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CONSTRUCTING POVERTY LINES IN CROATIA USING KAKWANI'S MODEL

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ABSTRACT. This paper presents a new model for defining the poverty line as a possible candidate for the construction of a new official poverty line in Croatia. The model, based on Kakwani's (2010) approach (nutrition-based anchor), uses consumer theory as the basis for defining food and non-food poverty lines. In Croatia, various alternative poverty indicators have been developed to define the official poverty line. To ensure international comparability and consistency, the poverty threshold expressed in local currency by applying the exchange rate of currencies' purchasing power (PPP) is expressed in international dollars. It is important to ensure implementation of redistributive policies, maximization of market efficiency, and increased social justice. All this policy goals and instruments heavily depend on efficient and precise poverty measurement methods.

JEL Classification: I32, P36, P2

Keywords: poverty line, Kakwani's method, poverty threshold, Croatia, purchasing power parity.

Introduction

Aggregation of the poor into an overall indicator, as Sen, A. (1989) concludes, is not an easy task because measurement must be integrated with evaluation. More on poverty measure issue can be found in research of Sen (1976), Alkire and Foster (2011) Bourguignon and Chakravarty (2003). Studying the evolution of poverty since the appearance of the first economic philosophers in ancient Greece, Rome, India, Egypt, and Babylon reveals the ambiguity of the concept and different views on the phenomenon itself throughout history. Various estimates of the number of poor confirm various methods of measurement. Atal (1999) observed that according to UNDP (1997), there are three different approaches to poverty: the income perspective, the basic-needs perspective, and the capability perspective. The income perspective focuses on the level of income of a person or family, and sets limits to draw a poverty line. The basic needs perspective views poverty from the angle of material deprivation rather than by income. A person or family is considered poor if it is not able to provide for minimally acceptable basic needs. The capability perspective focuses 'on the functioning' that a person can or cannot achieve, given the opportunities they have. Functioning refers to the various valuable things a person can do or be, such as living long, being healthy, being well-nourished, mixing well with others in the community and so on. Sen's "capability" approach was hugely influential during the 70s with the change in the

paradigm of the development concept from GDP to development, and it is even today embodied in the new multidimensional measures.

New measurements based on multidimensional poverty, introduced in Human Development Report 1997 and in World Development Report 2000/1, defined poverty as a lack or deprivation of well-being. Kakwani (2006) explained that in socioeconomic literature, several important approaches have been used to describe well-being: economic growth, quality of life and welfare. Baležentis and Brauers (2011) noted the importance of welfare and happiness in the society on the micro and macro level. There is a strong nexus between the quality of life and society sustainable development. Despite the shift to a multidimensional poverty concept (see more Lustig, 2011) and growing interest in the multidimensional poverty measurement (today there are a wide range of indicators; for example, Millenium Development Goals have 49 indicators), income measures of $1 and $2 a day, to be operationalized, are the most commonly used measures for poverty.

Many critics conclude that monetary poverty is not considered a capability deprivation and does not ascribe any importance to specific deprivations and joint distribution. Although monetary measures cannot reflect the multidimensional character of poverty, they can complement other measures and approaches. Kolodko (2009) noted that efficient economic policy designs is a proper mix of financial and social engineering, technocratic macroeconomic governance and genuine social dialog, professional pragmatism and social sensitivity. By the end of the 90s, scientific interest in this issue had increased, which resulted in publication of reports on poverty indicators, implementation of household survey data, better implementation of statistics, better technology and better computing power. Despite the progress in the research on this topic evidenced in Bourguignon and Chakravaty (2003), the "aggregation problem" remains (how to shift from identifying poverty to measuring poverty). Existing measures have not provided insight into how well-being is distributed among households, which is important because the costs of transition were accompanied by high levels of inequality. Existing measures also did not complement the gap between monetary and non-monetary poverty (multidimensional deprivation) and did not monitor parallel living standards and nutrition indicators. Thus, any indicator may be wrongly reported or used, and economic measures may not reflect societal well-being or sustainability across time. Therefore, the problem of measuring poverty and well-being in Croatia – despite small shifts for the better – has become and remains controversial.

