Prognostication of the asymmetry of population incomes in Ukrainian regions

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Abstract

The article presents the results of the medium-term forecast of income asymmetry of the population of Ukraine. Of the set of special research methods, statistical analysis was used. The initial information for the forecast was the official statistical data, namely: the income of the population of Ukraine in the dynamics by the type of economic activity and in the regional section over the past ten years. Construction of the forecast of the income and the definition of asymmetry was carried out based on the generalization of homogeneous phenomenons (million UAH and ten years). The average values were used to compare the obtained results, summarizing the characteristics of mass, qualitatively homogeneous socio-economic phenomenons, which scientifically predicted the main prospects. The results show a steady trend in the asymmetry of income asymmetry in Ukraine (both by type of economic activity and region), which will remain until 2024. In addition, it is found that Luhansk and Donetsk regions and the indicator (property income received) require additional research by surveying to establish the key risk factors.

Keywords*: Income asymmetry, Inequality, Poverty, Prognostication*

JEL Classification: C53, J31, R13

INTRODUCTION

In the modern world, such a social phenomenon as the asymmetry of the population's income is presented as a multidimensional interaction process and mutual influence of various factors. In Ukrainian society, the factors of increasing the asymmetry of incomes of the population can be attributed to the protracted socio-economic crisis over the past thirty years. Another factor causing the increase in population income asymmetry is a large sector of the underground economy and the labor market situation (which is characterized by high unemployment, low wages, and labor productivity).

A low level of public health is a consequence of the low incomes of a significant part of the population. The main features of which can be considered the average life expectancy at birth, a high level of child death and death at working age, disability, the attitude of the population to the prevention and treatment of diseases, as well as the possibility of purchasing paid medical services, etc., In these conditions, the adoption of informed management decisions regarding the processes of reproduction of the vital

activity of society in the presence of a deepening socio-economic differentiation of the population. It becomes important to scientific research that presupposes the scientific validity of modern trends based on diagnostics prevailing in each area of the territory's life, scripts of future development, taking into account the assessment of possible results of the taken decisions - both positive and negative.

For many years, the problems of forecasting the main parameters of the population's income have attracted the attention of government, business structures, and scientists. The works of scientists from different countries and periods have highlighted various theoretical, methodological, and practical aspects related to the income asymmetry of the population. In particular, the fundamental aspects of poverty, wealth, and income inequality are reflected by representatives of classical, neoclassical political economy, including Kene, Marx, Malthus, Mill, Ricardo, Smith. Marshall, Pi, Clark, Pareto, Engel, and others. So in the works of Quesnay, who is the author of the theory of net income from land and the founder of the economic term "reproduction", attempts were made to divide society into classes by distinguishing three groups of agents in the public economy (Quesnay, 1960). Marx later criticized Quesnay's theory. He rejected the axiomatics of the table, declaring the theory of "pure product" false and the concept of dividing society into three classes - incorrect.

According to Malthus (1836), "the population is growing exponentially, and the means of subsistence - in arithmetic" gives rise to an imbalance in the welfare of various segments of the population, that is, asymmetry. This statement could be true nowadays, except for one thing. Malthus, in his researches, used incorrect, by today's standards, migration statistics (does not take into account emigrants), did not take into account the mechanisms of self-regulation of the population size, leading to the demographic transition. In addition, it should be noted that during the time of Malthus, a clear asymmetry in income was observed only in large cities, while now this phenomenon has covered entire continents (including all developed countries without exception)

Follower Ricardo, within the framework of his research "on freedom", Mill touched upon the problems of income formation and the possibility of the development of society, focusing on the aspects of private property. He believed that property relations form the directions and proportions of the income distribution. The best state of humanity would be when "no one is poor, no one wants to become richer, and there is no reason to fear being thrown back because of the efforts of others to push forward." (Mill, 1993). The key conclusions of Mill are relevant at present. However, the existing realities indicate the presence of inequality, one of which is an asymmetry in incomes. This problem does not disappear but only transforms, acquiring different colors and manifestations.

