Challenges in measuring poverty in developing countries (on the example of Latin America)

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ABSTRACT

Poverty as a socio-economic phenomenon exists since the beginning of the economic system formation. It is typical for any type of society (from primitive to post-industrial) and has a long history of studying. However, scientists, trying to find the ways to prevent this threat through carrying out the poverty research, elaborating effective instruments to combat it and assessing the impact of poverty reduction programs, face serious issues in measuring poverty.

In the paper, the major problems arising during the academic research of poverty were identified. Besides, in order to optimize the collection of statistics and improve its quality, a new approach to calculate and apply poverty thresholds for international comparisons was proposed – the method of the multi-factorial classification that will allow a complex solution of the task, taking into account the mutual influence of stimulating and limiting factors.

Also, in the article, the dynamics of international activities in poverty eradication is traced. It highlights the importance of international organizations in combating poverty and accumulating statistics by countries on the wide range of indicators of socio-economic development.

Keywords: poverty, quality of statistics, multifactorial classification, socio-economic development, Latin America

1. INTRODUCTION

The poverty of the significant part of the world's population is one of the most urgent problems facing the international community as it is a result of unfair distribution of limited resources and presence a threat to social, economic and political stability. But scientists, trying to find the ways to prevent this threat through carrying out the research of poverty, elaborating effective instruments to combat it and assessing the impact of poverty reduction programs, face serious issues in measuring poverty. These problems result in a distortion of research and today's real situation with poverty.

The aim of the study is to identify the major problems arising during the academic research of poverty and to formulate the recommendations for optimizing the collection of statistical data and improving its quality.

2. RESEARCH RELEVANCE

On the world stage, the international organizations that accumulate statistics on the widest range of indicators of socio-economic development by the countries of the world are the main players in the fight against poverty. Among them there are the United Nations (UN), in particular the Regional Commissions of the Economic and Social Council, the World Bank, the International Monetary Fund (IMF), the Organization for Economic Co-operation and Development (OECD), etc.

For the first time, the poverty was widely announced as the major problem of the global development in 1990 by the World Bank [1]. The prerequisite of that were the negative effects of macroeconomic events in developing countries: the external debt crisis of the 1980s which began in Latin America and then spread to many developing countries.

At the turn of XXI century, the problem of poverty and its elimination was highlighted by the World Bank. In the World Development Report 2000 the world economy under the active transformation was considered and all the changes and processes were identified as the causes and consequences of two phenomena: globalization and localization [2]. It was stressed that the modern transforming world needed new institutional solutions: the processes of globalization and localization required the formation and functioning of a system of supranational and subnational institutions for solving development problems.

As a result, in 2000, the World Bank developed a comprehensive strategy aimed at implementing a number of missions: the elaboration of the main goals of global development and the expansion of institutional procedures regarding social and economic development and in particular poverty eradication [3].

Determined benchmarks of global development in the new XXI century formed the basis of the UN Millennium Declaration adopted in 2000 at the Millennium Summit by 193 member states and the Millennium Development Goals (MDGs) were evolved.

The MDGs included 8 goals, 21 targets and 60 indicators with the help of which the progress in reducing poverty, hunger, diseases, solving the problem of social exclusion, a lack of adequate housing and also improvement in achieving gender equality, better healthcare, education and environmental sustainability was measured [4]. But, the central place was given to the poverty reduction, as the other goals and objectives are aimed at dealing with the issues that are the cause or the consequence of poverty; the achievement of these goals contributed to creating auspicious conditions for development and poverty eradication.

The measures taken to obtain progress in poverty reduction had shown the high efficiency and the target to halve extreme poverty between 1990 and 2015 had been successfully achieved.

In 2016, the UN member states adopted an ambitious program – the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs).

The SDGs are more complex (17 goals, 169 tasks) than the MDGs and touch upon the problems of industrialization, innovation, infrastructure, development of cities and settlements, responsible

consumption and production, formation of effective institutions, etc. But still eradicating poverty in all its forms and dimensions again poverty in all its forms remains one of the greatest challenges facing humanity [5].

The World Bank's current activities are also aimed at achieving its main goals – to end extreme poverty by reducing the share of the world's population living in extreme poverty to 3% by 2030 and to ensure welfare for everyone by increasing the incomes of the poorest 40% of the population [6].

