World Economy: Growth, Proportions, Efficiency, and Forecasting

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Abstract This chapter firstly describes the factors and main models of economic growth, as well as its dynamics in retrospect. Then, it analyzes the main economic proportions and indicators of macroeconomic efficiency in the world. At the end of the chapter, there is a section on the methodology and practice of macroeconomic forecasting.

1 Introduction

The term "economic development" (of firms, industries, countries, regions, and the world) is widely used in the economic literature (e.g., Todaro and Smith 2020). The economic development of a country is a process that primarily encompasses economic growth, improving the proportions in the economy (especially sectoral), as well as the level and quality of life. Similar definitions can be given to the economic development of the world and the region.

2 Macroeconomic Growth: Theories and Trends

When analyzing economic development, most attention is paid to the economic growth, because it usually leads to progress of the other elements of economic development in the long run.

However, there may be situations when economic growth is not accompanied by the progress of other indicators of the level of development from the long-term perspective, and there is growth without development. This most often happens in conditions when the GDP growth rate is lower than the population growth rate, as happened, for example, in most countries of Sub-Saharan Africa in the 1970s–1990s.

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In conditions of economic growth exceeding the rate of population growth, only some indicators of the level of development can deteriorate, as was observed in China, where the enormous growth of industry has led to severe environmental pollution. In this case, the term "growth quality" is more applicable, meaning a multidirectional movement of economic development indicators.

2.1 The Concept of Economic Growth and Its Calculation Methods

The economic growth of a country is the rate of growth of its GDP. To compare GDP for different periods, one has to calculate it without price fluctuations, or, as statisticians say, calculate real GDP (GDP in real terms).

According to the chain indices method, the prices of the previous year are used to calculate the GDP volume index for the reporting year in real terms. To build dynamics for a longer period, the indices calculated for each year to the previous year are chain-linked. Using this method, one can also obtain data on the dynamics of GDP for a long period in the prices of the year taken as the base for this period (the so-called constant prices).

According to the double deflation method, price indices for individual components of GDP are used to convert them into constant prices. Such price indices are called deflators (for example, consumer price index—CPI), and the price index created on their basis for the entire GDP is called the GDP deflator. For example, the US GDP for 2001–2021 grew 2.2 times in current prices, but growth in real terms (in constant prices) was 1.4, since the GDP deflator for this period was 1.6.

According to the extrapolation method, the dynamics of GDP and its components are calculated using quantitative indices that adequately reflect the dynamics of output growth/drop in each type of economic activity, for which a set of goods specialized for a particular type of economic activity is usually taken. However, this method is more often used to measure the dynamics of some industries.

It is also worth saying that the most correct measurement will be the dynamics of GDP per capita. For example, the population of the USA grew by 18% during 2001–2021, and therefore GDP per capita grew only 1.9 times. However, in practice, the growth rate per capita is measured less often than the dynamics of GDP.

As for large countries and regions, Table 1 considers their economic dynamics at the end of the twentieth–beginning of the twenty-first century against the background of the growth rates of the world economy.

Table 1 shows that a group of developed countries has reduced its economic growth rates in the twenty-first century compared to the end of the twentieth century. A group of less developed countries, having accelerated their economic growth at the beginning of the twenty-first century, then also began to reduce them. As a result, the world has entered an era of more moderate economic growth.

Table 1 World output, annual percent change

	Average 1991–2000	Average 2001–2010	2013	2016	2019	2020	2021	2022, projection
World	3.1	3.9	3.3	3.3	2.9	−3.0	6.0	3.2
Advanced economies	2.8	1.7	1.4	1.8	1.7	−4.4	5.2	2.4
USA	3.3	1.7	1.8	1.7	2.3	−3.4	5.7	1.6
Euro Area	2.2[a]	1.2	−0.2	1.9	1.6	−6.1	5.2	3.1
Germany	2.1	0.9	0.4	2.2	1.1	−3.7	2.6	1.5
France	2.0	1.3	0.6	1.0	1.8	−7.9	6.8	2.5
Italy	1.6	0.3	−1.8	1.3	0.5	−9.0	6.6	3.2
Japan	1.3	0.6	2.0	0.8	−0.2	−4.6	1.7	1.7
Emerging market and developing economies	3.6	6.2	5.0	4.5	3.7	−1.9	6.6	3.7
Regional Groups								
Emerging and developing Asia	7.4	8.5	6.9	6.8	5.3	−0.6	7.2	4.4
China	10.4	10.5	7.8	6.9	6.0	2.2	8.1	3.2
India	5.6	7.5	6.4	8.3	3.7	−6.6	8.7	6.8
Emerging and developing Europe	2.0[b]	4.4	3.1	1.9	2.5	−1.7	6.8	0.0
Russia	−4.0	4.8	1.8	0.2	2.2	−2.7	4.7	−3.4
Latin America and the Caribbean	3.3	3.2	2.9	−0.6	0.1	−7.0	6.9	3.5
Brazil	2.5	3.7	3.0	−3.3	1.2	−3.9	4.6	2.8
Mexico	3.5	1.5	1.4	2.6	−0.2	−8.1	4.8	2.1
Middle East and Central Asia	4.0[c]	5.3	3.0	4.6	2.2	−2.7	4.5	5.0
Saudi Arabia	2.7	3.4	2.7	1.7	0.3	−4.1	3.2	7.6
Sub-Saharan Africa	2.4[d]	5.9	4.9	1.5	3.1	−1.6	4.7	3.6
Nigeria	1.9	8.9	5.3	5.7	2.2	−1.8	3.6	3.2

