https://doi.org/10.33271/nvngu/2024-6/158

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THE IMPACT OF URBANIZATION ON SOCIO-ECONOMIC DEVELOPMENT: THE EXPERIENCE OF POLAND, SPAIN AND UKRAINE

Purpose. To analyze and evaluate the impact of urbanization on socio-economic indicators of development in three different countries and determine how changes in the demographic processes of the urban population affect the economic development and financial stability of the regions.

Methodology. The research methodology is based on a combination of qualitative and quantitative analysis and includes the study of demographic characteristics, labor status, education, living conditions and well-being. To carry out such an analysis, statistical methods were used, namely regression analysis, which is used to identify the relationship between urbanization and economic indicators. The use of variation coefficient made it possible to determine the differentiation degree of urbanization level, and the use of correlation coefficients allowed assessing the closeness of the relationship between urbanization and the volume of the produced gross regional product, as well as the country's financial potential. In general, the regression model provided possibilities to present the dependence between significant factors and determine their influence on the socio-economic development of individual regions.

Findings. The study revealed the multi-component impact of urbanization on the development of regions, namely on the financial potential (measured as GDP per capita) of Poland, Spain and Ukraine. The research analyzed the complexity of urbanization and its impact on various socio-economic factors, such as regional differences, infrastructure concentration and ecological consequences. It has been shown that the significant benefits of urbanization, such as stimulating innovation, creating new jobs and facilitating global trade, can be accompanied by significant investment in urban infrastructure and cause environmental problems or facilitate the spread of disease. The conclusions emphasize the need to implement a national program of "smart cities" part of a long-term development strategy for effective management of urbanization processes. And the importance of further research on urbanization under the conditions of global demographic changes caused by the war in Ukraine is also underlined.

Originality. Based on the analysis of the processes of urbanization in Poland, Spain and Ukraine, the key factors shaping the advantages and disadvantages of urbanization for the socio-economic development of these countries are identified. By means of regression analysis, for each of the researched countries, the dependence between the indicators of population change in urban and rural areas and the volume of the produced gross regional product within each national economy was established, and the existence of a connection between the financial potential of the country and the number of its urban population was also revealed. The influence of urbanization on demographic changes, economic growth, infrastructure and environmental conditions of the studied countries is demonstrated.

Practical value. The article substantiates the data and analyzes the impact of urbanization on various aspects of life in the cities of Poland, Spain, and Ukraine. The results of the study can serve as a basis for developing policies aimed at optimizing urbanization processes, planning the development of urban agglomerations, as well as solving problems related to urban growth and management, including infrastructure, housing, transport and ecology.

Keywords: *urbanization, economic development, population, financial potential, social and demographic development, industrialization*

Introduction. The problems of urbanization caused by the growth of urban settlements, which considerably accelerated in the *20th* century, continue to attract the attention of scholars. Cities are provided with first priority support in government policies and investments, forcing people to leave the countryside in search of work. This process leads to the emergence of contradictions, previously unforeseeable trends, which requires a comprehensive analysis, including a statistical one. The rapid growth of the urban population is capable of radical changing the living environment of mankind in the future. Urbanization is gradually turning into a new global problem. At the same time, rapid urbanization can turn out to be a great boon, provided that society does not neglect this process.

The relevance of the study of modern processes of urbanization determines the purpose of the article and consists in

the study of the following directions using statistical methods and models:

1. The need to fix, study, identify the advantages and disadvantages of urbanization for each of the countries that are similar in terms of territorial and demographic features, as well as general economic development trends – Poland, Spain and Ukraine.

2. Conducting a regression analysis of the population structure, density, growth rates of the urban and rural population, as well as an assessment of the differentiation parameters of the regions of Poland, Spain and Ukraine by population.

3. Conducting an analysis of the impact of urban population changes on the socio-economic development of the investigated countries, since rapid urbanization occurs primarily due to migration from rural areas, which leads to the spontaneous growth of urban agglomerations and the development of their infrastructure.

4. Calculating the dependence of changes in the financial potential of Poland, Spain, and Ukraine on the number of their urban populations in accordance with the principle of resource concentration.

As a result of the rapid spread of the COVID-19 coronavirus disease epidemic, the governments of many countries began to introduce strict quarantine restrictions, which significantly affected the processes of urbanization and socio-economic development of countries.

Literature review. Economic science considers urbanization in the broad and narrow sense of this term. The first is identified as a global multidimensional socioeconomic process with distinct historical characteristics. Characteristic features of urbanization, which are observed in most countries, are the increase in the importance and expansion of urban territories, the growth of the number of cities and urban population, the spread of the urban lifestyle, as well as the development of urban agglomerations. At the same time, urbanization affects the psychological behavior of people, manifesting itself through increased requirements for the quality of life, culture and changes in moral values in general [1].

In a narrow sense, urbanization is the growth of cities and an increase in the specific weight of the urban population. Such growth occurs due to the natural increase in the urban population itself, the influx of migrants from rural areas, the transformation of rural settlements into urban ones, or the inclusion of suburban areas in the urban belt. Urbanization is characterized by the main directions of development: particularly rapid growth of millionaire cities; the formation of urban agglomerations, the population of which exceeds one million people; transformation of clusters of agglomerations into megacities; urban population growth not only due to internal migration but also due to the population of developing countries; the spread of the urban way of life not only to the countryside, but also to society as a whole.

According to this understanding, in modern scientific literature, the concept of urbanization is associated with an increase in the influence of cities on economic and social development. This process is characterized by the expansion of urban territories, the growth of the urban population share and the spread of the urban lifestyle at the regional and global levels. A large number of scientific works are devoted to the development of urban agglomerations, because in the current historical period, cities play a significant role in the economic progress of individual regions and countries as a whole. Moreover, the specificity of modern urbanization is its active influence on the formation of the social and cultural environment as well as the dynamic formation of social space [2, 3]. Nowadays, the process of creating cities that are called smart and in which education, science and technology are combined in order to create a favorable environment for the development of scientific and technological progress in the countries-leaders of technical progress is becoming more and more important. This, in particular, is noted in scientific studies devoted to innovative development, since the concentration of creative human capital in cities contributes to the birth of ideas, their transformation into innovations and social interaction, that positively affects the socio-economic development of countries [4, 5].

