Macroeconomics I. – Supplementary Materials

Economic Growth and Related Concepts

Ing. Milan Bednář, Ph.D.

Department of Economic and Social Policy

FACULTY OF ECONOMICS

Content

1. Importance of Economic Growth

2. Research of Economic Growth

3. Determinants of Economic Growth

4. Basic Relationships and Indicators

5. Production Function, Potential Output, Output Gaps

Importance of Economic Growth

Part I

Economic Growth and Production

— **Economic growth is crucial for the overall development of society and strongly affects other phases of the economic cycle, such as distribution, consumption and accumulation**

— The analysis of importance and position of **production process** in an economy is an important and often initial phase of any comprehensive macroeconomic analysis

  — This is due to its specific position in the economic cycle

  — It is the is closely linked to other areas of a national economy, e.g. consumption, investment, foreign trade or employment

  — The growth of production usually determines the development of these parts of an economy

Economic Growth and Production

— **While the relationship between production and living standards is not straightforward,** the overall well-being of society depends to a large extent on how many products and services a country is able to create over time and how production and pensions are distributed

 — **OECD:** Unweighted average current income of households in 30 OECD countries reached almost 73% of GDP in 2013

Economic Growth as Objective

— **Therefore, economic policy devotes such attention to stable and sustainable economic growth (/development)**

  — It is considered one of the main objectives of government (economic) policy, either directly or indirectly by stressing growth-influenced indicators such as employment

  — **Sustainable** because (mostly short-term or medium-term) economic growth can be achieved even without significant (internal and external) imbalances in an economy (which are harmful)

The Importance of Economic Growth

— **Economic (production) growth is considered one of the dominant objectives of economic policy for several reasons:**

  — Production growth is usually **linked to consumption growth**, that is, the rising standard of living and the overall well-being of the country's population

  — Production growth is closely **linked to investment growth**, on which not only economic growth but also the growth of national wealth depend

  — Finally, **better utilization of the country's production resources**, in particular the creation of new jobs, depends largely on growth in production

  — **Growth of labour productivity (GDP per worker)** and a country's **economic growth (GDP per capita)** are also driven by GDP growth

Growth Differences

— **Small differences in growth rates make large disparities in a long time period**

— **Example of two economies:**

— Economies A and B are at the same economic level

— Economy A is growing 1% per year

— Economy B is growing 2% per year (i.e. 1 pp. difference)

— **Results:**

— After 10 years: Economy A reaches 91% of economic level of B

— After 20 years: Economy A reaches 82% of economic level of B

— **After 100 years: Economy A reaches 37% of economic level of B**

Research of Economic Growth

Part II

Economic Growth – Research

— **Research boom started in 1950s and 1960s as governments had significant powers to influence economic development in the post-war recovery**

— Economic growth became one of the highest priorities in economic policy making

— **1990s:** Economic growth in some advanced economies accelerated again after 1970s and 1980s (e.g. in the US) and slowed down in other countries

— **International organisations (especially the EU, OECD and IMF) started to focus on the causes of different growth rates between countries**

Economic Growth – Research

— **They have been trying to identify factors, institutions, and policies that could potentially boost economic growth ever since**

— **Analyses have shown that so-called qualitative growth factors play an increasing role in addition to quantitative factors of physical capital accumulation and employment growth (the older view)**

— **The emphasis placed on the qualitative factors of growth was also reflected in economic theory**

  — I.e. the shift from neoclassical growth models to the so-called endogenous models that endogenize some of the mentioned factors

Economic Growth – Research

— **There are many qualitative factors, for instance:**

  — Institutional quality

  — Culture

  — Technological progress

  — Quality of human capital

  — Use of knowledge

  — Research and development, …

Economic Growth – Research

— However, the European debt crisis (for example) have shown that **significant shortcomings of existing approaches and theoretical concepts still exist**

— Putting emphasis on research of impacts of globalization of production, movement of goods and services, financial institutions, and science and research

— **The research is still in progress**

Total Factor Productivity (TFP)