The aim of this article, is to build a methodological indicator that allows targeting of the poor, aggregating the poor into an overall indicator, helping with the implementation of redistributive policies, and serving as technical and institutional support. The proposed indicator is sensitive to joint distribution, reflects a lack of deprivation and well-being, and ties the importance of anchoring Croatian poverty measures to the National Accounts. To ensure international comparability and consistency, the poverty threshold is shown in local currency by applying the exchange rate of currencies' purchasing power (PPP).

This paper is structured as follows: Section 1 presents the research background in Croatia, and section 2 provides a background for constructing the poverty lines. Section 3 presents research methodology and empirical data for Croatia. After presenting the empirical results, conclusions are drawn in the final section.

1. Background Research

The focus on poverty in transitional countries is of particular importance because during the socialist period, these countries officially denied the existence of poverty.

The costs from the transition have been reflected in the decline in the GDP, falling wages, and social protection; and the situation especially deteriorated after the global financial

crisis in 2008. Since then, inequality, especially in some transitional countries, has increased significantly although this is only a portion of the story. Excessively liberal financial markets have led to capital flight, difficulties in the balance of payments, and a sharp decline in aggregate demand, all of which have multiplicatively created a negative effect on production and employment. The growing public debt and the contraction of economic growth have created the basis for a new "mantra" of fiscal austerity that has "pushed" a growing number of households into poverty and has jeopardized citizens' social security. Considering the budget deficit, the implementation of correct redistributive policies based on macroeconomic indicators that reflect societies' well-being is essential for sustainable economic growth. However, comparing poverty pre-transition and post-transition is difficult because poverty was not officially monitored during socialism. Poverty as a research topic in Croatia was ignored until the first national poverty studies of the postwar period implemented in 1998 and published by the World Bank in 2000 (Study on Economic Vulnerability and Social Welfare) and studies of Škare (1999) using household consumption surveys. Since then, the multi-topic household survey data have increased, and technology has been developed to implement these data.

The World Bank published its reports on poverty indicators beginning with consumption and the concept of absolute poverty using the poverty line that measures the energy value of food, while the countries of the European Union (EU) used the poverty line based on income and the concept of relative poverty. According to the concept of relative poverty, the poor are considered those whose incomes are less than 60% of the median income. Considering that the relative poverty line is determined in relation to some statistical parameters (average income or median income), many believe that relative poverty does not reveal sufficient information regarding the actual conditions of the poor. Therefore, in 2000, the methodology of Eurostat was accepted as well as the official EU poverty line based on income and the concept of relative poverty. Poverty indicators are based on income that also includes income in kind; however, for the purposes of comparing data with the EU, only cash income is used because most EU countries do not gather data on income in kind.

However, that the rates of relative poverty in the Republic of Croatia from the period of higher economic growth (2001-2007) remained largely unchanged Šućur (2011) indicates the shortcomings of the concept of relative poverty.

Škare (1999) analyzed the dynamic aspect of poverty in the Republic of Croatia from 1960 to 1995 using U.S. methodology. The adoption of U.S. methodology was necessitated by poorly developed statistical databases on individual or household consumption as well as on the amount of disposable income that remains.

The poverty threshold is based on minimum nutritional needs, expressed in monetary terms, of appropriate caloric values (2900 kcal) for a family of four. The values obtained for comparison purposes are expressed in international dollars (purchasing power parity), and the value of the minimum consumption is multiplied by the coefficient 3.93, which represents the average share of food consumption expenditure of total household consumption expenditure. In this manner, the threshold includes other family expenses as well (housing, education and health expenditures, transportation, recreation and culture, etc.). The poverty rate is obtained by comparing the poverty threshold (which is adjusted for inflation every year) with the annual disposable income. Bejaković (2001) noted that Croatia has few statistical indicators and few research papers addressing this topic. Subsequently, the government has not adopted an official poverty line. Because no information on household consumption is available, a cost-of- living index cannot be determined, nor has a cost of living index been officially released. The data on wages in the private sector or on their distribution are nearly non-existent. Therefore, the data on the minimum cost of living could be obtained from the "social minimum"; however, the new Social Welfare Act (Official Gazette 72/1997) abolished the

social minimum, and a different procedure of calculating "subsistence allowance" was adopted. This amount was less than the existing minimum cost of living that for a working family of four during the period of March-April 1998 was estimated at HRK 4,818. The data indicated that the projected standard level was set too high and that the cost of living was estimated based on families who were not really poor. Bejaković concluded that it is necessary to work on improving the quality, scope and frequency of statistics to develop appropriate policies.

