Assesing efficiency of targeting in social services in Federation of Bosnia and Herzegovina

Adela Delalić
School of Economic and Business, University of Sarajevo, Bosnia and Herzegovina,
adela.delalic@efsa.unsa.ba

Ademir Abdić
School of Economic and Business, University of Sarajevo, Bosnia and Herzegovina,
ademir.abdic@efsa.unsa.ba

Muamer Halilbašić
School of Economic and Business, University of Sarajevo, Bosnia and Herzegovina,
muamer.halilbasic@efsa.unsa.ba

Lamija Šćeta
School of Economic and Business, University of Sarajevo, Bosnia and Herzegovina,
lamija.sceta@efsa.unsa.ba

Abstract

This paper analyses the inefficiency of social services targeting in the Federation of Bosnia and Herzegovina (FB&H). Using official statistics microdata of the Household Budget Survey 2015, three models of social minimum in FB&H were constructed: extreme and general poverty, and the model with multidimensional poverty aspects. The analysis of features of poor household categories showed that the most vulnerable residents of FB&H are not beneficiaries of permanent financial assistance. The reason for such an inefficient targeting was recognized in the Federal Law on Principles of Social Care, Care for the War-Disabled Civilians and Care for Families with Children that stipulates that only persons and families that (cumulatively): are incapable for work, have insufficient income, and there are no family members who are legally obligated to support them. The results indicated a high inconsistency in the legal criteria for qualification, and also in the amounts of permanent social assistance among cantons. The Proxy Means Test (PMT) Model is offered as one of the possible solutions for the improvement of social services targeting in FB&H. Given the importance of efficiency of targeting in social services, the research results could be useful, for both, vulnerable segments of the society and federal and cantonal ministries of labour and social affairs, in the process of targeting the households qualified for social support programmes.

Introduction

In Bosnia and Herzegovina (B&H), there is no jurisdiction or legal framework for harmonized social protection on the whole territory. The exclusive jurisdiction for the area of social protection lies at the Entity level: Federation of Bosnia and Herzegovina (FB&H) and Republic of Srpska (RS). Social protection system is organized at the cantonal level in FB&H and at the municipality level in RS and it is extremely bureaucratic, fragmented and inefficient. Twenty laws regulate the area of social protection in B&H at the entity and cantonal levels, whereby the laws at the entity level regulate these issues in different ways.

Especially complicated and dysfunctional is the system in FB&H, with marked overlap and frequent avoidance of jurisdiction between FB&H and 10 Cantons. In accordance with the five main types of schemes outlined in the European Commission Report: Minimum Income Schemes in Europe - A study of national policies (2016), European Commission (2016), B&H can be categorized *in the group of countries which have very limited, partial or individual schemes that are limited to narrow categories of people and do not cover many of those in need of assistance*.

As the research aim is the investigation of the efficiency of social service targeting system in FB&H, three research question are imposed:
(i) Is social service targeting efficient at the satisfactory level?
(ii) What are the main reasons for the possible inefficiency?
(iii) Are they any solutions to improve the existing targeting system?

The latest microdata from the Household Budget Survey 2015 (HBS 2015) were used for the defining of the social security minimum and assessing the efficiency of social service targeting. The HBS 2015, as the most comprehensive data source for the analysis of the living standard in B&H, was conducted on the sample of 7702 households, by the three official statistical agencies: Agency for Statistics of B&H, Federal Bureau for Statistics (FB&H) and RS Institute of Statistics.

In analyzing the efficiency of the targeting system in the FB&H, previous research on this topic has been considered. Report / Study (IBHI, 2013) titled "Non-financial cash benefits for social protection in B&H - What works and what doesn't?" considered the existing social protection system in FB&H and RS, i.e. legislation and its implementation, and provides a precise overview of administrative data in the area of non-financial assistance for social protection in B&H. The authors concluded that the targeting of budgetary remuneration remained regressive, and regressivity even increased in some aspects in 2011 compared to 2007. The root cause of this situation is that budgetary compensation is provided to beneficiaries on the basis of their status rights and not on the basis of actual needs. One of the focuses of the study was the analysis of the Proxy Means Test (PMT) approach when targeting social service users in B&H.