Ricardo's ideas had a tremendous influence on the subsequent development of economic theory, including developments in income distribution. In particular, Ricardo's labor theory of value, according to which “there are three main social classes and the corresponding three types of income” (Ricardo, 1852), was applied by socialists, including Marx, to substantiate the redistribution of wealth. However, some severely criticized the methodological aspects of Ricardo. So, Schumpeter, the application of the results obtained based on the methodology proposed by Ricardo to the solution of practical problems called "Ricardian sin", argues that "this is an excellent theory that can never be refuted - it has everything except meaning" (Schumpeter, 2004).

The founder of the modern theory of poverty, in the opinion of the overwhelming majority of economists, is Smith, who is the main source of "wealth" called "economic development - the forces and laws operating in human society, thanks to which the total income grows, it is also fairly distributed" (Smith, 2016).

Income inequality, the theory of distribution, including the theory of surplus-value, is thoroughly presented in the works of Marx (1934). In the works of representatives of the neoclassical direction, Marshall, Pi, Clark, Pareto, Engel raised the issues of incomes and their inequality, making it possible to identify consumer behavior patterns depending on available income and form the fundamental basis of modern science. Based on a research of factors affecting income asymmetry in urban slums in southern Sumatera (Indonesia), Suhel et al. (2021), has been proven that in the aggregate, such variables as education level, age, expected income, and type of work, provide both positive and negative impact on the level of income.

Among European contemporaries who devoted their researches to solving the problems of income inequality, can be singled out the works of scientists from the Institute of Demography and Social Research named after Birds of the National Academy of Sciences of Ukraine, Libanova, Vasiliev, Gerasimenko, Zayats, Klimenko, Boychenko, Vasilchuk, Varnaliy, Vorotin, Geyets, Zhalilo, Luchik, Pyatkina, and others. These works greatly contributed to the research of incomes and living standards of the population in the regional context. The global nature of the issues raised in the article is evidenced by the main provisions of the concept of sustainable development. The concept of sustainable development presupposes a set of measures aimed at meeting current human needs while preserving the environment and resources, without prejudice to the ability of future generations to meet their own needs (Agenda 21, 1992). Seventeen Sustainable Development Goals until 2030 were identified, the first of which is eliminating inequality and poverty in any of its manifestations.

In addition, in 2019, Michael Kremer of Harvard and his followers and colleagues Esther Duflo and Abhijit Banerjee of MIT proposed an experimental approach to poverty alleviation that was highly praised by the global scientific community in the field of economics, as a result of which the authors were awarded the Nobel Prize.

It should be noted that the existing popular and sufficiently tested forecasting methods are largely reduced to financial processes and financial activities. This includes including the two-factor and the five-factor model of Altman, the adapted discriminant model of Lis, the discriminant model of Taffler, the diagnostic model solvency of Conan and Golder, Biver's coefficient, Springate's model, Tereshchenko's discriminant model, Sayfullin's model - Kadykov, Zaitseva, etc.

The existing practice of forecasting the main parameters of the asymmetry of the population's income, as a rule, is limited to determining the priorities for the economic and social development of territories and the development of comprehensive and/or targeted programs aimed at their implementation. At the same time, a wide arsenal of forecasting methods is not used to the full extent, which makes it possible to predict future development not only based on the analysis of data from a retrospective period but also on the identification of external and internal factors of influence, taking into account quantitative and qualitative changes taking place in the territorial community (region, district, city, village, settlement). As a result, there is no inconsistency between the needs of resource provision of plans and programs developed for the future and the respective territories' annual budgetary possibilities.

Thus, the complexity and versatility of the phenomenon of poverty, on the one hand, and the narrow focus, as well as the scientific disunity of the methodological apparatus of forecasting. On the other hand, it has led to research interest in forecasting the asymmetry of the population's income. Based on this, the purpose of the article is to develop theoretical, methodological, and practical approaches to predicting the asymmetry of the population's income in the context of poverty alleviation.

The research object is to forecast the asymmetry of the population's income. The subject is theoretical, methodological, and practical foundations for predicting the asymmetry of the population's income.