(continued)

Table 1 (continued)

	Average 1991–2000	Average 2001–2010	2013	2016	2019	2020	2021	2022, projection
South Africa	1.8	3.5	2.5	0.7	0.1	−6.3	4.9	2.1

Source IMF. World Economic Outlook, April 2009; October 2022
[a]European Union
[b]Estimate, former USSR is not included
[c]Middle East only
[d]Including Northern Africa

2.2 Factors and Models of Economic Growth

Economic growth occurs due to the use of economic resources (otherwise called economic growth factors). Most economists of the twentieth to twenty-first centuries counted among them labor resources (labor, in terms of economics), natural resources (land), capital (both real and financial), and entrepreneurial resources (entrepreneurship). In recent decades, a fifth resource has been increasingly added to these four economic resources: knowledge, which has already become the main factor of economic growth in developed countries.

Theoretical models of economic growth have been created on the basis of economic growth factors (McConnel et al. 2017). The most famous ones are the neoclassical models of Cobb–Douglas and Solow, and the Keynesian models of Harrod and Domar.

The Cobb–Douglas model (more precisely, the Cobb–Douglas production function) is the simplest of economic growth models and can be applied in both micro- and macroeconomics. It is based on the simplest production function ($Y = f\ (K, L)$) and has the following form:

$$Y = AK^{\alpha}L^{\beta} \tag{1}$$

where Y is the volume of output in value terms (the volume of GDP or GNI at the macroeconomic level);

K—capital input (the amount of capital expenditure);

L—labor input (the amount of labor cost);

α—the share of capital in the total value of the labor and capital employed, varies from 0 to 1;

β—the share of wages in the total cost of labor and capital employed, $\beta = 1 - \alpha$; and

A—the coefficient of technological productivity; it reflects the contribution to the economic growth of all other economic resources (close to the indicator T in the Solow model, see below).

The Cobb–Douglas model is based on a number of assumptions. One of them is that capital and labor are interchangeable (i.e., equipment replaces employees, and vice versa), and therefore the coefficients α and β are introduced into the formula.

Another premise is that the coefficient of technological productivity changes slowly, is taken as a constant value in the short term, and is found empirically. This means that the Cobb–Douglas model primarily demonstrates how changes in the amount of capital and labor used affect economic growth. For example, if the parameter A provided 1% growth in previous years, the coefficients α and β were equal to ¼ and ¾, respectively, then if the volume of capital used this year increases by 4% and labor by 2%, then the rate of product growth will be 3.5%, since $1.01 \times 1.01 \times 1.015 = 1.035$.

The Solow model is also based on the simplest production function and represents the following system of equations in a simplified form:

$$
\begin{aligned}
&(1) \quad Y = Tf(K, L);\\
&(2) \quad Y = C + S;\\
&(3) \quad S = sY, \text{ where } 0 < s < 1;\ s = \text{const};\\
&(4) \quad S = I;\\
&(5) \quad I = K' + \mu k, \text{ where } 0 < \mu < 1,\ \mu = \text{const};\\
&(6) \quad L = gL',\ g = \text{const},
\end{aligned}
\tag{2}
$$

where T is the so-called Solow residual, interpreted as the efficiency of using all the combined factors of economic growth (total factor productivity, multifactor productivity);

C—the volume of final consumption;

S—the volume of gross savings;

s—the rate of gross savings;

I—investment (gross capital formation, investment in real capital);

K'—net capital formation (excluding depreciation);

μ—the rate of depreciation;

L—labor;

L'—growth of workforce;

g—the rate of use of workforce increase growth.

This means that the Solow model demonstrates the dependence of economic growth primarily on aggregate factor productivity, labor force growth, and investment in real capital. At the same time, the cumulative factor productivity primarily reflects the contribution of innovation and professional development to economic growth, although in some cases it may be something else (for example, a decrease in the cost of raw materials used due to conjunctural changes in prices).

Based on the Solow model, the Romer model (with a more detailed analysis of scientific and technological progress), the Barro model (including behavioral and institutional factors, such as economic policy), the Acemoglu–Johnson–Robinson model (with an emphasis on the analysis of institutions), the Nordhaus model (including natural resources and environmental damage), and others were created. Economic growth models do not sufficiently take into account the impact of the global economy on the national economy, without showing, for example, what specific

contribution to the total factor productivity is made by the country's participation in the international transfer of knowledge. Nevertheless, these models as a whole can reveal the quantitative contribution to the economic growth of labor, capital, and total factor productivity to economic growth as a whole. For example, the contribution of this productivity to world economic growth in 1950–1980 was about 44%, and in 1980–2010 about 33%.