Such a broad context of the study of urbanization as one of the important factors of socio-economic development is specified in the researchers' emphasis on certain aspects of this problem. Moreover, in different countries, scientists choose a rather different focus of research in this area. This is due to the fact that, despite the presence of common features, this process has certain differences in various countries and regions. This, in turn, determines the specificity of the subject area of urban studies.

A similar list of countries, namely Poland, Spain and Ukraine, was chosen for the study of the economic unevenness of regional development. The authors analyzed a number of integral indicators, in particular, the Williamson coefficient of variation, the weighted coefficient of variation, and the Theil index, the calculation of which is carried out taking into account the influence of the demographic factor, namely the population size. It should also be noted that certain countries have the best developing regions with a high level of urbanization, which in turn are capable of mutually beneficial foreign economic cooperation in investment, trade, and technological cooperation [6].

For example, in Spain, where this term was first used in 1867, it was used to study processes related to urban settlements, the increase in the number of cities, and the growth of the urban population. According to J. Díaz and J. Araujo, urban studies in Spain cover "education reforms and the end of the colonial empire (1746–1833), the end of the ancient regime and the new capitalist development (1833–1936), as well as the transition from dictatorship to integration into European Union" [7]. Spanish researchers point out that regional convergence, along with low migration, has led to significant spatial clustering. This is how the "Two Spains" map appeared and spatial polarization became the main problem [8]. The latest studies of urbanization processes in Spain [9] relate to the phenomenon of urbanization of the coastal zone of the Mediterranean Sea, the role of internal migration [10], as well as the development of smart cities [11].

Unlike their Spanish colleagues, Polish and Ukrainian scientists began to actively use the term "urbanization" only since the end of 1960 [12]. Urban studies in Poland 1945–1989 reflect the processes caused by the general industrialization and urbanization of the country. In studies devoted to the period of Polish independence, the causes of social inequality between the city and the countryside are researched [13]. Scientists draw attention to the fact that, despite significant subsidies, the infrastructure in rural areas is deteriorating, there is a noticeable advantage in the incomes of the urban population compared to the incomes of the rural population. In a number of studies, it is noted that the rural population in Poland is distinguished by the economic, social and mental diversity of its inhabitants, that caused the phenomenon of mutual diffusion of the rural and urban population [14]. As the scientists note, the further improvement of the territory of agricultural land and the progressive processes of urbanization led to the spread of the so-called urban lifestyle in rural areas. However, despite significant improvements, considerable disparities between the countryside and the city in terms of infrastructure development and the level of population well-being are still observed [15]. Such inequality, according to N. Borucińskiej-Bieńkowsksej, M. Heldak and K. Przybylej, leads to migration of the rural population to cities and deepens the consequences of urbanization. Using the examples of individual cities, the authors describe one of the important features of the Polish model of urbanization, namely: population concentration in large cities, when, having reached a certain critical population size, such cities rapidly increased their population [16, 17].

Haase, A., Wolff M., Špačková P., and Radzimski A. note that later the tendency of population concentration in large cities of Poland was preserved, but it was supplemented by the processes of small cities growth [18]. This, in turn, led to an increase in the number of residents of suburban settlements and to the development of further processes of urbanization and suburbanization [19]. Some attention of scientists is also paid to the processes of fiscal decentralization as a factor of economic development and it is noted that such processes, in the future, can significantly affect the process of depopulation of the city center and cause the phenomenon of shrinking cities [20].

Quite a lot of works are devoted to the processes of urbanization in Ukraine, but in most cases they are focused on the study of spatial aspects of the emergence, location, development or decline of urban settlements, the formation and changes of urban networks and systems, the phenomena of industrial and post-industrial cities, global, creative, smart, green and at the same time depressed or degrading cities, the transformation of urban space and the interaction of the city with the surrounding territory in particular [21]. A review of domestic literature devoted to urbanization shows that it primarily combines the dynamics of population development with the dynamics of economic development and presents spatial characteristics and trends [20].

Some authors emphasize the connection between financial stability and population size [22]. In the works by A. Komarnytska, the impact of structural policy on economic development and population is considered [23]. The works by D. Kotenok [24] are devoted to the analysis of the features of urbanization processes in Ukraine and their possible development from agglomeration through clusterization to metropolitanization. The general conclusion of the analysis of the works by Ukrainian scientists in this field is that Ukraine is recognized as an urbanized country only according to formal criteria, and its further economic development requires the introduction of financial instruments that can be used to regulate socio-economic processes in the urban context with the aim of increasing investment flows and overall GDP [24, 25].

Purpose. The purpose of this article is to determine the impact of urbanization on key indicators of social and economic progress, including changes in the financial potential of the territory. The definition of positive and negative urbanization processes makes it possible to develop recommendations for the formation of long-term strategies for the development of urban agglomerations, which will reduce the negative consequences of urbanization and contribute to the sustainable development of the city.

Through a comparative analysis of the experience of Poland, Spain and Ukraine, the article provides a deeper understanding of how different urbanization models and policies affect socio-economic systems in different cultural and economic contexts. This makes it possible to determine the most effective approaches to managing urbanization, which can be adapted and implemented in other countries with similar conditions.

Methodology. In order to study the impact of urbanization on the quality of the population's life and the impact of economic and social factors on the development processes of urban settlements, qualitative and quantitative methods are used. The applied research methodology combines quantitative methods with qualitative analysis, which provides a theoretical substantiation of the essence of urban processes in different countries by different categories of the population, taking into account the influence of a number of factors on the well-being and development of the region. As a result of the dialectical unity of quantity and quality, quantitative indicators simultaneously to a certain extent characterize the quality of economic phenomena associated with the spread of the urban way of life and the growth and development of urban settlements.