The IMF also indicates poverty reduction as the ultimate goal of its activities: "we provide recommendations concerning the policy measures that can help the member states reach the macroeconomic stability and thereby accelerate the economic growth and reducing poverty" [7].

The OECD examines the trends and patterns in inequality and poverty for OECD and emerging countries. Its work analyses the multiple causes linked to growing inequalities, such as globalization, technological change and changes in redistribution and policy fashion. It also assesses the effectiveness of social and labor market policies in tackling poverty and high inequalities [8].

Thus, the relevance of studying the poverty and, especially the ways it is measured, is obvious: despite existing programs at the national level and the actions of the international organizations on poverty reduction: in 2017, more than 10% of the world's population (776 million people) lived in extreme poverty (i.e. had income of 1.9 dollars a day). Latin America accounts for 4.3% of the world's population living in extreme poverty – that is 5.4% of the region's population (33 million people) [9].

Measuring the extent of poverty, determining the conditions and economic circumstances of the life of the poor population is the first and the most important step towards the effective strategy to combat this problem. But the existing challenges in measuring poverty create the great difficulties for adequate and objective assessment of poverty.

3. THEORETICAL BASE AND METHODOLOGY OF RESEARCH

The most important stage in identifying the issues in measuring poverty was a thorough study of approaches to the definition of poverty, methods for studying poverty, collecting statistical data and the ways the above-mentioned international organizations as well as the Economic Commission for Latin America and the Caribbean (ECLAC) and the Inter-American Development Bank calculate poverty indicators.

The researchers of the World Bank specialists and experts significantly influenced this study [10, 11, 12, 13, 14]. Many of the scientific and practical results of them were reflected in the reports of the World Bank [15, 16, 17].

Also, in order to define the challenges in measuring poverty, we investigated the omissions that had already been solved in the past [18]. Thus, for example, the dynamics of PPPs and changes in methods of its calculation since 1970 had been traced [19].

In addition, the empirical method of scientific research played a considerable role – this study is based on an independent long-term collection (over 10 years) and studying the statistics of the international organizations and national statistics on poverty indicators [20].

As a result of identifying the problems in poverty measurement, the recommendations to optimize the collection of statistics and improve its quality were formulated. The methodological basis of these recommendations included the research papers of the specialists in economic geography and economists devoted to socio-economic zoning (i.e. division of the territory into the areas that differ by specific characteristics, including indicators of the quality of life), classification and typological research in the spatial economy [21, 22, 23, 24].

A quantitative revolution in the middle of the 20th century enabled the successful use of the statistical and mathematical apparatus and laid the base for classification research [25, 26, 27].

From the second part of the 20th century, the socio-economic zoning (regionalization) had become widely used not only for research purposes but also in economic practice. Thus, the rational socio-economic zoning is considered by scientists as the main factor of effective functioning of the economies

of the world [28]. Classification approaches to the analysis of regional development got wide application due to the researches of Hagget P. [29]., Harvey D. [30].

4. OVERVIEW OF STATISTICAL CHALLENGES ON POVERTY INDICATORS

There are the three most critical challenges in measuring poverty.

Problem 1: Non-systematic and untimely statistics on poverty indicators.

The World Bank, which focuses on ending extreme poverty and has developed the international poverty threshold – indicator with the help of which poverty can be measured and compared between developing countries, provides statistics on most poverty indicators since 1981. And until 2008 the data were published every three years. Since 2008, when the International Comparison Program carried out the penultimate recalculation of purchasing power parity, according to which the World Bank updated many indicators, including poverty indicators, the frequency of publication of statistics on poverty has increased. So, the next actual data on poverty became available already in 2010 and were published each year until 2013. From 2013 till now, data on poverty have not been updated. Summing up the results of the United Nations Millennium Development Goals, where Target 1.1 was to halve the proportion of extreme poor people by 2015, was conducted by expert estimations, but not by official and adequate statistics.

If we talk about organizations that collect specialized regional statistics, specifically the United Nations Economic Commission for Latin America and the Caribbean and the Inter-American Development Bank, it should be pointed out that in the first case statistics on poverty indicators for Latin America are available for the period 1990-2014, and in the second case – 2000-2014. statistics: Thus, today's gap with current reality is 4 years – considering the dynamism and unpredictability of the world economy, the data are very outdated.