METHODS

In the research, a systematic approach was implemented. Generally, scientific methods were used: analysis, synthesis, induction, deduction, logical analysis (to generalize the views of domestic and foreign scientists to forecast categories, income asymmetry). Statistical analysis and forecasting were used from a set of special research methods. Data processing was carried out using an office suite of Microsoft Office applications, particularly a spreadsheet Microsoft Excel and a text editor Microsoft Word. The information base of the research was the publications of Ukrainian and foreign scientists, the official statistical information of the State Statistics Committee of Ukraine. The initial information for the forecast was the official statistical data, namely: indicators of incomes of the population of Ukraine in dynamics by types of economic activity and in the regional context over the past 10 years (Tables 1-3 Appendix).

The construction of the forecast of the population's income and the asymmetry determination was carried out based on the generalization of homogeneous phenomena (million UAH and ten years). The average values were used to compare the results obtained, making it possible to generalize the characteristics of mass, qualitatively similar socio-economic phenomena, making it possible to predict the main prospects scientifically reasonably. Information for 2014-2019 is given without considering the temporarily occupied territory of the Autonomous Republic of Crimea, Sevastopol, and part of the temporarily occupied territories in the Donetsk and Luhansk regions.

The presented accountings were carried out in the following interpretations: optimistic, pessimistic, and most probable scenarios. The accuracy of these predictions depends on the validity, completeness, and reliability of the diagnosis. From the point of view of the forecasting period (short-term, long-term, medium-term), the author presents a short-term forecast that covers 5 to 10 years since it is the most accurate and has a high degree of detail in the context of constantly changing impact factors.

RESULTS AND DISCUSSION

A survey analysis of various points of view regarding the current category of "forecasting" made it possible to establish this concept can be considered in a narrow and broad sense. In a narrow sense, the forecast is from the Greek - πρόγνωση "prevision, prediction".

In our research, the forecast is considered broadly since we are talking about a complex and multifaceted process (incomes and their asymmetry), which is constantly influenced by various factors that change the course of events. In this regard, the article's author calls a forecast a scientifically grounded judgment about the possible

states of the object (income of the population) in the future and (or) about alternative ways and terms of their implementation.

The general goal of forecasting income asymmetry is to provide the necessary information for developing regions' budgets, plans, programs, strategies, economic, social, and sustainable development. Thus, the determination of prospective wages by type of economic activity, by region, profit and mixed-income, income from property, social benefits, trends of natural and mechanical movement in the future, reproduction of labor resources, etc., create the basis on which the determination is made—the priorities and prospects of socio-economic development of territories.

Previous researches made it possible to establish that the following types of risks have the greatest impact on income asymmetry: economic, political, social, and environmental, which included the Covid-19 pandemic. It has been established that the specifics of determining the direction and strength of the action of each of the listed risks is the subjective nature and versatility of their influence. The existence of a direct relationship between the direction of the impact of risks and the reproduction of the main components of the vital activity of the regions leads to the emergence of negative trends in the course of these processes. So, considering the likelihood of certain risks is becoming an important condition in predicting income asymmetry. To predict the population's income asymmetry, we will construct trend models. Description of trend models of income asymmetry by main indicators: presented in (Tables 1, 2, 3)

Table 1. Trend model of income asymmetry in Ukraine

Indicators	Trend model	R^2
Salary	y = 137447x + 137920	0.8455
Profit and mixed income	y = 54570x + 51165	0.9116
Property income received	y = 3341,7x + 64823	0.5132
Social aids and other current transfers received	y = 79756x +268913	0.8907
including social benefits	y = 29290x + 192243	0.8480
social transfers actually	y = 34756x + 77335	0.8751

Source: Compiled by the author according to Table 5(Appendix)