Studies of urbanization processes in Poland, Spain and Ukraine are carried out on the basis of processing official documents of such international organizations as the United Nations, Organization for Economic Co-operation and Development, World Bank Group, Central Intelligence Agency, International Organization for Migration, Eurostat and etc., which make it possible to determine trends and prospects for the development of the studied processes.

In particular, according to Eurostat, the degree of urbanization (DEGURBA) is a classification that indicates the character of the district. Taking into account the share of the local population living in urban clusters and urban centers, the classification of local administrative units (LAU or communes) is carried out by: cities (densely populated areas); cities and suburbs (zones of medium density); rural areas (sparsely populated areas).

In turn, the analysis of the level of urbanization is carried out in the following areas: gradation of the population by age and sex, labor market, education, living conditions, well-being.

These sources of information serve as the basis for calculating population density indicators and population growth rates, trends in demographic processes, gender and age dependence of the population, provision of gross regional product, dependence of financial potential on the size of the urban population.

After clarifying the essence of urbanization in general and the manifestations of its individual elements by means of a qualitative analysis, there occurs a need to study quantitative functional dependencies and statistical regularities, such as regression analysis of the population structure, analysis of the impact of changes in the urban population on the economic development of the region, analysis of dependence of changes in the financial potential on a number of factors.

For this purpose, the influence of the factor of change in the population in urban and rural areas and the volume of the produced gross regional product is determined using a multivariate linear regression model. The research was conducted in several stages.

At the first stage, the selection and analysis of urbanization factors impact on socio-economic development is carried out. The second stage involves measurement and analysis of determined factors of population change in urban and rural areas. At the third stage, a mathematical and statistical analysis of factors was carried out with the verification of the main assumptions of classical regression analysis. The fourth stage consists in choosing the form of the regression multifactor model and evaluating individual parameters of the regression model by: establishing the significance (density) of the regression relationship between factors and the possibility of representing such dependence in the form of a mathematical expression – a regression equation.

The fifth stage is a general check of the reliability and significance of the regression equation using the values of the Fisher Significance F criterion (F-distribution), as the ratio of the sample variance of the group mean value to the mean value of the variance within the group. The purpose of the analysis is to check the correspondence of the x-variables to a significant part of the variations of the y-variable. In the case of a negative result of the correspondence, the constructed regression is insignificant and inadequate to the experimental data and may indicate the lack of influence of urbanization factors on the socio-economic development of the region.

Findings. ***Gender and age structure of the population.*** The urbanization experience of some Eastern European countries is unique for several reasons. Let us start with the fact that Poland and Ukraine have achieved a high level of urbanization within the framework of a centralized planning system, in which non-economic factors play a decisive role in shaping the distribution of the population and economic activity in the territory of the country under study. At the same time, next to Spain, these countries also experience the problems of low birth rates and population aging.

The population structure not only affects the demographic processes in each of the studied countries, but is also the result

of these processes in the past (Table 1). Thus, 38 million people live in Poland and are resettled in 16 voivodeships. According to the Central Intelligence Agency's World Factbook, Poland's population is concentrated in the southern part around Krakow and in the central part around Warsaw and Łódź, as well as in the northern coastal city of Gdansk.

The population of Spain in 2021 was more than 47 million people living in the 19 autonomous regions of the kingdom. So, with the exception of Madrid, Seville and Zaragoza, the largest urban agglomerations are located along the coast of the Mediterranean Sea and the Atlantic Ocean. Spain's numerous smaller towns are scattered throughout the territory, reflecting Spain's agrarian heritage. The distribution of the Spanish population by region is characterized by a very dense settlement around the capital Madrid, as well as the port city of Barcelona.

In turn, the population of Ukraine during 2010–2021 fluctuates between 43.8–45.9 million people due to the loss of control in 2014 over the territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the territories in the Donetsk and Luhansk regions. It is worth noting that the densest population is located in the eastern and western regions of Ukraine as well as around large urban agglomerations, such as Kyiv, Kharkiv, Donetsk, Dnipro and Odesa.

Distribution of the population of the researched countries for 2010–2021. The distribution of the population between the city and the village looks as follows. Thus, using the example of Spain, proximity to the sea coast or a mild climate has a positive effect on the growth of the city's population. However, a city's proximity to other major cities can harm a city's ability to attract population, especially when it is located in a region or country experiencing demographic decline.

The example of Poland and Ukraine proves that modern cities have to adapt their local infrastructure to ensure the best integration of the population into the urban environment, avoiding urban sprawl and balancing the growth of cities beyond administrative boundaries. The increase in the specific weight of the rural population of Poland and Ukraine during 2019 means that in most cities of the investigated countries, the population is fleeing from the city centers to the suburbs, a new trend called downshifting is emerging, which is becoming popular in various regions of these countries. There are more and more people willing to move away from the hustle and bustle of the city and immerse themselves in a quiet life, and the villages of the future began to appear on the map, which in terms of infrastructure are not inferior to small cities, and also give the local population the opportunity to enjoy the comfort of civilization and outside the city. The quality of public transport is important here, as well as the completely new – due to the coronavirus – interesting trend of working at home.

The population in each of the researched countries changes through birth rate, death rate and migration. Economic, political, social, ethnic, cultural factors contribute to this. Let us try to trace the dependence of the population on the ratio of the number of men and women in a certain country (Table 2).

The gender portrait of Poland, Spain and Ukraine reflects the socio-demographic situation and shows the characteristics of such social groups as women and men. Thus, the gender structure of the population of Poland, Spain and Ukraine is characterized by the superiority of the female population over men. In 2021, there were 1,040 women in Spain, 1,069 women in Poland, and 1,158 women in Ukraine for every one thousand men. The formation of the number of both women and men in each of the researched countries is influenced by the higher risk of mortality of men, compared to the mortality of women, not only due to differences in natural mortality rates, but also due to the increased risk of external factors, such as accidents, injuries, violence, armed conflicts, etc. Differences in the balance of the ratio of the number of women and men in the investigated countries are due to the increase in the life expectancy of men because of progress in local medicine and labor protection in Poland and Spain, as well as the external labor migration of Ukrainian men in search of a better life, in particular. In addition, the gender imbalance in the countries under investigation in 2019–2021 did not undergo significant changes even due to the relatively higher vulnerability of men to various strains of the COVID-19 coronavirus and their mortality associated with the impact of a number of genetic, behavioral, social and physiological factors in general.

