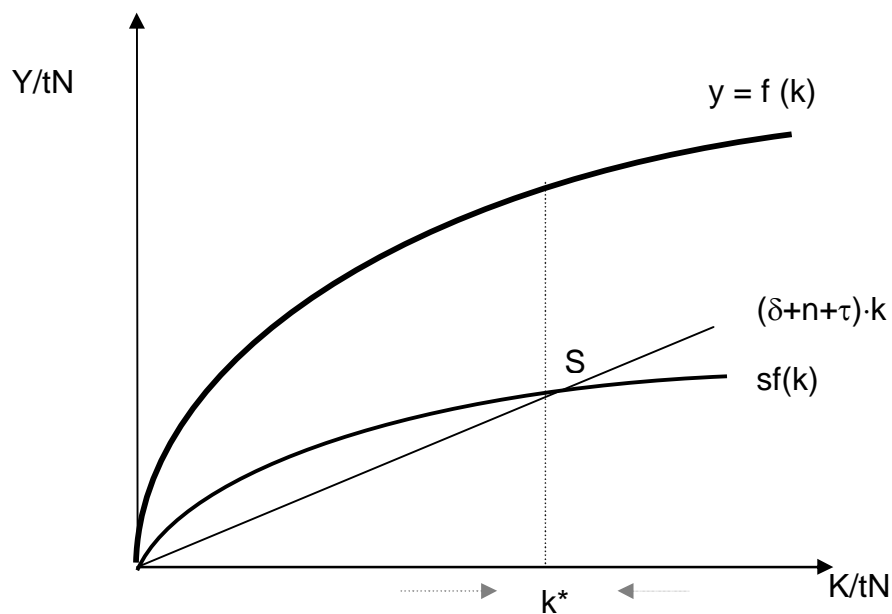
Graph 8 The Golden Rule – the highest consumption level



Graph 9 Faster population growth



Graph 10 The Steady State with population growth and technological progress



Solow growth model - key conclusions

1. it identifies three sources of economic growth (ΔY): population growth, capital accumulation, and technological progress.
2. Because of diminishing marginal product, capital accumulation alone cannot sustain growth. As a result, increased savings does not affect long-run growth; only temporary acceleration of the economic growth occurs than the growth rate returns to its previous level. But it shifts the economy into new steady state with the higher capital intensity (K/N) and the output per capita (standards of living). The economies with higher saving rate have permanently higher standards of living (Y/N) and K/N . The full convergence is possible only within group of economies with the similar parameters such as population growth rate, savings per capita, depreciation and capital stock,...
3. Only technological change causes the permanent growth in per capita output (standards of living) and K/N .
4. The product of less developed countries is more away from its steady state, so these economies will growth faster than the developed ones.



2.5.4 Endogenous Growth Theory

This theory tries to find sources of the permanent economic growth within the model. The **endogenous growth theory** or **new growth theory** was developed in the 1980s as a response to criticism of the neo-classical Solow growth model. The main representants are Paul M. Romer, R.E. Lucas or J.R. Barro and G. Becker. The endogenous growth theory holds that policy measures can have an impact on the long-run growth rate of an economy. For example, subsidies on research and development or education increase the growth rate in some endogenous growth models by increasing the incentive to innovate.

The engine for economic level growth is capital including human capital (incl. knowledge and experiences). The investment into capital (physical and human) might bring along spillover effects (spillovers are good externalities, benefits that are attributed to cost from other firms). And thanks to them the returns to scale are not diminishing but at least constant or even increasing.

Often endogenous growth theory assumes constant marginal product of capital at the aggregate level, or at least that the limit of the marginal product of capital does not tend towards zero. This does not imply that larger firms will be more productive than small ones, because at the firm level the marginal product of capital is still diminishing. However, higher savings rate might thus have a permanent positive impact on the long-term economic growth. As a result, the wide gap in savings rates among economies might cause permanent differences in economic levels of those countries.

The main implication of recent growth theory is that policies which embrace openness, competition, change and innovation will promote growth. The government should support investment into education and infrastructure, minimize government interruptions into market and promote R&D (research and development).

One of the main failings of endogenous growth theories is the collective failure to explain conditional convergence (the convergence to its own steady state, when the speed of convergence is faster the further it is from its own steady-state value).