Table 1 shows that the main share in the structure of incomes of the population of Ukraine falls on wages (47%), which tends to grow for the analyzed period, like other indicators. Considering the dynamics of changes in the share of sources of income of the population for the period from 2010 to 2019. It can be argued that there is an increase in the volume of wages in the structure of the population's income by 0.83% on average per year and, conversely, the share of social assistance and other received current transfers decreases by 0.78% on average per year. In addition, during the analyzed period in 2014, in all indicators, there was a drop in income and an increase in social aids, except for income from the property. This situation is associated with the military conflict in the Donbass, which contributed to the resettlement of 1 million 459 thousand 089 people, reducing income and devastating the savings of the population. (Ministry of Social Policy, 2021). Considering the values of the approximation, it is fair to consider the trend model reliable since for almost all indicators, the average value of R^2 was $0.8 \rightarrow 1$. However, in terms of property income, the received R^2 was 0.5132, which indicates that the model does not consider significant factors other than time t. This aspect was considered in the forecast presented in Table 2.

Table 2. Trend model of income asymmetry of the population of Ukraine by type of economic activity

Indicators	Trend model	R^2
Agriculture, forestry and fisheries	y = 803.38x – 390.47	0.8805
Industry	y = 947.95x + 435	0.8646
Constructing	y = 805.21x – 44.667	0.8768
Wholesale and retail trade; repair of motor vehicles	y = 993.81x – 295.73	0.9171
Transport, warehousing, postal and courier activities	y = 956.72x + 359.47	0.8587
Temporary accommodation and catering	y = 576.48x + 197.47	0.8855
Information and telecommunications	y = 1569.6x – 494.27	0.9036
Financial and insurance activities	y = 1537.2x + 1176.4	0.8902
Real estate operations	y = 736.17x + 206.13	0.9086
Professional, scientific activity	y = 1252.1x + 306.73	0.9270
Activities in the field of administrative	y = 714.22x + 89.467	0.8348
and support services	y = 1292.7x – 722	0.8073
Public administration and defense	y = 372.93x +288.2	0.8470
Compulsory social insurance	y = 572.38x + 301	0.8686
Education	y = 734.24x + 555.8	0.9337
Health service	y = 815.33x – 37.133	0.8996
Art, sport, entertainment and rest	y = 877.61x + 221.87	0.8742

Source: Compiled by the author according to Table 6 (Appendix)

The result of trend analysis for the indicator "wages by type of economic activity for the period 2010 - 2019, UAH million." is presented in Table 2. It indicates a significant differentiation in the sectors of the economy in terms of the average wages level.

So, unlike European countries, where the highest remuneration for their work is received by qualified workers in the field of high technologies, in science, medicine, education, in Ukraine, this contingent of workers was in the group of low-paid (< 10497 UAH). The difference between the highest-paid industry, “Financial and insurance activities” (19132 UAH), and the least paid “Temporary accommodation and catering” (6730 UAH) are almost three times in 12402 UAH. (65%). The approximation coefficient for all types of economic activity ranges from 08 to 09, indicating the forecast's reliability.

It can also be argued that the revenue is expected for such activities as agriculture, forestry, and fisheries; construction; wholesale and retail trade; repair of motor vehicles; information and telecommunications; public administration and defense; arts, sports, entertainment, and recreation to decline by 2020. This forecast coincides with the data of the analytical note of Rozumkov Center. The World Bank predicted it; the poverty rate in Ukraine increased from 2.1% in 2019 to 2.3% by the end of 2020. Although the government in the framework of the macroeconomic forecast for 2020-2022. It was planned to increase the average salary by UAH 2000. Per year, however, the introduction of quarantine caused the growth of the real incomes of Ukrainians to stop. At the end of the first half of 2020, the real disposable income of citizens decreased by 7.3% compared to the same period in 2019. This was the first drop in real incomes since 2016 (Razumkov Center, 2021).