Modern scholars working within the framework of unified growth theory and historical political economy include an even larger set of variables of economic growth in the factors of long-term economic growth—inequality in the distribution of factors, barriers to entry into industries, the level of education of the population, etc., (for more details, see chapters "World Economy Major Trends: Evolution of National Economic Systems" and "USA").

The proponents of the neoclassical trend emphasize the growing contribution of total factor productivity to economic growth, especially in developed countries, where labor growth is comparatively low, and investment growth is limited by declining capital productivity (capital-output ratio) and slowly growing demand for investment from the service sector, which dominates their post-industrial economy. In less developed countries that are still building or completing an industrial economy, the Keynesian approach is more popular, according to which one can influence economic growth primarily through investment. According to Keynesians, it is investment that generates a multiplier effect leading to GDP growth (at the same time they recognize the acceleration effect, i.e., that different prospects for GDP growth generate different inflows of investment into the economy).

For example, in the Domar model, the absolute increase in GDP/GNI is the result of the interaction of investment growth and capital-output ratio, which shows the ratio of investment to GDP/GNI growth

$$\Delta Y = \Delta I / R, \tag{3}$$

where ΔY—the increase in national income;

ΔI—growth of investment in real capital;

R—capital-output ratio.

The Harrod model emphasizes the dependence of growth rates not only on the capital-output ratio, but also on the rate of gross savings (assuming it is equal to the rate of gross capital formation (rate of investment):

$$\Delta \mathrm{Yt} / \Delta Yt{-}1 = \Delta It / \Delta It{-}1 = s/R. \tag{4}$$

The latter two models are very similar and are therefore often called the Harrod–Domar model, although the Harrod model is more detailed. For example, it uses the concepts of not only actual growth rate, but also natural and warranted growth rates. According to Harrod, the natural growth rate is such a steady growth of the national economy, in which the entire population growth is used, that all the possibilities of increasing labor productivity are also used and which would take place, even if there were no unemployment, underloaded production capacities, and periodic economic

crises, i.e., the maximum possible growth rate for the national economy (therefore it is sometimes called potential growth, potential GDP).

As for the difference between actual growth rate and potential growth rate, Harrod introduces a new category—warranted growth rate. This is the economic growth in which entrepreneurs are satisfied that they did the right thing, although the economy is not in a state of full capacity utilization and full employment. In many subsequent studies, guaranteed growth is called the growth rate of a country's economy in a historical perspective, or simply its historical growth rate (sometimes even natural growth rate, although Harrod's term "natural" has a different meaning). For example, the historical growth of US GDP per capita over the past 60 years has tended to be 1.9% per annum. Harrod explained the attraction of a developed economy to a guaranteed (historical) growth rate by the relative constancy of the gross savings rate in the country due to the inactivity in the long term of the marginal propensity of the country's population to save, as well as due to the fact that inventions that increase capital intensity are balanced by the inventions that save capital.

2.3 Instability of Economic Growth

Economic growth models help to determine the contribution of various economic resources and their effectiveness, but do not determine the causes of instability in the growth of national economies. Still, the fact that the growth of national economies is unstable both in the short term (by quarters), in the medium term (by years), and in the long term (by decades)—and, moreover, is accompanied by crises (during a crisis, economic growth rates become, as economists sometimes say, negative)—is obvious.

At the level of medium- and long-term fluctuations, this is caused by the following reasons:

- as the level of economic development of those less developed countries that have caught up with developed countries increases, the growth rates of their GDP begin to approach the moderate rates of these leaders. Recent examples are the Japanese economy, which caught up with the advanced economies of Europe and America in terms of development in the 1980s and then sharply slowed down, as well as the Chinese economy, which began to slow down its growth in the last decade as the phase of active industrialization was completed;
- the growth of all market economies is still cyclical, and economic theory pays considerable attention to the causes of medium- and long-term cycles. At the same time, special attention is paid to such reasons as over-accumulation of capital (before real capital, now financial capital) in the medium term (these are Kitchin cycles from 2 to 5 years, and Juglar cycles from 7 to 11 years), and mismatch of supply and demand for investment goods and change of technological patterns in the long term (this is reflected by the Kuznets building cycles of about 15–25 years, and Kondratiev cycles of 45–60 years);

- the country's economic growth is also affected by other factors that dramatically increase or decrease the volume and efficiency of using its economic resources (volatility of world prices for the country's export products, fluctuations in the inflow of foreign capital, the effectiveness of the country's institutions and economic policy in different years, the discovery of new deposits of natural resources, the combination of periods of good weather with periods of natural disasters, etc.). Non-economic aspects also have a strong impact on economic growth. They include political (especially wars), social (primarily strikes, unrest, revolutions), cultural ones (for example, the rejection of new institutions by the population), and, of course, epidemics and pandemics.

Due to the instability of growth rates, one should consider them in retrospect (preferably over several decades) to identify medium-term and long-term fluctuations and hypotheses about the causes of these fluctuations.