Another frequent critique concerns the cornerstone assumption of non-diminishing returns to capital. Some contend that new growth theory has proven no more successful than exogenous growth theory in explaining the income divergence between the developing and developed worlds.

2.5.5 Real-business-cycle theory

Real business cycle theory (RBC) was introduced by Finn E. Kydland and Edward C. Prescott in 1982. This theory assumes that output is always at its natural level and all fluctuations in output are movements of the natural level of output not away from the natural level of output! They envisioned the factor shifting natural level of output to be technological shocks i.e., random fluctuations in the productivity level that shifted the constant growth trend up or down. Examples of such shocks include innovations, bad weather, imported oil price increase, stricter environmental and safety regulations, etc. The general gist is that something occurs that directly changes the effectiveness of capital and/or labour. This in turn affects the decisions of workers and firms, who in turn change what they buy and produce and thus eventually affect output. RBC models predict time sequences of allocation for consumption, investment, etc. given these shocks.

According to this theory, business cycle fluctuations to a large extent can be accounted for by real (in contrast to nominal) shocks. RBC theory sees recessions and periods of economic growth as the efficient response to exogenous changes in the real economic environment. That is, the level of national output necessarily maximizes expected utility, and government should therefore concentrate on the long-run structural policy changes and not intervene through discretionary fiscal or monetary policy designed to actively smooth out economic short-term fluctuations. According to RBC theory, business cycles are therefore "real" in that they do not represent a failure of markets to clear but rather reflect the most efficient possible operation of the economy, given the structure of the economy.

RBC models explain data ex post, and thus are highly sample specific, leading some to believe that they have little or no predictive power.



2.5.6 New political economy of the growth

This theory has an ambitious to incorporate into the model the policy factors incl. political institutions. It explores the relationships among economic growth and capital accumulation, political instability, political freedom and democratic institutions, and income inequality. Institutions are assumed to be a key determinant of economic growth. This theory states that the observed economic growth is the process of catching-up the gap between the actual and potential economic growth. “Wise” economic policies and well-working institutions might promote the economic growth. The representatives of the theory are P.A. Baran, A. Alesina, R. Perotti or M. Olson.



2.6 System of National Accounts

System of National Accounts (SNA) compiles economic and financial data in annual (and sometimes in quarterly) frequency. It offers the compact information about the economy including data on gross product, investment, capital transactions, government expenditure and foreign trade. The national accounts are primarily constructed to assist governments and others to make market-based macroeconomic policy decisions, including analysis of markets and factors affecting market performance, such as inflation and unemployment. The book System of National Accounts (1993), which was prepared by representatives of the International Monetary Fund, European Union, Organization for Economic Co-operation and Development, United Nations and World Bank, contains the international standard for measuring GDP. The publication is normally referred to as SNA93 to distinguish it from the previous edition published in 1968. Within each country GDP is normally measured by a national government statistical agency.

More detailed data at a lower level of aggregation is often available. Because national accounts data is notoriously prone to revision (because it involves a very large number of different data sources, entries and estimation procedures impacting on the totals). Apart from the flash estimates of the GDP figures even the "first final figures" may in fact be retrospectively revised several times because of new sources, methods or conceptual changes. The yearly revisions may be quantitatively slight, but cumulatively across e.g. ten years they may alter a trend significantly.

The system SNA includes the following main accounts:

- the production account (components of gross output)
- the primary distribution of income account (incomes generated by production)
- the transfers (redistribution) account (including social spending)
- the household expenditure account
- the capital account
- the (domestic) financial transactions account
- the changes in asset values account
- the assets and liabilities account (balance sheet)
- the external transactions account.