Table 3. Trend model of income asymmetry by regions of Ukraine

Regions	Trend model	R^2
Vinnitsa	y = 10467x + 10573	0.8983
Volynsk	y = 5764x +6938.9	0.898
Dnipropetrovsk	y = 28738x+ 25935	0.8918
Donetsk	y = 45431x + 122170	0.2526
Zhytomyr	y = 7687.6x + 9024.1	0.887
Zakarpattia	y = 6207.9x + 7623.3	0.8956
Zaporizhzhya	y = 13414x + 16869	0.9079
Ivano-Frankivsk	y = 7851.1x + 10032	0.8977
Kiev	y = 13970x + 11008	0.879
Kirovograd	y = 5656.4x + 8373	0.9037
Luhansk	y = 331.98x + 58279	0.0101
Lviv	y = 17414x + 16073	0.8842
Nikolayev	y = 7205.3x + 10328	0.8921
Odessa	y = 18410x + 12366	0.8916
Poltava	y = 10360x + 11534	0.8933
Rovensk	y = 6602.2x + 8578.1	0.9082
Sumy	y = 7176.4x + 9352.1	0.9068
Ternopil	y = 5397.7x + 8110.4	0.8978
Kharkiv	y = 19233x + 25278	0.8898
Kherson	y = 6115.9x +7964.5	0.9095
Khmelnitsky	y = 7790.6x +10484	0.9096
Cherkasy	y = 7357.1x +9949.2	0.8981
Chernivtsi	y = 4624.1x + 6448.1	0.9024
Chernihiv	y = 5934.6x +10390	0.9022

Source: Compiled by the author according to Table 7 (Appendix)

The trend analysis of the incomes of the population in the regions of Ukraine made it possible to establish that there is also a significant asymmetry between them over ten years. High incomes are typical for the Dnepropetrovsk industrial region (UAH 89042), Kiev (UAH 76,232), Zaporizhzhya (UAH 76062), Odessa (UAH 75288) and Poltava (UAH 72843) regions. The listed territories' average per capita monetary income per month is almost three times higher than the average Ukrainian one (from UAH 48 to 70 thousand), 151.2%. Forecast data for 2020 indicate that the long-term trend will continue across the regions. The approximation rate for all regions, except for Donetsk and Lugansk, is 0.8-0.9. It indicates the reliability of the forecast.

Regarding the Donetsk and Luhansk regions, it must be said that this dynamics is explained by the military conflict (risk factor) that occurred in 2014, which was not taken into account in the forecast, which indicates an urgent need to study causal relationships. In addition, it should be noted that Covid-19 also made certain adjustments to the structure of trade and economy, and social policy in Ukraine and in all world states. Today, this risk factor is decisive since quarantine exposes the weaknesses of the population's health and socio-economic ones. In this connection, the author proposes to build a medium-term forecast for the main indicators of the asymmetry of incomes of the population of Ukraine until 2024. Table 4 presents the results of forecasting income asymmetry, which was carried out based on the obtained trend models, taking into account the speed of action, the strength of the impact, and the direction of influence of political, social, and economic risks.

Table 4. The results of forecasting the income asymmetry of the population of Ukraine until 2024

Indicators	The year 2024	Deflection 2019/2024	
		Total thousand UAH	Comparative %
Most possible script			
Salary, thousand UAH	2950020.292	1191432	67.71
Profit and mixed-income	1205066.592	526849	77.68
Property income received	133711.6061	16708	14.28
Social aids and other current transfers received	1985178.151	794926	66.77
including: social aids	1026341.373	467804	83.75
social transfers actually	616228.3819	177513	40.46
Pessimistic script			
Salary, thousand UAH	1932936.50	174 348	10
Profit and mixed-income	895091.55	216 874	31.98
Property income received	97820.70	-19183	-16.39
Social aids and other current transfers received	1331101.95	140849	11.83
including: social aids	663608.16	105071	18.81
social transfers actually	475961.02	37246	8.5
Optimistic script			
Salary, thousand UAH	3967104.08	2208516	126
Profit and mixed-income	1515041.64	836824	123.38
Property income received	169602.51	52599	44.95
Social aids and other current transfers received	2639254.35	1449002	121.74
including: social aids	1389074.59	830537	148.7
social transfers actually	756495.74	317780	72.43