The analysis of economic dynamics also involves a detailed consideration of the causes of fluctuations in economic growth in the short term. At the same time, the seasonal character of these fluctuations should be taken into account. For example, in many countries, the first quarter of the year involves fewer working days, which affects the volume of output, and the last quarter of the year is characterized by a large volume of pre-New Year retail turnover and final year tax payments of legal entities. If one cannot level seasonal fluctuations, the volume of output of the studied quarter is compared with the same quarter of the previous year.

The analysis of economic growth in the short term is especially relevant during the years of economic crisis, when everyone is interested whether the crisis has reached the bottom and whether there are signs of a reviving economic growth. Then they especially carefully consider the latest indicators of the macroeconomic conjuncture, although they are relevant during the period of economic growth.

2.4 The Growth Rates of the World Economy in Retrospect

Despite the unstable dynamics, the world economy is growing faster every century (but not every decade). However, the trend toward accelerating economic growth has different effects in different countries and regions and in different time periods.

For thousands of years, the standard of living of mankind has changed little from generation to generation. Economic development was very slow due to very low economic growth rates. The situation changed in the second millennium: the growth rate of GDP in the world began to accelerate. This is especially evident when recalculating economic growth rates per capita (for this, the GDP growth rate is reduced by the population growth rate, although this is a simplified version) (Table 2).

As Table 2 shows, the average annual growth rate of the world's population per capita was zero in the first millennium A.D., while in subsequent centuries it increased to hundredths of a percent, and in the last hundred and more years it has already been several percent. The acceleration of economic growth began in Western Europe, the

Table 2 The world's GDP growth rate per capita over the past two millennia, %

Country and region	Indicator										
	1–1000	1000–1500	1500–1820	1820–1870	1870–1913	1913–1950	1950–1973	1973–2003	2000–2012[a]	2015	2019
USA	0.00	0.00	0.36	2.19	1.76	1.21	2.60	1.80	0.90	2.1	1.8
Western Europe	−0.03	0.12	0.14	0.98	1.33	0.76	4.05	1.87	0.80	1.8[b]	1.1[b]
Japan	0.01	0.03	0.09	0.19	1.48	0.88	8.06	2.08	0.70	1.3	0.9
Central and Eastern Europe	0.00	0.04	0.10	0.63	1.39	0.60	3.81	0.87	5.00	4.1	1.2
Former-USSR countries	0.00	0.00	0.10	0.63	1.06	1.76	3.35	−0.38	5.30	−2.5[c]	1.4[c]
China	0.00	0.06	0.00	−0.25	0.10	−0.56	2.76	5.99	9.90	6.4	5.7
India	0.00	0.04	−0.01	0.00	0.54	−0.22	1.40	3.14	6.20	6.8	4.0
Other East Asian countries	0.00	−0.05	0.01	0.09	0.82	−0.24	2.89	3.23	…	3.4[d]	3.2[d]
Western Asia	0.02	−0.01	0.01	0.40	0.79	1.45	4.47	0.65	2.40	0.6[e]	0.15[e]
Latin America	0.00	0.01	0.16	−0.04	1.86	1.41	2.60	0.83	2.30	−1.4	−0.1
Africa	−0.01	−0.01	0.00	0.35	0.57	0.91	2.02	0.32	2.40[f]	0.1[f]	−0.4[f]
The world as a whole	0.00	0.05	0.05	0.54	1.31	0.88	2.91	1.56	1.50	1.6	1.4

Sources Maddison (2007); World Bank Open Data

[a]Author's calculations; [b]Euro Area countries; [c]only Russia; [d]including India; [e]including North Africa; [f]Sub-Saharan Africa

homeland of the industrial revolution, then it happened in the USA, Central and Eastern Europe, and Japan, before spreading to the rest of the world.

It was primarily the new knowledge gained by scientists that helped to accelerate economic growth. Their achievements, which have been like an avalanching in the last 200 years, have led to the fact that knowledge, which was not allocated by the classics of economic theory as a separate economic resource along with labor, capital, land, and entrepreneurship, has become such a resource, and at the same time no less important—if not more important—than other economic resources. It was the countries that generated knowledge and whose economy successfully adapted it (the latter is very important, as the example of China showed, where many inventions were made in the last millennium, which were poorly or almost not used due to the immunity of the Chinese traditional economy to these inventions). Firstly machines, and then chemistry, electronics, and biology, immeasurably increased the productivity of the economy.

Another important reason for the acceleration was the increase in gross savings and accumulation rates. The gradual increase in the welfare of mankind has increased its ability to save and invest more. This has increased the capital–labor ratio of employees and, accordingly, labor productivity, especially when real capital is becoming more productive (based on scientific achievements), and the employee themself is becoming more educated.

Another important reason for the acceleration was globalization. By contributing to the growth of the most competitive goods and services on the world market, and stimulating the movements of economic resources around the world, it accelerates economic growth in the countries actively participating in globalization. Indirectly, this is confirmed by the period of 1913–1950, when the pace of economic growth in the world fell not only because of the two World Wars and the Great Economic Depression, but also because of the curtailment of international economic relations.