A second report by the same organization (IBHI, 2014) gives an overview of the evaluation of potential results and examines the feasibility of applying selected targeting mechanisms / methods in four FB&H municipalities in 2013. The study simulated different targeting methods and differently conceptualized benefits based on three different budget scenarios. The results of the analysis indicate that the best targeting mechanism and the compensation concept are: the use of indirect property censorship PMT methods with unique benefits for the poorest 10% of the population. This concept consistently showed the best results in targeting efficiency and fee adequacy.

Glewwe, Kanaan (1989) investigated targeting systems in both urban and rural areas. Authors applied a simple regression technique to data from the Côte d'Ivoire Living Standards Survey 1985. They predicted incomes based on observable household characteristics that are correlated with the income and distributed

transfers on the basis of those predictions. The results of this study showed that the targeting in rural areas is more effective than the targeting in urban areas. In addition, the results of the study indicate that the significant reductions in poverty can be achieved by using this method.

Sharif (2009) has studied the PMT based household targeting system for Bangladesh, and identified the extreme poor on the basis of the PMT model. The model included the observable and verifiable household or individual characteristics that are selected based on their ability to predict welfare. The results of this study showed that the proposed PMT model for Bangladesh is highly progressive in its targeting performances when compared to the existing targeting safety net programs as well as in the fairness and transparency in the allocation of resources to the poor by these programs.

In the first part of the paper, three social minimum models have been defined as the basis for examining the efficiency of the targeting system in the FB&H. The first two models for defining social security minimums in the FB&H are based on the definition of absolute poverty or more precisely on extreme and general poverty concepts. To incorporate the multidimensional nature of poverty into the definition of social security minimums, two multidimensional poverty indexes have been selected, which have been proved to indicate a different identification of poverty than the one-dimensional indexes (Delalic et al. 2017). In the second, main part of the paper, poor efficiency of the social service targeting system has been proven and identified key causes. After analysis of targeting models, the most appropriate model is selected and applied on FB&H data. Selected and applied model was found to be much more efficient than existing one. Finally, concluding discussion of results provides guidance for policy makers to improve existing targeting system, step by step.

Modeling the Social Security Minimum for FB&H

This study proposes three models of the social security minimum that are based on the measurement of absolute poverty - extreme (Model I) and general (Model II), as well as the measurement of multidimensional poverty based on the Alkire - Foster and fuzzy approach to poverty measurement (Model III).

As an introduction to Models I and II, we first defined the concepts of absolute poverty and the absolute poverty line. The concept of absolute poverty is defined on the basis of minimal existential needs of the individual. The poverty threshold is defined as the value of the consumer package of products and services that are considered essential. In some cases, this package only consists of food products. Nutritionists, in accordance with age, sex, eating habits, lifestyle and life conditions, determine the minimum amount of calories required for life and health. Within absolute poverty, we distinguish between general and extreme poverty. Generally, persons are considered to be in extreme poverty if their existence is threatened and that is generally considered as nutritional poverty. In defining general poverty, it is taken into account that a person in order to survive must meet other basic needs: clothing, housing, medical treatment, etc.

As is usual in the HBS in B&H, the basic monetary measure of well-being is household consumption. For the purpose of determining absolute poverty lines, the average annual consumption per household member was used. In determining the food poverty line, the World Bank methodology was used to suggest a list of 66 products in the consumer basket of products and a threshold of 2100 kcal for an individual's nutritional needs. Based on this methodology, a food poverty line of BAM 919.79 per household member was determined. For a particular poverty line, a robustness analysis was conducted considering different reference groups. However, the differences in the food poverty lines obtained did not exceed 3.5 BAM per year.

Based on such poverty line, the percentage of the population is determined whose total consumption (food and non-food) is lower than the estimated threshold. According to the Food Poverty Line, based on data from HBS 2015, 0.36% of households, or 0.68% of affiliated household members in the FB&H are below this threshold, i.e. in the state of extreme poverty. Using the 2015 HBS weights, it is estimated that there are 2,322 households in the FB&H, or 13,217, in extreme poverty.

Although a diet with minimal intake of calories is a prerequisite for biological survival, even the poorest populations need to provide other, non-nutritional conditions for survival. All households, except for food, spend some of their expenses on other basic needs. Such basic, non-food needs include shelter, clothing and footwear, hygiene supplies, health supplies, etc. According to Engel's laws, it is considered that the general poverty line cannot be less than the total consumption of food in the population with the minimum amount required, that is, the amount close to the food poverty line (Ravallion, 1998). Based on this and the previously calculated poverty line, the general poverty line was set at BAM 2,628.72 annually, per household member. On these poverty lines, 11.76% or 76,706 households, with 15.07% and 292,961 affiliated household members, are generally poor in the FB&H.