Problem 2: Different approaches to measuring poverty.

Considering three organizations whose statistical data are used for comparing poverty indicators between the countries of Latin America, the disagreements in approaches to measuring poverty and methods of collecting statistical information on poverty were noted.

So, in October 2017, the World Bank supplemented the international poverty threshold ($1.9 per day) with two new ones: $3.2 and $5.5 per day and recalculated the poverty statistics for all the years for which it was available according to the new poverty thresholds. At the same time, the World Bank excluded the poverty threshold proposed in 2015 and equaled $3.1 per day.

The last update of the poverty database made by the Inter-American Development Bank, which also used the World Bank poverty threshold of $3.1 per day, was in December 2016 and, therefore, it did not present the data according to the new thresholds yet.

The United Nations Economic Commission for Latin America and the Caribbean measures poverty indicators in the countries of the region relatively to the national poverty thresholds.

Thus, according to the World Bank, in 2013, 6 countries in Latin America (Honduras, Dominican Republic, Colombia, Paraguay, El Salvador, Ecuador), with the largest proportion of the population with incomes below $3.2 per day (PPP 2011) were in the list of 10 countries of the region with the maximum proportion of the population living on less than $3.1 (PPP 2011), according to the Inter-American Development Bank. However, the total number of poor in these 6 countries, according to both sources of statistical information, varied significantly. According to the World Bank, the total population living on less than $3.2 per day was 5.3 million, while, according to the Inter-American Development Bank, 16.4 million people were in the same conditions. In this case, the difference in the results of measuring the scale of poverty is 11.1 million people.

The differences in the indicators on the scale of concrete country are also colossal. For example, in Honduras, the proportion of the population living on less than $3.2 per day (PPP 2011), according to the World Bank, was 15.9%; according to the Inter-American Development Bank, in Honduras, the proportion of people living on less than $3.1 (PPP 2011) per day reached 36.3%; and according to the UN

Economic Commission for Latin America and the Caribbean, the poverty level in Honduras was 42.6% (Table 1).

Table 1. The 10 Latin American countries with the largest share of the poor population, %, 2013 (according to the World Bank, the Inter-American Development Bank and the United Nations Economic Commission for Latin America and the Caribbean)

Sources of statistics						
World Bank			the Inter-American Development Bank		UN Economic Commission for Latin America and the Caribbean	
№	Country	Poverty headcount ratio at $3.20 a day (2011 PPP) (% of population)	Country	Poverty rate: % of population with income below $3.1 a day	Country	Population living in extreme poverty (national figures)
1	Honduras	15.9	Honduras	36.3	Honduras	42.6
2	Bolivia	6.6	Guatemala	35.3	Panama	11.1
3	Columbia	5.6	El Salvador	18.9	Paraguay	10.1
4	Brazil	4.5	Mexico	17.4	Dominican Republic	9.8
5	Ecuador	4.2	Columbia	16.6	Venezuela	9.8
6	El Salvador	3.4	Bolivia	15.6	Columbia	9.1
7	Peru	3.4	Dominican Republic	15.1	Ecuador	8.6
8	Panama	2.8	Paraguay	12.6	El Salvador	7.1
9	Dominican Republic	2.6	Ecuador	12.0	Costa Rica	6.4
10	Paraguay	2.3	Peru	11.1	Brazil	5.5
-	Total population with income below $3.20 a day in the countries included in the three rankings (6), mln people	5.3	Total population with income below $3.20 a day in the countries included in the three rankings (6), mln people	16.4	Total population with income below national poverty line in the countries included in the three rankings (6), mln people	11.4

Source: own elaboration by: [9, 31, 32].

Similar disagreements are revealed on condition that the organizations note the same method of research – household surveys.

Problem 3. Applying of the principle of compromise and approximation.

In accordance with the national interests and internal circumstances, governments of some countries apply certain methods of measuring poverty to achieve various goals. For example, countries often deliberately overestimate or underestimate the level of the subsistence minimum.

Overestimation of the subsistence minimum level is often used by low-income countries, according to the World Bank classification, for obtaining multilateral development financing. So, despite the complicated situation in Venezuela, there is the maximum poverty threshold there among all Latin American countries – $157 per month. Also, there is the high level of the poverty threshold in Guatemala (which is characterized by low socio-economic development) – it almost equal to the poverty line in Uruguay ($107.5 per month).