According to the calculations of the British economic historian Angus Maddison, GDP per capita in constant prices over the past millennium has grown in the world as a whole by 14.5 times. However, GDP grew unevenly across the regions of the world: whereas in the USA, Western Europe, and Japan it increased 72.5, 47, and 50 times, respectively, then in Central and Eastern Europe it increased 16 times, the Russian Empire (Commonwealth of Independent States) 13.5 times, China 10.5 times, India 5 times, and in Africa only 3.5 times (Maddison, 2007). It can be concluded that the acceleration of economic growth has increased the level of development of all countries of the world in retrospect, but to varying degrees.

As a result, the gap in the levels of economic development between the countries of the world, which existed before, has sharply increased, and the difference between developed and less developed countries became more obvious than before. The latter are faced with the task of catching up with advanced countries, or the task of catch-up development, which is possible only by accelerating economic growth in countries of catch-up development. In the last decade, China, India, and other Asian countries (primarily new industrial ones) took the path of reducing the gap with developed countries. Other regions of the less developed world have more modest rates of catching up.

Developed countries face another problem—maintaining rather high growth rates of about 2% per capita for the developed world. Although this is lower than during the recovery of the world economy after two World Wars (1950–1973), it is higher than the pace of the first wave of globalization (1870–1913). However, at the end of the twentieth to beginning of the twenty-first century, these rates in the most developed countries are below 2%. The reason may lie primarily in the decline in the growth rates of knowledge and labor in this group of countries (the so-called new normal—chapter "World Economy Major Trends: New Normal, the Forth Industrial Revolution, Globalization, Sustainable Development").

3 Proportions and Efficiency

Economists are interested in the proportions into which the GDP of the world, regions, and countries is divided, which helps them to better analyze the structure of GDP. At the same time, they analyze the efficiency of GDP production.

3.1 Macroeconomic Proportions

Primarily, this is the sectoral structure of GDP. As mentioned in paragraph 1.3, as the level of economic development increases, the share of the primary, and then the secondary, sector in GDP decreases, and the share of the tertiary sector increases. The main reason for the growth of the share of the tertiary sector is considered to be the growth of incomes of the population, which, as is known, increases spending on services. For example, the average Chinese family spent about a third of their income on services in 2013, while in 2020 it was about half.

A comparison of the sectoral structure of GDP and the structure of employment by sector also helps to analyze labor productivity by sector and industry. According to Table 3, it was 3.6 times lower in the Chinese primary sector, while in the secondary and tertiary it was 1.4 and 1.1 times higher than the average Chinese labor productivity.

Table 3 The shares of the three sectors in Chinese GDP, %

Sector	1980	2000	2019	2020	Share in employment, 2019
Agriculture, incl. forestry and fishery	29.6	14.7	7.1	7.7	25.3
Industry, incl. construction	48.1	45.5	38.6	37.8	27.4
Services	22.3	39.8	54.3	54.5	47.3

Source World Bank Open Data

An important proportion is the share of savings (gross savings) in GDP (the rest of GDP goes to consumption). Industrialization requires a large rate of savings, which traditionally presents a challenge for the countries starting industrialization. However, when entering the post-industrial stage with its emphasis on services, the need for a high rate of savings decreases, since the production of services is usually less capital-intensive compared to the production of goods, and investments in human capital are mostly considered in statistics as consumption expenditures. In addition, statistics also include the current account balance in savings, which is usually positive for commodity exporting countries.

The overwhelming part of savings goes to investment and partly to the export of capital, including replenishment of official reserve assets (see chapter "Balance of Payments"). The rate of investment (rate of gross capital formation) reflects investment in fixed assets plus an increase (decrease) in working capital stocks (if they are excluded, it is called the gross fixed capital formation rate). The investment rate in most countries (but by no means in all) is close to the savings rate. The difference between two rates is covered by net inflow (outflow) of capital abroad (from abroad) (see chapter "Balance of Payments"). Table 4 actually demonstrates that the net inflow of capital to the USA increases the rate of savings to a higher rate of investment in this economy, while in other economies it decreases.

Labor-related proportions are important for economic analysis. Firstly, this is the share of economically active population in the entire population of the country—the higher it is, the greater the contribution of labor to the economic development of the country can be. A large proportion of elderly people, caused by both an increase in life expectancy and a lagging retirement age, reduces this proportion in developed countries. The majority of the least developed countries are characterized by another problem—a large proportion of children and adolescents, caused by high fertility rates in these countries. Although the share of the working-age population is the

Table 4 Savings and investment rates in countries and regions of the world in 2021, % of GDP

Country and region of the world	Savings	Investment
Developed countries	24.1	22.5
incl. USA	20.0	21.4
Euro Area	26.4	22.8
Japan	28.1	25.2
Less developed countries	33.4	32.7
incl. China[a]	45.0	44.0
India[a]	31.0	29.0
Russia[a]	27.0	24.0
Brazil[a]	15.0	15.0
South Africa[a]	15.0	13.0

Sources IMF. *World Economic Outlook*, April 2022; World Bank Open Data
[a]2020

highest in Asia, however, it is due not so much to a large birth rate as to a low life expectancy. In Europe, on the contrary, a high proportion of the working-age population is caused by a low birth rate (Table 5).

