

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics



Bachelor Thesis

**Food Security and Related Macroeconomic Indicators
in Russia**

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BACHELOR THESIS ASSIGNMENT

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Economics and Management

Thesis title

The Analysis of Food Security and Related Macroeconomic Indicators in Russia

Objectives of thesis

The World faced multiple crises in recent years: a global pandemic, a climate crisis, and a number of local military conflicts. All these adverse events have heightened the urgency with which food security issues are discussed.

The main aim of the present Bachelor thesis is to disclose the relationship between national food Security and selected macroeconomic indicators on the example of the Russian Federation.

To achieve this goal the following research questions will be raised, discussed and gradually answered:

1. How the very concept of Food security is defined?
2. What aspects does Food security include?
3. Which organizations/institutions deal with the issues of achieving and maintaining Food security (at a national and global level)?
4. Which indicators are used to measure different aspects of Food security?
5. What macroeconomic indicators can be referred to as core ones for characterizing any economy?

Methodology

Theoretical part of the Bachelor thesis will rest on the analysis and synthesis of relevant literature comprised of selected study books, scientific articles, legal documents and some electronic sources.

Having collected all the necessary information and data, the Methodology, mainly based on descriptive and comparative techniques plus estimation of a linear relationship between selected macroeconomic indicators and food security in Russia, will be applied to answer the main and partial research questions. The results of the conducted analysis along with their discussion will constitute the Practical part.

Based on theoretical findings and outcomes of the Practical part, the conclusion and recommendations will be framed.

The proposed extent of the thesis

40-60

Keywords

Food Security, Macroeconomic Indicators, Russia, Statistical inference

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Prague on 15. 03. 2023

Declaration

I declare that I have worked on my bachelor thesis titled "Food Security and Related Macroeconomic Indicators in Russia" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on 15.03.2023

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Food Security and Related Macroeconomic Indicators in Russia

Abstract

This bachelor thesis is focused on the analysis of food security, where the author is, in particular, interested in analyzing the very concept of food security based on the example of the Russian Federation. The main motivation of the author to conduct the following research were international problems related to the food crisis in the world and also the phenomenon of the climate change, which both endanger the well-being of people all over the world and food security. In addition to the original goal, the author also aims at discovering the most important institutions dealing with food security and finding out if there are any macroeconomic indicators that can perfectly explain various indicators of food security.

For the methodology, the author is focused on the correlation analysis conducted based on the time series data from 2000 to 2020 with a subsequent hypothesis testing for each correlation coefficient. Additionally, the author also performs a descriptive analysis of each available variable with the help of measures of central tendency and dispersion.

In the conclusion, the author suggests that the country does not experience any significant problems with food security based on the selected time period from 2000 to 2020 covering 21 years, but the stability component seems to be the most troubled one. Additionally, the author concludes that the GDP per capita, exchange rate, inflation, and FDI can be used to explain food security in an accurate way due to the fact that the correlation is significant between the mentioned macroeconomic indicators and variables selected for the description of food security – food production index, poverty rate, the prevalence of undernourishment and unemployment rate based on the example of the Russian Federation.

Keywords: Food Security, macroeconomic indicators, Russia, statistical Inference

Potravinová bezpečnost a související makroekonomické ukazatele v Rusku

Abstrakt

Tato bakalářská práce je zaměřena na analýzu potravinové bezpečnosti, kde se autor zejména zajímá o analýzu samotného konceptu potravinové bezpečnosti na příkladu Ruské federace. Hlavní motivací autora k provedení následujícího výzkumu byly mezinárodní problémy spojené s potravinovou krizí ve světě a také fenomén změny klimatu, které ohrožují blahobyt lidí na celém světě a potravinovou bezpečnost. Kromě původního cíle se autor zaměřuje také na objevování nejdůležitějších institucí zabývajících se potravinovou bezpečností a zjišťování, zda existují nějaké makroekonomické ukazatele, které mohou dokonale vysvětlit různé ukazatele potravinové bezpečnosti.

Pro metodiku je autor zaměřen na korelační analýzu provedenou na základě dat časových řad od roku 2000 do roku 2020 s následným testováním hypotéz pro každý korelační koeficient. Kromě toho autor také provádí popisnou analýzu každé dostupné proměnné pomocí opatření centrální tendence a disperze.

Na závěr autor naznačuje, že země nezažívá žádné významné problémy s potravinovou bezpečností na základě zvoleného časového období od roku 2000 do roku 2020 pokrývajícího 21 let, ale složka stability se zdá být nejproblematictější. Dále autor dochází k závěru, že HDP na obyvatele, směnný kurz, inflace a PZI lze použít k přesnému vysvětlení potravinové bezpečnosti vzhledem k tomu, že korelace je významná mezi uvedenými makroekonomickými ukazateli a proměnnými vybranými pro popis potravinové bezpečnosti-index produkce potravin – míra chudoby, prevalence podvýživy a nezaměstnanosti na příkladu Ruské federace.

Klíčová slova: potravinová bezpečnost, makroekonomické ukazatele, Rusko, statistická Inference

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List of abbreviations

CPI	Consumer Price Index
GDP	Gross Domestic Product
ILO	International Labour Organization
UN	United Nations
FAO	Food and Agriculture Organization
USDA	United States Department of Agriculture

FDI	Foreign Direct Investment
FPI	Food Production Index
USD	United States Dollar
SDG	Sustainable Development Goals

1 Introduction

In the modern world, the issue of ensuring food security, as one of the global issues of priority importance, is given a key role. Today, no other catastrophe can compare its consequences with a fatal outcome from hunger. Eleven people die every minute from hunger and malnutrition as the proportion of people suffering from famine-like conditions skyrocketed since the pandemic's start. The world is heading in the wrong direction with only eight years left to end hunger, food insecurity, and all forms of malnutrition (SDG Targets 2.1 and 2.2). To prevent future rising levels of malnutrition and realize the human right to food, everyone needs access to healthy diets, but the latest estimates suggest that they are out of reach for nearly 3.1 billion people worldwide.

The COVID-19 pandemic's lingering effects and consequences continue to impede progress toward achieving SDG 2 by 2030. The uneven nature of the economic recovery between countries in 2021, as well as the unreturned income losses among those most affected by the pandemic, have exacerbated existing inequalities and worsened the food security situation for the population, which already can hardly feed their families. Food prices have also increased in the past year due to bottlenecks in supply chains, soaring transport costs, and other disruptions caused by the COVID-19 pandemic. Additionally, the conflict in Ukraine, which involves two of the world's largest producers of agricultural products and staple cereals, is upsetting supply chains and negatively influencing energy, grain, and fertilizer prices globally. Such a situation causes shortages and drives up food inflation rates even further. On top of this, especially in low-income nations, the increasing frequency and severity of extreme climate events are proving to be a significant disruptor of supply networks.

Even though everyone, according to the recommendations of the FAO, has the right to complete nutrition, not every country in the modern world can provide sufficient economic and physical availability of food for the population. At the same time, ensuring sustainable economic development of the country based on balanced nutrition of the population is an important criterion for assessing its competitiveness.

In addition to all said above, it is also wise to say that the author comes from Russia, a country which covers 1/6 of the Earth surface and has tremendous impact not only in region where the country is situated, but also on the global level due to the fact that country has one of the biggest economies in the world. The author is genuinely interested in understanding if the country experiences any problems with food security as of 2022-2023 and based on his findings, it is expected that the author can make general assumptions about the future of food security in the country.

2 Objectives and Methodology

2.1 Objectives

The world faced multiple crises in recent years: a global pandemic, a climate crisis, and a number of local military conflicts. All these adverse events have heightened the urgency with which food security issues are discussed.

The main aim of the present Bachelor thesis is to disclose the relationship between national food Security and selected macroeconomic indicators on the example of the Russian Federation.

To achieve this goal the following research questions will be raised, discussed and gradually answered:

- 1. How is the very concept of Food security defined?*
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2.2 Methodology

The theoretical part of the Bachelor thesis will rest on the analysis and synthesis of relevant literature comprised of selected study books, scientific articles, legal documents and some electronic sources.

Having collected all the necessary information and data, the Methodology, mainly based on descriptive and comparative techniques plus estimation of a linear relationship between selected macroeconomic indicators and food security in Russia, will be applied to answer the main and partial research questions. The results of the conducted analysis along with their discussion will constitute the Practical part.

The author's practical part is based on the empirical analysis involving trend analysis and correlation analysis based on the selected annual time series from 2000 to 2020. Based on theoretical findings and outcomes of the Practical part, the conclusion and recommendations will be framed.

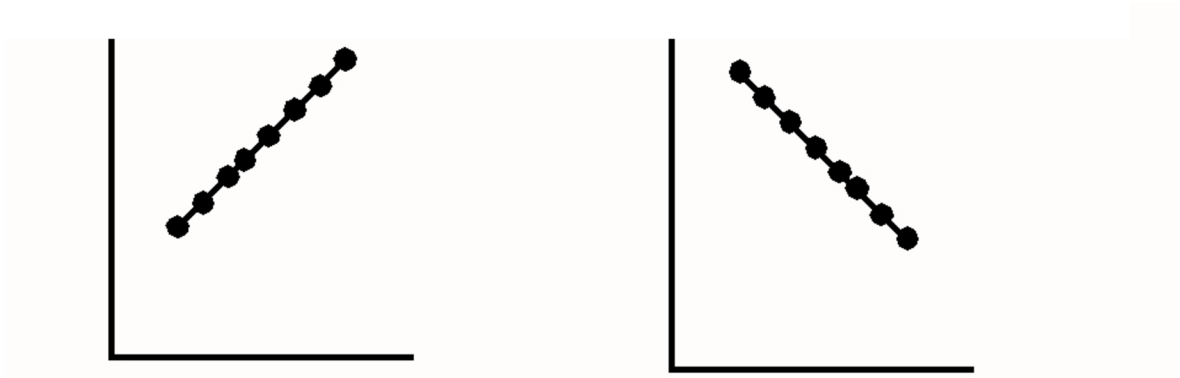
2.2.1 Pearson Correlation Coefficient

In addition to the main description of the methodology, the author also wants to specify main formulas used by him in more detail. Thus, one of the most fundamental pieces of calculations used by the author is Pearson correlation coefficient, which is computed based on the following formula:

$$\mathbf{R} = \frac{\Sigma(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\Sigma(X_i - \bar{X})^2(Y_i - \bar{Y})^2}} \quad (1)$$

Pearson correlation coefficient is used for the determination of the strength of the relationship between a selected pair of variables and this indicator can take values from -1 to 1 including both values, where a negative value means that the correlation is negative, and a positive value means that the correlation is positive. In Figure 1, the author presents graphs of perfect positive correlation (on the left) and the graph of a perfect negative correlation (on the right).

Figure 1, depiction of perfect positive and negative correlation



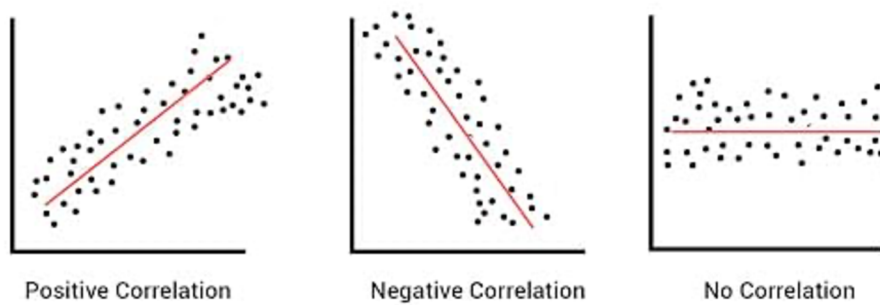
Source: own processing based on Cohen, 2009

Pearson correlation coefficient is one of many correlation coefficients that exist (for instance, Spearman's correlation coefficient is also used). However, the author considers Pearson correlation coefficient for his analysis since this kind of correlation coefficient evaluates the linear relationship between two continuous variables. Consequently, after estimating correlation coefficients based on (1) formula, the author proceeds to the verification of statistical significance for those correlation coefficients. This is done to ensure that a given correlation is statistically significant. For the verification of statistical significance, the author selects the level of alpha equal to 5% or 0.05. For the hypothesis testing related to the correlation coefficient, the null hypothesis (H_0) states that there is no statistically significant correlation, while the alternative states that the correlation between the pair of variables is statistically significant (H_a). The calculation is done according to the following formula:

$$T \text{ ratio} = \frac{r_{xy}\sqrt{n-2}}{\sqrt{1-r^2}} \quad (2)$$

In Figure 2, the author indicates three different outcomes of correlation analysis.