— **The Neoclassical Growth Theory (1950s – R. Solow, T. Swan) was not able to explain economic growth very much**

  — The actual rate of growth in the US in 1909–1949 was only explained by 12.5% of changes in quantitative factors (labour and capital), the rest being unexplained

  — **That is why a third factor was added – technological factor or total factor productivity (as a residual)**

— **Furthermore, technological factor has been extensively examined**

Endogenous Growth Models

— **Neoclassical model could not adequately explain:**

 — The proportion of both production factors in product distribution

 — Non-inclusion of other sources of growth

 — Type of economies of scale

 — The existence of an open economy and its enlargement

 — Gaps between developed and developing economies

 — The lack of convergence between economies, etc.

— **-> Emergence of the so-called New Growth Theory**

 — The individual model approaches differ greatly from the emphasis on selected ommited aspects in the original neoclassical model

Endogenous Growth Models

— **They model the technological progress (endogeneous) and incorporate the effects of diverse policies that have been empirically identified as affecting long-term economic growth**

— The models work with the existence of imperfections in the markets, the existence of external effects, etc.

— **There also was a high optimism about the inclusion of human capital**

— … However, the issue of accurate quantification arised again

Current Situation

— **The differences in capital stock are minimal**

— **The differences resulting from the contribution of human capital (education) exist but fail to explain the significant differences that exist**

    — Moreover, both of these factors are imperfectly measured

— **TFP is responsible for about 2/3 of the differences between countries**

— **Therefore, the analysis of GDP differences was mostly abandoned**

Analyses of Economic Growth

— The production analysis is carried out in connection with the main components of **economic demand**, but also in relation to the main growth factors on the **supply side**

1. **Short-term analysis** attaches greater importance to changes in the main components of aggregate demand and their impact on GDP growth

2. **Long-term analysis** observes growth trends and must take into account the development of the country's major production resources efficiency in their use

Determinants of Economic Growth

Part III

Determinants of Economic Growth

— **Note:** the factors often include socio-economic / demographic factors, institutional factors, geographical and cultural differences, etc., which are difficult to **empirically verify and quantify**

 — Furthermore, it is difficult, if not impossible, to distinguish their influence from other factors

— **Institutional economics:**

 — Property rights, market allocation of resources, historical ties (e.g. colonial governance), political and civil liberties

 — Human capital, infrastructure, Innovation (R&D), externalities and spill-over effects (learning by doing), migration, population ageing, investment support, financial markets development

 — Quality of institutions, efficiency of bureaucracy, impact of tax burden, government spending, regulation of the economy

Determinants of Economic Growth

— **International organisations** devote some of their capacities to this research as well

— **Growth factors:**

  — The accumulation of physical and human capital

  — Education

  — Stable and low inflation, fitting macroeconomic policies, and healthy government finance supporting growth

  — Public spending and taxes (should be carefully planned)

  — R&D expenditures, use of new technologies

  — World trade – bringing comparative advantages, economies of scale and technological development still play an important role

  — Policies and institutions have an impact on resource allocation efficiency

Determinants of Economic Growth

— **Quality of institutions – IMF:**

— Institutions that protect property rights, support the rule of law, fight against corruption, make the necessary regulation of the product, production and financial markets, encourage macroeconomic stabilization and pursue social cohesion and stability are recommended

— **The current economic slowdown: some authors also began to talk about depleting the potential for further growth**

Determinants of Economic Growth

— **On the contrary, the alternative explanation emphasized the rapid growth of technology leading to the growth of (technological) unemployment**

  — Because the labour market is not able to react to the structural change in the economy that fast

  — The solution is to continue to increase labor market flexibility and to focus on skills that are difficult for artificial intelligence to handle; for example, various non-automated or non-routine activities