Another proportion related to labor resources is the unemployment rate, i.e., the share of unemployed in the economically active (working or looking for work) population. Historical statistics show that the tangible rate of unemployment can be seen in industrial and post-industrial countries, while in less developed countries it is absorbed by extensive agriculture and traditional services, turning open unemployment into the hidden one (as, for example, in India). Besides, the lack of a developed system of insurance and unemployment registration makes potential unemployed there to accept any job, primarily in the mentioned industries (Table 6).

An important economic proportion is the share of government spending in relation to the country's GDP. Along with the share of the public sector in GDP production, it shows the role that the state plays in the economic and social life of the country. One

Table 5 The age structure of the population in the world and its regions

Region	The entire population	Up to 14 years old inclusive	15–64 years old	65+ years old
Europe	100	16.1	64.8	19.1
North America	100	18.1	65.1	16.8
Latin America	100	23.9	67.1	9.0
Asia	100	23.5	67.7	8.9
Africa	100	40.3	56.1	3.5
Oceania	100	23.6	63.6	12.8
World	100	25.4	65.2	9.3

Source United Nations Demographic Yearbook 2020. New York: UN

Table 6 Unemployment rate in countries and regions of the world

Country and region	1913	1950–1973	1973–1998	2010–2013[a]	2014–2019[a]	2021
USA	4.3	4.6	6.6	8	5	5.5
Western Europe	1.5[a]	2.9	7.1	12[b]	10[b]	7.8[a]
Japan	–	1.6	2.3	4	3	2.8
China	–	–	–	5	5	4.8
India	–	–	–	4	3	6.0
Russia	–	–	–	6	5	5.0
Brazil	–	–	–	5	11	14.4
South Africa	–	–	–	22	26	33.6

Source Bolto, A. and Toniolo, G. (1999). "The Assessment: The Twentieth Century – Achievements, Failures, Lessons", *Oxford Review of Economic Policy*, 15(4); World Bank Open Data. https://data.worldbank.org/indicator

[a]Estimate; [b]Euro Area

Table 7 Government expenditure to GDP in developed countries, %

Country	1913	1938	1950	1973	2000	2014	2020
USA	8	20	21	31	32	38	46
Germany	18	42	30	42	47	45	51
France	9	23	28	39	54	57	62
United Kingdom	13	29	34	42	41	48	50
Japan	14	30	20	23	44	41	47

Source Maddison (2006); Bolto, A. and Toniolo, G. (1999). "The Assessment: The Twentieth Century – Achievements, Failures, Lessons". *Oxford Review of Economic Policy*, 15(4); OECD.Stat

should look at this indicator in retrospect on the example of the leading developed countries (Table 7).

Table 7 shows an impressive increase in government spending in developed countries over the past hundred years. However, it should be borne in mind that this is a consequence not so much of the growth of state spending on the economy as of state social spending, primarily on human capital (education, healthcare, housing, science).

3.2 Macroeconomic Efficiency

Macroeconomic efficiency means obtaining the maximum possible benefits from the economic resources available at the country's disposal. Macroeconomic efficiency is achieved by ensuring both cost efficiency (in which products are made with the lowest possible costs in the country) and resource allocative efficiency (a set and quantity of products made in accordance with the buyers' needs, which gives the greatest return on the economic resources available to the country) and dynamic efficiency (the volume and structure of output are supported by appropriate investments and consumption). In economic theory, this corresponds to Pareto optimality, and for dynamic efficiency (the potential rates of economic growth). However, when analyzing the effectiveness in achieving the goals and objectives set for the country, the term "economic effectiveness" is used.

It is best to analyze the parameter T of the Solow model (i.e., the total factor productivity) to measure economic efficiency. However, in most countries, there are no systematic statistics on its size, and instead the statistics on its growth rates are published more often. According to the OECD, the average annual growth rates of aggregate factor productivity in 2001–2007 in the USA amounted to 1.4%, Germany to 1.1%, Japan to 1.1%, while in 2012–2019 they amounted to 0.3, 0.6, and 0.5, respectively; this means that this rate decreased.

Therefore, labor productivity (sometimes just productivity) is more often used as the most aggregated indicator of macroeconomic efficiency, i.e., the volume of GDP production (preferably in PPP terms) based on the number of employees, or (even

better) based on the number of hours worked. For example, in 2020, the GDP by PPP in the USA amounted to $20,953.0 billion (according to the World Bank), and the average annual number of employed is 147.8 million people; therefore, labor productivity in the whole country for the year amounted to $141,766. However, unregistered employment is high in the USA, and therefore the real number of employed people is several million more than the official figure.

In addition, this indicator in the countries exporting raw materials and fuel is derived from the volume of GDP, which depends on world prices of these export goods. Therefore, in such countries, it is better to consider labor productivity in the manufacturing industry.

