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ECONOMIC GROWTH VERSUS THE ISSUE OF FOOD SECURITY IN SELECTED REGIONS AND COUNTRIES WORLDWIDE

KRYSTYNA ŚWIETLIK

Abstract

The aim of this paper was to show the relationship between the level of economic growth and the state of food security in selected regions and countries in the world during 2012-2015. The source of the information was secondary data from GUS (Central Statistical Office), the United Nations, the World Bank, the International Monetary Fund and Global Food Security Index reports. The analyses showed significant territorial differences between levels of GDP and food security. It was apparent that higher levels of GDP were associated with higher levels of food security, and the biggest improvements in food security occurred in those countries with the fastest rise in GDP per capita. The high correlation between these indicators shows that the basic condition for improvement in world food security is economic growth and growth in real incomes, especially in poorer countries.

Keywords: economic growth, GDP *per capita*, purchasing power parity, global food security, less and highly developed countries.

JEL codes: H55, 010, 047.

Introduction

Economic growth is understood by definition as "a continuous increase in the country's capacity to produce goods and services demanded by people" (Nasiłowski, 2016, p. 373) or "the process of increasing basic macroeconomic indicators, in particular the process of increasing production within the whole economy (Krugman and Wells, 2012, p. 9, Milewski (ed.), 2012, p. 242). Gross domestic

Dr hab. Krystyna Świetlik, prof. IERiGŻ-PIB, Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej – Państwowy Instytut Badawczy, Zakład Badań Rynkowych; ul. Świętokrzyska 20, 00-002 Warszawa (krystyna.swietlik@ierigz.waw.pl).

product (GDP) is the most popular measure of economic growth, while GDP *per capita* is used for comparisons between countries. GDP reflects the final outcome of operations carried out by all entities in the national economy (GUS, 2017). It is widely believed to be the most synthetic measure of societies' affluence (Lis, 2011) and the best measure of nations' economic well-being (Burda and Wyplosz, 2013). Representativeness of GDP as a synthetic measure is its main advantage, as it synthetically expresses the development of all production activity, thus its growth rate reflects the operation of all factors of economic growth in the society. In turn, GDP *per capita* and the proportions of its distribution and the material structure of its consumed part synthetically express the material standard of living of the society. An increase in GDP *per capita* is interpreted as an improvement in the material situation of citizens, while its decline – as deterioration of their economic well-being (Daras, Zienkowki and Żółkiewski, 2006). The level of GDP translates into personal income of the population, which is the main determinant of the degree to which the population's needs are satisfied. According to Bywalec and Rudnicki (2002, p. 88), "an increase in satisfaction of needs (standard of living) will occur along with GDP growth, and thus also an increased consumption fund per inhabitant. Only such economic development is real and is perceived as beneficial for the whole society or at least its part".

Despite unquestionable advantages of GDP as a measure of economic growth, it is criticized in contemporary economic literature. The main areas in which GDP is criticized include ignoring numerous key aspects of the quality of the population's life. GDP does not account for the value of a number of services, including production of households for the needs of their members, online activity, as well as the usefulness of leisure time and rest. GDP does not measure unregistered activity (i.e. shadow economy) and does not account for external effects, such as environmental degradation that lowers the standard of living, but it does account for social costs that have no impact on well-being growth, such as spending from the state budget on arms and administration as well as production of the so-called "bads" that are harmful to the environment and people's health and lives. GDP does not expose debt, either public or private, and the quality of social services. GDP does not reflect either the actual proportions of income and wealth distribution within the society. As GDP does not show the existing income inequalities between the various population groups in the country, it does not take into account the highly uneven distribution of income recorded in most countries, that negatively affects the quality of their citizens' lives (Lis, 2011; Mankiw and Taylor, 2016; Stiglitz, Sen and Fitoussi, 2010). Relatively new objections to GDP as a measure of economic growth include the assertion that as a result of globalization, manifested through, e.g. dealings of transnational corporations, it is difficult to localize where the national product of a given country is actually generated (Van den Berg, 2007). Supporters of the sustainable development concept, focusing on environmental protection and reducing economic inequalities, take a critical attitude to GDP as well (Florczak, 2008; Rosicki, 2010). Due to the numerous defects of GDP, research has been carried out into alternative measures of economic growth and human well-be-

ing (Cieślik, 2008; Miciuła, 2015). So far, however, no other universal measure has been found in this respect, although there are more and more measure options that are becoming increasingly more comprehensive[1]. Alternative measures also have their drawbacks, and their methodological assumptions are questionable. These shortcomings prevent them from becoming widely recognized. Therefore, despite objections, GDP and GDP *per capita* and their growth rates remain widely used measures of macroeconomic activity, useful in research into growth dynamics and comparing standards of living or monitoring economic convergence or divergence in various countries. GDP growth results in an increase in the society's affluence and a greater capacity to satisfy its needs.

Out of all human needs, those relating to sustenance belong to the most important ones, as they are existential and the most urgent to satisfy (Kowrygo, 2000). Therefore, people have been struggling for food security since the dawn of time. Food should not only satisfy people's nutritional needs, but also must be safe, i.e. it cannot adversely affect their health condition (Gawęcki, 2004). In line with the terminology adopted at the World Food Summit in 2009, food security is a condition in which all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (The State of Food..., 2016). According to the above definition, economic availability of food is one of the conditions that must be met to guarantee individuals food security. It is ensured when each individual and each household has sufficient resources, i.e. adequate spending power to purchase food of an appropriate quality in an appropriate quantity (Weingärtner, 2005). To ensure economic availability of food conditions conductive to increasing personal income of the population, and more precisely – real income, i.e. income greater than the growth rate of prices of goods and services, should be created (Małysz, 2009, p. 86, p. 94). As income is a derivative of GDP, its level depends heavily on economic growth. For this reason, economic growth is treated in this study as the main reference point for food security assessments from the macroeconomic perspective.