The age structure of the population of the researched countries is also undergoing significant changes, accompanied by the transition from the predominance of the young population as a result of relatively high levels of birth and death in the

Table 1

Population by country (millions) [26]

Year	Poland			Spain			Ukraine		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
2010	38.0	23.2	14.9	46.6	36.5	10.0	45.9	31.5	14.4
2011	38.1	23.1	14.9	46.7	36.8	10.0	45.7	31.4	14.3
2012	38.1	23.1	15.0	46.8	36.9	9.9	45.6	31.4	14.2
2013	38.0	23.0	15.0	46.6	36.9	9.7	45.5	31.3	14.2
2014	38.0	23.0	15.1	46.5	36.9	9.6	45.3	31.2	14.0
2015	38.0	22.9	15.1	46.4	37.0	9.5	45.2	31.2	14.0
2016	38.0	22.8	15.1	46.5	37.1	9.4	45.0	31.1	13.9
2017	38.0	22.8	15.2	46.6	37.3	9.3	44.8	31.0	13.8
2018	38.0	22.8	15.2	46.8	37.6	9.2	44.6	30.9	13.7
2019	38.0	22.8	15.2	47.1	37.9	9.1	44.4	30.8	13.5
2020	37.9	22.8	15.1	47.4	38.3	9.1	44.1	30.7	13.4
2021	37.8	22.7	15.1	47.3	38.4	8.9	43.8	30.6	13.2
2022*	37.7	22.6	15.2	46.7	38.5	8.9	43.1	30.6	13.2
2023*	37.7	22.6	15.2	46.7	38.6	8.9	42.9	30.5	13.1
2024*	37.6	22.5	15.2	46.6	38.7	8.8	42.6	30.4	13.0

* *Data for 2022–2024 were obtained using a different methodology*

Table 2

Gender ratio by country (women per 1,000 men) [27, 28]

Year	Poland	Spain	Ukraine
2010	1,065	1,023	1,168
2011	1,065	1,025	1,167
2012	1,066	1,027	1,164
2013	1,066	1,030	1,163
2014	1,066	1,033	1,161
2015	1,066	1,035	1,160
2016	1,066	1,036	1,159
2017	1,066	1,038	1,159
2018	1,066	1,039	1,158
2019	1,067	1,041	1,157
2020	1,068	1,040	1,158
2021	1,069	1,040	1,158
2022*	1,064	1,034	1,157
2023*	1,064	1,034	1,157
2024*	1,064	1,034	1,157

* *Data for 2022–2024 were obtained using a different methodology*

past to the predominance of the elderly population because of the current low levels of birth and death.

According to the Central Intelligence Agency's World Factbook, information on the age structure is provided by gender and age group as follows (Table 3):

- 0–14 years old (children);
- 15–24 years old (early working age);
- 25–54 years old (the highest working age);
- 55–64 years old (mature working age);
- 65 and more years old (elderly).

The study of the structure of the population of Poland, Spain and Ukraine by gender and age groups makes it possible to conclude that the share of elderly people has generally increased compared to people of mature working age. In particular, the forecasting of the total number of pensioners in Spain [29, 30] indicates the need for structural reform of the Spanish social security system, since the country's demographic trends show a constant increase in the number of pensioners.

The ratio of the working population, as well as children and the elderly creates a relatively average social burden for the society of European countries.

Compared to other countries, Poland has a high population density (Table 4) – more than 124 people per sq. km. At the same time, the population density in Poland is extremely unevenly distributed. Thus, a dense network of Polish cities was formed in the territories associated with the birth of Polish statehood, as well as in those territories where industrialization processes were started earlier. Today, the socio-economic development of Poland is concentrated in the Katowice-Krakow region, as well as in large cities and urban complexes – Warsaw, Łódź, Tri-City, Wrocław and Poznan.

Spain, compared to other comparable countries, during 2010–2018 shows an average population density of more than 93 people per sq. km., and in 2019–2020 this indicator was 95 people per sq. km. Population density in Spain is very unevenly distributed due to the high concentration of economic activity in urban agglomerations and coastal regions. The distribution of the population of Spain is related not only to a high concentration of economic activity and material goods in urban agglomerations, but also to a sunny, favorable climate on the coasts, which are washed by the Mediterranean Sea and the Atlantic Ocean.

In Ukraine today, the population density does not exceed 79 people per sq. km. The eastern and western regions are the most densely populated. In the eastern regions of Ukraine, a high population density has been achieved due to urbanization and the presence of a dense network of urban settlements because of the location of large industrial facilities of the Soviet period. Western regions of Ukraine are traditionally characterized by high birth rates and large families, mainly in rural areas. The density of the population of Ukraine as a whole is affected not only by natural factors (high forest cover and significant wetlands in the northern regions, shortage of water resources and low soil fertility in the southern regions), but also by the aggravation of environmental problems in the habitat of the local population due to industrial and radioactive pollution of the environment waste in particular.

Overall population growth rates in Poland and Ukraine continue to decline, and these countries must adjust to the effects of population aging (Table 5). Differences in the rates of growth of the urban and rural population of Poland during 2010–2021 are caused not only by the mental and genetic characteristics of Poles who seek to purchase residential real estate in the urban areas with little development, but also by the using post-industrial zones for housing construction because of the shortage of land plots for development within the city.

Spain, in turn, during 2010–2021 demonstrates positive dynamics of general population growth, due to the growth of the urban population as a result of migration processes.

Because of a number of factors, a depopulation trend is observed in Ukraine, both in general and in terms of the urban and rural population. It is possible to stop the population decline in Ukraine thanks to the encouragement of inward migration, economic growth and state support for young families.