The dynamics of labor productivity are also important. According to the World Bank, during 2001–2020, the index of GDP (in constant prices) per person employed in Brazil was 221%, and in Nigeria it was 296%: the average annual labor productivity rates in these countries were 4.3 and 5.9%, respectively. In developed economies, it grew by about 1% per year (which is two to three times lower than at the end of the twentieth and the beginning of the twenty-first century), but its growth is projected to accelerate in the current decade.

Indicators of the efficiency of capital and natural resources are widely used in macroeconomic statistics. These are primarily the indicators of the use of real capital, especially capital intensity, as well as indicators of material and energy intensity (materials- and energy-output ratio, materials- and energy-to-GDP ratio, materials- and energy intensity).

Capital to GDP ratio at the macroeconomic level is defined as the ratio of the cost of fixed capital to the volume of GDP. For example, in 2020 in the USA, the volume of fixed assets amounted to $65,150.3 billion and the aforementioned ratio was $65,150.3: $20,953.0 = 3.11. Therefore, the production of $1 of the GDP in the USA required $3.12 of fixed assets.

Material consumption throughout the economy is difficult to calculate due to the large nomenclature of raw materials and other materials used. Therefore, in practice, such indicators of material intensity as the consumption of steel, cement, timber, etc., per unit of GDP are used.

The energy intensity of the national economy is usually calculated as the ratio of the volume of primary energy consumption (in tons or kilograms of oil equivalent—toe or koe) in relation to GDP, preferably by PPP). Its inverse indicator is energy intensity (energy-output ratio, energy-to-GDP ratio), which is calculated as the ratio of GDP to physical volume to the volume of primary energy consumption to GDP. International comparisons give a very motley picture of energy intensity: in the past decade, in Canada, $5.7 of GDP by PPP was produced for every kilogram of oil equivalent consumed, $7.8 in the USA, $18.0 in Malta, and $26.8 in Hong Kong, which speaks not so much about the efficiency of energy consumption in Malta and Hong Kong as about the presence or absence of energy-intensive industries in the country, as well as about the difference in climate—otherwise in the last two countries energy intensity would not be much better than in the USA and Canada.

Therefore, it is better to compare the dynamics of energy intensity than cross-country energy output (energy intensity of energy output) in the country. For example,

in 2000–2020, energy intensity in the world decreased at an average annual rate of 1.4%, but this was primarily in developed countries.

One can also try to measure the efficiency of the country's economic model (see chapter "World Economy Major Trends: Evolution of National Economic Systems"), if it is compared with the economic models of the countries of a similar level of development in the three areas: the pace of economic growth, improving proportions, and improving the level and quality of life.

4 Macroeconomic Forecasting

4.1 Macroeconomic Forecasting and Its Main Methods

The exact information about the future is unknown, especially in the conditions of the new normal (see chapter "World Economy Major Trends: New Normal, the Forth Industrial Revolution, Globalization, Sustainable Development"), but economic agents all over the world have to make decisions now, the result of which will be known only in the future. Whether signing in the beginning of the year a contract for the supply of goods at the end of the year, enrolling in a university to receive a diploma in a few years, or making investments to produce products in ten years, all economic agents have to act in conditions of economic uncertainty, i.e., the lack of information about the future. To overcome it, economic forecasting is used. It implies scientific foresight in the form of forecasts (Summers 2015).

Forecasts (scenarios, projections) are very different, but this book mainly deals with macroeconomic and global forecasts of economic growth. They can be short-term (for a year or two), medium-term (up to five or seven years), or long-term (from five–seven years to several decades).

Macroeconomic forecasts are compiled by analytical organizations, large companies and banks, ministries and departments, international organizations, universities, and individual economists. Various methods are used for forecasting, often in combination:

- a method of analogies based primarily on the extrapolation of trends. The future is formed under the influence of the same trends that existed before and during the preparation of the forecast. Extrapolation is the main method for short-term forecasts, but it does not suit for the medium- and long-term forecasts;
- the scenario method. There are usually three possible scenarios at the same time: optimistic, pessimistic, and the most probable between them (baseline). Consumers of forecasts should be guided by the latter scenario, but be prepared for pessimistic and optimistic scenarios;
- expert assessments. To make judgments about the future, numerous experts are involved, who make their own forecasts, which are then generalized (the Delphi

method). The most extreme of individual judgments are usually not taken into account (consensus forecast). Sometimes the forecast is made by hundreds and thousands of experts (foresight method), and sometimes even by one;
- building a goal tree. This method takes into account the numerous connections between the elements of the forecast by comparing the benefits and risks of alternative decisions that may be taken in the future;
- modeling—primarily the mathematical method. This is based on cross-sectoral input–output tables, multiple regression analysis, game theory, and other mathematical methods;
- connecting different forecasts. The average value of forecast indicators is output on this basis.

