

## PROVIDING LABOR INCOME AS A SUPPORTING FACTOR OF THE FOOD SECURITY

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The lack of comprehensive provision of a sufficient level of economic affordability of food in conditions of social instability and low level of solvency of the population of Ukraine constitutes a threat to the food security of the state. The purpose of the article is to formulate the relationship between the economic affordability of food and the average monthly wage in the country, as well as arrears in its payment. The methodic of work is based on the usage of a correlation-regression analysis of the statistical information that reflects the structure of total household income in Ukraine, which made it possible to calculate the degree of influence of factors of the correlation model on the availability of food for the population. The results of the study indicate a significant stratification of the population in terms of purchasing power. The degree of dependence between the economic availability of food and the average monthly salary in the country, as well as the amount of arrears in its payment, which confirms the need for the government to create a sustainable system of social standards for the population, providing an adequate level of purchasing power, is established.

*Keywords: correlation-regression analysis, economic availability of food, food security, Gini index, household incomes, index of income differentiation, wages.*

*JEL Codes: Q12, Q14.*

### 1. Introduction

Nowadays the food security is based on the main human-oriented principles, including the food sufficiency, food access and food use, which means that there is a permanent sufficient quantity of food and resources, which will ensure the right diet, as well as water supply and sanitation.

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The accessibility of food is realized through the possibility of its acquisition, which considers the purchasing power, prices and the availability of the products. Food security is the socio-economic and ecological state in the country, where all citizens are provided with food in the required quantity, assortment and quality.

The purpose of the article is to clearly formulate the relationship between the economic affordability of food and the average monthly wage in the country, as well as arrears in its payment. The subject of the study is the structure of total household incomes in Ukraine and the factors of the citizens' purchasing power providing in the context of food security of the country. The object of the study includes theoretical, practical and methodological aspects of ensuring the labor income of citizens in order to increase the social standards and strengthen the food security of the state. The papers of many domestic and foreign scientists are devoted to studying the issues of ensuring the labor incomes of people and a sufficient level of their purchasing power in the context of food security. Thus, the research of the general problems of income providing in the context of food security is made by Cohen and Garrett (2010), Bourguignon (2015), Wilkins (2015), Jones and Kim (2018) and others.

In their papers Babych and Kovalenko (2018) note that the successful functioning of the food industry contributes to the market infrastructure development as well as to the rational distribution of food and minimizes the total costs of production, processing and marketing of food products, improves the mechanism of food supply. Some scientists such as Carlson and Mc Chesney (2015), Lerman and Yitzhaki (1985) emphasize the expediency of increasing the quality of the education as a condition of the labor income growth. Cohen and Garrett (2010), Murray (2016) in their studies made a conclusion that the structure of the citizens' diet was altered with the population growth and the urban lifestyle.

The thesis that an effective economic organization of a society promotes economic cooperation of people and directs resources for the production of the necessary goods, which ensure the high level of food security, are inherent for the scientific works of such scholars as Sun, Li, Wang and Jiang (2017), Willows, Veugelers, Raine and Kuhle (2009) and others. Darmon and Drewnowski (2015) as well as Kotykova and Albeshchenko (2017) state in their works that the impact of the world markets on the food security is mostly manifested in the variation of the product prices, which is usually due to the unfavorable weather conditions in the regions-leaders of production of a particular type of products.

Glied, Ma and Pearlstein (2015) investigate the influence of professional orientation on the income of the different specialists. Guvenen and Kaplan (2017) as well as Hurst, Li and Pungsley (2014) and Weber (2016) investigate the low-income households as well as the self-employed citizens that conceal the real level of their income; identify the possible threats of the current situation to the development of society and food security. In his writings Shaikh, Papanikolaou and Wiener (2014) as well as Shebanina (2018) state that social inequality threatens social stability and reduces economic efficiency due to the low competitiveness of consumers. However, a number of issues remain unresolved and need the additional research, developing and

tools for boosting food security of the country and providing it on the high level.