Factors differentiating the level of urbanization. Population size is considered to be an important factor in regional differentiation of the level of urbanization. Recently, in most of the European countries under study, population decline has been observed, as a result of which the indicators of urbanization, which previously had a clear territorial differentiation, have leveled off. This is confirmed by the analysis of distribution series using special quantitative criteria (Table 6).

During the investigated period, the values of the coefficients of variation, which give the most complete description of the homogeneity of the regions of the researched countries, are almost unchanged, which confirms the previous conclu-

Table 3

Population structure by gender and age groups (%, 2021) [27]

Age group	Poland			Spain			Ukraine		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
0–14 years old	14.83	51.42	48.58	15.02	51.41	48.59	16.16	51.54	48.46
15–24 years old	9.8	51.4	48.6	9.9	51.67	48.33	9.28	51.22	48.78
25–54 years old	43.33	50.54	49.46	43.61	51.05	48.95	43.66	49.32	50.68
55–64 years old	13.32	47.54	52.46	12.99	48.9	51.1	13.87	43.16	56.84
65 and more years old	18.72	40.01	59.99	18.49	42.94	57.06	17.03	33.73	66.27

Table 4

Population density by country (persons per sq. km of area) [31]

Year	Poland	Spain	Ukraine
2010	124.2	93.2	79.2
2011	124.3	93.5	78.9
2012	124.3	93.5	78.7
2013	124.2	93.2	78.5
2014	124.1	92.9	78.2
2015	124.1	92.9	77.9
2016	124.0	93.0	77.7
2017	124.0	93.3	77.4
2018	124.0	93.7	77.0
2019	124.0	94.0	77.0
2020	124.0	95.0	76.0
2021	123.0	95.0	76.0
2022*	120.6	92.5	71.6
2023*	120.6	92.5	71.1
2024*	120.3	92.3	70.6

* *Data for 2022–2024 were obtained using a different methodology*

sions of the analysis of the population structure, density, and growth rates of the urban and rural population. During 2010–2021, the total population of the regions of Poland, Spain, and Ukraine will be homogeneous, and its variability will be weak, i.e., the population in certain regions of the countries under investigation will deviate from the average national level by an average of 0.01–0.05 percentage points or by 0.22–0.51 %.

The level of urbanization development in an individual country at the level of regions is also determined by the dynamics of gross regional product and gross regional product per person of the local population (Table 7). One of the factors of the regional development in a single country and the growth of the gross regional product produced in it is not only the structure of economic activity. Another important factor that determines the volume of gross regional product is the population of the region. Thus, the natural reduction, as well as the situation in the regional labor market, has a negative impact on its number. In particular, the high level of unemployment is characteristic of the agrarian and industrial regions of Poland, which leads to a decrease in the level of wages of the economically active population as one of the important factors of the regression of the labor force of the researched country, as it affects its qualification characteristics.

At the same time, such conditions stimulate the population to swing, seasonal or permanent migration to regions or neighboring countries with more favorable conditions, that leads to a significant weakening of the labor potential, and, therefore, a negative trend in the formation of the gross regional product. At the same time, most regions of Ukraine are characterized by negative internal migration, which can explain the growth of the gross regional product per person of the local population for the period 2010–2021. Thus, the situation with the formation of the gross regional product in Ukraine began to change rapidly in 2014, when the economic crisis after the loss of control over the territory of the Autonomous Republic of Crimea, the city of Sevastopol as well as part of the territories in the Donetsk and Luhansk regions forced many Ukrainians to look for work outside Ukraine. According to Babakov [32], "... Poland with an understandable language, liberal migration legislation and salaries 5–6 times higher than in the homeland perfectly satisfied their needs" at that time.

The impact of urbanization on socio-economic development. To study the impact of urbanization on the socio-economic development of countries (Table 8), we will use indicators of population changes in urban and rural areas and the volume of produced gross regional product, as well as create multifactorial linear regression models for each of the countries.

The results of calculating the indicators of the influence of changes in the urban population on the socio-economic development of Poland, Spain and Ukraine show that their multifactorial linear regression models have the form:

$Y = 606.26 + 212.71X_1 - 189.56X_2$, where there is a negative relationship between the factor of population change in rural

Table 5

Population growth by country (annual %) [26]

Year	Poland			Spain			Ukraine		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
2010	–0.286	–0.469	+0.001	+0.460	+0.757	–0.61	–0.397	–0.260	–0.696
2011	+0.054	–0.130	+0.340	+0.355	+0.649	–0.722	–0.359	–0.224	–0.656
2012	–0.001	–0.208	+0.321	+0.065	+0.356	–1.015	–0.247	–0.112	–0.544
2013	–0.060	–0.267	+0.257	–0.328	–0.035	–1.429	–0.228	–0.093	–0.526
2014	–0.075	–0.283	+0.244	–0.299	–0.005	–1.422	–0.480	–0.344	–0.779
2015	–0.067	–0.274	+0.249	–0.078	+0.219	–1.288	–0.261	–0.126	–0.561
2016	–0.043	–0.209	+0.208	+0.084	+0.383	–1.089	–0.331	–0.197	–0.632
2017	+0.012	–0.109	+0.196	+0.235	+0.535	–0.963	–0.386	–0.253	–0.685
2018	–0.001	–0.078	+0.118	+0.435	+0.738	–0.779	–0.466	–0.313	–0.812
2019	–0.001	–0.045	+0.042	+0.700	+0.898	–0.653	–0.500	–0.359	–0.929
2020	–0.200	–0.200	–0.200	+0.500	+0.800	–0.800	–0.600	–0.400	–1.000
2021	–0.300	–0.300	–0.400	–0.100	+0.200	–1.400	–0.700	–0.500	–1.200
2022*	–0.145	–0.193	–0.424	0.059	+0.216	–1.407	–0.627	–0.442	–1.076
2023*	–0.141	–0.18	–0.467	0.219	+0.233	–1,414	–0.683	–0.465	–1.162
2024*	–0.138	–0.166	–0.509	0,379	+0.249	–1,421	–0.655	–0.489	–1.119