Research material and methodology

The paper is to present the geographical diversification of GDP levels and the situation as regards food security in the selected regions and countries, demonstrate the relationships between affluence levels in various populations measured by GDP *per capita* and a given country's rating in the Global Food Security Index (GFSI), as well as specify the relationships between changes in GDP and those in the food security level. The main research problem was to answer the questions whether it is reasonable – given its numerous drawbacks – to treat GDP as one of the key determinants of the food security level, or whether and to what extent the economic growth rate translates into changes in food security indicators and how

[1] The World Bank's report entitled *The Changing Wealth of Nations 2018* analyses the wealth level in 141 countries in 1995-2014, by developing a single measure based on several indicators such as: natural capital, human capital, produced capital and net foreign assets (Lange, Wodon and Carey (ed.), 2018).

these dependencies have developed in countries with different levels of affluence. Due to the availability of data, the analysis covered the period from 2012 to 2015. Data regarding total GDP and GDP *per capita* as well as average annual growth rates come from United Nations (UN) databases. The data were presented in accordance with the UN division of the world into economically developed, developing and transition countries, i.e. ones changing the type of economy, and by continents (*National Accounts*..., 2017). GDP amounts were analysed also in terms of the Purchasing Power Parity (PPP), calculated as part of the international comparison programme run by the World Bank. The PPP reflects the purchasing power of the currency of a given country, and the international dollar is its common hypothetical currency. Countries selected to the study were grouped in accordance with the division applied by the World Bank and the International Monetary Fund (IMF), using the IMF database, updated in October 2017. Cumulative economic growth indexes for 2012-2015 were calculated based on the average annual growth rates of total GDP and GDP *per capita* (in nominal and real terms) and the PPP, with 2012 as the base year. The situation as regards food security has been presented using the Global Food Security Index (GFSI), which has been developed as of 2012 by the Economist Intelligence Unit (EIU) at the request of Du Pont. GFSI is based on 28 measurement factors divided into three categories: affordability, access to food, and food quality and safety. It is an index of countries (105 in 2012 and 109 in 2015) ranked according to their food security levels. The values of synthetic indicators are assigned to four groups of countries worldwide with different income levels, and presented on a regional basis. In 2015, high-income countries included those where gross national income (GDI) *per capita* was USD 12,616 and more, while the group of countries with income above the average level included those with GDI *per capita* of USD 4,086 – 12,615. In the group of countries with income below the average level, GDI *per capita* was in the range of USD 1,036 – 4,085. In low-income countries, GDI *per capita* was USD 1,035 USD and less. In order to empirically verify the strength of the linear relationship between GDP *per capita* and the GFSI, the Pearson product-moment correlation coefficient was used. GDP values served as independent variables, while GFSI values as dependent ones. Correlation coefficients were calculated for 20 most and 20 least affluent countries in 2015. The obtained material was evaluated using descriptive and comparative statistical methods.

Changes in GDP in the selected regions and countries worldwide in 2012-2015

According to the UN estimates, gross domestic product generated worldwide in 2017 amounted to USD 74.18 trillion (at current prices), compared to USD 74.8 trillion in 2012, of which 57.6% was generated by developed countries (*National Accounts*.., 2017). Developing countries generated 39.7% of global GDP, while transition ones – 2.7%. Compared with 2012, the share of developed and transition countries in global GDP decreased by 1.7 and 1.3 percentage points, respectively,

while that of developing ones increased by 2.9 percentage points (*National Accounts*..., 2017) (Table 1). Poland's share in global GDP in 2015 was 0.6%, compared to 0.7% in 2012.

Compared to 2012, global gross product (USD) increased by 7.6% in real terms. In each analysed year, its growth rate was stable, but enormously diversified territorially. This period was not particularly favourable for the global economy. A second wave of the global crisis that started in 2008 (*Nawrot*, 2009, *Polska wobec*…, 2009; Światowy kryzys… 2009), which in the European Union developed into a debt crisis in some countries of the Economic and Monetary Union, led to a recession in the euro area and deterioration in the global economic situation in 2012. In 2012, the world economy was developing at the slowest rate since 2009. In 2013, its growth rate accelerated, in particular in developed countries, but in most of the developing and emerging economies economic growth slowed down. World economy recovery continued in 2014 mainly as a result of a better economic situation in developed countries, especially in the United States (*Sytuacja makroekonomiczna*..., 2015). In the largest emerging economies, the growth rate of macroeconomic activity was relatively low, and in some of them (China, Russia) it even clearly slowed down (*World Economic*..., 2015, pp. 3-4; Monetary Policy..., 2014). Despite the slowdown, economic growth in emerging and developing countries was higher than in developed ones. In 2015, a moderate improvement in the world economy was recorded. Like in previous years, the economies of developing countries, mainly in Asia, sub-Saharan Africa and Europe (with the exception of the Commonwealth of Independent States), grew faster than those of highly developed countries. The poor recovery in the euro area was accompanied by a serious recession in the transition countries, especially in Russia and Ukraine (*World Economic*..., 2016).

The analyses show that the prevalence of the growth trend in the global economy in 2012-2015 resulted mainly from a significant economic growth in developing countries, where real GDP increased by 13.4%. Economic growth rates in the countries of Southeast Asia, especially China (23.7%) and India (23.0%), were of particular importance in this respect. The economies of highly developed countries grew on average by 5.3%, while those of countries in transition remained stagnant (an increase by 0.1%) (Fig. 1). In Poland, despite unfavourable external conditions, real GDP growth in 2012-2015 was 8.8%, and was more than twice as high as the average in the European Union (4.1%).