Furthermore, in 2003, a group of authors (Lipovčan *et al.*, Foley) issued a study on monitoring poverty. This Report proposes poverty monitoring based on multiple parameters because poverty is a multi-dimensional problem. The authors proposed that when using multiple indicators, it is necessary to establish priority indicators, educate the media as well as the economic and social policy makers regarding these indicators, and continuously upgrade indicator systems so that differing results do not confuse the public. Šućur (2012) compared poverty rates in Croatia (2003-2008) derived from official EU monitoring methodology using material deprivation, income poverty and subjective poverty indicators. Šućur (2012) observed that there is a correlation but not a complete overlap among the dimensions of poverty. His conclusion was that different poverty measures result in different poverty dimensions (rates) and that various poverty measures are required to assess the dimension and depth of poverty. The UNDP (2006) also provided some additional information regarding poverty and exclusion. The UNDP uses non-monetary indicators such as keeping the home adequately warm, paying for a week's annual holiday away from home, being able to afford a meal with meat, buying new clothes, etc., to measure living standards, which is quite common in the study of poverty and exclusion (see more Bejaković, Kaliterna Lipovčan (2007). He addressed the ideological, political (proclaiming the idea of egalitarianism in society), economic and social reasons for poverty (nearly all of the layers to the beginning of the 80's participated in the positive effects of successful development). He analyzed the contribution of the World Bank study (2000) and the work of Škare (1999). He notes that since 2001, the Central Bureau of Statistics in the Republic of Croatia conducts research on the risk rates of poverty year after year. Simultaneously, he notes that the methodology is taken from the research that was applied in the EU and that statistics are based on income when calculating poverty rates and the notion of relative poverty. The poverty threshold represents 60% of the national median equivalent income.

Based on the above research results, it is evident that poverty measurement tools depend greatly on the interests of individual researchers and that there is no single universally accepted measurement. Under the conditions of the existing limited statistical standards in Croatia, redefining the existing poverty line becomes a necessity.

2. A New Model for Constructing Poverty Lines

A classic approach to poverty such as B.S. Rowntree's (1901), measuring poverty based on material hardship expressed through income and consumption, remains vital although the definition of poverty was rendered more complex in the 1980s. New studies have led to an understanding of poverty as multidimensional; and in recent years, the literature on multidimensional poverty measures has grown, represented by Kolm (1977), Atkinson and Bourguignon (1982), Maasoumi (1986), Tsui (1995), Alkire and Foster (2011), Sen and Anand (1997), Brandolini and D Alessio (1998), Atkinson (2003), Deutch and Silber (2005), Bourguignon and Chakravarty (2003), Chakravarty and Silber (2008), Kakwani and Silber (2008), Porter & Quinn (2013), Alkire and Foster (2011), Bourguignon and Chakravarty (2003).

The multidimensional approach is related to the welfare approach and has led to an understanding of poverty as a complex set of deprivations in society. According to Younger

(2011), the main criticism of this approach is reliance on unobservable welfare or utility. To avoid this problem, utility is assumed primarily to map income; however, there is criticism of using money as a measure of welfare or utility, mostly because monetary poverty does not define poverty as capability deprivation and because of insensitivity to the joint distribution of deprivations. The most important aspect of multidimensional poverty except the welfare approach is the duration of poverty over time. According Porter & Quinn (2013), the duration of poverty over time includes the duration or chronicity, systematic changes or shifts, variability or uncertainty and risk or vulnerability. Today, the most widely used measure, presented in the Report of the World Bank in 1990 and developed by Ravalion and Van de Wale in 1991, is $1 per day. Although the World Bank increased the measure from $1 to $2, it is most commonly criticized as being mono-dimensional. Income measure can be a good indicator of standard of living but only reveals a portion of the phenomenon. Kakwani (2006) argued that a low level of well-being is more important than a low level of income because of various approaches to assessing poverty in different countries. Kakwani's (2006) approach is applied to the Croatian example in this paper.

The main idea of Kakwani's approach is to determine the poverty line based on food (consumable) and non-food components. The component of diet (food) is determined by the dietary energy threshold (kcal per person per day), and the non-food poverty line is defined as the average consumption per capita in households whose food expenditure is between 95% and 105% of the absolute poverty line (food poverty line).