* *Data for 2022–2024 were obtained using a different methodology*

Table 6

Parameters of regions differentiation by population

Year	Poland			Spain			Ukraine		
	Average population, million	Standard deviation, percentage point	CV, %	Average population, million	Standard deviation, percentage point	CV, %	Average population, million	Standard deviation, percentage point	CV, %
2010	2,378	0.01	0.39	2,451	0.02	0.61	1,699	0.05	2.68
2011	2,379	0.01	0.40	2,460	0.02	0.63	1,693	0.05	2.67
2012	2,379	0.01	0.39	2,462	0.02	0.65	1,689	0.05	2.59
2013	2,378	0.01	0.39	2,454	0.02	0.81	1,685	0.04	2.43
2014	2,376	0.01	0.39	2,446	0.02	0.71	1,811	0.04	2.11
2015	2,374	0.01	0.39	2,444	0.02	0.71	1,806	0.04	2.06
2016	2,373	0.01	0.39	2,447	0.02	0.69	1,800	0.03	1.98
2017	2,373	0.01	0.39	2,452	0.02	0.67	1,793	0.03	1.89
2018	2,373	0.01	0.39	2,463	0.02	0.66	1,785	0.03	1.78
2019	2,373	0.01	0.37	2,478	0.02	0.71	1,775	0.03	1.64
2020	2,369	0.01	0.30	2,493	0.02	0.78	1,765	0.03	1.45
2021	2,361	0.00	0.21	2,491	0.02	0.70	1,753	0.02	1.17
2022*	2,359	0.00	0.19	2,459	0.00	0.09	1,725	0.01	0.59
2023*	2,355	0.00	0.14	2,457	0.00	0.07	1,716	0.01	0.47
2024*	2,350	0.00	0.00	2,454	0.00	0.00	1,705	0.00	0.00

* *Data for 2022–2024 were obtained using a different methodology*

Table 7

GDP by country (current USD) [29]

Year	Poland		Spain		Ukraine	
	Regional GDP, billion	GDP per capita	Regional GDP, billion	GDP per capita	Regional GDP, billion	GDP per capita
2010	29.958	12,599.53	74.789	30,502.72	5.038	2,965.14
2011	33.052	13,893.51	77.842	31,636.45	6.043	3,569.76
2012	31.273	13,145.54	69.737	28,324.43	6.510	3,855.42
2013	32.765	13,781.06	71.316	29,059.55	6.789	4,029.71
2014	34.087	14,347.92	72.053	29,461.55	5.340	3,104.64
2015	29.849	12,572.43	62.895	25,732.02	3.641	2,124.66
2016	29.502	12,431.82	64.842	26,505.34	3.734	2,187.73
2017	32.899	13,861.31	69.105	28,170.44	4.488	2,640.68
2018	36.695	15,460.64	74.737	30,337.68	5.236	3,096.82
2019	37.010	15,595.23	73.368	29,613.67	6.151	3,659.03
2020	37.289	15,742.5	67.421	27,056.4	6.265	3,751.7
2021	42.128	17,840.9	75.000	30,115.7	8.003	4,835.6
2022*	39.472	18,005.82	70.554	28,396.69	9.581	5,821.37
2023*	40.264	18,714.42	70.341	28,274.16	11.161	6,809.03
2024*	41.056	19,423.03	70.128	28,151.64	12.742	7,796.69

* *Data for 2022–2024 were obtained using a different methodology*

areas of Poland and the volume of produced gross regional product, i.e. the more the rural population decreases, the more gross regional product is produced in the city.

$Y = 1{,}376.38 + 42.79X_1 + 46.20X_2$, where there is a positive effect of the population change on the socio-economic development of Spain, but the relationship between the urban population change factor and the volume of the produced gross regional product is more significant.

$Y = -73.34 + 523.68X_1 - 489.93X_2$, where there is also a negative relationship between the population change factor in rural areas of Ukraine and the volume of the produced gross regional product.

The value of Multiple R characterizes the quality of the obtained models of the influence of urban population changes on the socio-economic development of the researched countries. According to the calculations, this coefficient indicates

Table 8

Indicators of the impact of urban population change on socio-economic development

Regression statistics	Poland	Spain	Ukraine	Recommended value indicator
Multiple R	0.9124	0.3538	0.7329	more than 0.7
R Square	0.8325	0.1252	0.5372	more than 0.5
Significance F	0.0000	0.4482	0.0098	less than 0.05
Intercept	606.26	1,376.38	–73.34	–
X Variable 1	212.71	42.79	523.68	–
X Variable 2	–189.56	46.20	–489.93	–

Table 9

Indicators of the dependence of the change in financial potential on the number of the urban population

Regression statistics	Poland	Spain	Ukraine	Recommended value indicator
Multiple R	0.9464	0.2629	0.7663	more than 0.7
R Square	0.8957	0.0691	0.5872	more than 0.5
Significance F	0.0000	0.6506	0.0049	less than 0.05
Intercept	375.68	1,081.01	–63.50	–
X Variable 1	143.95	38.68	369.04	–
X Variable 2	–148.29	17.12	–363.73	–

the existence of a high correlation, and therefore, a close connection between changes in the number of urban and rural populations of the investigated countries and the volume of the produced gross regional product. At the same time, the value of Multiple R up to 0.7 indicates an average relationship between the researched indicators of Ukraine.

The value of R Square indicates the correspondence of the initial data of Poland for 2010–2021 and its regression model, as their values exceed the recommended level of the indicator of the connection closeness of the researched factors. Thus, the linear model of Poland explains 76.42 % of the variation, which means that the selection of factors is correct, while only 23.58 % is stipulated by other factors that affect the socio-economic development of Poland, but are not included in the linear regression model. The value of R Square at the level of 0.1354 and 0.3215 proves that the performance indicators of Spain and Ukraine depend on the two factors by 13.54 and 32.15 %, respectively.