In order to create the third model of social minimum, two multidimensional poverty identification approaches were used: Alkire - Foster approach and the fuzzy set approach (completely fuzzy and relative approach). The most important reason for choosing these two approaches is the undoubtedly proven multidimensional nature of poverty, which can be quantified through other, non-monetary poverty indicators, except on the basis of the monetary indicator - household consumption. In doing so, indicators were used to construct these indexes, indicating quality of housing, ownership of durable goods, household structure, social inclusion and monetary poverty. The ultimate goal of determining multidimensional poverty indices is to identify "multiple selected" units, that is, units identified as poor on the basis of multiple different identification approaches.

As part of the identification of the poor, based on the Alkire-Foster approach, a poverty line has been identified according to which poor is considered to be poor if deprived of at least 3 of the 14 indicators included. According to this approach, the percentage of multidimensional poor households in the FB&H is 10.8%, or 70,443 households with 143,440 members.

The use of fuzzy sets in poverty analysis is motivated by the artificial division of the population into poor and non-poor units. Aforementioned is defined by the poverty line, which is not unique and is subject to arbitration. The concept of fuzzy sets involves defining the degree of poverty affiliation for each observation unit, using the poverty membership function. There are several different methodologies for calculating multidimensional poverty indexes based on the fuzzy approach. A completely fuzzy and relative approach was chosen for the purpose of this research (Cheli, Lemmi, 1995), due to less arbitrariness in the choice of poverty / deprivation thresholds. The construction of this index, based on the indicators included, identified 35.6% of poor households in the FB&H.

In order to identify households at serious risk, we identified households classified as poor by three different approaches: using the general poverty Line, the Alkire - Foster approach and the fuzzy approach. Using this model, in the FB&H is 1.0%, or 6.499 households with 22,624 members are affected with poverty.

It should be noted that in the case of households which are classified multiple times as poor, only 6.7% (436 out of 6,499) were simultaneously identified as extremely poor. Therefore, we conclude that priority in social services should be given first to households classified as extremely poor, then to generally poor households, which are

also classified as poor by two multidimensional aspects, and ultimately to remain generally poor households.

Targeting - selecting households qualified for social services in the FB&H

In the FB&H, the areas of social protection are regulated by the Law on Principals of Social Protection, Protection of Civilian Victims of War and Protection of the Family with Children (Official Gazette of the Federation B&H, No. 36/99, 54/04, 39/06 and 14/09). The aforementioned federal Law obliged the competent cantonal authorities in the FB&H to adopt appropriate regulations within their jurisdiction. This Law regulates only the basics of the social protection system, and all other rights, duties and responsibilities from that protection are left to be determined, regulated and exercised by the cantonal legislature and its organs.

The Constitution of the Federation of Bosnia and Herzegovina guarantees the right to social protection, and the responsibility for conducting social policy is divided between the FB&H and the cantons. A social need is considered to be a permanent or temporary situation in which a citizen or family finds themselves, and is caused by war events, natural disasters, general economic crisis, psychophysical state of individuals or other reasons that cannot be eliminated without the help of the community. The functioning of the social protection system is regulated by the aforementioned law, which establishes basic rights, forms, beneficiaries and conditions for social protection, while the cantonal laws regulate more closely the social protection rights, the procedure for exercising rights, the scope, amount and manner of exercising social protection, exercising supervision, financing of social protection and other issues of importance for the exercise of rights in the Canton. Beneficiaries of social protection, according to federal law, are persons who are in a state of social need.

Analysis of the efficiency of the existing targeting system in the FB&H

For the purpose of analysis and basis for eventual improvement of the existing targeting system in the FB&H, data from HBS 2015 was used. As a representative social service, the category of Permanent Financial Assistance (PFA) was used, which is the basic and most stable social service with the highest coverage. Based on HBS 2015 data, it is calculated that 0.81% of households in the FB&H are recipients of permanent financial assistance, with more than 60% of beneficiaries living in rural areas. In order to evaluate the effectiveness of the existing targeting system, a survey was conducted of households in the FB&H, which are extremely, generally and multiple identified as poor according to the status of receiving permanent financial assistance (Table 1).