4.2 Short-Term Forecasts

The short-term macroeconomic forecast is most often based on how the components of GDP by expenditure will change: final consumption expenditures (total domestic demand), gross capital formation, net exports of goods and services (foreign balance). Knowing the specific weights of these components in GDP for the previous year and having survey data and statistical data, one can predict the growth (reduction) of these components for the next year and obtain the forecasted GDP growth for the next year on this basis (Table 8). Note that the short-term forecast does not use changes in economic factors and aggregate factor productivity—they change little over the short-term period.

Table 8 GDP growth forecast for developed countries for 2023

GDP and its components	Growth, %
GDP in constant prices	1.1
Real total domestic demand	1.0
Incl. private consumer expenditure	1.2
public consumption	0.7
Gross fixed capital formation	1.3
Stock building	–0.1
Foreign balance (net exports of goods and services)	0.2

Source IMF (2022). *World Economic Outlook*. October

4.3 Medium- and Long-Term Forecasts

These forecasts are made on the basis of those changes that may occur with the factors of economic growth and their effectiveness. They are calculated on the basis of the economic growth models and forecasting methods described above (Table 9).

An example of a long-term forecast can be the one made by the OECD a few years ago for a very long-term perspective (see Table 10).

Table 9 World GDP mid-term growth projections

Parameter	2023	2027
Global GDP growth rates, %	2.7	3.2
incl. advanced economies	1.1	1.7
emerging market and developing economies	3.7	4.3

Source IMF (2022). *World Economic Outlook.* October

Table 10 Baseline projection of GDP volume, $ mln at constant 2015 PPP

	2010	2030	2060
World	77,466	141,996	237,831
OECD countries[a]	48,795	70,076	101,940
USA	16,319	24,302	36,527
Euro Area (17 countries)	13,349	16,891	23,010
Germany	3569	4566	5891
France	2580	3267	4736
Italy	2316	2499	3366
Japan	4935	5632	6333
Non-OECD countries	28,611	71,920	135,891
China	12,158	36,976	62,140
India	5103	16,603	42,204
Russia	3237	4233	5340
Brazil	2850	3750	5746
Indonesia	2023	5309	12,320
Saudi Arabia	1200	2009	3066
Argentina	806	1034	1685
South Africa	622	954	2074

Source OECD Economic Outlook, #109, October 2021. https://www.oecd-ilibrary.org/economics/data/oecd-economic-outlook-statistics-and-projections/long-term-baseline-projections-no-109-edition-2021_cbdb49e6-en

[a]Including Chile, Columbia, Costa Rica, Mexico, Turkey as OECD member-countries

5 Conclusions

1. The economic development of a country is a process that encompasses economic growth first of all, as well as improvement of proportions in the economy, and improvement of the standard and quality of life. Economic development does not always follow an ascending line, but can be contradictory and even backward. Economic growth is analyzed mostly because it usually leads to the progress of other elements of economic development in the long run.
2. Economic growth occurs due to the use of economic resources (economic growth factors). In the nineteenth to twentieth centuries, most economists counted labor resources (labor, in terms of economic theory), natural resources (land), capital (both real and financial), and entrepreneurial resources (entrepreneurship) among them. In recent decades, a fifth resource has been increasingly added to these four ones—knowledge—which has already become the main factor of economic growth in developed countries. Economic growth models have been created based on the concept of economic growth factors.
3. The growth of national economies is unstable both in the short term (by quarters), in the medium term (by years), and in the long term (by decades). Moreover, is accompanied by crises.
4. The acceleration of economic growth observed in recent centuries was primarily based on new knowledge obtained by science. Another important reason for this acceleration was globalization. By promoting the growth of the most competitive goods and services on the world market, and stimulating the movements of economic resources around the world, it accelerates economic growth in those countries actively participating in globalization.
5. Economists are interested in the proportions into which the GDP of the world, regions, and countries is divided, which helps them to better analyze the structure of GDP. Most significantly, these are the sectoral proportions of GDP, the share of savings and investment in GDP, the ratio of government spending to GDP, the share of the economically active population, and the unemployment rate. When analyzing the current economic situation, indicators of economic conditions are used.
6. Economic efficiency is getting the maximum possible benefits from the economic resources available to the country. One should analyze total factor productivity to measure macroeconomic efficiency. However, in most countries, there are no systematic statistics on its magnitude; therefore, labor productivity is usually used as the most aggregated indicator of macroeconomic efficiency. The indicators of the efficiency of capital and labor use of natural resources are widely used in macroeconomic statistics.
7. The short-term macroeconomic forecast is most often based on how the components of GDP by expenditure will change. Medium- and long-term forecasts are made on the basis of those changes that may occur with the factors of economic growth and their effectiveness. They are calculated using economic growth models and a variety of forecasting methods.

References

Maddison, A. (2007). *Contours of the World Economy, 1–2030 AD. Essays in Macro-Economic History.* Oxford University Press.
McConnell, C. R., Brue, S. L., & Flynn, S. M. (2017). *Macroeconomics.* (21st ed.). McGraw Hill.
Summers, P. (2015). *Macroeconomic Forecasting: A Practical Guide*. Business Expert Press.
Todaro, M. P., & Smith, S. C. (2020). *Economic Development* (13th ed.). Pearson.