The methodic of work is based on the analysis of the structure and the dynamics of the change in the aggregate household incomes in Ukraine, as well as the determination of the income differentiation degree and the factors` influence on the availability of food products. During the study, the following methods are used: monographic, comparative analysis, statistical, generalization methods, modeling, correlation-regression analysis and others.

## 2. Results and discussion

Food security in Ukraine depends on many factors, which can be characterized not only by indicators of sufficiency and environmental friendliness of production, but also by the indicators, that express the economic availability of food for the population. Thus, the level of solvency of the population, which depends on the ratio of incomes and expenditures, is one of the main factors that have an influence on the food security in Ukraine. The different sources of cash income form the basis of households` solvency in Ukraine. At the same time, in recent years, which are accompanied by the crisis phenomena in the economy of the state, there is a change in the structure of the cash incomes that determine the purchasing power of the population and, as a consequence, affect the food security of the country. Consider the structure of the total income of domestic households in table 1.

Table 1. Total households` incomes of Ukraine and their structure

Indexes	Years		Change 2017/2013, p. p.
	2013	2017	
Average monthly resources per household, UAH	4470.5	8165.2	3694.7
Structure of total households` resources,%			
Cash income:	90.8	87.5	-3.3
- wages	50.6	52.4	1.8
- income from entrepreneurship and self-employment	4.1	4.4	0.3
- proceeds from the sale of agricultural products	2.8	3.0	0.2
- pensions, scholarships, social benefits provided in cash	27.1	20.2	-6.9
- cash assistance from relatives, other persons and other cash income	6.2	7.5	1.3
Cost of consumed products received from personal auxiliary farms and from self-procurements	3.9	4.0	0.1
Benefits and subsidies from non-cash payments for housing and communal services, electricity, and fuel	0.4	4.7	4.3
Non-cash benefits for the payment of goods and health care services, tourist services, vouchers for recreation facilities, etc., for payment for transport services, communications	0.5	0.4	-0.1
Other income	4.1	3.4	-0.7

Calculated using (Prokopenko, 2017).

The data presented in table 1 shows that during the years under the study, the main source of cash incomes of the population which forms its purchasing power is earnings received in the form of wages, in addition, a significant source of the households' cash resources is pensions, scholarships and social subsidies. Comparing the structure of total households' incomes in Ukraine in 2017 and 2013, it should be noted the tendency to reduction of the monetary incomes of the population (by 3.3 percentage points), while the share of the privileges and subsidies in the structure of citizens' resources is growing (by 4.3 percentage points).

Against the background of the general reduction of the citizens' cash income, the share of revenues from entrepreneurial activity and self-employment increased (by 0.3 p.p.) and from sales of agricultural products (by 0.2 p.p.). Despite a slight increasing in the share of wages in the structure of incomes of the population (by 1.8 p. p.), there is a tendency for a significant reduction of the share of pensions, scholarships and social benefits (by 6.9 p.p.) and the increasing of the proportion of cash incomes from relatives and others in the structure of total income (by 1.3 p. p.). This indicates the unsatisfactory state of material provision of citizens, which has a negative impact on their purchasing power and, consequently, the level of food security in the country as a whole. Taking into account the value of wages in the formation of aggregate household income, we will investigate the state of wages of employees involved in various spheres of economic activity of Ukraine in table 2.