OECD: Going for Growth Publication

Figure 1.6. *Going for Growth 2019* priorities across main policy areas
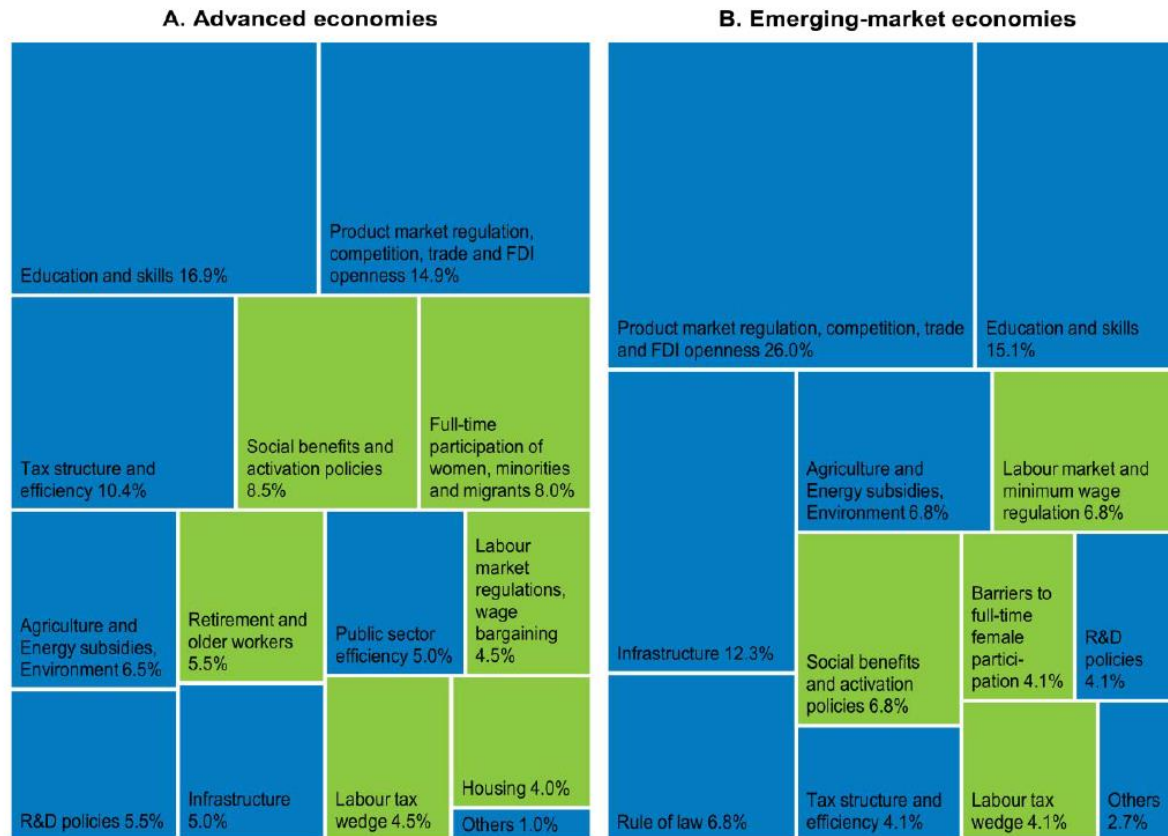
Note: The blue boxes indicate priorities primarily targeting labour productivity, and the green boxes indicates priorities primarily targeting labour utilisation. This distinction is only approximate, as many priority areas, e.g. education, can impact both labour productivity and labour utilisation.

Data source: OECD (2019) – https://www.oecd.org/economy/growth/Top-2019-economic-reform%20priorities-2019.pdf.