Figure 2, different applications of correlation coefficient



Source: own processing based on Cohen, 2009

Based on those graphs, it is visible that in cases of positive correlation, two variables inevitably move in the same direction – either increase or decrease simultaneously, while in cases of negative correlation, those variables move in absolutely opposite direction, but this situation is still considered to be a correlation. On the other hand, situations where variables do not really have any relationship to each other are classified as a total absence of correlation.

2.2.2 Descriptive Analysis

In addition to the correlation analysis, the author also uses a series of descriptive measures, which are related to either measures of central tendency or measures of dispersion. For the measures of central tendency, the author considers mean and median, which are calculated according to the following formulas:

$$\bar{x} = \frac{\sum a_1 + a_2 + a_n}{n} \quad (3)$$

$$\tilde{x} = \left(\frac{n+1}{2}\right)^{th} \text{ term} \quad (4)$$

For the measures of dispersion, the author considers just two – standard deviation and coefficient of variation, which are calculated according to the following formulas:

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}} \quad (5)$$

$$CV = \frac{s}{\bar{x}} \quad (6)$$

3 Literature Review

3.1 Evolution of the Food Security Concept

The goal of this chapter is not to provide a comprehensive overview of the issues encompassing food security throughout human history, but rather to put those issues into perspective and highlight a few major signs of progress in the recent development of concepts and knowledge about hunger, malnutrition, and food insecurity as well as the actions taken to mitigate their effects. For the purpose of simplicity, the author decided to separate the last approximately 75 years into four periods, based mainly on the state of the world food situation and understanding of the concept of food security. Its only goals are to help place events in chronological order and attempt to draw attention to any connections and details that may be overlooked in the hope that they will help the world to better understand current and future approaches to food security.

3.1.1 Post-World War I and League of Nations

The history of Food Security starts when and where communities all over the world began to worry about “Food Security” as an issue that is crucial on the worldwide levels, not only at household, regional, or country levels.

The League of Nations handled international issues throughout the 1930s, as well as this organization, was responsible for dealing with world affairs right after World War I (Iacob, 2022).

In the book called “World Food Security” written by John Shaw, he describes Sir John Boyd’s writings regarding ideas that could be recognized as the birth of the nowadays complex concept of Food Security. “In the early 1930s, Yugoslavia [as a member of the League of Nations] proposed that in view of the importance of food for health, the Health Division of the League of Nations should disseminate information about the food position in representative countries of the world. Its report was the first introduction to the world food problem into the international political arena“ (Shaw, 2007).

In the first assessment of the global scope of hunger and malnutrition, the research revealed a severe food deficit in poor countries. The League of Nations Assembly addressed debates on nutrition, nutrition policies, and the demand for coordinated nutrition policies in several states after reviewing the report. The Health Division's active participation in this analysis of global hunger and malnutrition as well as the knowledge of nutritionists may help to shed light on the current, sometimes complicated links between food security and nutrition.

Generally speaking, because food security is inherently multidisciplinary, it is not difficult to include nutrition as a problem within the context of food security, and, at least from the standpoint of development, it would be useless to separate nutrition from the other disciplines that contribute to the analysis of food security.

While discussions about addressing the issues of malnutrition were being held within the League of Nations in response to the work done by nutritionists, medical professionals, scientists, international civil servants, and national diplomats, on the other hand, other professionals, other international civil servants were always within the League of Nations discussing the international commodity trade, the tariff barrier, and whether a decrease in food output would result in higher cost of food after a massive decline due to the economic crisis.

However, the League of Nations eventually came to the conclusion that increasing food production to meet human needs would prosper the agriculture sector, which would then generate whole industry and bring important growth to the global economy through what was referred to as the "marriage of health and agriculture."

In addition to the emergence of modern food security, this first period was caused by a number of actual events that occurred earlier and which were all connected to factors that directly or indirectly impacted global food security. For example, there was a period of time in the history of the United States when agricultural goods were produced in excess. Such a situation was in 1896, the US Department of Agriculture (USDA) began to develop and implement policies of influencing production, using tools such as price control, credit control, export support, including programs and models which were very close to the early

food aid programs (Caswell, 2001). For instance, the first large-scale food aid operation was carried out after the First World War in 1918, when the United States sent more than 6 million tons of food products to Europe between 1919 and 1926 (Costigliola, 1984).

The United States was always a step ahead in terms of Food security, confirmation of this statement is the situation in the late 1920s and early 1930s, when food supplies exceeded the norm, thereby causing a drop in prices on the market. The USA decided to come up with various acts, mechanisms, and schemes for influencing, controlling, and regulating the agro-industrial sector. Subsequently, the Agricultural Adjustment Act (AAA) appeared, which was approved in 1933, this statute was aimed at increasing agricultural prices by eliminating surpluses. The government paid farmers subsidies in return for what they should not plant on part of their land, in addition, the government bought livestock for slaughter. Moreover, a Commodity Credit Corporation (CCC) was created for the purpose of buying and selling agricultural products, thus influencing prices in the market, also being able to issue loans to farmers. The CCC is still a crucial tool in US agriculture policy today, and it was instrumental in acquiring surpluses and other food products from the US market to be sent abroad as food aid.

3.1.2 Post-World War II, FAO, and UN

The Food and Agriculture Organization of the United Nations (FAO) plays a significant role in the management of the process of guaranteeing global world food security. FAO is now active in 75 nations across the globe, providing help in the form of food (Herforth, 2020). FAO, in accordance with its aims, is asked to find a solution to the problem of food shortages across the world, and the fact that its mission is "for a world without hunger" specifies the importance it has in the system of global world economic regulation of the food sector. On the worldwide food market, the Food and Agriculture Organization is always looking for new ways of working that are suitable to the current conditions of a world that is undergoing fast transformation. For instance, global tendencies toward the development of innovations are reflected in the activities of the FAO to disseminate the most up-to-date information in the field of innovations among participants in the global food market. These activities contribute to the introduction of the knowledge economy in the agricultural market, which ultimately results in the agricultural market's modernization into a significant part of the global innovation system. This is made easier by the numerous offices of the

organization, which can be found in 130 different countries around the world (Psarikidou, 2022). These offices are focused on enhancing the effectiveness of the agricultural market, both in the traditional domains of FAO's activities and in the domains of the contemporary digital economy. The network of FAO offices represents, in the modern sense, an international system for implementing the global food policy of knowledge, both in the effective use of natural resources and in the development of innovations in animal husbandry, crop production, fisheries, and modern forestry. At its heart, the network of FAO offices is a modern international system for implementing the global food policy of knowledge. Satellite data not only provide FAO with operational data for monitoring the state of the food sector of the planet and factors that can change it, but also modern information and analytical systems that are capable of predicting future changes in the global agricultural market. These systems are utilized by the Food and Agriculture Organization of the United Nations.

As a result, the Food and Agriculture Organization of the United Nation has established, with the assistance of contemporary technologies, a system of rapid response to the challenges posed by natural climatic risk factors for the loss of the planet's food potential. In addition to keeping this potential intact, the FAO also models ambitious development programs. For instance, the findings of the so-called "Green Revolution" are being extensively disseminated in underdeveloped nations by the Food and Agriculture Organization, which is increasing the yield in such regions and lowering the risk of starvation. FAO's primary objective has not changed despite the fact that it now engages in a wide variety of activities. This objective is to reduce poverty and hunger and, as a consequence, child mortality, the socialization of the entire society, its health, the fight against a variety of diseases, the preservation of the environment, as well as the development of global partnerships and cooperation in these areas.

There are two paths in which modern vectors of development for FAO are directed:

- To ensure the safety of the world's food supply and the availability of food for each and every person on the earth
- To create a high-tech, environmentally friendly, and sustainable growth of food production that is in harmony with the social development of rural regions, using the inventive achievements of mankind as a foundation.

The following vectors are geared toward mitigating the effects of the world's most pressing problems:

- The unstoppable and fast expansion of the world's population poses a significant threat of famine to the inhabitants of underdeveloped nations.
- The inevitability of the exhaustion of the planet's natural resources in the context of an increasing demand for food.
- A great deal of rivalry in the market for agricultural products, which causes a decline in pricing and brings to the demise of agricultural producers.
- The globalization of the agriculture market has been dominated by multi-national firms.
- An increasing reliance on goods imports on the part of emerging nations.
- A decline in overall food consumption in less developed nations, in contrast to an increase in that level in more developed nations.

FAO derives its budget from two different sources in order to assure the food security of the entire world: assessed contributions from participants and volunteer contributions. It is important to note that during the past several years, there has been a tendency toward a rise in the number of voluntary payments. If the required contributions in the budget for the 2017-2018 fiscal year came to a total of 1.4 billion US dollars, for instance, then the approximate amount of the voluntary contributions would be 1.7 billion US dollars (Boliko, 2019).

In other words, instead of providing direct food aid, efforts are being redirected toward actively encouraging the growth of agricultural output in the underdeveloped nations of the world. For instance, the Zero Hunger program, which has been active in Brazil since 1996 as a pilot project for the FAO, has shown an increase in the incomes of farmers of 43 percent per year. This has earned the program distribution in dozens of countries around the world as an effective practice in stimulating agricultural production. A unique program for ensuring food security is currently being carried out in 83 countries all over the world in an effort to end world hunger (Dasgupta, 2022). This program not only offers financial assistance to underdeveloped nations in the form of food, but it also encourages regional authorities to

work together in the search for methods that are successful in the battle against malnutrition. The Food and Agriculture Organization of the United Nations promotes the sharing of information, the collaboration of professionals, and the distribution of technology among developing nations. As a result, progress is made toward increasing the amount of food available to the population.

In accordance with the provisions of its Charter, the Food and Agriculture Organization of the United Nations bases its work on a collaboration with a diverse array of international non-governmental organizations that are enthusiastic about the steady expansion of the food market. This type of cooperation brings together a number of professional platforms for the purpose of maintaining an ongoing exchange of perspectives with a diverse group of stakeholders in the food market and, on the basis of their expert opinion, developing efficient management decisions that are suitable to the environment of the market. Illustrative of this is the partnership between the Food and Agriculture Organization and the International Cooperative Alliance. The integration of cross-country corporate movement that is based on the construction of an efficient model for the development of the agricultural market is the primary objective of this organization, which also has as one of its primary goals the consolidation and support of the corporate movement in all countries.

Since it was established in London and currently unites 247 cooperative federations from 91 countries around the world, the Alliance enjoys a great deal of prestige across the globe. This is due to the fact that it represents more than 700 million people who are actively participating in the contemporary cooperative agrarian movement. Since the cooperative community makes a significant contribution to food supply not only in developed countries but also in developing countries, the scale of this public organization allowed it to receive a consultative status in the field of the cooperative movement at the UN. This is due to the fact that cooperatives are not only prevalent in developed countries but also in developing countries. FAO has also collaborated with the International Association of Agricultural Economists (IAAE), an organization that promotes the dissemination of information pertaining to agricultural economics, the implementation of cutting-edge financial technologies within the agro-industrial complex, as well as the growth of international integration ties.

The International Association of Agricultural Economists is a public organization that is responsible for significant developments in the field of global and regional agricultural policy. Within this context, the conceptualization of financial strategies and mechanisms for investing in and providing assistance to agriculture is taken into consideration as an element of the overarching plan for modernizing the international agricultural market (Whittard, 2022).

3.1.3 Final Years of the 20th Century and 21st century

According to the FAO, the prices on the international market hit an all-time high in 2010, and it is expected that they will continue to increase even further in the nearest future. This is explained by the fact that it is likely that there will not be enough time and capacity to find a solution to the food shortage while the wellbeing of people constantly gets damaged.

Figure 3, FAO logo



Source: FAO, 2022

The spike in food costs, which started in 2007 and affected practically all the people on the earth, was one of the most significant causes that kept the global economy from recovering from the global financial crisis. Over the course of the previous three years, this issue has been the topic of discussion at gatherings of the most influential international and intergovernmental organizations. The projections of industry experts indicate that there will be an additional rise in the prices of food throughout the world and that hunger will spread across the globe. The specialists at the United Nations predict that in the next two or three decades there may be a massive lack of food, and as a consequence, the price of food will skyrocket, which can develop into a true catastrophe for the people of the globe (Ben Hassen, 2022). The rate at which the population of the planet is expanding is speeding up so pursuing the idea of every citizen on the planet having food is becoming much harder each day.