Table 2. Average salary of employees involved in various spheres of Ukrainian economy in 2017

Types of economic activity	UAH	% to the average economy level
For all kinds of economic activity	7104	100
Agriculture, Forestry and Fisheries	6057	85.3
Agriculture	5761	81.1
Industry	7631	107.4
Construction	6251	88.0
Wholesale and retail trade; repair of motor vehicles and motorcycles	7631	107.4
Transport, warehousing, postal and courier activities	7688	108.2
Temporary placement and organization of food	4988	70.2
Information and telecommunications	12018	169.2
Financial and insurance activities	12865	181.1
Real estate operations	5947	83.7
Professional, scientific and technical activities	10039	141.3
Activity in the field of administrative and auxiliary services	5578	78.5
Public administration and defense; compulsory social insurance	9372	131.9
Education	5857	82.4
Health care and social assistance	4977	70.1
Arts, sports, entertainment and recreation	6608	93.0
Provision of other types of services	6536	92.0

According to table 2, we can conclude that the wages of workers involved in the majority of economic activities in Ukraine (into 9 of the 16 sectors listed) is lower than the average wage in the national economy. Thus, employees in agriculture, construction, catering, education, health care, art, etc. have a level of income that is significantly lower than the average level in the state. These conditions contribute to the stratification of society by income and cause difficulties in ensuring food security on a sufficient level (table 3), which refers to the impossibility of people with low incomes not only to provide their diet on the level of consumption of the citizens with higher income, but even on the level, which provides the reproduction of the resources of their organism and is based on the recommendations of the Ministry of Health of Ukraine.

Table 3. Indicators of the ratio of cash incomes of the most and the least secured groups of the population of Ukraine in 2017

Decile groups for cash income	Number of cash revenues,%
The first (with the lowest income)	3.9
The second	5.5
The third	6.4
The fourth	7.2
The fifth	8.2
The sixth	9.2
The seventh	10.4
The eights	11.9
The ninth	14.3
The tenth(with the highest income)	23.0
Indexes:	Calculated values
Gini index	0.274
Decile coefficient of differentiation of cash incomes, times	3.300
The ratio of cash incomes of the most and the least secured 10% of the population (decile factor of funds), times	5.900
The ratio of cash incomes of the most and the least secured 20% of the population (quintile ratio of funds), times	4.000

Source: calculated using (Prokopenko, 2017).

Calculated in table 3, the ratio of cash incomes of the most and the least secured groups of the population of Ukraine indicates a significant gap in the income of the most and the least secured 10% population groups (almost in 6 times). No much favorable is the ratio of incomes of the most and the least secured 20% population groups (almost in 4 times). In addition, the ratio of the minimum income level among the wealthiest 10% population groups and the maximum income level among the least secured 10% population groups, ranked on the basis of the average per capita income, is more than 3 times. The obtained calculations are confirmed by the Gini coefficient

(0.274), which indicates a significant stratification of the Ukrainian society by income. This situation proves the impossibility of equal access to qualitative food for all strata of the population in Ukraine, which poses a threat to its food security.

An important indicator of the food security in the country is the indicator of the economic availability of food products, which is calculated as the ratio of households' expenditures on food purchases and the amount of aggregated costs. According to the legislation of Ukraine, the permissible value of this indicator is determined within the limits of 60%. At the same time, the reduction in the share of food expenditures in the overall structure of population costs may indicate the positive changes in the state of food security of the country.

Shaping the state food policy it is important to take into account the main factors that have a significant impact on the change of the economic availability of food products for the population. Consider the effect of the average monthly wage and the amount of debt from its payment to change the share of household expenses on food in the structure of total population costs (table 4), for this we identify the variables of the econometric model:

$$Y = \beta_0 + X_1\beta_1 + X_2\beta_2 \quad ,$$

where  $Y$  – vector of economic availability of food;  $X_1$  – vector of average monthly salary in Ukraine;  $X_2$  – vector of arrears of wages;  $U$  – vector of residues (stochastic component).

Table 4. Output data for calculation the impact of factors on the economic availability of food products in Ukraine

Years	Household expenditures on food products in the structure of total expenditures,%	Average monthly salary, UAH	Arrears of wages on 31/12, UAH million
2010	51.6	2250	1 139.0
2011	51.3	2648	915.2
2012	50.1	3041	830.1
2013	50.1	3282	753.0
2014	51,9	3480	1 320.1
2015	53.1	4195	1 880.8
2016	49.8	5183	1 791.0
2017	47.9	7104	2 368.4

Source: calculated using (Prokopenko, 2017).