Underestimation of the subsistence minimum level leads to artificial reduction of the actual proportion of poor population – this is often used by countries when it is necessary to implement the quantitative indicators on national strategies for social and economic development.

Above-mentioned problems in measuring poverty are subsequently expressed in the difficulties of comparing the poverty level between countries. This also complicates the identification of trends in the dynamics of poverty indicators of concrete country and does not allow to evaluate the results of measures aimed at poverty reduction objectively, as the tools of studying are constantly changing. This, in turn, affects the calculation methodology, therefore, the data is also significantly adjusted. In addition, the lack of uniformity in the methods of establishing the poverty threshold, collecting information, conducting surveys and aggregating the obtained results creates problems in integrating the indicators of countries into the regional and global scales.

5. RECOMMENDATIONS

It is worth acknowledging that the existing international poverty threshold is used in international comparisons mainly for approximate definition of the poverty extent which is actually far from reality. And the most important thing is that it is impossible to work out a universal indicator application of which would allow to compare countries by poverty rate. Because even within the one group of countries – for example, lower-middle-income economies (by the World Bank countries' classification) – the comparison between the poverty rates in El Salvador and Honduras has no any scientific and practical value.

The key idea to optimize the collection of statistical data and improve its quality is the localization of the calculation of the poverty threshold for international comparisons.

It is not permissible to take the national data on poverty for international comparisons (since the cost of living or the median income with respect to which the share of the poor is usually calculated is different in all countries), then we can make the samples of countries according to the most similar features of development and calculate the poverty threshold for each countries' group.

The important advantage of this approach is that it can be used at any level: international, regional and, in fact, even at intra-national. Also, within this approach, the threshold will be tied to the level of the development of the specific countries' group. And now, the international poverty threshold is calculated for the poorest countries and is applied to all countries. As a result, statistics say that in most countries that belong to groups of middle-income and high-income economies the poverty rate is unrealistically low or completely zero.

Thus, localization of the poverty threshold calculation for international comparisons can be carried out using the method of the multi-factorial classification.

This method allows to solve the task comprehensively. While the distribution of countries into different groups by individual indicators (now the poverty lines are calculated within the groups of the country classified by the level of GNI) can solve limited tasks. The presented methodology allows to

identify groups of countries by a complex of indicators taking into account the mutual influence of positive and negative (limiting) factors.

To complete the task, which involves optimizing the collection of statistics and improving its quality, countries with the most similar characteristics by a complex of indicators should be identified through the using the multi-character classification methodology. It includes the following stages:

1. Selection of the most significant characteristics (indicators) for classification.
2. Establishment of the logical basis of classification (ranks of "good" and "bad" indicators).
3. Collection of statistical data on selected indicators.
4. Calculation of the confidence interval by the formula:

$$X = \frac{\max - \min}{n},$$

where X – confidence interval, max – maximum value of the indicator, min – minimum value of the indicator, n – the number of groups into which the countries will be divided. For example, n=5.

5. Calculation of the ranks of the indicators.

Countries, depending on the interval in which the indicator that characterizes them, receive a corresponding rank.

In case the maximum indicator is "bad":

1-й rank – from min to (min + x) = y,
2-й rank – from y to (y + x) = z,
3-й rank – from z to (z + x) = α,
4-й rank – from α to (α + x) = β,
5-й rank – from β to max.

In case the maximum indicator is "good":

1-й rank – from max to (max – x) = y,
2-й rank – from y to (y – x) = z,
3-й rank – from z to (z – x) = α,
4-й rank – from α to (α + x) = β,
5-й rank – from β to min.

6. Ranking of indicators (i.e. replacing the data matrix with the ranks matrix).

Thus, the countries scored the minimum number of points will be assigned to the first group, in which the indicators of socio-economic development are the most favorable and the poverty rate is low. The highest poverty line should be calculated for this countries' group. The countries scored the maximum number of points are the poorest and the poverty line should be the lowest.

7. Summing up the ranks of each country and revealing the difference in the amount of ranks between countries.
8. Analysis of the results.

Further – we give calculations on the specific example.

Example.

Initial conditions (Table 2):

- 6 countries that differ by socio-economic indicators;
- 3 indicators;
- statistical data.