In this paper, three "tools" are used to define the threshold:

1. The model comprises the nutritionally based poverty line, which reflects the cost of basic human needs depending on family size, gender, age, health, geographical area and religion.
2. Household consumption is calculated by quintile groups (quintile groups are defined by income per capita). Sensitivity to the joint distribution is helpful in measuring different degrees of poverty.
3. To ensure international comparability and consistency of the poverty threshold expressed in local currency using the exchange, currency purchasing power (PPP) is expressed in international dollars.

The methodology developed in this paper illustrates the establishing of the poverty line in the Republic of Croatia for the years 2000, 2005, and 2010, upon which the poverty rate was defined.

3. Data and Methodology

The constructed poverty line presented in this paper is a result of using The Cost of Basic Needs Method and The Food Energy Intake Method. The food poverty line specifying the consumption bundle considered adequate (meeting minimal nutritional intake, the basic needs food bundle) for an individual is derived using a nutrition-based anchor. The derived food poverty line is corrected for demographics (urban, rural population, activity), age, and gender factors to reflect an average Croatian household. After the costs of basic food needs are estimated, the non-food poverty line (basic non-food needs are estimated) is defined. To construct a non-food poverty line accurately by measuring the non-food component, household expenditures close to the nutritional anchor are utilized. The expenditure composition of households below (90% of the food poverty line – lower boundary) and above (110% of the food poverty line – upper boundary) the poverty line is considered. To avoid a lower and upper non-food poverty line bias, a non-parametric approach identifying average non-food expenditures for the lower and upper boundaries is applied. After the food poverty line is estimated, the non-food component (non-food poverty line) is added to construct a national

poverty line for Croatia. This approach appeared quite stable and robust. Changes from a transitional social and demographic shift to a market economy were captured as well without losing indicator consistency. Consumption-based poverty line methods are more reliable for assessing poverty for countries undergoing significant social and economic change.

To resolve the question of which poverty line should be adopted as the official line for Croatia, we used Kakwani's (2010) model to construct a consumption-based poverty line (threshold) in the form

$$u = u\left[\frac{q_f}{r}, \frac{q_n}{n}\right] \qquad (1)$$

where
u – utility function, r – calorie requirement of an individual, n – measure of non-food basic needs for the same individual.

Equation (1) defines the food and non-food (basket) poverty line for an individual with givens r and n by setting $u = u^*$ (minimum standard of living). Because r and n are basically different, food and non-food poverty lines will be different for individuals to reflect social, economic and demographic differences among them. Essentially, poverty analysis constraints existing in Croatia demand the construction of a new official poverty line for Croatia because the official World Bank model reflects many shortcomings as evidenced in Auffret (2006).

4. Empirical Results: Croatia

4.1. The Food Poverty Line

In constructing the food poverty line, we used the calorie requirements appropriate for Croatia and an estimation of calorie value cost.

4.1.1. Calorie Requirements

The first step in calculating the poverty threshold is to calculate the minimum daily energy threshold (kcal/person/day), which was calculated according to data from the POP-er software (FAO; Food and Nutrition Division): "Calculating population energy requirements and food needs". The average daily energy requirements for a population calculate the energy requirements for healthy populations with a full range of physical activity lifestyles among adults, including a mix of urban and rural populations.To obtain the data for the daily calorie intake based on the software data, the average household must be defined for each country according to that country's national statistics and the percentage of males and females in the average household (see *Table 1*). The average weight according to age and gender is calculated as well as the recommended daily calorie intake, also according to gender and age).

Table 1. The average number of people per household

The average household	
The average number of households	2,6
Age	
Male (%)	35,57
Female(%)	38,71

Source: Eurostat 2009, accessed May 2012.

The minimum caloric value that each person must consume was calculated depending on age, gender and psychophysical effort. The calculation was obtained for a healthy population with average psychophysical effort (FAO energy requirements).

Based on the calculation for the nutritional requirement by gender and age, an average calculation for the recommended calories per person/day was calculated. The recommended calorie intake per person/day in 2000 was 2699 Kcal, in 2005 it was 2693 Kcal and in 2010 it was increased to 3226 Kcal. It is normal to expect an increase in the cost of calories with an increase in income because wealthier households buy higher quality foods. Therefore, it is necessary to identify the cost of calories for a typical poor person. Difficulties arise mostly because it is not known who the poor are. However, to avoid this type of problem, the calculation of average consumption is based on quintile groups (quintile groups are defined by income per capita) and is shown below. When the caloric intake per household has been estimated, the cost of one kilocalorie can be calculated.