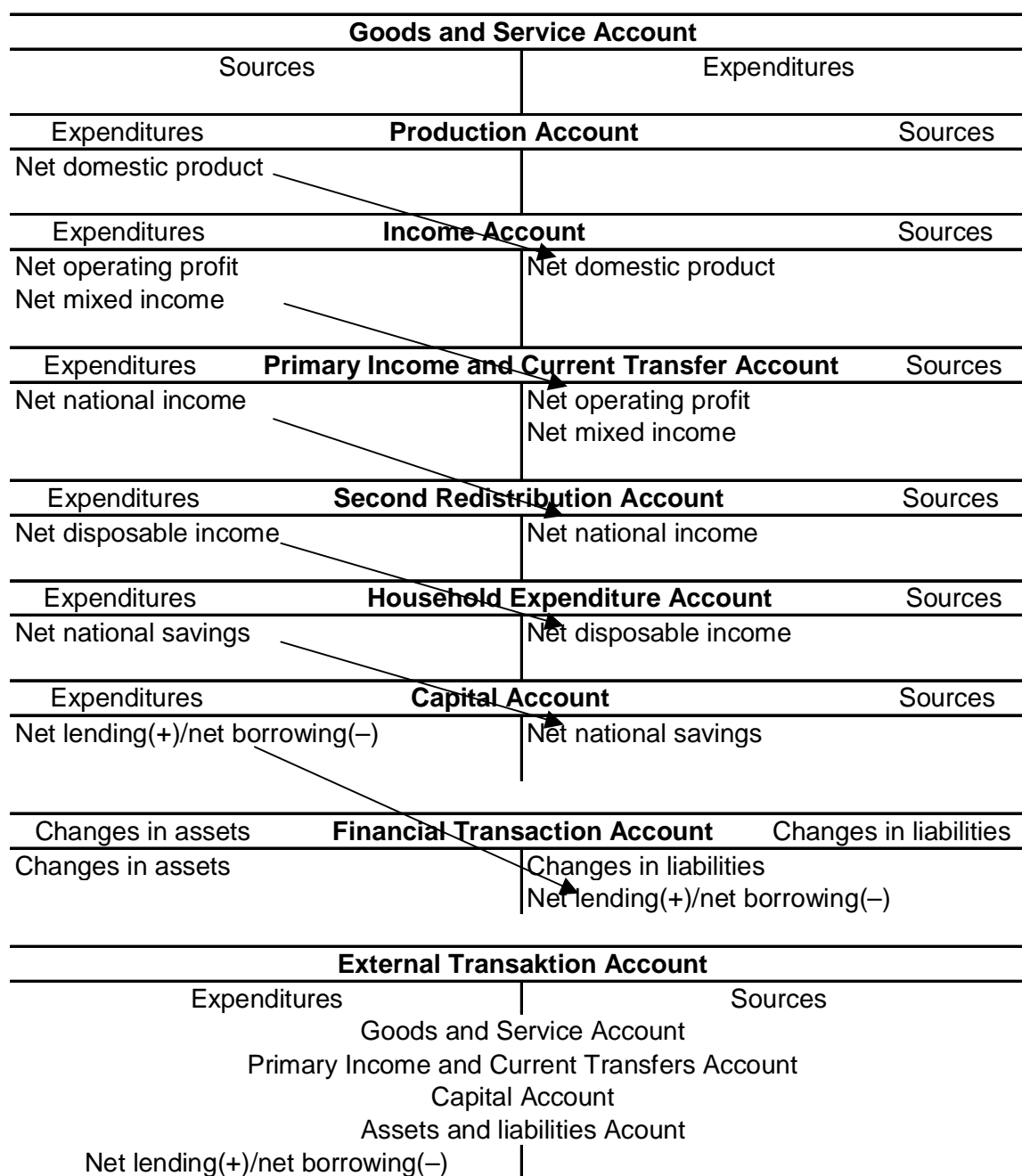


These accounts include various annexes and sub-accounts, and standards are also provided for input-output tables showing the transactions between economic sectors.

In Europe the macroeconomic data are published within The European System of National and Regional Accounts (1995 ESA, or simply: ESA). The ESA can be also described as an internationally compatible accounting framework for a systematic and detailed description of a total economy (that is a region, country or group of countries), its components and its relations with other total economies. The 1995 ESA is fully consistent with the revised world-wide guidelines on national accounting, the System of National Accounts (1993 SNA, or simply SNA). However, the ESA is focused more on the circumstances and data needs in the European Union. The ESA follows the **accrual-based accounting** standards. Accrued revenue and expenditure are recognized when the transaction is executed no matter when the cash is received.



Graph 11 Series of national accounts



Note: for more details see <http://unstats.un.org/unsd/sna1993/introduction.asp>.



GDP can be determined in three ways, all of which should in principle give the same result. They are the product (or output) approach, the income approach, and the expenditure approach.

The most direct of the three is the product approach, which sums the outputs of every class of enterprise to arrive at the total. The expenditure approach works on the principle that all of the product must be bought by somebody, therefore the value of the total product must be equal to people's total expenditure in buying things. The income approach works on the principle that the incomes of the productive factors must be equal to the value of their product, and determines GDP by finding the sum of all producers' incomes.