Additionally, it is essential to take into account the events that transpired towards the close of the 20th century for the simple reason that the adoption of a unified agricultural policy is one of the first phases.

The adoption of a unifying agricultural strategy in the middle of the 20th century can be considered to have successfully completed the first step of the process. Its fundamental elements were included into the Treaty of Rome, which was also signed in 1957 by a number of nations that are now members of the EU (Gehler, 2022). The objective that the signatory nations of the agreement have set for themselves is to organize the free movement of people, capital, products, and services across their respective boundaries. The signatory nations include the United States of America, Luxembourg, France, Italy, and Germany. The European Economic Community (EEC) was formally established with the signing of this treaty, which is considered the founding document of the EEC. In one of the articles of the Treaty of Rome, the primary objectives of the common agrarian policy were described as follows.

A steady rise in labor productivity within the framework of the unified agricultural market through the promotion of the application of the outcomes of scientific and technological advancements to the process of agricultural production; to put it another way, the provision of the agricultural market with an innovative impetus for the advancement of the industry as a whole is maximizing the use of the available labor force in rural areas, with the goal of raising farmers' earnings and enhancing their overall quality of life.

In fact, there was a program designed to secure agricultural market employees in rural areas, with the goal of establishing conditions that would prevent those people from migrating to the city. To put it another way, the objective was to make the human capital that is employed in the agriculture sector significantly more valuable, so laying the groundwork for innovation in that industry.

Main points and goals of this agrarian program:

- Stabilize the market, which will finally assure the stability of the economy in times of crisis.

- Guarantee the capability of supplying the agricultural market with the optimum quantity of the resources essential for its growth.
- Guaranteeing that food is available to consumers at prices that are within their financial means should form the cornerstone of any effort to achieve food security.

Increasing worker productivity in the agricultural sector was given the most focus early on in the process of implementing the common agrarian policy because this was one of the goals that was outlined for the policy. It was worker productivity that served as the foundation for the creation of a viable agricultural sector in the European Union, which in turn made it possible for people of the EU to purchase food at a price that was within their means. It was essential for the state to provide financial assistance to farmers in order for them to be able to rapidly adapt to the economic and social conditions of the market at the time and to fulfill the responsibilities that were assigned to them during the transition to intensive agricultural production. Restrictive measures on imports as a protective measure against external expansion and government subsidies in the form of public purchases at high prices from farmers in exchange for affordable prices for end-users of basic foodstuffs were the tools that were used to achieve the goals and objectives of agricultural policy. These restrictive measures on imports were implemented as part of the agricultural policy.

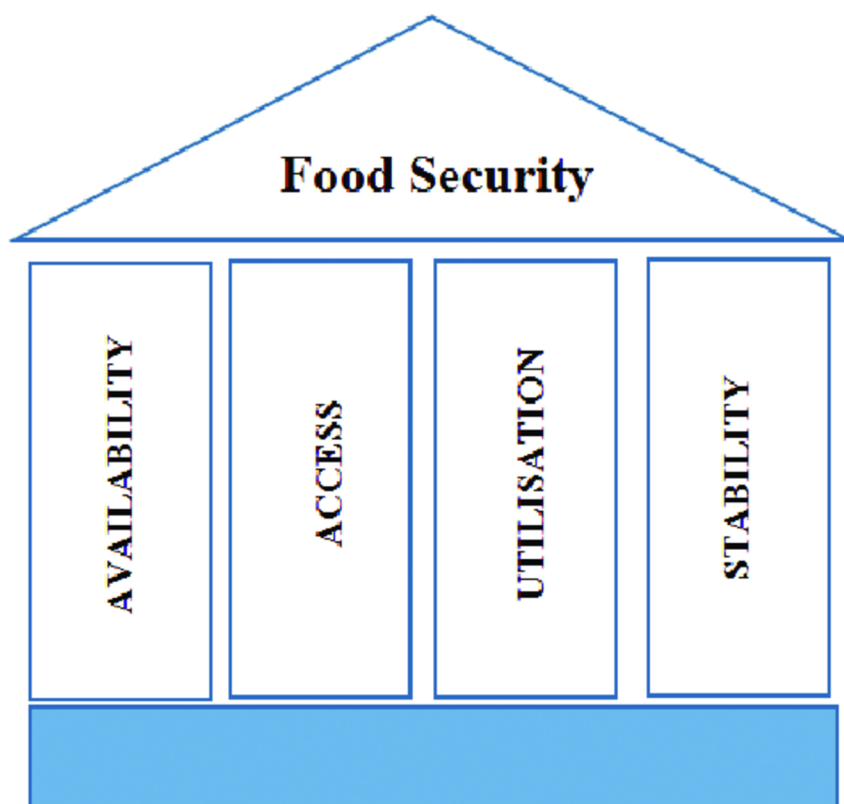
The first stage of the common agricultural policy was started right after World War II, and the primary objective, which was to successfully provide food for the population while also maintaining a high level of food security in the countries that make up the European Union, was successfully accomplished (Guth, 2020). On the other hand, this very high degree of food security has resulted in the emergence of a new challenge: the persistent overproduction of essential goods, in particular grains and milk. As a direct consequence of this, the additional monetary and administrative burden that falls on the state in its role as a regulator of crisis response methods has grown.

3.2 Concepts and Definitions related to Food Security

3.2.1 Food Security and Four Pillars

Food security is a part and a crucial element of the national security of the state. While national security is stability that can be maintained for a long time, a state of sufficiently reasonable dynamic protection from the most significant of the real threats and dangers, as well as the ability to recognize such challenges and take the necessary measures to neutralize them in a timely manner.

Figure 4, four pillars of food security



Source: Gentilini, 2002

As it was mentioned above, it is difficult to establish one stable definition of such a complex concept of “Food Security”, therefore in this paragraph, the author would like to present some of them, which are the most significant and accurate. Even a decade ago, there were about 200 definitions in published writings (Smith, 1993). It should be referred to the most acceptable definition that was approved by the 1996 World Food Summit (WFS) and remains an important achievement of the meeting (Gentilini, 2002).

According to the United Nations Committee on World Food Security, food security is defined as “meaning that all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life”. The term “Social” was added to the 1996 definition in 2002 WFP offers the following definition: “A condition that exists when all people, at all times, are free from hunger” (WFP, 2009).

Based on USDA “Food security for a household means access by all members at all times to enough food for an active, healthy life. Food security includes, at a minimum: The ready availability of nutritionally adequate and safe foods. An assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies).

As well as a definition of “Food security”, it is necessary to define who is “Nutrition secure” for a better understanding of the problem. “A person is considered nutrition secure when she or he has a nutritionally adequate diet and the food consumed is biologically utilized such that adequate performance is maintained in growth, resisting or recovering from disease, pregnancy, lactation and physical work” (Simelane, 2020). In 2009, the World Summit on Food Security stated that the "four pillars of food security are availability, access, utilization, and stability (Food Summit, 2009).

Availability

The first element is availability. In the WFS meaning, it refers to the term “sufficient”. It is defined by WFP as “The amount of food that is present in a country or area through all forms of domestic production, imports, food stocks and food aid “ (WFP, 2009). The definition applies to villages and households, not only to countries and areas. Agricultural production has expanded crucially over the last 50 years, it has grown more quickly than the world population (Asif, 2007). Nowadays there are enough food reserves per capita in the world, which means that each country can feed its citizens if one relies on statistical indicators. But then why the problem of malnutrition and starvation is in the first place? Sometimes the presence of food does not mean its availability. Food availability relates to the supply of food through production, distribution, and exchange.

Access

The second dimension of food security is access. In the WFS definition, it implies to “have physical, economic and social access” WFP, for instance, identifies food access as “A household’s ability to acquire an adequate amount of food regularly through a combination of purchases, barter, borrowings, food assistance or gifts “ (WFP, 2009). The term "food access" relates to the availability and cost of food as well as personal and household preferences. The UN Committee on Economic, Social, and Cultural Rights stated that access to food is usually restricted by poverty, not by a lack of food, which is a significant reason of hunger and malnutrition. Poverty can limit access to food and make a person or household more susceptible to increases in food prices. Access depends on whether the household has enough income to purchase products at existing prices or has sufficient land and other resources to grow its own food.

In fact, there are three elements describing access to food: physical, financial, and socio-cultural:

- Physical – this aspect depends more on the supply chain and logistics work when delivering a particular food product around the world.
- Financial - means that access to food is influenced by market factors and the price of food as well as an individual’s purchasing power, which is related to employment and livelihood opportunities.
- Socio-cultural - relates to the fact that food commodities may be geographically close to the consumer who may have the resources to buy them, but that there may be socio-cultural barriers limiting access to food, particularly for various sectors of the population for gender or cultural reasons, for example (Leckie, 1998).

Utilization.

The third dimension of food security is food **utilization**. In the WFS definition, it refers to “**safe and nutritious** food which **meets their dietary needs**” (Gentilini, 2002). Utilization is commonly understood as the way the body makes the most of various nutrients in the food. Sufficient energy and nutrient intake by individuals are the result of good care and feeding practices, food preparation, diversity of the diet and intra-household distribution of food.

Combined with good biological utilization of food consumed, this determines the nutritional status of individuals. (Abbade, 2017).

Stability

The fourth dimension of food security is **stability**. In the WFS definition it belongs to: “**at all times**”. Even if your food intake is adequate today, you are still considered to be food insecure if you have inadequate access to food on a periodic basis, risking a deterioration of your nutritional status. Adverse weather conditions, political instability, or economic factors (unemployment, rising food prices) may have an impact on your food security status.

All four dimensions must be met at one time for the achievement of food security goals. What is more, stability is something that ensures that no problems with food security will be reoccurring as human beings are characterized by the constant need to maintain necessary level of daily calory intake, so stability is downright important when it comes to ensuring absence of uncertainty in relation to food security (Garcia-Diez, 2021).

When considering all four pillars of food security, it is wise to understand that relying solely on annual reports reflecting the situation with food security in points for given countries is not the only approach to measuring food security. In fact, given the fact that food security is inevitably related to a country’s internal situation and especially to its level of economic development, it is also possible to say that evaluating the situation with food security with the help of macroeconomic indicators, such as unemployment (a great measure of stability), GDP per capita (a great measure of availability), prevalence of undernourishment, poverty rate and exchange rate is also possible and quite often it provides really good results in terms of accuracy (Diaz-Bonilla, 2015).

3.2.2 Food Insecurity

Speaking of food security, it is important to consider the other side of the issue raised - food insecurity. Global food insecurity is still a problem. Fishermen and farmers all over the world are suffering due to climate change, there is a severe poverty problem, and conflicts in many nations are preventing people from having secure access to nutritious food. It could be brought on by a lack of food, low purchasing power, improper distribution, or poor usage

of food at the household level. All these elements play a role in the issue of global food insecurity.

Food insecurity is defined by the UN FAO as the “situation when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life.” (Gundersen, 2015)

The following table presents a brief overview of two types of food security that is most frequently encountered:

Table 1, general types of food insecurity

	Chronic food insecurity	Transitory food insecurity
Is...	Long-term or persistent	Short-term or temporary
Occurs when...	Over a long period of time, people are unable to achieve their minimum food needs.	The capacity to create or obtain enough food to sustain a healthy nutritional status suddenly declines.
Results from...	Long-term poverty, a lack of assets, and insufficient access to financial or productive resources.	short-term shocks and changes in food access and availability, also including year-to-year fluctuations in domestic food production, food prices, and incomes of households.
Can be overcome with...	Common long-term development strategies, such as education or access to productive resources, such as loans, are also employed to combat poverty. They may also require greater direct access to food in order to	Food insecurity that is just transitory might appear out of nowhere. Due to this, planning and programming are more complicated and require a variety of intervention kinds and capacities, such as safety net programs and early warning systems.

	increase their productive capability.	
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Source: Baro, 2002

Food insecurity can be chronic or transitory. Chronic food insecurity refers to a continuously inadequate diet caused by the inability to acquire food. On the other hand, transitory food insecurity refers to the short-term household inability to access enough food. Two more subcategories, cyclical and temporary, can be used to further categorize transitory food insecurity. When there is a recurring pattern of food insecurity, such as just before harvest, this is referred to as cyclical food insecurity. Droughts, floods, and conflicts are examples of short-term shocks that can cause temporary food insecurity (Barrett, 2010).