Table1 Poor household, PFA users (HBS 2015)

	Extremely poor	Generally poor	Multiple identified
Permanent financial assistance	0%	36.6%	16.6%

Source: Authors' calculations

Unsurprisingly, no beneficiaries of permanent financial aid belong to extremely poor households, while 36.6% of beneficiaries of permanent financial assistance are generally poor households and 16.6% are households that are repeatedly identified as poor. Thereby, 63.4% of all beneficiaries of permanent financial assistance do not belong to poor households, suggesting a large error of inclusion.

On the other hand, no extremely poor households are beneficiaries of permanent financial assistance, while only 2.4% of generally poor and 13.0% of multiple identified households are beneficiaries of permanent financial assistance (Figure 1). This fact indicates the extremely poor efficiency in the distribution of permanent financial assistance within the existing targeting system in the FB&H.
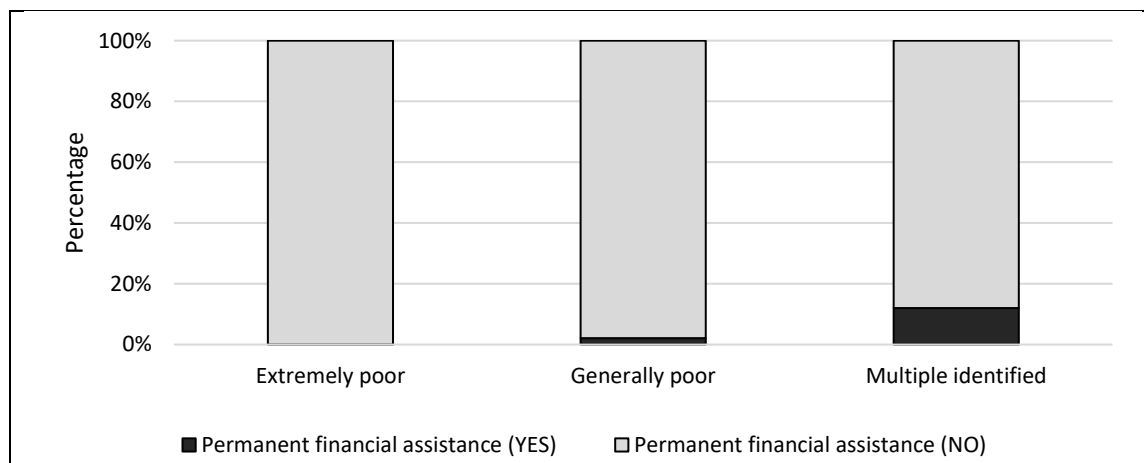

Figure1 TNP within categories of poor households (HBS 2015)
Source: Authors' creation

The reasons for the perceived inefficiency are identified lies, first of all, in the FB&H legal regulations, i.e. the umbrella Law on the Basics of Social Protection, Protection of Civilian Victims of War and Protection of the Family with Children. According to the aforementioned law, "the right to permanent financial assistance and other material support is granted to persons and families, if they are:
1. Unable to work, or prevented from exercising their right to work.
2. They do not have enough income to support themselves.
3. They have no family members who are legally obliged to support them, or if they have ones, those persons are not able to discharge the obligation."
These conditions apply cumulatively, that is, unless at least one of the conditions is met, persons and families cannot exercise the right to permanent financial assistance and other material assistance. The Law defines conditions 1, 2 and 3 more precisely, but it is evident that very few households in the FB&H can cumulatively meet these criteria.
Furthermore, the reasons for the inefficiency were also found in the inconsistency of laws and practices across the cantons within the FB&H. Namely, according to the current legislation, permanent financial assistance is regulated at the cantonal level, by cantonal laws in the field of social protection. The aforementioned laws introduce additional restrictions on the already existing conditions for exercising the right to permanent financial assistance, such as: owning a car, the size of a housing unit, etc. In addition, when analyzing cantonal laws, many differences were observed across cantons, such as basis for permanent financial assistance, treatment of household total income components, percentage increase in assistance for an additional or incapacitated member, and numerous other differences.
This indicates that current targeting is not satisfactory and that financial assistance does not reach the most vulnerable households. Therefore, first of all, it is necessary to harmonize legislation in the field of social protection so that all households, i.e. citizens, would have the same rights in all cantons. It is also necessary to standardize the criteria

which households, i.e. which household members and on what basis they are qualified to permanent financial assistance.

Targeting models qualified for social support programs

Different targeting models are being applied for identifying households suitable for social support programs. There are three models that are the most commonly used. The choice of the appropriate targeting model is conditioned by the specificities of the society and the economy, the capabilities and the level of reliability and verifiability of the information provided by the applicant, as well as the sources of data on the basis of which the model is constructed.