Keep in mind, that "Gross" domestic product include expenditure for replacing depreciated fixed assets. "Net" domestic product is net of capital depreciation cost. "Domestic" means that GDP measures production that takes place within the country's borders.

Production Approach – the GDP is a sum of the added value produced by various sections of the economy (agriculture, manufacturing etc.) within the country over a given time period (usually one year or one quarter). It doesn't include semi-final products such unplanned inventories to avoid double-counting errors.

Expenditure Approach - Components of GDP by expenditure:

$$Y = C + I + G + (X - M) \quad (2.7)$$

C is the private consumption or household final consumption expenditure for durable goods, non-durable goods, and services. It does not include the purchase of new housing.

I (investment) includes business investment in equipments. Spending by households (not government) on new houses is also included in Investment. In contrast to its colloquial meaning, 'Investment' in GDP does not mean purchases of financial products. Buying financial products is classed as 'saving', as opposed to investment.



G (government spending) is the sum of government expenditure on final goods and services. It does not include any transfer payments, such as social security or unemployment benefits.

X (exports) represents gross exports including goods and services produced for other nations' consumption.

M (imports) represents gross imports. Imports are subtracted since imported goods will be included in the terms G , I , or C , and must be deducted to avoid counting foreign supply as domestic.

A fully equivalent definition is that GDP (Y) is the sum of **final consumption expenditure** (FCE), gross capital formation (GCF), and net exports ($X - M$):

$$Y = FCE + GCF + (X - M) \quad (2.8)$$

FCE can then be further broken down by three sectors (households, governments and non-profit institutions serving households) and GCF by five sectors (non-financial corporations, financial corporations, households, governments and non-profit institutions serving households).

Note that C , G , and I are expenditure on final goods and services; expenditure on intermediate goods and services do not count. (Intermediate goods and services are those used by businesses to produce other goods and services within the accounting year.

Income Approach - this method measures GDP by adding incomes that firms pay households for the factors of production they hire: wages for labor, interest for capital, rent for land and profits for entrepreneurship.

The SNA divides incomes into five categories: (1) wages, salaries, and supplementary labour income, (2) corporate profits, (3) interest and miscellaneous investment income, (4) Farmers' income and (5) income from non-farm unincorporated businesses. These five income components sum to net domestic income at factor cost.

Total factor income = Employee compensation + Corporate profits + Proprietor's income + Rental income + Net interest



However, two adjustments must be made to get GDP: indirect taxes minus subsidies are added to get from factor cost to market prices. Depreciation (or capital consumption) is added to get from net domestic product to gross domestic product.

$$\text{GDP} = \text{compensation of employees} + \text{gross operating surplus} + \text{gross mixed income} + \text{taxes less subsidies on production and imports} \quad (2.9)$$

Compensation of employees (COE) measures the total remuneration to employees for work done. It includes wages and salaries, as well as employer contributions to social security and other such programs.

Gross operating surplus (GOS) is the surplus due to owners of incorporated businesses. Often called profits, although only a subset of total cost are subtracted from gross output to calculate GOS.

Gross mixed income (GMI) is the same measure as GOS, but for unincorporated businesses. This often includes most small businesses.

Production that is relatively independent and isolated from markets, or difficult to value in an economically meaningful way (i.e., difficult to put a price on) is excluded. Thus excluded are services provided by people to members of their own families free of charge, such as child rearing, meal preparation, cleaning, transportation etc. Most other production for own (or one's family's) use is also excluded, with two notable exceptions which are given in the list later in this section. Goods and services provided by governments and non-profit organizations free of charge or for economically insignificant prices are included. The value of these goods and services is estimated as equal to their cost of production. This ignores the consumer surplus generated by an efficient and effective government supplied infrastructure. Renovations and upkeep by an individual to a home that she owns and occupies are included. The value of the upkeep is estimated as the rent that she could charge for the home if she did not occupy it herself (we seek about **imputed rent**).