Table 1

Gross domestic product in selected regions and countries worldwide

Specification	2012	2013	2014	2015
	Gross domestic product, current prices, total – USD billion			
THE WORLD	74,796.7	76,830.8	78,612.1	74,176.9
Economically developed countries	44,341.1	44,578.8	45,424.1	42,718.3
Developing countries	27,479.2	29,142.9	30,335.1	29,466.3
Countries in transition[a]	2,976.4	3,109.0	2,853.0	1,992.2
Africa	2,337.9	2,410.7	2,502.1	2,267.6
North, Central and South Americas	24,129.4	24,856.6	25,454.6	25,000.5
North America	17,987.5	18,542.2	19,194.1	19,597.4
Australia and Oceania	1,799.7	1,764.9	1,697.6	1,448.5
Asia	25,563.6	25,987.1	26,821.7	26,514.8
China	8,570.3	9,635.0	10,534.5	11,158.5
India	1,862.2	1,923.8	2,046.3	2,116.2
Europe	20,966.2	21,820.4	22,136.2	18,945.4
Poland	500.3	524.2	545.2	477.1
	per capita in USD			
THE WORLD	10,541	10,700	10,822	10,095
Economically developed countries	43,545	43,623	44,299	41,518
Developing countries	4,761	4,980	5,114	4,902
Countries in transition[a]	9,743	10,143	9,277	6,459
Africa	2,130	2,141	2,166	1,914
North, Central and South Americas	25,071	25,572	25,933	25,229
North America	51,424	52,604	54,044	54,767
Australia and Oceania	48,227	46,576	44,133	37,107
Asia	6,001	6,035	6,167	6,036
China	6,323	7,072	7,693	8,109
India	1,474	1,504	1,580	1,614
Europe	20,376	29,510	29,918	25,590
Poland	12,959	13,574	14,116	12,355
	in total, constant prices (previous year=100)			
THE WORLD	102.2	102.3	102.5	102.6
Economically developed countries	101.0	101.2	101.8	102.2
Developing countries	104.9	104.7	104.2	103.9
Countries in transitiona	103.1	101.9	100.9	97.4
Africa	105.7	102.4	103.8	103.1
North, Central and South Americas	102.3	101.9	100.1	100.1
North America	102.2	101.7	102.4	102.5

cont. Table 1

Specification	2012	2013	2014	2015
	Gross domestic product, current prices, total – USD billion			
Australia and Oceania	102.5	102.4	102.4	102.6
Asia	104.2	104.6	104.0	104.0
China	107.9	107.8	107.3	106.9
India	105.8	106.6	107.2	107.6
Europe	99.9	100.4	101.6	101.8
Poland	101.6	101.4	103.3	103.9

[a] The countries of the Commonwealth of Independent States and Georgia, Albania, Croatia, Bosnia and Herzegovina, Kosovo, Montenegro, Serbia and Macedonia.

Source: UN data and the author's own calculations.

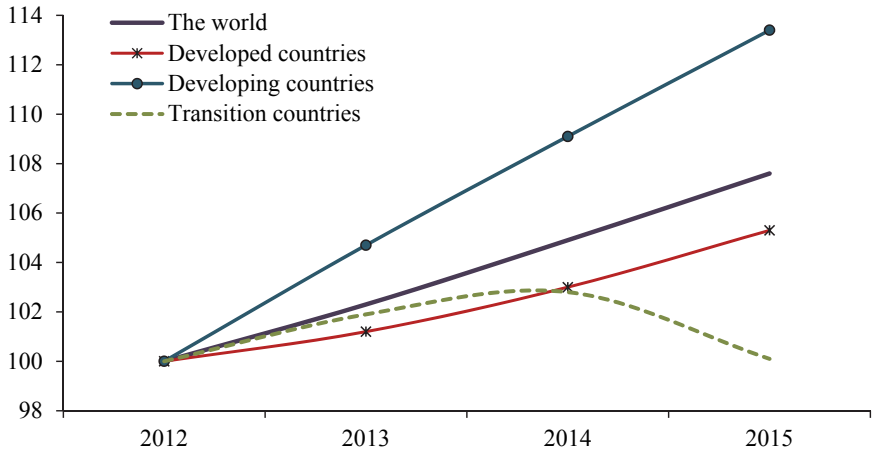

Fig. 1. Growth rate of GDP in USD, constant prices (2012 = 100).

Source: the author's own calculations based on UN data.

Nominal GDP estimated in USD in accordance with the current exchange rate is a determinant of the size of the economy, but it is not the best measure of the society's well-being, because it does not take into account the population number. For this reason, another indicator is used, namely GDP *per capita*. Analysing the data contained in Table 1, it can be noticed that global GDP *per capita* went down in 2012-2015, from around USD 10.5 thousand to USD 10.1 thousand, i.e. by 4.2%. North America remained the most affluent region in the world, with 2015 GDP *per capita* at USD 54.8 thousand, while African countries, with GDP of only USD 1.9 thousand, were the poorest one.

In order to estimate the actual levels of affluence, the values of GDP in the various regions and countries, denominated in national currencies, are converted into an international currency (e.g. USD) in accordance with contractual conversion factors referred to as Purchasing Power Parity (PPP). PPP GDP reflects better the actual value of production generated in a given country (region), as it takes into account the differences in prices of goods and services on local (regional) markets. Thus calculated GDP is also less susceptible to exchange rate fluctuations (Begg, Fischer and Rudiger, 2007). However, data on PPP GDP *per capita*, at current prices, fail to reflect the effect of price changes, and can only be used to compare real GDP *per capita* between countries in a given year. To determine real growth of GDP *per capita*, it is necessary to include these values at constant prices.