4.1.2. Calorie Cost

After determining calorie requirements, the next step is the conversion of calories into a poverty line. If the cost of purchasing calories is included, the poverty line is equal to the recommended calories multiplied by the cost of those calories. It is important to note that the necessary changes for each country were made according to its actual needs based on eating habits, culture and religion. The cost of the minimum basket of goods indicates a minimum level of food consumption (food poverty line) below which households are defined as being poor. The poverty threshold is expressed in U.S. dollars to provide a precise comparison with other countries. When calculating the cost of the minimum basket of goods, the price of each food item is defined. The calculations include the following food items: cereals, meat, fish, milk, dairy products, eggs, fruits, vegetables, root crops, fats, oil, salt and sugar, and non-alcoholic beverages.

Table 2. Average Per Capita Food Poverty Line (2000) – monthly cost kuna/eq.adult

Product	Kcal	Monthly cost (2000)	Kcal	Monthly cost (2005)	Kcal	Monthly cost (2010)
Cereals	800	101,7	800	94,8	950	135,6
Meat	200	126,6	200	125,7	250	38,4
Fish	15	15,3	15	17,4	18	168
Milk, dairy products, eggs	280	74,4	280	62,7	350	124,5
Fruits	100	26,7	100	30,9	120	45,3
Vegetables	110	54,9	110	45,6	130	53,7
Roots and tubers	220	29,7	220	21,3	250	92,7
Fats and oils	872	134,1	867	144,9	1033	141
Soft drinks	102	114,3	102	91,5	125	111
Total	2699	677,70	2693	634,80	3226	910,2

Source: Author's calculation.

Table 2 shows that the average calorie intake per equivalent person in Croatia in 2000 was 2699 Kcal/day and the resulting monthly cost for the minimum food basket was 677,70 KN per month per person (1762,02 KN per average family/monthly or 21.144,24 KN per family/year). In the 2005 the average calorie intake per equivalent person in Croatia was 2693 Kcal, and the resulting monthly cost for the minimum food basket was 634,80 KN

monthly per person (1.650,48 KN per average family/monthly or 19.805,76 KN per family/year). In 2010, the average calorie intake per equivalent person in Croatia was 3226 Kcal, and the resulting monthly cost for the minimum food basket was 910,20 KN monthly per person (2.366,52 KN per average family/monthly or 28.398,24 KN per family/year). Food poverty line (per family/year) increased from 4975 PPP$ in 2000 to 6282 PPP$ in 2010. The structure of food consumption by food items for the observed three years is observed. The largest share goes to the consumption of sugar, fats, oils (32.3%), and cereals (29.6%) whereas the lowest percentage goes to fish consumption, only 0.5%. The same trend may be observed in 2005 and 2010, with a slight structural change.

4.2. Non-Food Poverty Lines

Ravallion (1998) suggests that the non-food poverty line should be estimated by adopting the idea that if the individual's total income is sufficient to reach the food poverty line, everything the person spends on non-food is considered basic non-food needs. According to this idea, the non-food poverty line is the non-food household consumption whose total consumption equals the food poverty line. The average non-food poverty line comprises several components, including clothing and footwear, housing, water, electricity and gas, furnishings and household equipment, health, transportation, communication and education. It is possible to include even alcohol, cigarettes, and free time in the non-food poverty line; however, such elements are often excluded because only basic components of consumption are considered.

In calculating the non-food poverty line, Kakwani (2010) takes the average consumption of a household that spends 95% to 105% of the food poverty line on food. The calculation of the average non-food poverty line is based on selecting the class of average monthly income that corresponds to average monthly consumption.

Following the Kakwani (2010) approach, the total poverty line (threshold) is the sum of food and non-food components of the poverty line (see the *Table 3* below).

Table 3. Constructed Poverty Line (threshold) in 2000, 2005 and 2010 (US$PPP)

	2000	2005	2010
Poverty threshold	9595	9309	11350
Food Poverty line	4975	4479	6282
Non food poverty line	4620	4830	5068

Note: The conversion factor for 2000 is 4,25; for 2005, it is 4,42; and for 2010, it is 4,52; from mdgs.un.org.
Source: Authors' calculation.