Graph 12 National Product and National Income

PRODUCT Value-added approach	INCOME Income approach	EXPENDITURE Expenditure approach
Agriculture Manufacturing & Construction Transport & Distribution Financial Services Health, education, etc. - semifinal production + indirect taxes - subsidies	Employee compensation + Corporate profits + Proprietor's income + Rental income + Net interest NET DOMESTIC INCOME at factor cost + capital depreciation GROSS DOMESTIC INCOME at factor cost + indirect taxes - subsidies	Private Consumption + Government Spending + Investment + Net Exports (X - M)
GROSS DOMESTIC PRODUCT in market prices		
-depreciation		
NET DOMESTIC PRODUCT		
+ income receipts from the rest of the world - income payments to the rest of the world		
NET NATIONAL PRODUCT	GROSS NATIONAL PRODUCT	
	-indirect taxes +subsidies	-depreciation
	NATIONAL INCOME	NET NATIONAL PRODUCT
		-direct and indirect taxes -social contributions +subsidies +social benefits + other households' transfers DISPOSABLE INCOME(C+S)

Disposable Income is a portion of an individual's income over which the recipient has complete discretion. To assess disposable income, it is necessary to determine total income, including not only wages and salaries, interest and dividend payments, and business profits, but also transfer income such as social-security benefits, pensions, and alimony. Obligatory payments, including personal income taxes and compulsory social-insurance contributions, must be subtracted. Disposable income may be used for consumption or saving. (It should be noted that employers' contributions to social insurance, are not deducted from the computation of disposable income).

Read more: <http://www.answers.com/topic/gross-domestic-product>

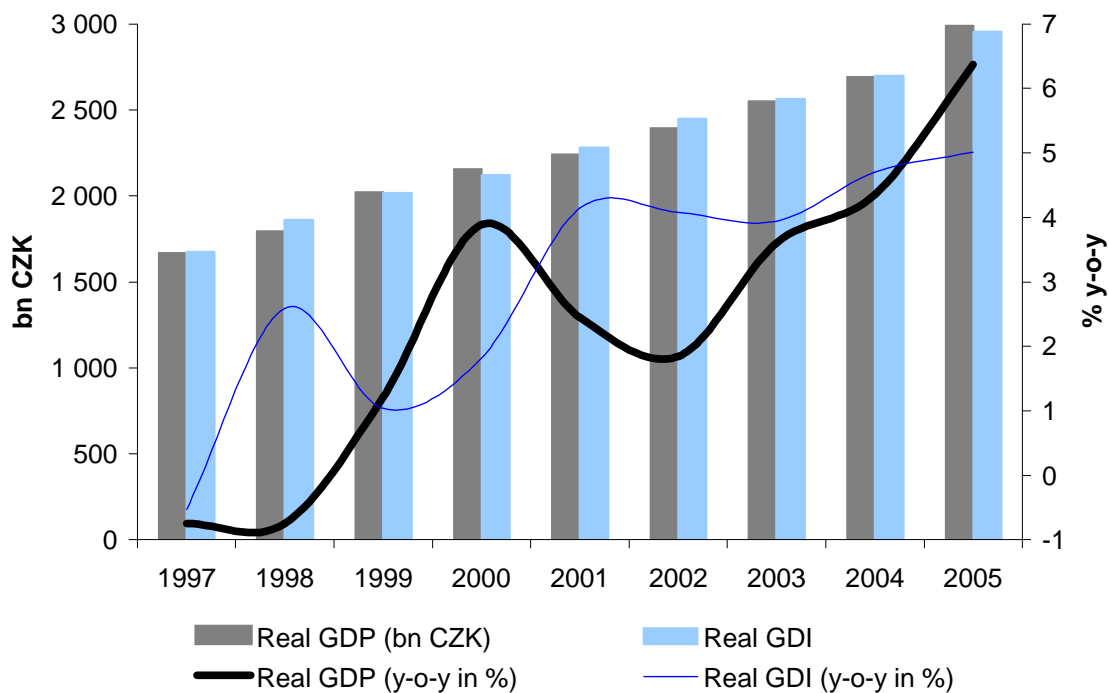


Box 2 Alternative measure of product

Real gross domestic income (real GDI) measures the purchasing power of the total incomes generated by domestic production (including the impact on those incomes of changes in the terms of trade).

It is equal to gross domestic product at constant prices plus the trading gain (or less the trading loss) resulting from changes in the terms of trade.

The real GDI is used to be published regularly within SNA/ESA.