According to the estimates of the IMF, 2015 PPP GDP *per capita*, at constant prices from 2011, ranged from INTL$ 3.6 thousand in sub-Saharan Africa to INTL$ 45.1 thousand in the most economically developed countries in the world (G7). High values of thus calculated GDP *per capita* were achieved also by other economically advanced countries, excluding G7 and the euro area – INTL$ 42.3 thousand, and European Union Member States – INTL$ 35.9 thousand. The least-affluent regions, apart from sub-Saharan Africa, included developing and emerging Asian countries as well as the ASEAN-5 countries (Indonesia, Malaysia, Philippines, Thailand and Vietnam), where PPP GDP *per capita*, at constant prices, was in the range of INTL$ 9.4-10.4 thousand (Table 2)[2].

Attention should be paid to changes in these values in 2012-2015, as they indicate that the increase in affluence of emerging and developing countries' residents (10.0%) was faster than in highly developed countries (4.1%). In the most economically developed and most affluent countries in the world, GDP *per capita* at constant prices increased on average by 3.8%, and by 3.6% in the European Union. In Poland, an increase by 9.0% was recorded. In developing countries its changes were multi-directional and varied as regards their rate. The greatest (by 18.4%) increase in PPP GDP *per capita*, at constant prices, was recorded in emerging and developing economies in Asia (in China – by 21.8%). The value of the same affluence indicator in European emerging and developing countries and in the ASEAN-5 increased by 12.4% and 10.7%, respectively. The real affluence of sub-Saharan Africans rose by 5.8%, while that in the countries belonging to the Commonwealth of Independent States and in Latin America and the Caribbean, an increase by mere 0.7-0.9% was recorded. Unlike most developing countries, in the Middle East and North Africa countries, the real level of affluence decreased by 0.3%.

[2] Differences in GDP between various countries are due to a complex system of natural, political, social, economic and historical determinants, etc. Due to the limited length of the paper, these factors cannot be analysed in detail. The literature, mainly in the field of economics, economic geography and international relations, includes many papers devoted to this issue, e.g. by A. Bąkiewicz, Z. Dobosiewicz, R. Domański, K. Kuciński, T. Olszewski, R. Piasecki, M.W. Solarz, J. Witkowski, M. Weresa and U. Żuławska.

Table 2

PPP GDP per capita (in international dollars,at constant prices from 2011)

Specification	2012	2015	2015 2012=100
Highly developed countries	41,795.9	43,520.5	104.1
Main highly developed countries (G7)	43,436.7	45,106.5	103.8
Other highly developed countries (excluding G7 and Eurozone countries)	40,311.9	42,340.9	105.0
The European Union	34,672.8	35,916.8	103.6
Poland	22,937.0	24,991.7	109.0
Emerging and developing countries	9,201.5	10,120.7	110.0
Commonwealth of Independent States	17,546.6	17,697.7	100.9
Asian emerging and developing countries	7,965.8	9,429.8	118.4
China	11,048.6	13,457.1	121.8
ASEAN-5 (Indonesia, Malaysia, Philippines, Thailand and Vietnam)	9,386.4	10,394.0	110.7
European emerging and developing countries	19,233.8	21,610.4	112.4
Latin America and the Caribbean	14,462.6	14,563.6	100.7
The Middle East, North Africa, Afghanistan and Pakistan	12,345.2	12,443.7	100.8
The Middle East and North Africa	16,727.0	16,671.6	99.7
Sub-Saharan Africa	3,427.8	3,626.3	105.8

Source: IMF data and the author's own calculations.

Comparing the 2012 and 2015 values of real PPP GDP *per capita*, it can be seen that in some of the poorest regions of the world the income gap between these regions and the most developed ones decreased. This was especially true for emerging and developing Asian countries. An unfavourable phenomenon, namely a relatively insignificant progress in this respect in African countries, was also recorded. In 2012, PPP GDP *per capita*, at constant prices in G7 countries was 12.7 times higher than that in sub-Saharan African countries. In 2015, it was 12.4 times higher. These data show that although the gap between the regions of the world in terms of affluence decreased in 2012-2015, the fundamental differences remained. According to the World Bank's report entitled The Changing Wealth of Nations 2018, in 2015, OECD countries were 52 times more affluent, *per capita*, than poor countries (Lange et al. (ed.), 2018).

Table 3

Differences between GDP per capita in selected countries

The richest counties in the world			The poorest countries in the world		
Specification	GDP *per capita* by PPP in international dollars, constant prices		Specification	GDP *per capita* by PPP in international dollars, constant prices	
	2015	2012		2015	2012
Qatar	121,898	144,216	Guinea	1,717	1,659
Luxembourg	96,323	90,436	Guinea-Bissau	1,558	1,518
Macau	93,391	120,401	Togo	1,406	1,294
Singapore	80,892	76,029	Mozambique	1,120	992
Brunei	74,661	81,982	Malawi	1,058	1,006
Kuwait	66,855	70,446	Niger	1,020	950
Norway	64,243	63,460	Liberia	821	811
United Arab Emirates	63,039	60,718	Burundi	781	788
Ireland	61,679	45,227	Democratic Republic of the Congo (DRC)	721	620
Switzerland	55,810	54,725	Central African Republic	589	932

Source: own compilation based on IMF data.

It follows from the ranking of the world countries according to their PPP GDP *per capita* in 2015 (in prices from 2011) that the differences between the ten richest countries, where the average income in the range of INTL$ 55-122 thousand, and the ten poorest ones, in which GDP *per capita* amounted to INTL$ 580-1,720, were more than 100-fold, and even over 200-fold. Compared to 2012, in some cases these differences increased to the disadvantage of the poorest countries (Central African Republic) (Table 3). The presented disproportions are shocking. This is an enormous problem and a major challenge for underdeveloped countries. This problem has been aptly summarized by Górecki (2010, p. 111): "No wonder such a low income level leads to starvation or permanent malnutrition. It also leads to a dramatic situation in many aspects of economic and social life – to an extremely low standard of living".