The concept of **seasonal** food insecurity lies between chronic and transitory food insecurity. This is almost similar to chronic food shortage, as it is usually predictable and follows a sequence of known events. However, since seasonal food insecurity has a limited duration, it can also be considered as a recurring, transitory food shortage. Such a situation happens when there is a cyclical pattern of insufficient food availability and access to it. This is due to seasonal climate fluctuations, it is associated with crop structure, employment opportunities (demand for labor) and diseases (Nord, 2006).

3.2.3 Current Situation

This chapter presents an up-to-date analysis of food insecurity and nutrition for the period up to 2021, as well as a report on the economic impact on the manufacturing sector.

Today, a new crisis is developing that has the potential to have far-reaching repercussions for the safety of food and nutrition throughout the world. This crisis is the conflict in Ukraine. However, the direct and indirect repercussions of the conflict in 2022 will have a varied influence on global agricultural markets in terms of trade, output, and pricing. It makes the problems of food security and nutrition in many countries, especially in those that are already dealing with hunger and food shortages, much worse, and it further complicates the achievement of the Sustainable Development Goal 2 targets, which are to put an end to hunger, ensure access to adequate food, and put an end to all forms of malnutrition (Zhao, 2020).

The success of initiatives to refocus assistance to the agriculture and food industry is dependent on components of political economy, as well as on general direction and incentives provided to key players in local, national, and international contexts. In a broad sense, political-economic factors are social, economic, cultural, and political factors that influence the structure, existence, and transformation of interconnected systems consisting of public and private figures of the economy, as well as their interests and relationships. In other words, political-economic factors are a subset of social economic cultural political factors. This refers, in particular, to the institutional structures, as well as the laws and norms, that have an effect on the course that contemporary politics takes and its overall structure. General governance consists of laws, structures, and procedures, both formal and informal, that allow public and private actors to communicate their respective interests, as well as to make choices and put those decisions into action.

Obviously, every nation possesses a distinct political makeup all their own. Even though they provide just a small portion of both GDP and employment, the upstream stages of the agricultural value chain in nations with high incomes receive a large amount of support. For instance, in the year 2020, around 30 percent of the total budget of the European Union was allocated to the operation of the European Union's Common Agricultural Policy (CAP) (Baquedano, 2022). As a result, producer support in these countries takes the form of border and trade controls, which do not require any funding from the government. This is because many low-income countries do not have the financial capacity to support the agricultural and food processing industries in the form of subsidies (Hazell, 2020). It is possible for governments to suffer a loss in trade income if they reorganize border regulations. It is reasonable to presume that different political interests and concerns are the driving force behind the decisions of national governments about whether or not they will support reorientation activities and to what degree they will do so.

3.3 Macroeconomic Indicators

3.3.1 GDP

In order to meet the author's objectives related to the defining essential variables explaining the development of food security in Russia, it is first essential to understand which macroeconomic variables there are and what they generally explain.

To begin with, it is first essential to focus on the most commonly used macroeconomic indicator which is called the gross domestic product. Gross domestic product refers to the total monetary value of goods and services produced within one country over the course of the whole year and there are multiple approaches for measuring the GDP variable. The author presents the breakdown of the most commonly used approach for calculating GDP – expenditure approach:

$$GDP = C + I + G + NX, \text{ where} \tag{7}$$

- C stands for the private final consumption expenditure.
- I stands for the investor spending on business capital goods.
- G stands for the government spending on public goods and services for inhabitants
- NX stands for the difference between Exports and Imports.

Also, it is wise to consider that it is possible to distinguish two main types of the GDP variable – nominal one (expressed in monetary terms and without the inflation being adjusted) and real one (expressed in the output terms) (Callen, 2008).

3.3.2 Inflation

Then, continuing to other essential macroeconomic variables, it is also wise to mention inflation, which reflects the overall increase in the price level in a given country over the course of one year in percentual terms. Usually, for measuring inflation, the CPI approach is used, which involves the calculation of the average change over time in the prices paid by consumers for goods offered and sold on the market. Inflation is an important measure that is related to stability of an economy and wellbeing of consumers, since constant drop in the

purchasing power of money can sometimes lead to horrific consequences, especially when this increase in the price level is not accompanied by the rise of real income of domestic population (Castelnuovo, 2003).

There are three main types of inflation which are:

- Demand-pull inflation, this particular type of inflation is characterized by active consumption by consumers despite increasing prices for goods due to increasing wages or having a lot of savings.
- Cost-push inflation, this particular type of inflation is characterized by the increase in the prices of inputs, which inevitably leads to the increase in the price of goods that are being sold on the market.
- Built-in inflation, this particular inflation occurs when the increase in prices is primarily explained by the need to increase wages, so firms increase prices as well to have the same profit margin as they had had before.

Contrary to the concept of inflation, there is also deflation, which is characterized by the annual percentual decrease in the price level. In other words, deflation is the opposite process to inflation and when there is a deflation in the country, it is believed that the purchasing power of money increases, so the prices drop. Yet, this particular phenomenon might seem to be rather satisfying, but for firms, it is not good at all, since they are losing their profit and consequently, they can shut shown. All in all, it is possible to highlight that inflation is bad for consumers, while deflation is bad for firms. For this purpose, countries usually keep a very small level of inflation as a target and by doing so, they stimulate economies (Bryan, 1997).

3.3.3 Unemployment

Unemployment is the third macroeconomic variable that will be mentioned by the author and this particular one is crucial as high unemployment has a disruptive effect on the economic growth of countries. Unemployment refers to the percentage of the labor force that is not currently engaged in any economic activity. Yet, as it might become obvious, there might be different approaches to classifying and identifying unemployed people, so there might be different methodology applied (Brandolini, 2006). International Labor

Organization (ILO) measures captures people who are not engaged to any work, but are available for it, so this is the most commonly used methodology, which is transformed to the following formula for the calculation of unemployment:

$$Unemployment = \frac{Unemployed}{Labor\ Force} * 100\% \quad (8)$$

As the author has mentioned it, unemployment is a crucial indicator because actively working and employed people inevitably earn wage and this wage is actively being spent, thus increasing the overall turnover of money and keeping economies running. Yet, there is a drawback of low unemployment, which is the fact that low unemployment can cause demand-pull inflation given that people have money to spend, and firms use it for their own benefit. For this purpose, governments try to stick to particular level of unemployment that will be suitable for them, and which will not be harmful to the economic environment of a given country.

What is more, unemployment is a seasonal variable, which means that during periods when economies are extremely productive, this variable tends to be lower. This is primarily explained by the presence of seasonal unemployment that exists alongside the other types of unemployment, which are:

- Frictional – this type is explained by voluntary changes and shifts in working position of people, when they quit one job and they are in the search of another, presumably a better paid one.
- Cyclical – this type is explained by the fact that some jobs are offered only during the times when an economic activity is being delivered. For example, some jobs in agriculture and tourism can be perfect explanations for that.
- Structural – this type is explained by structural and technological changes in the structures of economies, when people with lower qualification are being replaced by more educated and experience labor or even automatization (Hart, 1990).

3.3.4 Balance of Payments

Finally, the author briefly mentioned the existence of the fourth variable which is often used alongside the first three mentioned by the author. Balance of payments itself presents the journal of all differences between the money entering and leaving a country within a given year or any other selected time frame according to particular transactions. Balance of payment is a complex variable, which consists of three accounts:

- Current account, this account consists of a given country's trade in goods and services and also remittances.
- Financial account, this account consists of all transactions in relation to FDI (foreign direct investments) in the country and funds invested abroad and controlled directly and in relation to portfolio investment (not controlled by the investor).
- Capital account of central bank account, this account refers to a given country's manipulations with reserves used for the devaluation or valuation of domestic currency.

In addition to this essential indicator of a given country's wellbeing, it is also wise to consider that exchange rate is an integral part of this variable that explains particular tendencies related to almost all transactions. Also, it is wise to say that the capital account is being actively used in countries that follow a fixed exchange rate regime, where a country tries to maintain a particular level of exchange rate using their reserves. However, the overwhelming majority of countries in the world have switched to the floating exchange rate regime, where those manipulations are kept to minimum and being used only in situations when something goes extremely wrong (Kindlebergera , 1969).

3.4 Russian Federation: Overview of Internal Situation

Source: Freepik, 2023

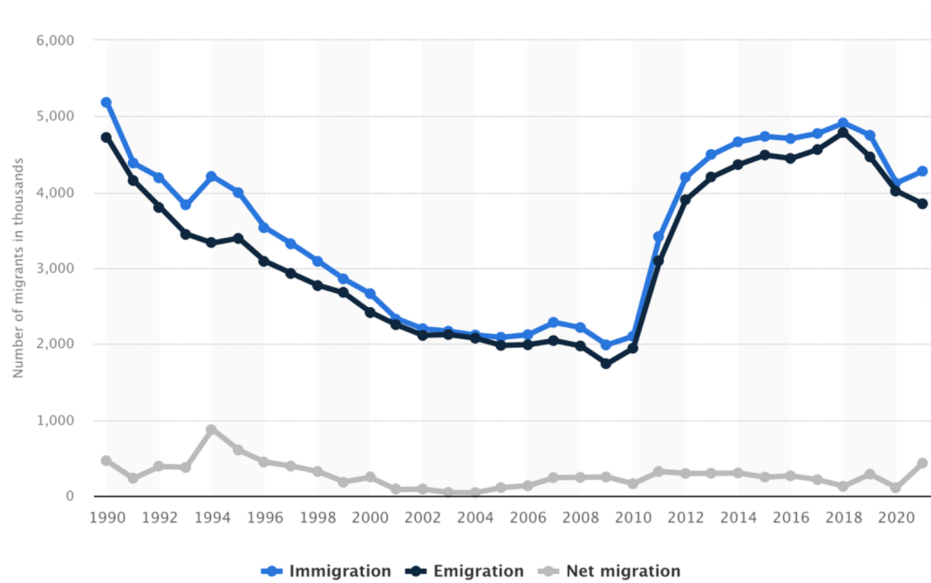
Figure 5, infographics about Russian economy



The domestic situation in Russia in 2022 was characterized by a number of noteworthy events on the political, economic, and social fronts. Regarding issues of food, safety, and quality, as well as socially oriented programs, Russia is currently experiencing a kind of motivated rise; however, this trend has not always been like this. The internal situation in Russia over the past 20 years could not be called calm. However, Russia is currently experiencing a rise in terms of how blossom economy became (Aksoy, 2022). In this regard, the author of this work would like to omit issues related to politics and those data that can or could become an argument in favor of a position and idea that the author does not haunts for the sake of conducting an analysis of such an important subject as food security.

In the realm of the economy, Russia continued to confront a variety of issues, some of which included a slowdown in economic development, high levels of inflation, and a decline in the quality of life for many people residing in Russia, which lead to the increase in the immigration from the country, which is visible in Figure 5.

Figure 6, immigration compared with emigration in Russia



Source: Statista, 2022

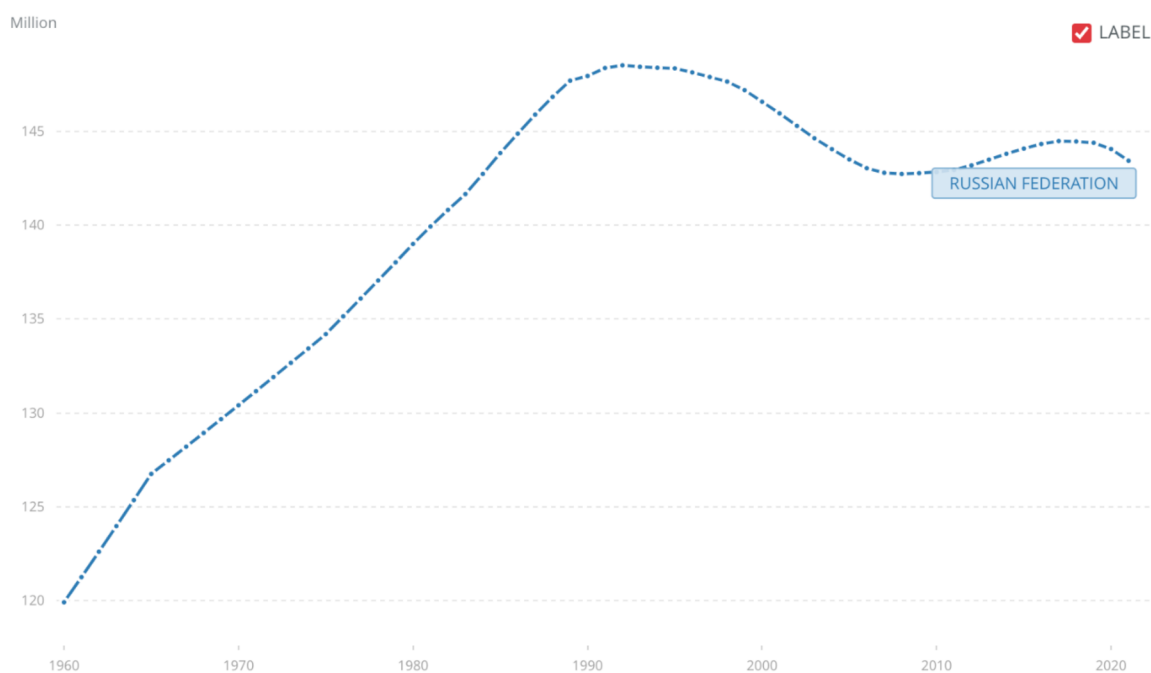
In recent years, the oil and gas industry of the country, which has traditionally been a significant contributor to the government's overall revenue, has been facing challenges as a result of a decline in the price of oil on a global scale as well as an increase in the amount of competition from renewable energy sources. Many people in Russia are still strongly reliant on the natural resource industry for their livelihoods, despite the fact that the government has been making attempts to diversify the economy, but development has been gradual and there has been little success so far (Deryugina, 2019).