The obtained values of Multiple R and R Square indicate that the dependence of the change in the number of urban and rural population of Poland and the volume of the produced gross regional product for 2010–2021 is natural. In addition, the value of Significance F shows that the results of assessing the impact of the change in the urban population on the socio-economic development of Poland are sufficiently reliable, while the relationship between the indicators of Spain and Ukraine, which are included in the two-factor regression model, is rather insignificant (occasional).

The conducted study of indicators of the urban population changes impact on the socio-economic development of Poland, Spain and Ukraine during the period 2010–2021 showed differences in the reliability and accuracy of data for building an adequate model for further forecasting the influence of factors on the volume of the produced gross regional product of the researched countries. Such differences are an argument for the need to improve the level of comparability of the used statistical indicators of the development of individual countries. The same applies to the calculation of the dependence of the change in financial potential on the size of the urban population (Table 9). The financial potential of any region of Poland, Spain and Ukraine includes budgetary resources, tax revenues, financial resources of companies, as well as the incomes of the population of the studied countries in particular. By default, we interpret financial potential as the indicator of GDP per capita for 2010–2021.

The results of calculations of indicators of the dependence of changes in financial potential on the size of the urban population of Poland, Spain, and Ukraine show that their multifactor linear regression models have the form:

$Y = 375.68 + 143.95 - 148.29X_2$, where there is a negative relationship between the factor of population change in rural areas of Poland and changes in financial potential, i. e. the more the rural population decreases, the greater the financial potential accumulated in the city is.

$Y = 1{,}081.01 + 38.68X_1 + 17.12X_2$, where there is a positive effect of the change in financial potential on the size of the urban population of Spain.

$Y = -63.50 + 369.04X_1 - 363.73X_2$, where there is also a negative relationship between the factor of population change in rural areas of Ukraine and changes in financial potential.

According to the calculations of the dependence of the change in financial potential on the size of the urban population, Multiple R indicates the presence of a high correlation in the case of Poland and Ukraine, while the value of Multiple R indicates an average connection between the investigated indicators of Spain.

The obtained value of R Square indicates the correspondence of the original data of Poland for 2010–2021, so this model explains 74.48 % of the variation, while only 25.52 % is stipulated by other factors affecting the financial potential of Poland. Since the value of R Square is less than recommended, the accuracy of the approximation is insufficient and the regression model of Spain requires the introduction of new independent variables. It is worth remembering that the drawback of R Square, whose value increases with the addition of new independent variables, which do not necessarily mean an improvement in the quality of the regression model of the dependence of the change in financial potential on the size of the urban population. The value of R Square at the level of 0.4243 proves that the effective indicator of Ukraine depends on two factors by 42.43 %.

In addition, the value of Significance F shows that the results of assessing the indicators of the dependence of financial potential changes on the size of the urban population of Poland are sufficiently reliable, while the relationship between the indicators of Spain and Ukraine, which are included in the two-factor regression model, is rather insignificant (accidental).

Therefore, according to the resource concentration principle, any reduction in the number of urban populations in the countries under investigation has important consequences in the form of budget imbalances, since the revenue base of cities is destroyed, and the cost of providing services per capita increases. In addition, in view of the durability of housing, the reduction of the urban population of Poland, Spain and Ukraine may lead to the idleness of residential premises, a decrease in housing prices and the decline of the cities of the researched countries in general.

Conclusions. Urbanization is inextricably combined with certain socio-economic factors. The result of calculating the indicators of the urban population change influence on the socio-economic development of the investigated countries and the dependence of the financial potential change on the number of the urban population indicates the appropriateness of the regression model and its reliability for Poland, while for other countries the efficiency of the models can be determined by other factors.

It is worth noting that the regional differences in the socio-economic development of the researched countries are caused

by the different geographical location of the regions, natural and climatic conditions, demographic situation, development history, etc., that results in a number of socio-economic problems in an individual region.

The cities of each of the countries under investigation concentrate the majority of the country's population on a relatively small area. Thus, the impact of urbanization is multicomponent (Table 10). The city exerts a food impact, both through a change in the nature of land use and an increase in the burden on the production of food for the city population. The transport infrastructure is changing, both in terms of resources and the distribution of the population's habitat. As cities grow, natural ecosystems are destroyed, so increasing the area of urban agglomerations is likely to lead to a significant reduction in biological diversity.

The conducted study of urbanization trends in Poland, Spain and Ukraine is a prerequisite for the development of the national concept of so-called smart cities, since any large cities of each of the investigated countries are more similar to each other in terms of transport infrastructure, provision of housing and work, public security, migration processes. One of the directions of the future research is the study of the agglomerations of the world, since the agglomerations of certain countries are actually inhabited by half of their population and 50 % of the national GDP is produced there.

It will not be superfluous to study the gender portrait of urbanization trends in Poland, Spain and Ukraine, which will give an opportunity to look more specifically at the detailed information of the city population in terms of women and men according to demographic indicators, health status, level of education and unemployment etc.

Urbanization makes the life of human civilization much more comfortable, but the very process of rapid urbanization causes irreparable damage to the environment due to the needs of the urban population in food supply, development of transport and energy infrastructure of cities. Urbanization is happening everywhere, but its pace, driving force, and consequences differ in Poland, Spain and Ukraine.

An important aspect is the implementation of long-term strategies for the development of urban agglomerations, which will make it possible to avoid the negative consequences of urbanization, promote the involvement of specialists, increase the labor productivity of the urban population, and develop innovations in the urban environment in particular.

It should be noted that the COVID-19 pandemic, which shook the world and caused significant globalization changes, also affected urbanization processes. Avoiding large gatherings of people, social distancing, restrictions on the use of public transport, the advantages of a suburban lifestyle and other restrictions can contribute to a decrease in the level of urbanization. In turn, as a result of the relaxation of quarantine restrictions, the population begins to return to their usual way of life, that is, it can be assumed that after the risk of infection is weakened or completely eliminated, the urbanization processes will resume, since social activity is inherent in a person, which can best be ensured by living in the city. The popularization of micromobility, the development of digital technologies and "smart" cities is not only a requirement in times of a pandemic, but will also be relevant in the future, in the conditions of climate change, air pollution and revitalization of urbanization processes in the future.