This table indicates that the estimated poverty threshold (food and non-food) increased from 9595 in the year 2000 to 11350 in 2010. Thus, the average family in Croatia, to meet the same needs in 2000, should have allocated a total of $9,595 per year; the situation improved in 2005 to $9,309; however, after the 2008 financial crisis, the situation worsened again as indicated by the Total Poverty Threshold in 2010 of $11,350 per year. The negative economic trend after 2008 is reflected in the contraction of economic growth, a drop in real income, rising unemployment, and the lowering of budget revenues and social spending, which have pushed an even larger number of households into poverty. The structure of the food and non-food poverty line indicates that after the 2008 financial crisis, the food poverty line moved away from the non-food poverty line; in 2010, the food poverty line was $6,282 per year whereas the non-food poverty line was $ 5,068 per year, which is also evidence of a decline in living standards. Food budget share increased from 2000 to 2005 from 31% to 32%, a clear indicator of negative economic trends and the reduced purchasing power of the population.

The decline in purchasing power is indicated by the structure of non-food expenditures as follows: spending on recreation and culture decreased from 6.54% to 5.58%, followed by clothing and footwear expenditures, which decreased from 8.06% to 6.37%, and furniture decreased from 5.35% to 4.92%, indicating a rise in the prices of durable goods. During the same period, however, expenditures for various other services decreased. According to the structure of expenditures for non-food consumption in 2000, 2005, and 2010, the largest share goes to housing and energy consumption (13.33%, 13.02%, 14.93%); and the lowest share goes to education (0.73%, 0.74%, 0.86%). In the period from 2000 to 2010, the share of expenditures on housing and energy increased from 13.33% to 14.93% as did the share of expenditures on education, from 0.73% to 0.86%. The share of spending on health care increased from 2,09% to 3.25%, communications increased from 2.76% to 5.25%, and the rest increased from 5,6% to 8.65%. During the same period, the share of transport and transportation expenditures decreased from 12.20% to 11.97%, the share of spending on restaurants and hotels fell from 3.68% to 2.41%, the share of alcoholic beverages and tobacco fell from 3.89% to 3.81%, recreation and culture fell from 6.71% to 5.58% and clothing and footwear fell from 10.08% to 6.37%. The preceding two tables show the multiplicative effect of personal consumption on economic trends: in the period of high economic growth (between 4% and 5% of the GDP) between 2001 and 2007, the share of expenditures increased from 66% (in 2000) to 69% (in 2005), indicating a positive effect on the structure of personal consumption whereas in 2010, the average share of non-food expenditures dropped to 68%.

Totaling the number of households below the poverty line (data obtained based on the data of income distribution C-GIDD) and dividing by the total number of households obtains the poverty rates (*Table 4*).

Table 4. Measured poverty rates in Croatia for years 2000, 2005 and 2010

Poverty rates	2000	2005	2010
	25.5	13.8	12.5

Note: Poverty rate = Total number of households below the threshold (A+B+C+D+E+F/ Total Number of households).
Source: Authors' calculation.

It can be concluded that although the poverty threshold was greater in 2010 than in 2000, the poverty rate decreased from 25.5% in 2000 to 12.5% in 2010. This result suggests that real improvement or deterioration in the living conditions of the lower class population will not be distinguishable from the relative poverty rate unless there are simultaneous changes in distribution (social stratification prevents people from growth). To obtain the data on how many households have incomes below the threshold, the C-GIDD data were used: "Global income Distribution Database" 2000, 2005, 2010 (see *Table 5*).

Table 5. Distribution of income by household in Croatia (USD PPP) 2000-2010

Households	2000	2005	2010
1	*2*	*3*	*4*
Total	1614886	1592110	1578255
A	2045	1501	1430
B	2303	1521	1431
C	4705	2806	2609
D	12874	6669	6099
E	66825	27261	24247

1	*2*	*3*	*4*
F	323390	181103	161815
G	650101	570543	553915
H	387966	509101	516753
I	132309	221139	233693
J	32368	70466	76263

Notes: A= >1.500, B=1.500-2.500, C=2.500-3.750, D= 3.750-5.500, E=5.500-8.500 F=8.500-14.000, G= 14.000-25.000, H=25.000-42.000, I= 42.000-70.000, J=<70.000.
Source: C-GIDD; Global Income Distribution Database.