The first of these is Property Census – Means Testing (MT), which is recommended for use in countries with large formal sectors. Programs that use property censorship for the purpose of targeting rely on the validity or verifiability of the applicant's identity and household structure and household income and assets. On the basis of the documents and information provided by the applicant, detailed checks of information are made, by comparison with existing databases. Targeting based on this model is in use in France, the United Kingdom, the United States and other countries with a large formal sector where verifying such information is reliable.

Countries with large informal sectors use a targeting model based on the Indirect Household Property Indicator – Proxy Means Testing (PMT). This indicator is based on an estimate of household consumption or income, which is essentially difficult or impossible to observe in a specific claim. The PMT allows a decision as to whether an applicant is entitled to a social service based on the determination of a multidimensional indicator that contains in its construction measurable and relevant characteristics of households that are closely related to the well-being or standard of living of the household. The information collected on household characteristics, through a regression model for estimating household consumption or income, is aggregated into a single result - a PMT score, based on which it is possible to classify households that are eligible for participation in a specific social support program.

The third model, the Hybrid Means Testing (HMT), is essentially a hybrid solution created by a combination of the first two models. This model bases the applicant's financial situation on two indicators: household income as the sum of income on which documents or sources can be verified, and estimated income resulting from the statistical model that cannot be verified.

PMT targeting model

As noted earlier, countries with large informal sectors use the PMT targeting model of the poor, i.e. model based on an indirect indicator of household wealth. Based on the HBS 2011 database for the FB&H, we found that the average monthly consumption per household member was 69% higher than the corresponding income. Since the HBS 2015 income was not calculated, no differences were found based on the most recent data, but it is generally considered that the income measurement based on the Household Budget Survey is underestimated. Although aware of the informal economy and the size of the informal sector, the above results confirm these facts. In addition, these results indicate that there is a significant portion of income that is not reported or verifiable from other sources of information. For these reasons, the Indirect Indicator of Household property state - PMT is the most appropriate choice.

One simulation of the PMT model in B&H was conducted by the World Bank in 2009. Within this project, the results of the HBS 2004-based formula were updated and the PMT model based on the HBS 2007 was evaluated, which found that the introduction

of the PMT model achieves a significant improvement in current income assessment programs and thus a targeting model for qualified social service applicants. By introducing standardization by using this model, comparability with other countries has been achieved. This report also highlights the shortcomings of HBS in measuring income, as well as the fact that, on the basis of HBS, income is greatly underestimated.

The PMT method involves collecting a set of indirect indicators - proxy variables, on the basis of which household income or consumption can be estimated with sufficient accuracy. Indicators should be well correlated with poverty, consumption or income, in order to have the role of indirect indicators for assessing household wealth. Although the final list of indicators depends on the local context, there are some indicators that are standard in PMT worldwide. They include the physical characteristics of the residential unit (construction, electricity, water, etc.), the possession of durable goods, demographic structure of the household, education and employment in the household.

After selecting the indicators, they need to be weighted to determine the PMT score. There are several ways to weight the indicators. Given that in our case we have data from the HBS containing information on consumption and on household characteristics, statistical methods are used to determine the type and strength of the relationship between consumption and indicators and to estimate the most likely household consumption on the basis of indirect indicators. To this end, multiple regression analysis is used to assess the relationship between household characteristics and the corresponding monetary measure of household well-being, consumption or income. The result of applying the PMT method is a regression model:

$$\hat{Y} = b_0 + b_1 X_1 + b_2 X_2 + ... + b_n X_n ,$$ (1)

whereby the obtained regression coefficients: b_0, b_1, ..., b_n represent the weights that will be used in the calculation of the estimated consumption (PMT score) $\hat{Y}$ on the basis of indirect indicators X_1, X_2, ..., X_n.

Regression analysis reveals indirect indicators that are most correlated with well-being of the household. While individual indicators may have poor correlation with consumption, multiple indicators have a higher correlation and also indicate a multidimensional aspect of household wealth. Typically, the PMT method includes 10 - 30 indirect indicators of household economic status, but there are no formal restrictions. The number and type of indicators are conditioned by local specificities. It is common for indicators for the PMT method to be taken from bases on household consumption, income or standard of living.