On the social front, there have been a number of noteworthy changes, some of which include the expanding sway of technology and the internet, as well as the rise of social media and online activism in popularity. Younger generations are becoming more involved not only in learning but also in understanding of what is going around the globe and by utilizing internet platforms to share their ideas. Also, the younger generation is beginning to acquire information and expertise outside of educational institutions. In this sense, not just Russia, but the entire globe has become encircled by opinions, politics, and political opinions that sometimes too hard to avoid (Sibirskaya, 2015)

In the last decade, one of the most significant difficulties that Russia was going to face was the fast aging of the country's population (see Figure 7). The birth rate in the nation has been falling for a number of years, and this, in conjunction with an increase in the average

life expectancy, has led to a population that is fast becoming older. This has resulted in a variety of social and economic issues, including the need to provide for a rising number of retirees and a scarcity of young employees to maintain the economy. Both of these challenges have been brought about as a direct result of the aging population. There has been effort made by the government to solve these problems, but progress has been gradual, and many Russians are apprehensive about their prospects for the future (Ustinova, 2014).

Figure 7, Russia's total population



Source: The World Bank, 2022

The worsening state of the environment was yet another significant problem for Russia in the year 2022. The nation is struggling with a variety of environmental issues, including as pollution in the air and water, the loss of forest cover, and the deterioration of soil quality. Many Russians are worried about the long-term effects that environmental deterioration will have on their health, and the government has been making some attempts to address these concerns, but progress has been gradual and the government's efforts have not been enough (Siddi, 2021).

In spite of these actions, Russia continued to be a significant participant on the international scene in the year 2022. The nation continued to play an important part in the

workings of the international community and kept up tight ties with a number of important allies, including China, Iran, and Syria. (Umar, 2022). But one of the most important ways to protect the safety of the country and ensure its long-term growth and prosperity is to make sure that its people always have access to enough food. This is a cornerstone of sound socioeconomic policy and a prerequisite for achieving Russia's top national priority, which is to raise the standard of living for its people (Porfiriev, 2020).

4 Practical Part

4.1 Overview of Russian Economy

First, before proceeding to answering the main research questions mentioned earlier in the very thesis, it is first essential to take an insight into the world of Russian economics, understand the main trends and tendencies and try to characterize the current development of the economy in general. For this purpose, the author selects key macroeconomic variables quickly mentioned in his literature review and in addition to them, the author expands the dataset by including the variable of FDI or net foreign direct investment, which indicates the total volume of investments done. This indicator can be negative, and, in this case, it means that the country is more actively invests abroad rather than accommodates investments in the country, while a positive indicator means that a country receives more investments than it invests abroad. Furthermore, it is vital to specify that the variable of FDI indicates investments made and controlled by companies or individuals directly, whereas portfolio investments are traditionally opposed to the FDI since investors do not directly manage their investments. In the appendix (Table 6), the author presents the overview of the database used for his analysis, where macroeconomic variables are located in the right part of the table and it is marked with the orange colour.

In the first chapter of the practical part, the author, as he already mentioned it before, observes the development of Russian economy from 2000 to 2020 and for this purpose, the author uses basic measures of descriptive statistics, which were described in the methodology of the work. Based on the Table 6 from the appendix, the author proceeds to the descriptive analysis of all variables related to the macroeconomic domain of Russia. The results of the analysis are indicated in Table 2.

Table 2, descriptive analysis of macroeconomic indicators

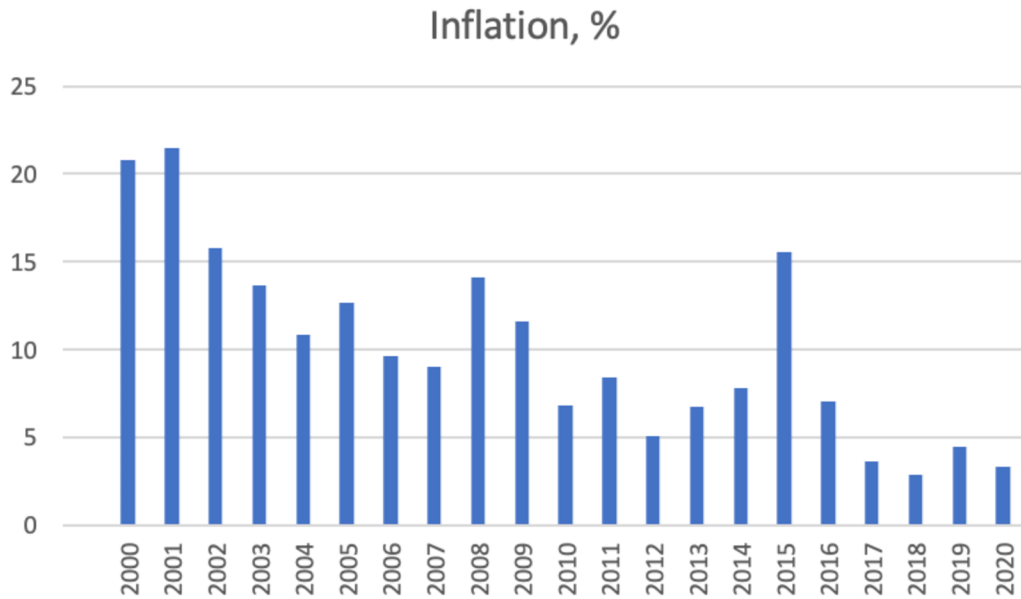
	Inflation, %	GDP per capita, dollars	Exchange rate, ruble per USD	FDI, net inflow in billion USD
<i>Mean</i>	10.08	8908.48	39.64	29.09
<i>Median</i>	9.01	9313.01	30.84	28.56
<i>Standard Deviation</i>	5.39	4426.28	16.39	22.48
<i>Coefficient of Variation</i>	0.53	0.50	0.41	0.77
<i>Minimum</i>	2.88	1771.59	24.85	2.68
<i>Maximum</i>	21.48	15974.64	72.10	74.78

Source: own processing based on The World Bank data

According to Table 2 and the result of the descriptive analysis, it is possible to say that the best-performing years of Russian economy, were identified prior to 2014, when the first sanctions were applied on the country. Hence, the level of GDP per capita was on its peak prior to 2014, as well as the level of FDI, which had the second highest value in 2014 after the largest one indicated in 2008, when it reached 74.78 billion USD. Undoubtedly, it is pretty evident that the worst-performing period of Russian economy is identified in the beginning of the 2000s, when the country was just recovering from the long-lasting series of economic shocks from the 90s and was just starting its expansion. In the mentioned period, the level of FDI and GDP per capita was the lowest one. In addition to that, it is wise to say that despite a series of problems in the beginning of 2000s, the country had a relatively favorable exchange rate, but also had the highest figure for inflation – 21.48 in 2001, which is an astonishingly high value.

The author first analyzes the variable of inflation rate, whose development in time is depicted in Figure 8.

Figure 8, development of inflation in time

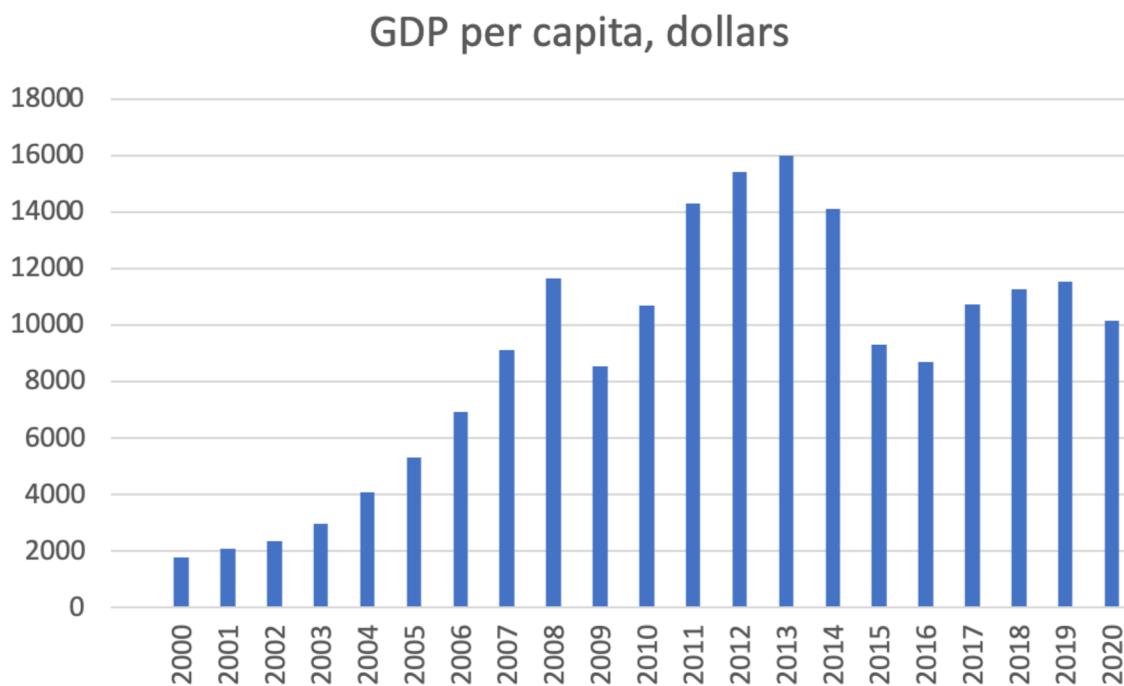


Source: own processing based on The World Bank data

First, when analyzing the variable of inflation for The Russian Federation, it is possible to say that the average inflation for the country was equal to 10.08%, which is a relatively high number. The author suggests that it can be explained by the fact that the country has been going through a rapid economic expansion. Apart from that, it is also wise to say that this relatively high average inflation is also associated with the country's transition from a centrally planned economy to a market one, which was not finished until the beginning of the new century due to the series of economic shocks, such as the devaluation of ruble in 1998. The value of median for inflation rate is 9.01%, which is also a high number. However, those high values are also explained by high variability of the inflation rate in the Russian Federation, which becomes obvious when looking at the values of coefficient of variation and also of standard deviation. The lowest-ever level of inflation on the selected time period (2000-2020) was identified in 2018, when the indicator was equal to 2.88%, whereas the highest level of inflation is identified in 2001, which might be related to the country's long recovery from the financial crisis of 1998 and the shock therapy of the 90s. Overall, the development of inflation for the country in the second half of the 10s became more stable and predictable, which suggests that as of 2020, the country managed to control the situation.

Then, the author proceeds to the second variable – GDP per capita, which is a good indicator to express the country’s level of economic development. The development of this variable is shown in Figure 9.