Table below show the sensitivity to the joint distribution.

Table 6. Income Distribution and Poverty Lines for Croatia 2000, 2005, 2010

Country	GDP/p.c.	Poverty line	Total number of households	Total number of households below the threshold	Income bracket by household
Croatia (2000)	4862	9595	1614886	412.142	8500-14000
Croatia (2005)	10090	9309	1592110	220.861	8500- 14000
Croatia (2010)	13327	11350	1578255	197.631	8500-14000

Note: Total number of households below the threshold = A+B+C+D+E+F.
Source: Authors' calculation based on C-GIDD and www.worldbank.org.

Table 6 indicates that in 2000 total number of household was 1.614.886 and 412.142 households registered an average income of 8.500-14.000 PPP$ whereas in 2005, of 1.592.110 households, 220.861 households registered an average income of 8.500-14.000 PPP$. In 2010, of 1.578.255 households, 197.632 households registered an average income of 8500-14000 PPP$. The suggested methodology indicates that although the poverty rate declined from 25,5% to 12,5% between 2000 and 2010, the actual number of households below the threshold increased. When we compare the obtained rate with the national statistics, there are some differences that suggest that different methods of calculation produce different results. According to our estimation, the poverty rate in 2000 was 25,5%; and in 2010, it decreased by 12,5%. Although the poverty rate declined from 2000 to 2010, the total poverty line (food and non-food) increased from 9595 in 2000 to 11350 in 2010. Thus, for the average family to meet identical needs would require greater financial resources. Simultaneously, after the global financial crisis, there was a decline in real income, employment, and social allocation, which affect the growing inequality and poverty.

Tables 5 and *6* confirm the decline in living standards. *Table 6* indicates a decline in the number of households that had an average annual income ($8500-$14000). The structure of the poverty threshold shows that after the financial crisis, there was an increase in the food poverty line compared with the non-food poverty line: for example, in 2010, the food poverty line was $6,282 per year, and the non-food poverty line was $5,068 per year (as opposed to 2005 when the food poverty line was $4479 and the non-food poverty line was $4830). These results indicate that the consumption-based poverty line has many advantages over an income-based poverty line because consumption can indicate a change in poverty. Furthermore, if we compare the results with other available statistical data, we derive a different result; therefore, it is of great importance to review a new and unique measure. Design issues (data limitations on consumption and nutritional needs over longer periods of

time) present the main limitation of this research. Data from longer periods of time would allow more powerful analysis and greater test validity of the study results.

The lack of a model is also reflected in the fact that the food poverty line based on recommended calories per person/day calculated by the author includes only a healthy population with a full range of physical activity lifestyles among adults and a mix of urban and rural populations. Second, in the FAO software, young individuals are estimated to be quite heavy (body weight), which may have also limited the results. Also, the author has made an independent assessment in this paper regarding the consumption of commodities according to climate, culture, and religious criteria; therefore, the seasonality problem has not been considered. This approach avoids the following question: is a particular food eaten because the family is poor, or do they choose to eat it?

Despite some shortcomings, the proposed methodology in this paper is consistent for different countries and different times; and this methodology considers the different needs and living standards of the countries whose poverty is being compared.

Conclusion

The denial of the existence of poverty in Croatia under socialism, the lack of systematic planning, and insufficient and non-summarized statistics have had a great effect on the measurement of poverty and the implementation of social policy. Thus, the greatest challenge for policymakers in the 21st century is how to address poverty and economic inequality. To obtain results, it is necessary to resolve aggregation problems and problems using national accounts.

This paper presents our modest attempt to construct an official poverty line for Croatia (which is sensitive to joint distribution, deprivation and lack of well-being) as an instrument for poverty analysis. This paper may at least encourage further efforts toward the development of an official consumption based poverty line in Croatia. Currently in Croatia, there is no single poverty measure based on anchor construction. This paper also attempts to highlight the importance of anchoring Croatian poverty measures to National Accounts. Despite progress in the field of measuring poverty since 2000, there are strong demands for developing a single poverty measure.

Finally, this study notes the differences among the methods of estimating poverty; the various methods are discernable from the calculation of the poverty threshold and poverty rates as well as by comparing the rates with national statistics.

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