Substituting in the system of normal equations the calculated values obtained on the basis of the original data in table 4, we obtained a system of normal equations in the following form:

$$\begin{cases} 8\beta_0 + 31183\beta_1 + 10997.6\beta_2 = 405.8 \\ 31183\beta_0 + 139132339\beta_1 + 48573650\beta_2 = 1570486 \\ 10997.6\beta_0 + 48573650\beta_1 + 17488059\beta_2 = 556057.3 \end{cases}$$

Having solved this system of equations with respect to unknown parameter estimates  $\beta_0$ ,  $\beta_1$  and  $\beta_2$  we obtain the following values of system components:

$$\beta_0 = 52.8; \beta_1 = -0.002; \beta_2 = 0.004.$$

Thus, the multiple regression equation, which characterizes the dependence of the level of economic availability of food products on the level of average monthly wages in Ukraine and the arrears on its payment, has the following form:

$$Y = 52.8 - 0.002x_1 + 0.004x_2.$$

The regression coefficients show how much the level of economic availability of food products will change with the change of the corresponding factor per unit, provided that the second factor is on an average level. Thus, if  $\beta_0 = 52.8$  shows that in the absence of the influence of the investigated factors, the level of economic availability of food in Ukraine will be on an average level and will amount to 52.8%, which meets the regulatory requirements. At the same time  $\beta_1 = -0.002$  shows that the increasing of the average monthly wage per unit (by UAH 1) in Ukraine will lead to the decreasing of the share of food expenses in the total expenditures of the population by 0.002%. Thus, to reduce the share of food expenses in the aggregate of total households' costs by 1% it is enough to increase the average monthly wage in the country by UAH 500 or by 7% from the current level (UAH 7104). At the same time, the increasing of the amount of arrears of wages per unit (by UAH 1 million) will lead to the growth in the share of food expenses in the aggregate of total households' expenses by 0.004%, since  $\beta_2 = 0.004$ . Thus, in order to reduce the share of food expenses in the aggregate of total expenditures of population by 1%, it is enough to reduce the arrears of wages in the country by UAH 250 million or by 10.6% from the current level (UAH 2368.4 million).

To determine the tightness of the relationship between the studied variables determine the correlation coefficients. The pair correlation coefficients will be equal to:

- between the level of economic availability of food products and the average monthly wages in Ukraine ( $r_{yx1} = -0.584$ ). This coefficient shows an inverse strong relationship between variables. This means that the increasing of the average monthly wage in the country leads to the reduction in the share of food expenditures in the total population expenditures;

- between the level of economic availability of food and the wage arrears ( $r_{yx2} = 0.229$ ). This ratio shows a direct moderate relationship between the variables. This means that the increasing of wage arrears leads to the growth of the share of food expenditures in the aggregate of total household expenses;

- between the average monthly wage in Ukraine and the arrears of its payment ( $r_{x1x2} = 0.577$ ). This ratio shows a direct strong correlation between the variables. This means that the increasing of one of the factors leads to the growth of the other (the growth of the average wage increases the arrears on its payment).

The multiple correlation coefficient ( $R_{yx1x2} = 0.907$ ) shows a strong correlation between the level of economic availability of food products in Ukraine and other factors included in the correlation model (the average wage and arrears of its payment).

The multiple determination coefficient ( $R^2 = 0.823$ ) shows that the 82.3% variation in the level of economic availability of food products in the investigated period is due to the included factors. The remaining fluctuations in the level of economic availability of food products are due to other unintentional factors.