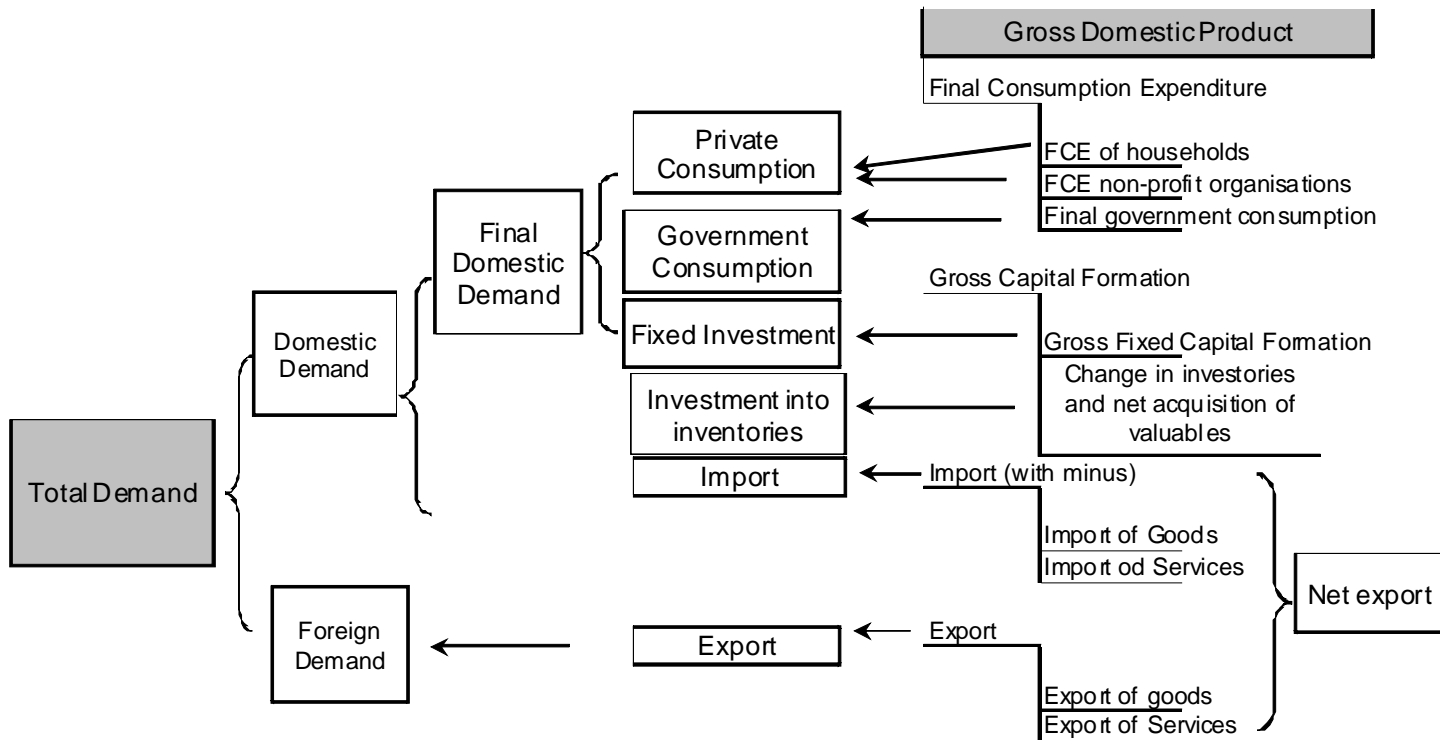
Source: CSU. *National Accounts*. Aug 2009.



2.6.1 Demand and its components

See the scheme below.

Graph 13 Demand Structure



On GDP and total demand we can demonstrate how to calculate the contribution of a component (such as household consumption or fixed investment) to the growth of any aggregate indicator.



Exercise: See the below table and calculate the contribution of given GDP components on the total GDP growth rate. And secondly, calculate the contribution of final domestic demand to the real GDP growth.

bn CZK	2001	2002	2003	2004	2005
Private Consumption	1174,0	1199,749	1271,52	1304,662	1341,48
Government Consumption	477,6	509,591	545,999	528,767	534,005
Gross Fixed Capital Formation	652,9	686,1	689,1	721,8	731,2
Inventories and Valuables	35,2	33,874	20,483	46,191	49,115
Net Export	-96,7	-146,4	-170,5	-152,9	-44,7
Export	1542,5	1575,2	1688,5	2044,1	2256,9
Import	1639,2	1721,7	1859,1	2196,9	2301,5
GDP	2242,9	2282,935	2356,577	2448,582	2611,185

We might apply two methods:

1. y-o-y changes of any component time the share of the given component on GDP at the period t-1(!)
2. or to divide the absolute change of any component by the absolute GDP change in t-1 period and multiply by the annual GDP rate growth.