The poorest countries owe their poverty to various factors; some of them have an unfavourable climate, others are located in areas inhibiting economic development (deserts, marshland). In a large part of these countries there is no elementary

economic infrastructure (roads, telecommunications and postal connections, ports, etc.). Some of them are devoid of minerals or elementary natural resources (forests, rivers, sources of drinking water), which leads to developmental delays practically in all areas of life. Local civil wars, natural disasters and epidemics, assassinations, greed and corruption of local authorities as well as the institutional weakness of the state are other factors leading to the lack of development prospects for the poorest part of the society. In such conditions, the least developed countries do not pursue a rational economic policy. They have neither premises nor a concept of an economic policy that would put them on the path of accelerated development. They remain stagnant, which means that they in fact regress compared to countries whose economies are growing. In this situation, most of these countries rely solely on foreign aid (Jeremczuk, 2011; Klima, 2016; Lendzion, 2015).

Although the standard of living in poor countries is slowly improving, the gap between the richest and the poorest countries in the world remains enormous. Only one third of 3.75 billion people live in affluent regions, i.e. in Europe, North America, Australia and Japan. Until recently it seemed that income inequalities cease to be an important topic in political discourse, which was due to the conviction that economic and social development as well as civilization progress would make this problem less acute. So far, no solution to this problem has been found. At the same time, a marked increase in global wealth is observed, and so are enormous inequalities in its distribution. Existing and increasing income inequalities on a global scale are one of the key challenges of the modern world. These inequalities result in significant differences in opportunities to satisfy the needs of the Earth's inhabitants, including elementary needs relating to food. In the most affluent countries, overconsumption of agri-food products is common, while the populations of poor countries are struggling with hunger and malnutrition.

The level of food security in selected regions and countries of the world in 2012-2015

The number of undernourished and starving people is one of the key indicators of the situation as regards nourishment of the world's population. According to the FAO, in 2014-2016, the number of malnourished people in the world reached 789.1 million, i.e. 10.7% of the total population. In countries with lower than average income there were 398.4 million undernourished people, i.e. 13.6% of the total population of these countries, while in low-income countries, their number was 182.3 million, i.e. 13% of their population. It is estimated that Central African Republic, where the number of malnourished people in 2015 accounted for 58.6% of the total population, was the country with the highest degree of malnutrition (*The State of Food*…, 2017; *Global Hunger*…, 2017). Malnourished people live also in economically developed countries. According to national statistics, their number is usually below 5% of the population of these countries. It is estimated that in 2015, about 2.5% of the Polish population faced malnutrition. Compared to 2004-2006, in most regions and countries of the world, the abso-

lute number and percentage of malnourished population decreased, but in some countries (including Central African Republic, Liberia, Madagascar, Uganda, Namibia) the opposite was observed. In low-income countries and in sub-Saharan Africa the number of malnourished people increased by 30.3 and 33.3 million, respectively. The above data show that the problem of ensuring food for the world's population prevails and concerns primarily developing countries with low average income *per capita*.

Ensuring food security is not possible without appropriate measurement tools such as the Global Food Security Index (GFSI) that continuously verifies price availability, access to food as well as its quality and safety in most countries around the world. The GFSI is used to analyse relationships between factors affecting food security in the various countries, but it does not directly present these relationships, nor does it identify key determinants of a given country's result. Considering particular categories of the index and their analytical tools (including the share of food consumption in household expenses, global poverty lines, access to financing for farmers, GDP *per capita*, nutritional standards, public expenditure on agricultural R&D, agricultural production stability, agricultural infrastructure, food losses, food prices), it can be seen that they are directly related to the level of economic development. Based on their detailed analysis, it can be stated that economic growth is the main determinant of the improvement in food security. It can be verified by confronting GFSI rates in particular regions and countries of the world with economic growth rates in the analysed period.

In 2015, the Global Food Security Index in a hundred-point scale for 109 countries was 55.8 points, with significant differences between the analysed countries. The United States was ranked first (89.0 points), Singapore came second (88.2 points), followed by Ireland (85.4 points). The last three top ten countries with the highest level of food security scored the same number of points (83.8). These were Australia, France and Norway (Fig. 2). The lowest rated countries included Sierra Leone (29.0 points), Madagascar (28.8 points), Chad (27.9 points) and Burundi (25.1 points) (Global Food Security..., 2015) (Fig. 2 and 3).

Regional differences were as follows: the greatest number of points was scored by North America (80.6) and Europe (75.7). The Middle East and North African countries scored in total 61.0 points. The score of the countries of Central and South America was 58.0 points. Asia-Pacific and sub-Saharan Africa scored 57.3 and 37.8 points, respectively. Poland with its 74.2 points out of 100 was ranked 28 among monitored countries and 17 among European countries. In North America the highest level of food security was recorded in the United States (89.0 points), followed by Canada (84.2 points). Mexico with its 68.7 points was the country with the lowest level of food security in the region. Europe is a complex region, as it consists of economically advanced and prosperous countries of Western Europe and Central and Eastern European countries whose economies are in transition. In the former group of countries, the Food Security Index was 81.6-85.4 points, while in the latter, this index was in the range of 56.1-74.9 points. In other regions, the differences in the food security level were

even greater. In Central and South Americas, Chile scored the greatest number of points (73.4), while Haiti, with its 31.1 points, was the last in the ranking. In the Middle East and North Africa, Israel was the country with the highest food security level (78.9 points, and the 19th position in the world ranking), while the last position was occupied by Yemen (37.3 points). Among the Asia-Pacific countries, the highest levels of food security were achieved by Singapore (88.2 points) and Australia (83.8 points), ranked 2nd and 9th, respectively, in the GFSI, while in Bangladesh and Cambodia, food security indicators were at 37.4 and 34.6 points, respectively. Sub-Saharan Africa, where GFSI values ranged from 25.1 points (Burundi) to 64.5 points (South Africa), was the region with the greatest differences in the level of food security.