After selecting the indicators and associated coefficients in the regression model, it is determined to what extent and to what ways the variables affect household consumption. Based on the indicators selected through the regression model, a questionnaire is created, which is completed for candidates for the social support program and through which the values of the selected indicators are determined.

Based on the calculated PMT score, households are classified into groups of those who are qualified and those who are not qualified for social support programs. Households can be ranked by PMT score, for society as a whole or by region. Selection of eligible households is made on the basis of an established threshold that is linked to the poverty line or other spending level or, according to the quota set by the specific program or its budget. Depending on the particular program, the PMT score may be combined with some other criterion, e.g. household protection program with children, etc.

Model Validation: When the PMT scores of households are known and the threshold for qualifying for the program is determined, a certain percentage of the poorest households are selected from the sample on the basis of which the model evaluation is performed (usually 30%, 40% or 50% of the poorest households). For selected households, the percentage of matching is calculated: those whose actual consumption is below the established threshold and those whose calculated PMT score is below the established threshold.

As the actual consumption is more reliable than the PMT score, if the household is below the poverty line based on consumption but not based on the PMT score, we are talking about the **exclusion error**. In the opposite case, if the sample household is not classified as poor and based on the PMT score below the poverty line, it is an **inclusion error** (Glewwe, Kanaan, 1989; Grosh, 1994; Grosh, Baker, 1995; Baulch, 2002; Ahmed, Bouis, 2002; Narayan, Yoshida, 2005; Schreiner 2006; Zeller, Alcaraz, 2005; Houssou et al. 2007; Coady, Skoufias, 2004; Zeller et al., 2006; Sharif, 2009; Coady, Parker, 2009; Johannsen. 2006; Houssou, 2010; Bakhshoodeh, 2013).

On the one hand, the exclusion error reduces the impact of the program on the level of social protection of potential beneficiaries but has no effect on the budget. On the other hand, the inclusion error has no effect on the level of well-being of potential beneficiaries but increases the cost of the program or increases the budget. There is no targeting model where these two types of errors are completely eliminated. Ideally, both types of errors would be minimized, but in a typical PMT model there is usually an exchange of these two types of errors in the range of 30-40%. If the goal is to prioritize the poor then the focus is on reducing the exclusion error, and if the goal is to prioritize cost savings then the focus is on reducing the inclusion error. In addition to the two errors mentioned, the following are used to evaluate the accuracy of the PMT model:

a) **Overall accuracy** - *the percentage of households whose poverty status is correctly determined by the PMT model, among all households,*

b) **Accuracy of the poor**- *Percentage of correctly identified poor households out of the poor ones,*

c) **Accuracy of the non-poor**- *Percentage of correctly identified non-poor households out of the non-poor ones.*

Very often, the same country-wide models are not evaluated, but separate models are created for regions of otherwise defined subpopulations. It is common to create separate models for urban and rural areas; given that they are characterized by different indicators of well-being.

Finally, the models need to be updated regularly. Practically, with each new set of data on household consumption, income or well-being, the living conditions and living standards of the population have changed, and it is necessary to evaluate the new PMT model.

Like all methods, PMT has its advantages and disadvantages. The most significant advantage of this method is that it overcomes the difficulties and disadvantages of measuring household income or consumption. In most countries of the world as in our country, it is very difficult to obtain reliable household income data. The Household Budget Survey and all poverty measures for B&H and FB&H are based on household consumption. It is almost impossible and technically impracticable to accurately determine the consumption of households that are candidates for social services programs, especially since there are many opportunities to manipulate spending in order to achieve a better position for qualification. Therefore, PMT is an adequate choice because it overcomes these shortcomings. On the other hand, this method

requires a high level of technical capacity for design and implementation. Because it is based on statistical models, it may also contain an inherent error.

Application of PMT model in FB&H

In order to define the best predictors (indirect indicators) of household poverty in the FB&H, we created a regression PMT model based on data from HBS 2015. As a dependent variable in the model we used the natural logarithm of annual per capita household consumption, and as indirect variables indirect wealth indicators households that can be correlated with household poverty status.