### **3. Conclusions**

1. The level of solvency of the population, which depends on the ratio of incomes and expenditures, is one of the main factors influencing food security in Ukraine, because it causes the sufficient level of purchasing power of citizens that allows them to meet their own needs in food. The main source of cash incomes of the population which forms its purchasing power is earnings received in the form of wages; in addition, a significant source of the households' cash resources is pensions, scholarships and social subsidies. Despite a slight increasing in the share of wages in the structure of incomes of the population, there is a tendency for the significant reduction of the share of pensions, scholarships and social benefits and the increasing of the proportion of cash incomes from relatives and others in the structure of total income. This indicates the unsatisfactory state of material provision of citizens, which has a negative impact on their purchasing power and, consequently, the level of food security in the country as a whole.

2. The employees engaged in agriculture, construction, catering, education, health care, art, etc. have a level of income that is significantly lower than the average level in the state. These conditions contribute to the stratification of society by income and cause difficulties in ensuring food security on a sufficient level. The ratio of cash incomes of the most and the least secured groups of the population of Ukraine indicates a significant gap in the income of the most and the least secured 10% population groups (almost in 6 times). No much favorable is the ratio of incomes of the most and the least secured 20% population groups (almost in 4 times). In addition, the ratio of the minimum income level among the wealthiest 10% population groups and the maximum income level among the least secured 10% population groups, ranked on the basis of the average per capita income, is more than 3 times. The obtained calculations are confirmed by the Gini coefficient (0.274), which indicates a significant stratification of the Ukrainian society by income.

3. In the absence of the influence of the investigated factors, the level of economic availability of food in Ukraine will be on an average level and will amount to 52.8%, which meets the regulatory requirements. At the same time the increasing of

the average monthly wage per unit (by UAH 1) in Ukraine will lead to the decreasing of the share of food expenses in the total expenditures of the population by 0.002%. Thus, to reduce the share of food expenses in the aggregate of total households` costs by 1% it is enough to increase the average monthly wage in the country by UAH 500 or by 7% from the current level (UAH 7104). At the same time, the increasing of the amount of arrears of wages per unit (by UAH 1 million) will lead to the growth in the share of food expenses in the aggregate of total households` expenses by 0.004%. Thus, in order to reduce the share of food expenses in the aggregate of total expenditures of population by 1%, it is enough to reduce the arrears of wages in the country by UAH 250 million or by 10.6% from the current level (UAH 2368.4 million).

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## **GYVENTOJŲ PAJAMŲ UŽTIKRINIMAS KAIP MAISTO SAUGUMO FAKTORIUS**

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### **Santrauka**

Socialinio nestabilumo ir žemo gyventojų mokumo lygio Ukrainoje sąlygomis kompleksinio pakankamo ekonominio prieinamo požiūriu lygio aprūpinimo maisto produktais stokojimas kelia grėsmę valstybės maisto saugumui. Straipsnio tikslas – nustatyti sąsają tarp ekonominio maisto produktų prieinamumo ir vidutinio mėnesinio darbo užmokesčio lygio šalyje bei jo išmokėjimo įsiskolinimų. Darbo metodika – taikoma koreliacinė-regresinė statistinės informacijos analizė, kuri atspindi bendrųjų namų ūkių pajamų Ukrainoje struktūrą. Analizė leido apskaičiuoti koreliacijos modelio veiksmų įtakos laipsnį maisto prieinamumui gyventojams. Tyrimo rezultatai liudija apie žymią gyventojų stratifikaciją perkamosios galios požiūriu. Nustatytas priklausomumas tarp ekonominio maisto prieinamumo ir vidutinio mėnesinio darbo užmokesčio šalyje, taip pat jo išmokėjimo įsiskolinimo dydžio. Patvirtinamas būtinumas valstybei sukurti tvarią socialinių standartų gyventojams sistemą, užtikrinančią adekvataus lygio perkamąją galią.

*Raktiniai žodžiai: koreliacinė-regresinė analizė, maisto produktų ekonominis prieinamumas, maisto saugumas, Gini indeksas, namų ūkių pajamos, darbo užmokestis.*

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