The analysis of GFSI indicators shows enormous food security disparities between high and poorly developed countries (regions). The best results were achieved by countries with high GDP *per capita*, while the lowest scores were recorded in low-income countries, especially in sub-Saharan Africa. Figure 4 shows that in 2015, the GFSI value in the most affluent countries was 79.3 points and was more than twice as high as in countries with the lowest income (35.0 points).

The strength of the correlation between the Food Security Index value and GDP is shown by the value of the correlation coefficient. The closer it is to 1, the stronger this correlation is. It is assumed that values in the range of 0.2-0.4 represent small correlation, those in the range of 0.4-0.7 – moderate, between 0.7 and 0.9 – significant, and above 0.9 – very strong (Ostrasiewicz, Rusnak and Siedlecka, 2001). Research shows that the 2015 Pearson correlation coefficient between the Food Security Index and PPP GDP *per capita*, at constant prices, for 20 most affluent countries in the world (yielding income in the amount of USD 12.616 thousand *per capita* and more) was 0.78. In the case of countries with the lowest income (USD 1.035 thousand *per capita* and less), this coefficient was lower (0.61), but it still confirmed significant correlation. In his research carried out in 2016, Kraciuk found that this coefficient for the European Union countries was 0.89 (Kraciuk, 2017). Weaker correlation between the food security level and GDP *per capita* in less affluent countries than in more affluent ones is an interesting phenomenon. It can be assumed that in the former group of countries, the deficiencies of GDP as a measure of well-being are more pronounced. It should be remembered that GDP is an indicator measuring production, not the benefits derived from it by the society. GDP does not account for numerous important determinants of the standard of living of a given society, and, above all, it does show the distribution of income between different population groups[3]. According to the OECD and World Bank data, in developing countries, especially in Africa, Asia and South America, the degree of inequality in the division of total income, measured through gross domestic product, between inhabitants of these countries

[3] If, for example, in some countries, the upper decile accounts for 40% of income, and 60% of income for the remaining 90% of the population, then, despite the high level of GDP, inequalities in this country may be very significant.

is very high[4]. Economic growth in the least affluent countries is often "export led growth". This means concentration of economic activity in several sectors, operating on an enclave basis, with no major connections with the remaining part of the economy. In this situation, only a small part of the labour force benefits from economic growth. In the poorest countries, the process of negative deagrarisation is observed. Part of the rural population emigrate to cities to join the unemployed and the homeless. In some of them income inequality increases. As a result of the accumulation of these factors, poverty in these countries does not diminish even when GDP *per capita* grows.

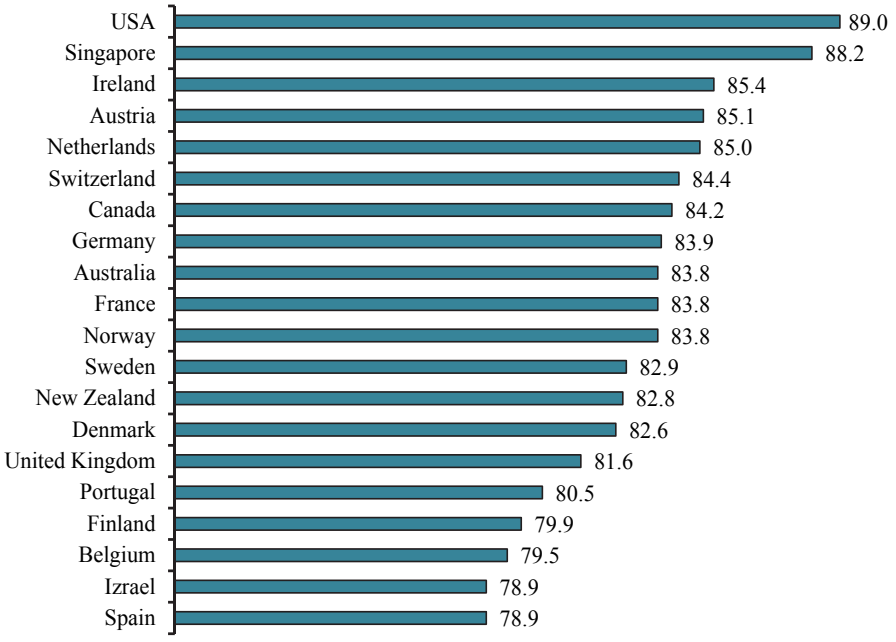

Fig. 2. Ranking of 20 countries with the highest food security indicators in 2015 (high-income countries).

Source: the author's own compilation, based on: Global Food Security Index 2015.

[4] According to the OECD, in 2015, the Gini coefficient in South Africa was 0.620, in Mexico – 0.459, in Chile – 0.545, in Costa Rica – 0.480, and in Brazil – 0.470, while in Iceland, Slovenia, Slovakia, the Czech Republic and Finland it was in the range of 0.246-0.260.