Figure 9, development of GDP per capita in time

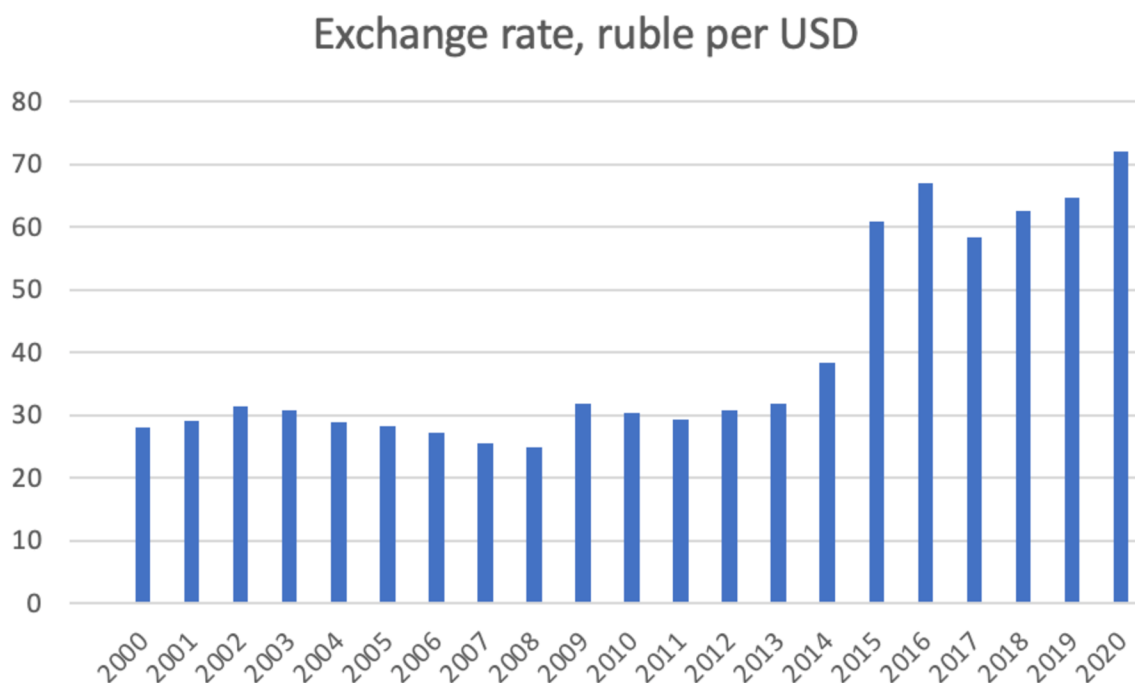


Source: own processing based on The World Bank data

Based on the descriptive analysis from Table 2, it is possible to say that the average GDP per capita for Russia is equal to 8908.48 USD per capita, which is not high when comparing the level of this indicator to other countries. At the same time, from Figure 9 it is visible that the country was approaching a much better level of the indicator until 2014, when the first series of international sanctions were applied after the events associated with Crimea. Afterwards, the level of the indicator continued to drop until 2017, when the country started to recover again and were hit by the pandemic, which also lead to a slight decrease. The indicator is in a constant development, which is also visible from a relatively high volatility, based on the standard deviation and coefficient of variation. The lowest level of the indicator is identified in 2000, which is associated with a very bad economic situation from the 90s, while the highest level of the GDP per capita is identified in 2013 – the year before the events of Crimea.

Then, the author proceeds to the exchange rate variable, whose development is indicated in Figure 10.

Figure 10, development of exchange rate in time

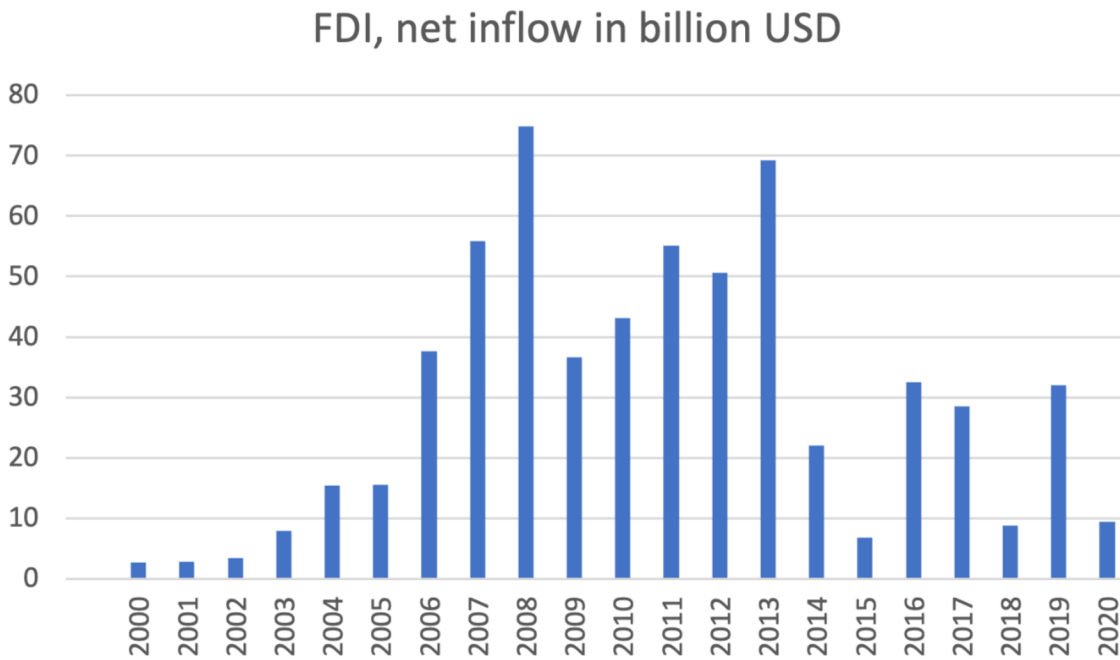


Source: own processing based on The World Bank data

Based on the descriptive analysis from Table 2, it can be said that the average exchange rate for the country to USD was 39.64 rubles per one dollar. However, the situation started to change rapidly after the events related to Crimea peninsula, which eventually indirectly lead to the all-time high level of exchange rate of 72.1 rubles per USD in 2020. The standard deviation and coefficient of variation indicate that there is a variation present, but this variation is lower than for inflation and GDP per capita and the author believes that it mostly comes from the fact that the Russian central bank can to some extent directly influence the level of the exchange rate using manipulations with the country's reserves. All in all, there seemed to be no troubles until 2015, but sanctions actually badly hit the country and led to a depreciation of the domestic currency and presumably accelerated inflation. Overall, the situation is concerning as the country's currency is rapidly depreciating and it might cause inhabitants of the country problems in the form of an increasing level of prices.

Finally, the fourth variable is FDI net inflow, whose development in time is indicated in Figure 11.

Figure 11, development of FDI in time



Source: own processing based on The World Bank data

The average level of FDI for the Russian Federation was equal to 29.09 billion usd, which is a relatively high number. However, it is visible that the biggest inflow of FDI was happening in the late 00s, while Foreign Direct Investments to Russia decreased after the events of Crimea and sanctions that followed. This indicator is the most volatile one but the very indicator itself is dependent on the country's stability, as investors do not usually like high risk. Presumably, a series of sanctions and problems with foreign partners prompted investors to slowly stop to consider Russia as a safe haven for their investments, which is visible in the dynamics after 2015, or investing procedures were simply made more complicated by either side of the relationship.

4.2 Overview of Food Security Indicators

Then, the author proceeds to the same kind of analysis – the descriptive one, but it will be applied to variables related to food security. For the food security domain, the author selects 4 variables, each reflecting the situation with a particular pillar. For the availability pillar, the author considers the food production index since this indicator perfectly describes the country's situation with production and, consequently, with the availability of food. For the access pillar, the author considers poverty rate as a perfect indicator that will help to describe the country's situation with access to food since poverty is something that inevitably

restricts people's access to food. For utilization, the author considers the variable of prevalence of undernourishment, which is directly related to the way how food is being utilized. Finally, for the stability, the author considers the variable of unemployment as the best indicator for the depiction of stability since having secured a job is one of the most powerful aspects that can significantly reduce vulnerability to food security related issues. In Table 3, the author presents the result of the descriptive analysis for those variables.

Table 3, descriptive analysis of food security indicators

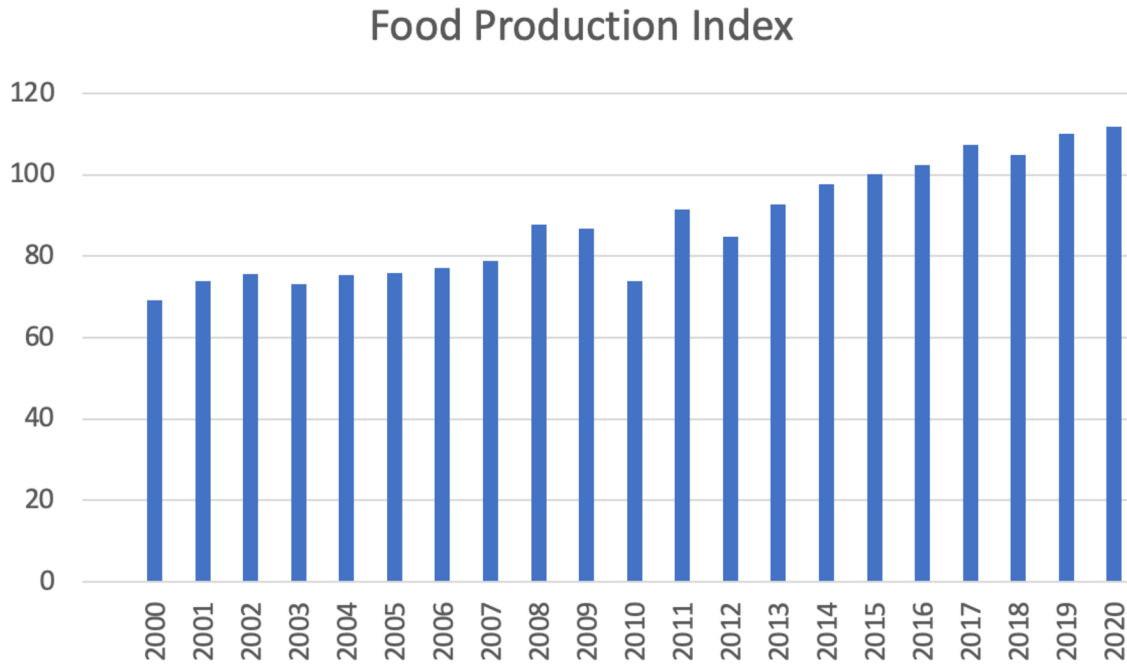
	Food Production Index	Poverty rate, %	Prevalence of undernourishment, %	Unemployment, %
<i>Mean</i>	88.11	15.53	2.62	6.64
<i>Median</i>	86.66	13.30	2.50	6.21
<i>Standard Deviation</i>	13.85	5.38	0.36	1.56
<i>Coefficient of Variation</i>	0.16	0.35	0.14	0.24
<i>Minimum</i>	69.17	10.70	2.50	4.50
<i>Maximum</i>	111.93	29.00	4.00	10.58

Source: own processing based on The World Bank data

When it comes to the second descriptive analysis and the output of it, it is wise to say that the most pessimistic dynamic and figures are observed in the beginning of the 00s, when the economy was just preparing to start its expansion. Thus, the lowest values for Food Production Index are all located in the beginning of 2000s, while the highest ones for poverty rate, prevalence of undernourishment and unemployment are also identified in the first years selected for the analysis. Over time, the situation with food security was developing in a positive way and despite a series of problems in the middle of the 10s, the indices of food security do not seem to have been hurt badly as the bunch of macroeconomic variables selected for the analysis and described earlier. Then, the author proceeds to the detailed analysis of each variable's development over time.

First, the author starts with the Food Production Index, whose development in time is indicated in Figure 12.