We apply method 1:

GDP structure	2001	2002	2003	2004	2005
Private Consumption	0,52	0,53	0,54	0,53	0,51
Government Consumption	0,21	0,22	0,23	0,22	0,20
Gross Fixed Capital Formation	0,29	0,30	0,29	0,29	0,28
Inventories and Valuables	0,02	0,01	0,01	0,02	0,02
Net Export	-0,04	-0,06	-0,07	-0,06	-0,02
GDP	1,00	1,00	1,00	1,00	1,00

y-o-y (in %)	2001	2002	2003	2004	2005
Private Consumption	2,2	2,2	6,0	2,6	2,8
Government Consumption	3,6	6,7	7,1	-3,2	1,0
Gross Fixed Capital Formation	6,6	5,1	0,4	4,7	1,3
Inventories and Valuables	7,7	-3,7	-39,5	125,5	6,3
Net Export	46,3	51,4	16,5	-10,4	-70,8
GDP	2,5	1,8	3,2	3,9	6,6

Contribution to GDP (v pb)	2001	2002	2003	2004	2005
Private Consumption	1,1	1,1	3,1	1,4	1,5
Government Consumption	0,8	1,4	1,6	-0,7	0,2
Gross Fixed Capital Formation	1,8	1,5	0,1	1,4	0,4
Inventories and Valuables	0,1	-0,1	-0,6	1,1	0,1
Net Export	-1,4	-2,2	-1,1	0,8	4,4
GDP	2,5	1,8	3,2	3,9	6,6

Final Domestic Demand	2001	2002	2003	2004	2005
FDD	2304,5	2395,5	2506,6	2555,3	2606,7
Share on GDP	1,03	1,05	1,06	1,04	1,00
FDD y-o-y (in %)	3,7	3,9	4,6	1,9	2,0
Contribution to GDP (v pb)	3,7	4,1	4,9	2,1	2,1



2.7 Advanced Macroeconomic Indicators

From the data in SNA/ESA we can derive advanced macroeconomic indicators. There are some of them.

Openness of the economy:

- Export of goods and services / GDP
- Import of goods and services / GDP
- Foreign trade turnover (export + import) / GDP

Average propensity to consume (AMC): final consumption expenditure / disposable income.

Average propensity to save (AMS): national savings / disposable income.

Savings rate: gross national savings / GDP.

Investment rate: gross capital formation / GDP.

Self-financing rate: gross national savings / gross capital formation.

Margin rate: net operating surplus / NDP.

Redistribution rate: (indirect and direct taxes + social contributions) / GDP

Net lending/ Net borrowing of public sector – are not equal to public budget since the budget balance is net of capital expenditure.

Table 4 Public Balance a Net borrowing

CR, in % GDP	2005	2006	2007	2008
Net borrowing of government institutions	-3,58	-2,64	-0,61	-0,16
General Government Balance	-3,58	-2,64	-0,61	-1,46

Source: CSO. Notification of general government deficit and debt. Apr 2009. www.czso.cz



2.7.1 Macroeconomic Identities - overview

$$\mathbf{GDP = C + G + I + NX \text{ or } GDP = A + NX}$$

- C final household consumption expenditure
- G final government consumption expenditure
- I Gross capital formation
- A absorption or final domestic demand (C + I + G)
- NX Net export

$$\mathbf{GNI = GDP + IB}$$

- GNI Gross national income
- IB the balance of incomes received by residents from abroad minus incomes claimed by nonresidents.