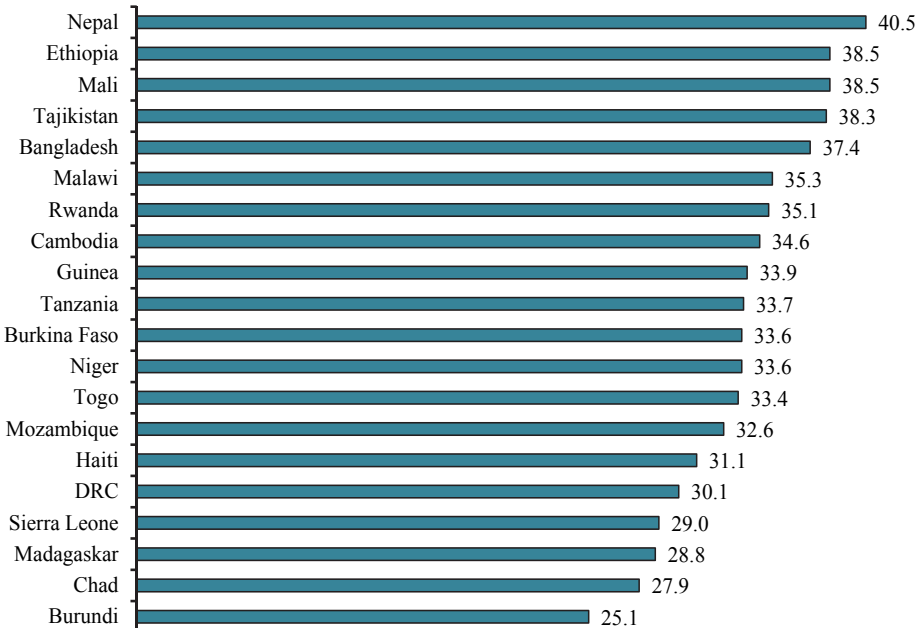

Fig. 3. Ranking of 20 countries with the lowest food security indicators in 2015 (low-income countries).

Source: as in Figure 2.

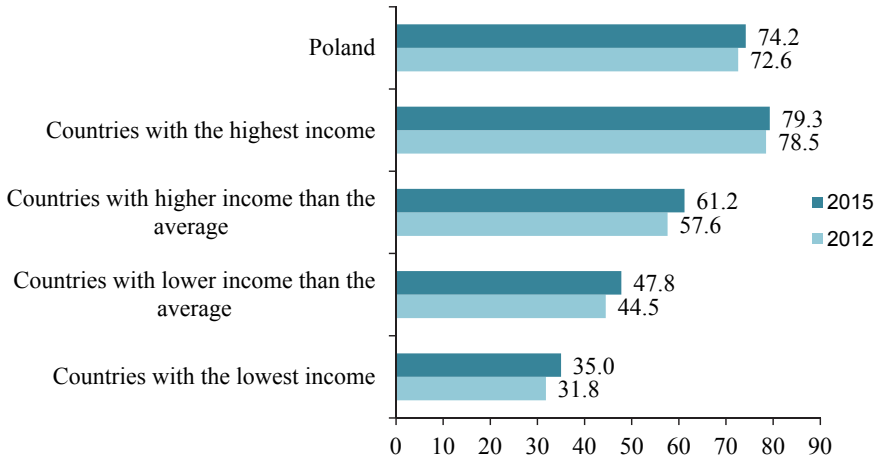

Fig. 4. Global Food Security Index values in countries with different income levels in 2012 and 2015.

Source: the author's own compilation, based on Global Food Security Index 2012 and Global Food Security Index 2015.

Comparing the GFSI figures from 2012-2015, it can be seen that in almost every region of the world their increase was recorded, which means an improvement in food security. In the Asia-Pacific region, the GFSI increased by 5.5 points, in sub-Saharan Africa – by 5.4 points, in the Middle East and North Africa – by 5.1 points, and in Central and South America – by 4.3 points. A small increase was recorded in North America (by 0.4 percentage point), while in Europe, the GFSI went down (by 1.0 percentage point). The overall Food Security Index for 109 countries increased by 2.7 points, whereby in less affluent countries its increase (by 3.2 points) was much higher than in the most affluent ones (by 0.8 points) (Fig. 4), which should be considered a positive phenomenon. The most significant improvement in food security was recorded in countries with average and higher than average income, where the GFSI increased by 3.6 points. These changes were strongly correlated with changes in GDP *per capita* (Table 2). According to the World Bank data, in 2015, compared to 2012, PPP GDP *per capita*, at constant prices from 2011, converted into international dollars, increased in high-income countries by 4.2%. In countries with average and higher than average income, GDP *per capita* increased by 11.1%, and in low-income countries – by 8.8% (*GDP per capita*..., 2015). The slight decrease in food security in Europe resulted from the low economic growth rate in the euro area (2.2%) and the CIS (0.9%). Nonetheless, Western European countries are still high in the global GFSI ranking and much ahead of other countries in this respect, serving as a benchmark of good food security practice in highly developed countries.

Changes in the GFSI in 2012-2015 indicate a decrease in disproportions in the area of food security between poorly and highly developed countries. They also indicate a decrease in the differences between the most and least food-secure countries, resulting from an increase in food security in the poorest countries in the world, especially those in sub-Saharan Africa (including Senegal – by 12.9 points, Ethiopia – by ca. 12.1 points, the Democratic Republic of the Congo – by 11.7 points, Sudan – by 8.9 points, and Mali and Malawi – by 8.1 points).

The analysis of these figures against aggregate economic growth rates suggests that the global food security growth in 2012-2015 was due to the economic expansion trend prevailing in most regions, especially rapid economic growth in emerging and developing countries in Asia and sub-Saharan Africa. Food security was enhanced also by a decline in global food prices, which significantly improved the standard of living in poorer countries with a high share of food in the structure of household expenses (FAO Food Price..., 2018). Food schemes and government investment in agriculture and infrastructure in developing countries, taken after the food crisis and food price shock in 2007-2008, were also of key importance to improving food security (*The State of Food*..., 2009; *Global Food Crisis*..., 2013). These factors are part of a set of six components taken into account by the Economist Intelligence Unit while determining the scoring in the 'Affordability' category, which is one of the three categories included in the global index. The authors of Global Food Security Index 2015 found that in 2015, compared to 2012, the score in this category increased by 3 points, with a GFSI increase of 2.7 points. Over 70% of the 109 monitored countries improved their results in this respect.