Figure 12, development of food production index in time

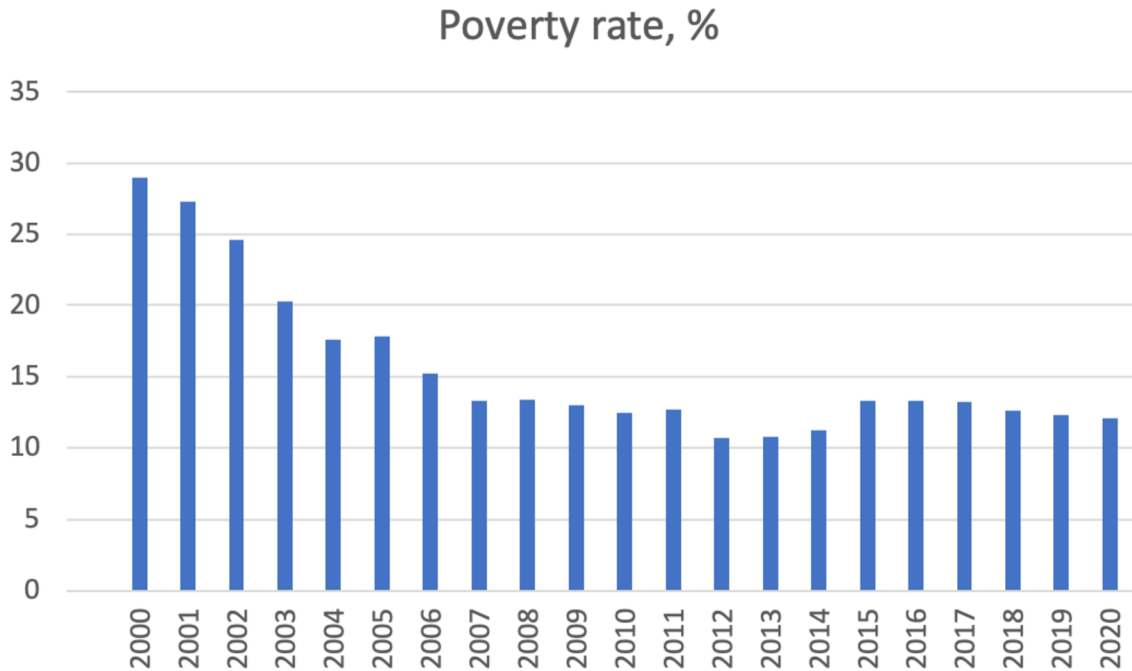


Source: own processing based on The World Bank data

Based on the development of the variable, it is possible to say that the level of food availability in Russia as constantly been increasing and given the fact that the country's population was not really going up, as the author has already identified it in the theoretical part, it suggests that this increase in the food production index has had a very positive effect on the availability and wellbeing of Russians. The average value for the indicator is 88.11 and its variability in general is very low with just 16% for the coefficient of variation, which suggests that there is a very small uncertainty related to the availability of food in Russia. As of the beginning of the new decade, the level of food availability had been in a constant development, so the author suggests that there are seemingly no problems with this pillar of food security.

Then, the author proceeds to the second pillar – access, which is depicted by poverty rate, whose development in time is indicated in Figure 13.

Figure 13, development of poverty rate in time

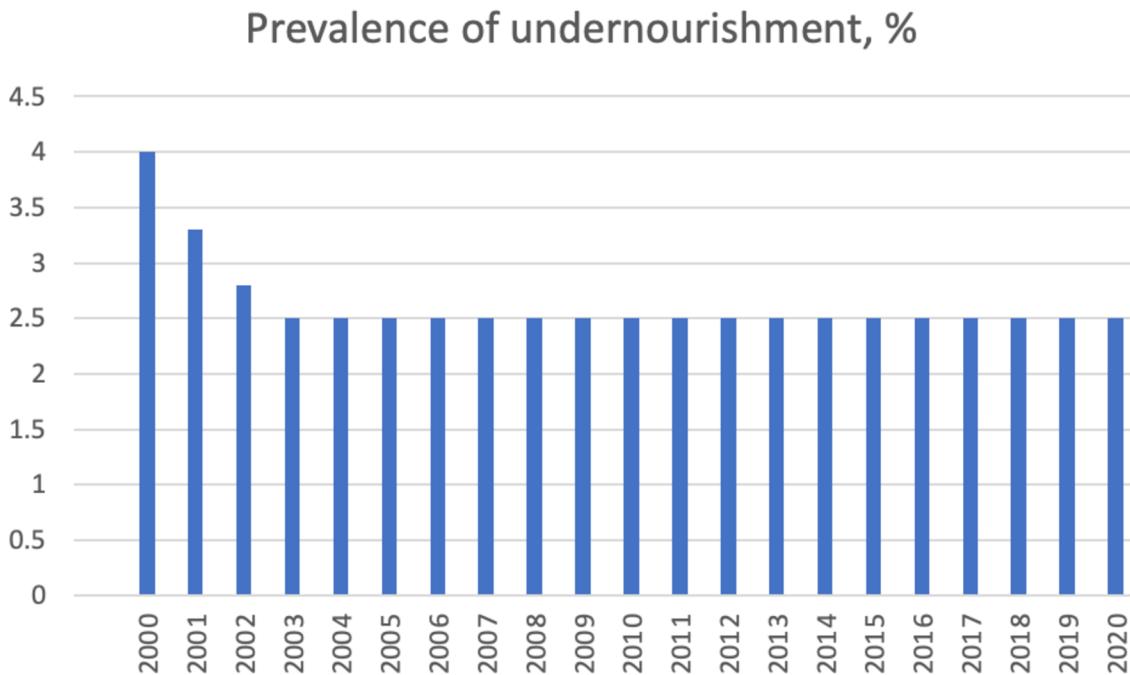


Source: own processing based on The World Bank data

Based on the development of the poverty rate for Russia in time, it is possible to say that the country achieved a significant progress in this domain, since the country managed to decrease this indicator from the absolute maximum on the selected period, which was 29% to the lowest figure of 10.7%. However, this progress seemingly stalled after the country's relatively bold external policy's application. According to the descriptive analysis, the mean level of poverty is 15.53% with variation of 35%, which is also acceptable. Seemingly, there are no serious problems with access, but the level remains still relatively high and based on the current state of affairs with the country's economy, it is not expected that it will go down anytime soon.

The author proceeds to the analysis of prevalence of undernourishment, whose development in time is indicated in Figure 14.

Figure 14, development of prevalence of undernourishment in time



Source: own processing based on The World Bank data

The development of this indicator for the case of the Russian Federation is relatively predictable, since it was not changing at all after reaching the level of 2.5% in 2003, which helps to conclude that the country does not really experience any problems with utilization, which might be a consequence of a relatively successful food and nutrition policies exercised in the Soviet Union.

Finally, the author proceeds to the final variable, which represents the stability pillar – unemployment rate, whose development in time is indicated in Figure 15.

Figure 15, development of unemployment in time



Source: own processing based on The World Bank data

According to the descriptive analysis from Table 2, the average level of unemployment for Russia is high with 6.64%, which suggests that there are some problems with stability. The absolute lowest level of unemployment is identified in 2019, when the level of indicator was equal to 4.5%, while the highest inflation is identified in 2000, when the level was 10.58%. All in all, based on the development, there seems to be no significant shocks even in the times of big economic crises, such as the Great Recession (2008-2009), first sanctions (2014-2015) and the pandemic (2020). Indeed, there is a minor increase, but the level is not usually exceeding the boundary of 10%.

4.3 Correlation Analysis

After basically describing the situation with each variable related either to the macroeconomic domain or to food security, the author proceeds to the correlation analysis. For this purpose, the author uses correlation matrix generated from Excel and available in Table 4.

Table 4, correlation matrix

	<i>Food Production Index</i>	<i>Poverty rate</i>	<i>Prevalence of undernourishment</i>	<i>Unemployment</i>	<i>Inflation</i>	<i>GDP per capita</i>	<i>Exchange rate</i>	<i>FDI</i>
<i>Food Production Index</i>	1							
<i>Poverty rate</i>	-0.64	1						
<i>Prevalence of undernourishment</i>	-0.43	0.82	1					
<i>Unemployment</i>	-0.81	0.84	0.72	1				
<i>Inflation</i>	-0.67	0.83	0.69	0.80	1			
<i>GDP per capita</i>	0.61	-0.88	-0.56	-0.78	-0.73	1		
<i>Exchange rate</i>	0.87	-0.36	-0.24	-0.60	-0.51	0.24	1	
<i>FDI, net inflow</i>	0.07	-0.60	-0.42	-0.37	-0.36	0.68	-0.30	1

Source: own processing based on The World Bank data

Based on the correlation matrix, the author proceeds to the calculation of t-ratios for each coefficient of correlation, which is based on the formula (2) from the methodology of this bachelor thesis. For the hypothesis testing, where the null hypothesis assumes no correlation in the pair, the author uses the critical value equal to 2.09, which is attributed to this particular situation. In Table 5, the author presents the result of the hypothesis testing, where significant correlation coefficients are indicated by the green color and insignificant ones are indicated with the red one.

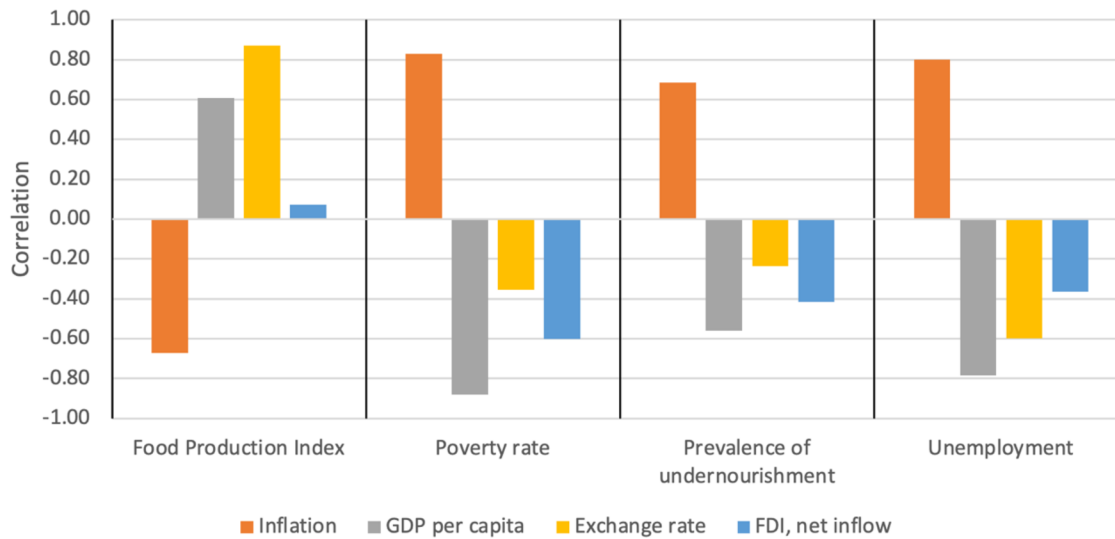
Table 5, t-ratios for the correlation matrix

	<i>Food Production Index</i>	<i>Poverty rate</i>	<i>Prevalence of undernourishment</i>	<i>Unemployment</i>	<i>Inflation</i>	<i>GDP per capita</i>	<i>Exchange rate</i>	<i>FDI</i>
<i>Food Production Index</i>	1							
<i>Poverty rate</i>	-3.61	1						
<i>Prevalence of undernourishment</i>	-2.09	6.36	1					
<i>Unemployment</i>	-6.07	6.65	4.48	1				
<i>Inflation</i>	-3.97	6.49	4.1	5.83	1			
<i>GDP per capita</i>	3.32	-8.09	-2.96	-5.50	-4.61	1		
<i>Exchange rate</i>	7.74	-1.66	-1.06	-3.27	-2.6	1.07	1	
<i>FDI, net inflow</i>	0.31	-3.28	-2	-1.71	-1.67	4.09	-1.40	1

Source: own processing based on The World Bank data

Based on the original correlation matrix, the author proceeds to the creation of chart that will help him to describe relationships between macroeconomic indicators and food security-related ones with the help of correlation coefficients.

Figure 16, depiction of correlations between variables



Source: own processing based on The World Bank data

It is wise to recall that the author selected the following combination of variables for the food security domain – food production index (availability), poverty rate (access), prevalence of undernourishment (utilization) and unemployment (stability). Now, the author will interpret the relationship between food security and macroeconomic indicators starting with the food production index that is selected as a variable explaining the availability pillar. The relationship between the index and the majority of selected macroeconomic indicators is positive with the exception of inflation. Thus, according to the diagram, it can be suggested that whenever inflation increases, the food production index decreases and vice versa, which is fully logical as it might negatively hurt producers, whose costs of inputs are increasing. When the GDP per capita in Russia increases, food security also goes up, which is a logical observation since as the level of production in the country increases proportionally to the population, the agrarian sector starts to produce more and more goods as well. Interestingly, whenever exchange rate increases, the volume of the food production also increases, which might be related to the fact that depreciating domestic currency makes agrarian sector more competitive and producers cooperate with foreign buyers. Finally, when FDI increases, FPI also increases but just by a small amount, which might be related to the fact that foreign investors are not really interested in the Russian agrarian sector presumably due to the high national interest and significantly barriers to enter. The last coefficient (FDI and FPI) is the only one which is not significant.