$$\mathbf{GNDI = GNI + CTB}$$

- GNDI Gross national disposable income
- CTB the balance of current transfers (wages and other incomes) between residents and nonresidents

$$\mathbf{GNDI = C + G + S}$$

- S savings

$$\mathbf{CU = NX + IB + CTB}$$

- CU Current Account of Balance of Payment

By adjusting above formulas we get the next macroeconomic identity:

$$\begin{aligned} \text{GNDI} &= \text{GNI} + \text{CTB} \\ \text{S} + \text{C} + \text{G} &= \text{GDP} + \text{IB} + \text{CTB} \\ \text{S} + \text{C} + \text{G} &= \text{C} + \text{I} + \text{G} + \text{NX} + \text{IB} + \text{CTB} \\ \text{S} + \cancel{\text{C}} + \cancel{\text{G}} &= \cancel{\text{C}} + \text{I} + \cancel{\text{G}} + \text{NX} + \text{IB} + \text{CTB} \\ \text{S} &= \text{I} + \text{BU} \\ \mathbf{S - I} &= \mathbf{BU} \end{aligned}$$

This last identity reveals the source of external imbalance within balance of payment. For example, if national savings do not cover national investment in the economy.



Assigned reading

- BERNANKE, B. S. -- FRANK, R. H. *Principles of Economics*. Chapter 16-17 (up to page 460), Chapter 19-20 and Chapter 22 except the Section „The Natural Rate of Unemployment and Cyclical Unemployment“. Fourth Edition. USA: McGraw-Hill, 2009. 836 s. ISBN 978-0-07-128542-1.
- WORLD BANK (2008). *World Development Indicators*. April 2008. (photocopy)

Self-study

- BURDA, M. – WYPLOSZ, Ch. (2001) *Macroeconomics – A European Text*. Ch 3: Economic growth. p 44-67.
- STOCKMAN A. C. (1988). *Real Business Cycle Theory: a Guide, an Evaluation, and New Directions*.
<http://clevelandfed.org/research/review/1988/88-q4-stockman.pdf>
- ALESINA A. (1991). *Political Models of Macroeconomic Policy and Fiscal Reforms*. http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1992/09/01/000009265_3961003095320/Rendered/PDF/multi0page.pdf

Sources

- PASS, Ch. – LOWES, B. – ROBINSON, A. (1995). *Business and macroeconomics*. First edition, Routledge 1995. ISBN 0-415-12400-X.
- BURDA, M. – WYPLOSZ, Ch. (2001) *Macroeconomics – A European Text*. 3th edition. Oxford University Press, 2001. ISBN 0-19-877-650-0.
- www.oecd.org
- BLANCHARD, O. (2002). *Macroeconomics*. 5th edition, Prentice-Hall 2002, Ch 27. ISBN 0-13-110301-6.
- www.imf.org
- <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home>.



Exercises

1. Identify potential growth rate, if the share of capital on the total product is 30%, annual growth rate of capital 5%, labour force growth rate 1%, and the growth rate of aggregate labor productivity 3%.
2. Gross national income per capita in Croatia was in 2004 6820 USD. Expressed in purchasing power parity amounted to 11920 USD. Make a rough calculation ERDI and CPL. Determine whether the Croatian kuna undervalued or overvalued.
3. The Czech Republic in 2005 reached 73.7% of the average EU-25 GDP per capita in PPS. How many year it takes to the Czech Republic to reach the average economic level of EU-25, if the Czech economy is going to expand by 2 percentage points faster than the EU-25?
4. Calculate the sector's contribution to gross value added, if you know the following information:

Sectors / bn CZK	2004	2005
Agriculture, hunting, forestry	77 811	84 051
Fishing	719	509
Mining and quarrying	31 418	32 488
Manufacturing	627 866	745 644
Electricity, gas and water supply	92 947	109 041
Construction	157 251	168 974
Wholesale and retail trade; repair...	316 940	330 026
Hotels and restaurants	53 873	49 005
Transport, storage, communic.	266 118	274 297
Financial intermediation	89 922	88 795
Real estate, renting, business activities	315 005	354 394
Public administration and defence; social security	134 464	138 614
Education	101 293	109 142
Health and social work	91 766	97 762
Other community, social and personal service activities	78 717	74 387
Private households with employed persons	411	471
Gross Value Added at basic prices	2 436 521	2 657 600



5. Complete the following table and calculate current account deficit of the balance of payments.

Math symbols	Components	Value (bn CZK)
	Private consumption	1200
+	Government expenditure	600
+	Gross capital formation	800
+	Net export	50
=
+	Income balance between residents and nonresidents	-50
...	Gross national income	...
+	Current Transfer Balance	20
=
-	Final consumption expenditure	1800
...	Gross national savings	...