Basic Relationships and Indicators

Part IV

Basic Relationships

— **Changes in production are affected by both supply and demand sides**

— Growth factors determine the growth of potential output and thus the supply side (and indirectly also the demand side)

— Major demand-side components affect production changes by creating effective demand without which production (the supply side) could not be realised

— **Changes in demand tend to be decisive in the short term**, as there are usually unused production capacities that allow for an immediate increase in production in the event of increased demand for demand

— **Changes in supply usually determine long-term development (for both potential and actual product)**

Definitions of Basic Indicators

— **Growth formula (e.g. real GDP changes)**

$$g_t = \frac{Y_t - Y_{t-1}}{Y_{t-1}} = \frac{\Delta Y_t}{Y_{t-1}}$$

— **Nominal growth rate** = volume growth (real variable) * price growth (inflation)

— This can be approximated by just summing the growths (relatively very accurate for values < 10%):

$$g_{t,Nominal} \approx g_{t,Real} + \pi_t$$

Example: (1.03*1.025)-1 ≈ 3% + 2.5% = 5.5%

Year-On-Year (YoY) Growth Rates

— Formula for quarter-to-quarter changes is identical with the first one

— **However, sometimes is useful to assess year-on-year changes**

    — It may significantly reduce seasonal component

    — Absolute values: it is not as volatile as first differences

$$g_{t,q}^{YY} = \frac{Y_{t,q}}{Y_{t,q-4}}$$

Annualised Growth Rates

— Furthermore, the rates are sometimes converted to the so-called quarterly **annualised** growth rates (e.g. in USA – BEA):

$$g^A_{t,q} \;=\; \left(\frac{Y_{t,q}}{Y_{t,q-1}} \right)^4$$

— To convert these back, you need to take the 4th root (to neutralise the 4th power)

— The annualized pace is a **fictitious pace** that would only be the real growth rate if growth in the coming quarters were exactly the same as in the quarter

Production Function, Potential Output, Output Gaps

Part V

Production Function

— **It is the basic methodological tool for examining the impact of growth factors on GDP growth**

— It captures the relationship between output (GDP) and inputs (production factors) needed to produce it

— **It is a strong simplification / rough approximation, it is simply not possible to quantify the impact of all the (diverse) factors on supply-side growth in real GDP (such as education, structural change, innovation, etc.)**

Production Function

— The most commonly used production function assumes that GDP growth is determined by weighted quantitative growth in labour and capital

$$Y = (T,R,K,N,κ) \leftrightarrow F(K,N,κ)$$

— Y is the amount of production
— T is the amount of land (also forests or non-renewable resources such as metals or energy raw materials; sometimes more generally understood as part of natural resources)
— R is the amount of natural resources
— K is the amount of capital
— N is the amount of labour
— κ is the level of used technology (usually residual term)

Potential Output

— **A potential product (potential output volume) is the amount of product that is achievable with full use of available resources in the economy**

  — **It is not the maximum achievable amount**
  — Maximum output which can be sustained in the long term (i.e. consistent with stable inflation)

— **Three basic approaches (it can be mixed):**

1. **Use of economic indicators**

   — Capacity utilisation in industry, employment, etc.

2. **Time series econometrics** (usually Hodrick-Prescott or Kalman filter)

3. **Use of production function** (usually Cobb-Douglas production function)

33

Output Gaps

1. **Positive output gap (unstable, too high level of production)**

   — Strong growth in aggregate demand

   — Employment rate above full/natural employment (low unemployment rate)

   — High or accelerating inflation and capacity utilisation

2. **Zero/no output gap (stable, optimal level of production)**

   — Balanced, steady aggregate demand

   — Optimal, steady (un)employment rate, inflation, and capacity utilisation

3. **Negative output gap (unstable, too low level of production)**

   — Weak, insufficient aggregate demand

   — Employment rate below full/natural employment (high unemployment rate)

   — Low or falling inflation and capacity utilisation

Output Gaps

— **They are not directly observable**

  — We can only estimate it / try to guess it

— **We need to use economic and statistical theory**

— **Why do we need it:**

  — **Short-run guidance in macroeconomic policy calibration**

  — **Medium and long-run guidance in formulating structural reforms**

  — Use in sophisticated models, inferring other variables etc.

EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
Operační program Výzkum, vývoj a vzdělávání

MINISTERSTVO ŠKOLSTVÍ,
MLÁDEŽE A TĚLOVÝCHOVY

Národohospodářská fakulta VŠE v Praze