For the access pillar, it is possible to say that all relationships are almost all significant with the exception of the exchange rate, which is not correlated significantly with poverty rate. Inflation and poverty are correlated positively and it is fully logical: as prices rise under the condition of no increase in the real income, purchasing power of populations is decreasing. Poverty rate and GDP per capita are negatively correlated and it is fully logical as the indicator of the GDP per capita is an indicator of economic development, which lies on the opposite of poverty. Exchange rate is not correlated significantly, and the author believes that the explanation lies in the fact that depreciating currency indirectly triggers poverty. Yet, a depreciating exchange rate positive influences inflation, which has a serious impact on the poverty rate, so the author believes that two variables are indirectly related even despite the absence of statistical significance in the relationship. However, FDI is related to poverty and the relationship is statistically significant, where whenever FDI increases, poverty decreases and vice versa, which might be explained by the fact that more and more foreign investments create working places for people and help them to escape from the grip of poverty.

When it comes to the utilization pillar, it is possible to say that just two pairs are significant – prevalence of undernourishment and inflation, and prevalence of undernourishment and GDP per capita. Thus, whenever inflation increases, it drives the level of people suffering from undernourishment in Russia up and the author believes that the explanation is somewhat similar to what was observed in the relationship between poverty rate and inflation. Then, whenever GDP per capita increases, it leads to a drop in the share of people suffering from undernourishment, which is fully logical as well.

For the final pillar – stability, it is wise to say that this pillar is statistically correlated with inflation, GDP per capita and exchange rate, while FDI is not statistically related to it. First, the relationship between unemployment and inflation is positive, which traditionally seems to be opposite, as it was described in the economic theory and notable in Phillips curve. Unemployment and GDP per capita are negatively correlated, which is a sign of the fact that whenever there are opportunities to work as firms are expanding, people are offered more jobs.

5 Results and Discussion

The very first question that was asked by the author in the goals and objectives was: *how is the very concept of food security defined?* The author, based on the analysis of relevant framework, scientific publications and the analysis of the country selected for the analysis – Russia, comes to the conclusion that food security is defined as a situation or a state in which people have reliable, fair and stable access to sufficient quantities of nutrition or food, which are also pretty affordable. The author's definition of food security fully coincides with the one provided by numerous authors, such as Shaw (2007) and Barrett (2010). To continue the elaboration on the results of the analysis, it is also essential to mention that the Russian Federation did not, as of 2020, experience any problems related to food security as the indicators selected by the author for measuring food availability, food accessibility, food utilization and food stability return values that suggest that the situation is favorable and the country cannot be classified as a one vulnerable to food insecurity-related problems, which is a good sign. The same finding is also made by Nabiyeva (2022), who suggests that the country has a good situation in terms of food security, but there is still room for a potential improvement.

The second research question of this work was: *what aspects does food security include?* The author suggests that food security is a complex indicator that include numerous aspects and it is equally being affected by countless many external factors, but it is still possible to define four key concepts, which are also called pillars of food security: availability, access, utilization and stability.

The third research question was: *which organizations/institutions deal with the issues of achieving and maintaining Food security (at a national and global level)?* The author suggests that there are numerous institutions dealing with the issue of food security on the global or international level, but the most active and crucial ones are FAO and UN with their numerous initiatives. On the national level, given the overall situation with the food security in Russia, there are not so many organizations dealing specifically with the issues of food security, but if there are any, they fall under the jurisdiction of Russian Ministry of Health.

The author's fourth question was: *which indicators are used to measure different aspects of food security?* The author believes that it is wise to select four different indicators each representing a particular pillar, where the author considered the following series of indicators: food production index for the availability, poverty rate for the access, prevalence of undernourishment for the utilization and unemployment for the stability. Thus, when considering the very definition of the food security and four pillars that were already mentioned in this thesis multiple times, as well as in this paragraph, it is wise to further elaborate on the results achieved in the practical part of the work. First, the author starts from the domain of availability, where the author primarily focused on inspecting the development of the food production index and the way how it is correlated with two macroeconomic variables – inflation, exchange rate and the GDP per capita. The fact that there is a statistically strong correlation between those pairs of variables suggests that the food production index variable can serve as a good indicator for defining the pillar of availability due to the fact that basically all production of food for the case of Russia is explained by this variable. As for the Russian case, there seems to be no problem with this aspect of food security as the economic output of the country increased significantly over the 21 years inspected in the analysis. Nevertheless, the author does not consider the situation to be so optimistic as the GDP of the country is likely to shrink in the nearest future due to an unstable economic situation, which was also mentioned by Liadze (2022) in his research on the current economic state of the country. Yet, the author believes that despite potential decrease in the total volume of economic output attributed to the complicated international situation, the food production is not likely to be damaged significantly, as potential economic difficulties of the Russian Federation are not likely to inflict considerable amount of damage to sectors producing goods with high value added and sectors where presence of technology is not so crucial. In the case of the agrarian sector, technology plays a crucial role, but it is wise to understand that application of high technologies which, as of now, will not be exported to Russia can partially be substituted by hiring more people to work in agriculture. Contrary to this logic, Nabiyeva (2022) believes that the key for good food policy and persisting absence of problems related to food security in Russia are technology and innovative policies, which does not fully correlate with the current development of the situation and potential limitations in that domain.

Then, continuing to access, the author has decided to incorporate just one variable in this domain, where poverty rate (according to the national standard) is being considered as an indicator explaining this pillar of food security. Poverty rate is negatively correlated with all macroeconomic variables apart from the inflation rate, where the correlation was a strong positive one. Henceforth, it can be suggested that whenever inflation increases, it triggers a sharp rise in the poverty rate, whereas increments in GDP per capita, exchange rate and FDI ultimately lead to a diminishing level of poverty rate in Russia. Clearly, the nature of the relationship is fully logical, so the author suggests that all those variables can be used for the explanation of the access pillar with the exception of exchange rate, whose correlation with the poverty rate is not significant.

The third pillar is represented by the prevalence of undernourishment, which is negatively correlated with FDI, exchange rate and GDP per capita, while it is positively correlated with the inflation rate. Yet, exchange rate and FDI are not significantly correlated with the variable, so the author suggests that for the description and explanation of tendencies with the third pillar of food security, GDP per capita and inflation are acceptable and relatively good indicators.

Finally, when it comes to the domain of stability, the author selects the unemployment rate, which is a good indicator of stability due to the fact that having a job for a very long time is something that is inevitably likely to ensure an ability to satisfy one's needs. Effectively, unemployment is correlated with all variables in a significant way apart from the FDI. Unemployment is correlated positively with inflation and negatively with the rest of variables.

Finally, the fifth research question was: *what macroeconomic indicators can be referred to as core ones for characterizing any economy?* The author suggests that FDI, GDP per capita, inflation and official exchange rate are good examples of indicators that can be referred to as core ones for characterizing any economy. Additionally, these indicators were used for the analysis of Russian economy. Hence, the author reached the conclusion that the economic situation of Russia as of 2020 could be considered as favorable with a tremendous difference between the performance in the early 00s and the late 10s, where the country managed to increase its GDP by almost 700% with a significant progress in tackling

unemployment and inflation, which both slumped in 21 years reaching very low figures for 2020, when comparing them with 2000. Of course, the author is not so optimistic, as the economic growth of Russia was inevitable after experiencing the series of shocks in the 90s, but it is wise to say that the situation did not get worse and proper policies and favorable external factors (such as high prices for oil in the 00s) made Russian economic development possible. The same conclusion about the economic growth in Russia and its relatedness to natural resources is also noted by Korkmaz (2022). In addition to the main conclusion, the author believes that the situation started to get worse after the series of shocks in 2014-2015 caused by the Crimea events and further problems with international partners. Negative tendency is underpinned by the development of the official exchange rate, which depreciated by almost 300% in 2020 when being compared to the figures from 2000. The biggest concern of the author is that this depreciation can get even worse thus endangering the country's situation with the food security.

6 Conclusion

To conclude, the author is able to answer the research questions that were the main focus of the author's bachelor thesis. In the first research question, the author was interested in the way how the very concept of food security is defined. Eventually, after analyzing the relevant framework, the author suggests that food security is a fundamental concept that consists of four pillars – food accessibility, availability, utilization and stability, where the food security concept refers to a situation where people are offered reliable and fair access to sufficient quantities of nutrition. Effectively, all those pillars were all analyzed based on the case study of the Russian Federation, for which the author concludes that there are no significant problems with all pillars of food security and with the food security in general in the selected time period of 21 years – from 2000 to 2020.

According to the author's analysis, he is able to suggest that the concept of food security inevitably involves 4 different pillars that are strongly dependent on each other, where the first pillar is availability; the second pillar is access; the third pillar is utilization and the fourth pillar is stability. Ensuring that the situation with all four pillars is satisfying is a guarantee that people will not face significant problems with food security. Effectively, the wellbeing of people in terms of food security and the situation with all those pillars in given environments are controlled by the United Nations and FAO, which are the world's most important organizations tackling problems of food insecurity. In addition to that, the majority of countries have their own institutions focused on ensuring wellbeing of people in terms of food security. For the case of Russia, there is such institution which is The Ministry of Health.

The fourth question was about indicators that can perfectly explain the situation with food security. The author concludes that for the case of Russia and food security, inflation and GDP per capita can be used for explaining the situation with food security in the country as the correlation between variables related to pillars of food security (food production index for availability, poverty rate to accessibility or access, undernourishment prevalence to utilization and unemployment to stability) is statistically significant and relatively high. At the same time, exchange rate can explain the situation just partially as it has a statistically significant correlation for just two pairs – unemployment and food production index. FDI is

believed to be the least relevant variable for explaining food security in Russia as it is almost not correlated with any of variables with the exception of poverty rate. In addition to that, it is wise to say in relation to food production index and FDI that the low correlation between the two indicates that the level of investment into the agrarian sector of the country is low, which might be attributed to the governmental protection of the sector or simply reluctance of foreign investors to seek returns in the industry.

Finally, the author's fifth question was related to the search of macroeconomic indicators that can be categorized as core ones to describe a given economy. The author suggests that GDP per capita, FDI net inflow, inflation rate and exchange rate are the best fit due to the fact that they simultaneously explain the situation with the economic development and growth (GDP per capita), attractiveness to foreign investors (FDI) and they also indicate stability (inflation rate and exchange rate). The author suggests that based on the analysis conducted by him, Russia seems to have an outstanding economic performance in the first half of the analyzed period – from 2000 to approximately 2013, whereas for the following period, the country's economic growth was halted.

For the recommendation, the author recommends expanding the framework of the research and consider more variables since it might help to explain not just the situation with the food security itself, but also with relevant tendencies related simultaneously to agrarian sector, macroeconomic domain of the country and food security.

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8 Appendix

Table 6, dataset for the analysis

Year	Food Production Index	Poverty rate, %	Prevalence of undernourishment, %	Unemployment, %	Inflation, %	GDP per capita, dollars	Exchange rate, ruble per USD	FDI, net inflow in billion USD
2000	69.17	29	4	10.6	20.80	1771.6	28.1	2.7
2001	73.8	27.3	3.3	9.0	21.48	2100.4	29.2	2.8
2002	75.71	24.6	2.8	7.9	15.79	2377.5	31.3	3.5
2003	73.09	20.3	2.5	8.2	13.66	2975.1	30.7	7.9
2004	75.48	17.6	2.5	7.8	10.89	4102.4	28.8	15.4
2005	75.95	17.8	2.5	7.1	12.69	5323.5	28.3	15.5
2006	77.05	15.2	2.5	7.1	9.67	6920.2	27.2	37.6
2007	78.77	13.3	2.5	6.0	9.01	9101.3	25.6	55.9
2008	87.88	13.4	2.5	6.2	14.11	11635.3	24.9	74.8
2009	86.66	13	2.5	8.3	11.65	8562.8	31.7	36.6
2010	73.9	12.5	2.5	7.4	6.85	10675.0	30.4	43.2
2011	91.44	12.7	2.5	6.5	8.44	14311.1	29.4	55.1
2012	84.81	10.7	2.5	5.4	5.07	15420.9	30.8	50.6
2013	92.6	10.8	2.5	5.5	6.75	15974.6	31.8	69.2
2014	97.58	11.2	2.5	5.2	7.82	14095.6	38.4	22.0
2015	100.04	13.3	2.5	5.6	15.53	9313.0	60.9	6.9
2016	102.38	13.3	2.5	5.6	7.04	8704.9	67.1	32.5
2017	107.41	13.2	2.5	5.2	3.68	10720.3	58.3	28.6
2018	104.78	12.6	2.5	4.8	2.88	11287.4	62.7	8.8
2019	109.98	12.3	2.5	4.5	4.47	11536.3	64.7	32.0
2020	111.93	12.1	2.5	5.6	3.38	10169.1	72.1	9.5

Source: The World Bank, 2022