Tasks:

- calculate the confidence interval for each indicator;
- rank the indicators into 3 groups;
- sum up the ranks for each country and find the difference in the amount of ranks.

Table 2

Indicators	Country A	Country B	Country C	Country D	Country E	Country F

1	9600	1300	1300	11100	41800	32300
2	67	17	34	73	78	68
3	1,5	43,7	62,9	0,4	0,8	0,1

Indicators:

1. GDP per capita, PPP (constant 2011 international $);
2. Urban population (% of total);
3. Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)

Actions:

1) Calculation of the confidence interval for the indicator №1:

$$X = \frac{41800 - 1300}{n},$$

where n = 3.

$$X = 13500.$$

2) Calculation of the ranks of the indicator:

Indicator №1. The maximum level of the indicator “GDP per capita, PPP (constant 2011 international $)” is "good" then:

Rank 1: 41800 – 13500 = 28300;
Rank 2: 28300 – 13500 = 14800;
Rank 3: 14800 – 13500 = 1300.

Thereby,
Rank 1 has a range of values: (41800; 28300);
Rank 2 has a range of values: (28300; 14800);
Rank 3 has a range of values: (14800; 1350).

3) Calculation of the confidence interval for the indicator №2:

$$X = \frac{78 - 17}{n},$$

where n = 3.

$$X = 20{,}3\ (3).$$

4) Calculation of the ranks of the indicator.

Calculation of the ranks of the indicator №2. The maximum level of the indicator “Urban population (% of total)” is “good” then:

Rank 1: 78 – 20,3 (3) = 57,7;
Rank 2: 57,7 – 20,3 (3) = 37,4;
Rank 3: 37,4 – 20,3 (3) = 17.

Thereby,
Rank 1 has a range of values: (78; 57,7);
Rank 2 has a range of values: (57,7; 37,4);
Rank 3 has a range of values: (37,4; 17).

5) Calculation of the confidence interval for the indicator №3:

$$X = \frac{62{,}9 - 0{,}1}{3},$$

where n = 3.

$$X = 20{,}9\ (3).$$

6) Calculation of the ranks of the indicator.

Calculation of the ranks of the indicator №3. The maximum level of the indicator is "bad" – rank. The minimum level of the indicator is "good" – rank 1, since the higher the share of the population living on less than $1.9, the lower the level of socio-economic development, then:

Rank 1: 62,9 – 20,9 (3) = 42;
Rank 2: 57,7 – 20,9 (3) = 21,1;
Rank 3: 37,4 – 20,9 (3) = 0,1.

Thereby,
Rank 1 has a range of values: (62,9; 42);
Rank 2 has a range of values: (42; 21,1);
Rank 3 has a range of values: (21,1; 0,1).

7) Ranking of indicator (i.e. replacing the data matrix with the ranks matrix) (Table 3).

Table 3

Indicators	**Country A**	**Country B**	**Country C**	**Country D**	**Country E**	**Country F**
1	3	3	3	3	1	1
2	1	3	3	1	1	1
3	1	3	3	1	1	1

8) Summing up the ranks of each country and revealing the difference in the amount of ranks between countries (Table 4).

Table 4

Indicators	**Country A**	**Country B**	**Country C**	**Country D**	**Country E**	**Country F**
1	3	3	3	3	1	1
2	1	3	3	1	1	1
3	1	3	3	1	1	1
Sum of ranks	5	9	9	5	3	3
Types	2	3	3	2	1	1

Thus, the matrix of statistical data is transformed into a matrix of ranks which becomes possible to analyze. After summing up the ranks of each country and revealing the difference in the amount of ranks between countries it was determined that countries with a minimum difference in the amount of ranks are of the same type. In the example, the countries D and E, A and G, B and B belong to the one countries' type.

The number of countries' types should be expedient. A limited set of indicators can be approved at the international level – this will make the method uniform. If there is no statistical data on some indicator, it can be replaced by rank on the basis of expert review or mathematical projection.

Methods of measuring poverty affect the concept of policy formation and identification of the categories of the population, to which it should be targeted.

Thus, the universal and concerted practice of using the methods of measuring poverty based on transparent research, has the international importance and can become a huge step towards meeting the ambitious goal of poverty eradication.

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