So, it follows from the presented forecast that the current trend of the income distribution will continue in the next five years. In addition, it was found that such an indicator requires additional research as "property income received", and the Luhansk and Donetsk regions. Since these regions and this indicator were influenced by risk factors that were not considered in official statistics, which negatively affected the coefficient of reliability R^2.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

A survey analysis of scientific points of view regarding the current category of "forecasting" made it possible to conclude that it is advisable to understand as such a scientifically grounded judgment about the possible states of the object (income of the population) in the future and (or) about alternative ways and timing of their implementation. Previous research made it possible to establish that such risks most influence the asymmetry of incomes of the population of the regions of Ukraine as the economic, political, social, and spontaneous short-term risk of Covid-19, the consequences of which are the author's prospective studies. It was found that during the analyzed period of 2010-2019. in Ukraine, a stable trend of income distribution has formed, namely, an asymmetric distribution, which is expressed in a change in the structural income of the population by individual indicators, by types of economic activity and regions, while being in direct dependence on the economic and social development of society.

Trend analysis for the period from 2010 to 2019 gives grounds to assert that the main share in the structure of incomes of the population of Ukraine falls on wages (47%) and social assistance. The main average per capita income in Ukraine in 2019 was from UAH 48 to 70 thousand. While the regions were identified, the average per

capita monetary income per month exceeds almost three times the average Ukrainian one. These regions include Dnipropetrovsk, Kiev, Zaporizhzhia, Odessa and Poltava. It was determined that the dominant factor in the growth of income differentiation of the population of Ukraine is the intersectoral gap in the wages of full-time employees. So the difference between the highest-paid industry “Financial and insurance activities” (19132 UAH) and the least paid “Temporary accommodation and catering” (6730 UAH) are calculated as three times - 12402 UAH. (65%).

In addition, it was found that revenue is expected for such activities as agriculture, forestry, fisheries; construction; wholesale and retail trade; repair of vehicles; information and telecommunications, public administration and defense, arts, sports, entertainment, and leisure to decline in 2020. The presented forecast until 2024 indicates that the current trend will continue in the next five years. It was also found that such an indicator requires additional research as "property income received", and Lugansk and Donetsk regions since these regions and this indicator were influenced by risk factors that were not considered in official statistics, which negatively affected the approximation rate.

Recommendations

The forecasting results and the author's toolkit for implementing the forecast and assessment of risk factors, developed and published in another article, are offered to local and state authorities. The forecast proposed in the article should become the basis for strategies and programs for the socio-economic development of the regions of Ukraine.

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APPENDIX

Table 5. Dynamics of incomes of the population of Ukraine for the period 2010 - 2019, UAH million

Index	Period									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total income	1101175	1266753	1457864	1548733	1516768	1772016	2051331	2652082	3248730	3744060
Wage	449553	529133	609394	630734	615022	709590	898326	1209097	1529367	1758588
Profit and mixed income	160025	200230	224920	243668	254307	323506	378213	477854	572065	678217
Property income received	67856	68004	80769	87952	85114	80035	75452	78673	91164	117003
Social benefits and other current transfers received	423741	469386	542781	586379	562325	658885	699340	886458	1056134	1190252
including: social help and	237213	263633	301621	323123	311360	342562	337773	391776	465776	558537
social transfers	152131	164775	192827	204840	195881	236647	270560	382345	446193	438715

Source: Compiled by the author based on data (Statistical collection "Income and Expenditures of the Population", 2021)

Table 6. Dynamics of average monthly wages by type of economic activity for the period 2010 - 2019, million. UAH