Since the research was conducted within the framework of the "Regional Initiative of Excellence" program 2019–2022, it does not take into account the latest trends in world migrations. The full-scale invasion of Russia on the territory of Ukraine in February 2022 caused changes in all spheres of life of the population on the territory of our state. It is worth noting that a significant amount of statistical data on Ukraine is in public access until 2021 inclusive, since access to information is limited in many cases during martial law period.

The war has led to a significant increase in the number of displaced persons, refugees, internally displaced persons, victims among the population, destruction of infrastructure, including housing, loss of sources of income, etc. Since the military actions had a significant impact on the demographic processes of Ukraine, the future research should be directed to the study of the impact of urbanization on the socio-economic development of Ukraine in the post-war period as well as Poland and Spain, which provided military aid and financial support.

According to UN statistics [28], the full-scale invasion of Russia into Ukraine has led to mass migration of the population, which became one of the important factors influencing urbanization processes. Thus, during the six months since the start of the war, the wave of migration exceeded 7.8 million refugees. The main migration mass fell on Poland and amounted to about 1.5 million refugees, and the number of migrants to Spain was about 150 thousand refugees. Aid to forced migrants, humanitarian aid, armaments – all these became invaluable aid, which brought Ukraine, as an outpost of Europe, one step closer to the victory. We are very grateful to the governments and citizens of Poland and Spain for supporting Ukraine in difficult times.

Acknowledgements. *The article was prepared as part of a project financed by the Ministry of Science and Higher Education of Poland within the framework of the "Regional Initiative of Excellence" program 2019–2022, project No. 015/RID/2018/19.*

Table 10

Advantages and disadvantages of urbanization [33, 34]

Urbanization	Poland	Spain	Ukraine
Advantages	The increase in the urban population of Poland is stipulated by the intensive industrialization of the country, which provided new jobs in cities	Innovative development of large cities is aimed at solving the problems of obsolescence as well as wear and tear of engineering, transport, social and medical infrastructure in order to ensure the comfort and safety of life of the urban population of Spain	Large cities play a leading role in the economic, cultural and political life of Ukraine. The concentration of the population in the city allows for the organization of activities with the involvement of a large number of specialists
Disadvantages	Air pollution, transport problems, urban chaos and relatively high rents for housing negatively affect the attractiveness of Poland's big cities. The high level of regional economic development significantly affects the increase in the percentage of people of working age who have health problems	The population of Spain is unevenly distributed, as it is located on the country's sea coast. The growth of illegal immigration contributes to the development of smuggling in cities, which hinders the integration and assimilation of legal immigrants into Spanish society. Residential real estate is being sold by whole villages due to the reduction in the number of the rural population	The concentration of critical infrastructure objects in cities, combined with a significant level of population density, can lead to a number of dangers under the conditions of global challenges and threats

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Вплив урбанізації на соціально-економічний розвиток: досвід Польщі, Іспанії, України

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Мета. Проаналізувати та оцінити вплив урбанізації на соціально-економічні показники розвитку у трьох різних країнах і визначити, як зміни в демографічних процесах міського населення впливають на економічний розвиток і фінансову стабільність регіонів.

Методика. Методологія дослідження базується на комбінації якісного й кількісного аналізу та включає вивчення демографічних характеристик, стану праці, освіти, умов життя й добробуту. Для здійснення такого

аналізу використані статистичні методи, а саме регресійний аналіз, що застосовується для виявлення зв'язків між урбанізацією та економічними показниками. Використання коефіцієнту варіації дозволило визначити ступінь диференціації рівня урбанізації, а використання коефіцієнтів кореляції дозволило оцінити тісноту зв'язку між урбанізацією та обсягом виробленого валового регіонального продукту, а також фінансовим потенціалом країни. У цілому регресійна модель дозволяє представити залежність між значущими факторами й визначити їх вплив на соціально-економічний розвиток окремих регіонів.

Результати. Дослідження виявило багатокомпонентний вплив урбанізації на розвиток регіонів, а саме на фінансовий потенціал (вимірюваний як ВВП на душу населення) Польщі, Іспанії та України. У процесі дослідження проаналізована складність урбанізації та її вплив на різні соціально-економічні фактори, такі як регіональні відмінності, концентрація інфраструктури та екологічні наслідки. Доведено, що значущі переваги урбанізації, такі як стимулювання інновацій, створення нових робочих місць і сприяння глобальній торгівлі, можуть супроводжуватись значними інвестиціями до міської інфраструктури й викликати екологічні проблеми або сприяти поширенню хвороб. У висновках наголошується на необхідності впровадження національної програми «розумних міст», у рамках довгострокові стратегії розвитку для ефективного управління урбанізаційними процесами. Також відзначається важливість подальшого дослідження урбанізації в умовах глобальних демографічних змін, викликаних війною в Україні.

Наукова новизна. На основі аналізу процесів урбанізації в Польщі, Іспанії та Україні виокремлені ключові фактори формування переваг і недоліків урбанізації для соціально-економічного розвитку цих країн. Для кожної із досліджуваних країн встановлена залежність між показниками зміни чисельності населення в міській і сільській місцевості та обсягом виробленого валового регіонального продукту в межах кожної національної економіки, а також виявлене існування зв'язку між фінансовим потенціалом країни та чисельністю її міського населення. Продемонстровано вплив урбанізації на демографічні зміни, економічне зростання, інфраструктуру та екологічні умови досліджуваних країн.

Практична значимість. У статті обґрунтовані дані та проаналізовано вплив урбанізації на різні аспекти життя міст Польщі, Іспанії та України. Результати дослідження можуть слугувати основою для розробки політики, спрямованої на оптимізацію процесів урбанізації, планування розвитку міських агломерацій, а також для вирішення проблем, пов'язаних із міським ростом та управлінням, включаючи інфраструктуру, житлове будівництво, транспорт та екологію.

Ключові слова: *урбанізація, економічний розвиток, населення, фінансовий потенціал, соціально-демографічне становище, індустріалізація*

The manuscript was submitted 29.11.23.