The research showed that food affordability is strongly correlated with the population's income situation, expressed through PPP GDP *per capita*, as confirmed by the Pearson correlation coefficient of 0.87 (*Global Food Security*..., 2015). In 2014, the food affordability scores were as follows: in high-income countries – 84.3 points, in countries with higher than average income – 59.9 points, in countries with less than average income – 41.5 points, and in low-income countries – 26.4 points (the maximum score was 100 points) (*Global Food Security*..., 2014). These data suggest that differences in food security between regions and countries of the world result primarily from differences in economic development.

Summary

The aim of the paper was to present differences in GDP and food security between selected regions and countries, and to identify correlations between changes in GDP and food security in 2012-2015. The considerations started with the assumption that food security is strongly correlated with affluence, expressed synthetically through gross domestic product *per capita* in a given year. The analyses showed that this indicator is extremely diverse in geographical terms. The IMF estimates that 2015 PPP GDP *per capita*, at constant prices from 2011, ranged from INTL$ 3.6 thousand in sub-Saharan Africa to INTL$ 45.1 thousand in the most economically developed countries in the world (G7). Analysis of its fluctuations showed that the increase in affluence of the population of less economically developed countries in 2012-2015 was faster than that in highly developed countries, which was due to the high economic growth rate in emerging and developing countries in Asia and in Europe5. As a result, the income gap between poorer countries and the most developed regions decreased, especially in emerging and developing Asian countries.

The stable global economy growth, prevailing in 2012-2015, contributed to the improvement in food security in all regions. The increase in Food Security Indexes was greater in poorer countries than in the most affluent ones, which was a positive phenomenon. Although there was a decrease in disproportions in food security between poorly and highly developed countries and the differences between the most and least food-secure countries diminished, major discrepancies were not eliminated.

The results of a detailed analysis of food security in various regions and countries confirmed that its enormous territorial differentiation is due to differences in economic development and thus also in GDP and income *per capita*. It was found that geographical differences in GDP *per capita* in 2012-2015 were consistent with the territorial food security situation. Countries with the lowest domestic income were least food secure, as opposed to those with the highest GDP *per capita*. It was found that the correlations between food security and the level of economic

[5] In the studies of the World Bank and the International Monetary Fund, the developing and emerging countries in Europe include: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Kosovo, Macedonia, Montenegro, Poland, Romania, Serbia and Turkey.

development were more apparent in more economically developed countries, as confirmed by correlation coefficients. It was also found that an increase in GDP *per capita* was followed by an increase in the level of food security. The analyses showed that the changes in food security observed in 2012-2015 in different regions and countries were strongly correlated with changes in GDP *per capita* in these countries, and the most significant improvement in food security was recorded in countries with the highest growth rate of GDP *per capita*. Although GDP has significant drawbacks, its impact on the food security level is clear and unambiguous, i.e. positive. This means that any qualitative phenomena used in the GFSI depend on quantitative phenomena, primarily an increase in GDP and the population's income, as evidenced by high coefficients of correlations between GDP *per capita* and the food security indicator. This clearly indicates that the improvement in food security depends on the level of income *per capita*. Thus, it can be stated that economic growth and increased income are the preconditions for improving food security and the priority for poorer countries. Personal income is in fact the key determinant of the population's purchasing power and the guarantor of food security in the economic aspect. The correlations between food security and income were indicated, among others, by Sen (2001) and Swinnen (2015). Sen was one of the first to prove that famine may occur in areas where there is enough food, in regions where certain population groups do not have access to food even when it is physically available. Swinnen showed that real income is the main determinant of food insecurity, and the correlation between food security and income is ca. 70%

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WZROST GOSPODARCZY A KWESTIA BEZPIECZEŃSTWA ŻYWNOŚCIOWEGO WYBRANYCH REGIONÓW I KRAJÓW ŚWIATA

Abstrakt

Celem artykułu było pokazanie związków i zależności pomiędzy poziomem rozwoju gospodarczego a stanem bezpieczeństwa żywnościowego w wybranych regionach i krajach świata w latach 2012-2015. Głównym źródłem informacji były wtórne dane statystyczne zaczerpnięte z baz Głównego Urzędu Statystycznego, Organizacji Narodów Zjednoczonych, Banku Światowego i Międzynarodowego Funduszu Walutowego, raporty Global Food Security Index oraz literatura przedmiotu. Przeprowadzone analizy ujawniły znaczne terytorialne zróżnicowanie poziomu PKB i bezpieczeństwa żywnościowego. Stwierdzono, że wyższemu poziomowi PKB towarzyszy wyższy poziom bezpieczeństwa żywnościowego, a największa poprawa bezpieczeństwa żywnościowego dokonała się w krajach o najwyższym tempie wzrostu PKB per capita. Wysoka korelacja pomiędzy tymi wskaźnikami sugeruje, że podstawowym warunkiem poprawy światowego bezpieczeństwa żywnościowego jest wzrost gospodarczy i zwiększenie realnych dochodów, zwłaszcza mieszkańców mniej zamożnych krajów.

Słowa kluczowe: wzrost gospodarczy, PKB na mieszkańca, parytet siły nabywczej, światowe bezpieczeństwo żywnościowe, kraje nisko i wysoko rozwinięte.

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