Economic type Activities	Period									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Agriculture, forestry and fisheries	1472	1853	2086	2340	2556	3309	4195	6057	7557	8856
Industry	2570	3170	3478	3763	3763	4789	5902	7631	9633	11788
Constructing	1758	2270	2516	2702	2860	3551	4731	6251	7845	9356
Wholesale and retail trade; repair of motor vehicles	1877	2342	2704	3010	3439	4692	5808	7631	9404	10795
Transport, warehousing, postal and courier activities	2658	3072	3412	3589	3768	4653	5810	7688	9860	11704
Temporary accommodation and catering	1455	1777	2055	2249	2261	2786	3505	4988	5875	6730
Information and telecommunications	3161	3683	4286	4599	5176	7111	9530	12018	14276	17543
Financial and insurance activities	4638	5377	6012	6275	7020	8603	10227	12865	16161	19132
Real estate operations	1856	2181	2356	2757	3090	3659	4804	5947	7329	8626
Professional, scientific activity	2869	3529	4252	4465	5290	6736	8060	10039	12144	14550
Activities in the field of administrative	1839	2165	2430	2527	2601	3114	3995	5578	7228	8700
and support services	2722	3036	3415	3702	3817	4381	5953	9372	12698	14785
Public administration and defense	1905	2079	2530	2700	2745	3132	3769	5857	7041	8135
Compulsory social insurance	1628	1774	2202	2367	2441	2829	3400	4977	5853	7020
Education	1928	2358	2886	3286	3626	4134	4844	6608	7612	8659
Health service	1717	2056	2618	2707	3361	3634	4615	6536	8132	9096
Art, sport, entertainment and rest	2239	2633	3026	3265	3480	4195	5183	7104	8865	10497

Source: compiled by the author based on data (Statistical collection "Income and Expenditures of the Population", 2021)

Table 7. Dynamics of incomes of the population by regions of Ukraine for the period 2010 - 2019, UAH million

Regions	Income for the period									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Ukraine	1101175	1266753	1457864	1548733	1516768	1772016	2051331	2652082	3248730	3744060
ARC	39393	45562	51759	57324	-	-	-	-	-	-
Vinnitsa	33602	38990	44265	46157	49418	60923	71888	94417	114480	129061
Volynsk	19137	22584	25741	26907	27986	34064	40792	53204	63810	72185
Dnipropetrovsk	88922	101868	118823	124594	136810	166076	188816	245778	307844	360385
Donetsk	118223	135599	158003	166366	142745	117471	117735	141340	174771	199322
Zhytomyr	26124	30069	34110	34947	36814	45053	53684	70126	84830	97301
Zakarpattia	20841	24446	28028	29102	29988	37182	44137	56568	69194	78182
Zaporizhzhya	45779	52272	59191	62671	68327	81737	96695	122759	147627	169384
Ivano-Frankivsk	26504	31224	36186	37310	37848	47152	56418	73474	87479	98587
Kiev	42732	48990	55941	58894	63342	76150	90505	117755	150606	173511
Kirovograd	20213	23443	27129	27695	28901	35350	41875	54514	63999	71713
Luhansk	51338	58619	67025	71485	56233	44157	41267	49342	58880	66287
Lviv	54838	63602	72828	75762	79378	97740	116285	152256	189077	216876
Nikolaev	26034	29800	33907	35125	36373	44275	52390	67558	81581	92529
Odessa	52924	61435	70429	78285	80438	101179	118472	153640	193923	225458
Poltava	34462	39299	44835	46984	49928	60610	71926	92768	114656	129647
Rovensk	22362	26144	29557	31811	33314	40309	47356	61831	73661	82555
Sumy	24918	28347	32415	33469	35375	44311	52551	67287	79848	89702
Ternopil	19587	22712	26102	26345	26892	33851	40277	52196	61731	68282
Kharkiv	67102	77316	88352	91333	95897	116880	135675	175850	216227	245934
Kherson	20978	24096	27221	29489	30077	38233	44268	57144	68064	76449
Khmelnitsky	26987	31336	35458	36770	38853	48653	57367	73520	86821	97560
Cherkasy	26194	29646	33484	35024	36694	44708	53496	69399	82600	92887
Chernivtsi	16114	18682	21012	22408	22941	28316	33657	43542	52108	58028
Chernihiv	23179	26277	29654	30393	31998	38780	45716	58255	69247	76808
Kiev	143903	164057	194436	218747	240198	288856	338083	447559	555666	675427
Sevastopol	8785	10338	11973	13336	-	-	-	-	-	-

Source: compiled by the author based on data (Statistical collection "Income and Expenditures of the Population", 2021)