The development of the PMT model involves finding a weighted linear combination of indirect household wealth indicators that collectively estimate expected household consumption. More than 100 predictors were included in the initial PMT model. Potential predictor variables were determined based on previous empirical research such as: Glewwe, Kanaan, 1989; Haddad et al., 1992; Grosh, Baker, 1995; Grosh, Glinskaya, 1997; Ahmed, Bouis, 2002; Narayan, Yoshida, 2005; Castañeda, 2005; Sharif, 2009; Schnitzer, 2016; Gassmann et al., 2013; Bakhshoodeh, 2013. The selection of indirect indicators was made on the basis of the following criteria: (i) they are easily accessible and measurable; (ii) they cannot be easily manipulated by households; (iii) that they are not politically, religiously or nationally sensitive. Based on the above criteria, more than 80 poverty-related indirect indicators (80 dummy variables, 1 continuous variable and 2 interaction variables) were included in the final PMT model. These indirect indicators are grouped into four categories:
   a) Household structure (household size, number of children in the household, number of employees, age and gender of the head of the household, level of education of the head of the household and spouse (if any), marital status of the household head, and activity and type of employment of the household head)
   b) Living space and property ownership (dishwasher, air conditioning, internet, telephone, computer or laptop, car, electricity, refrigerator, garage, balcony, garden, etc.)
   c) Sanitary / hygiene conditions (indoor bathroom, indoor toilet, running water, cleaning equipment)
   d) Location (rural / urban, canton).

Using OLS (Ordinary Least Squares) regression, we estimated the coefficients that serve as weights when calculating the PMT score for households. Given that households have different patterns of housing but also property, reflecting their lifestyles and priorities, three PMT models have been created:
   a) PMT model for all households in FB&H (FB&H total)
   b) PMT model for households in urban FB&H (FB&H urban)
   c) PMT model for households in rural FB&H (FB&H rural)

The estimated PMT model coefficients and the corresponding weighting to the predictor variables are presented in Appendix 1. Statistically significant coefficients with explanatory variables at the 5% significance level are bolded.

The adjusted coefficient of determination of $R^2 = 0.4943$ FB&H for total model is sufficiently high and indicates the suitability of the PMT model in estimating annual per capita household consumption. The adjusted coefficient of determination of the FB&H urban model has a value of $R^2 = 0.5471$, while in case of the FB&H rural model has a value of $R^2 = 0.4398$. Comparing the FB&H total regression model with estimated PMT models in other countries, we can conclude that the model predicts household consumption well and therefore has a satisfactory targeting accuracy rate (Sri Lanka, $R^2 = 0.56$ and Pakistan, $R^2 = 0.53$ (Hou, 2008); Armenia , $R^2 = 0.20$ (Glinskaya, Grosh,

1997); Latin American countries have R^2 in the interval from 0.30 to 0.40 (Gorsh and Baker, 1995); Egypt, R^2 = 0.43 (Ahmed, Bouis, 2002; Bangladesh, R^2 = 0.56, Rwanda , R^2 = 0.44, Indonesia, R^2 = 0.37 (Kidd, Wylde, 2011). If we compare the PMT FB&H total model with the PMT model for B&H created by the World Bank in 2009, we can see from HBS 2007 that it is a model that has approximately the same value of R^2.

After the creation of the final FB&H total model, it was necessary to determine the reference PMT score (threshold) on the basis of which households are classified into groups of those who are qualified and those who are not qualified for social support programs. The threshold is determined on the basis of the distribution of actual annual household consumption (e.g. second decile, third decile, fourth decile). A household is considered poor and thus eligible for participation in a social support program if its estimated expenditure (PMT score) is less than the reference PMT score, also known as the targeting line. Generally, social policy makers set this PMT threshold to cover the maximum number of poorest households given the available budget.

As noted earlier, different criteria may be considered when determining a reference PMT score. However, it should be borne in mind that targeting errors increase in PMT models when estimating consumption in the lowest and highest deciles. Therefore, we determined the reference PMT score based on sensitivity analysis.

If we set the reference PMT score at 15% of the poorest households (i.e. targeting 15% of the poorest households), only 29.41% of the targeted 15% of the poor will be identified as acceptable on the basis of the PMT model, which represents a major exclusion error (70.59%). If we target 20% of the poorest households, 37.35% of households would be identified as eligible, reducing the exclusion error even though it is still relatively high. However, if we target 40% of the poorest households, 67.12% of households would be identified as eligible, greatly reducing the exclusion error to 32.88%. Therefore, the reference PMT score of 40% of the poorest households generates a reasonable level of targeting accuracy and is considered the most appropriate threshold for identifying the poor in rural and urban areas of the FB&H.

Using the data on annual per capita household consumption based on HBS 2015, we set a reference PMT score of BAM 4,756.93. The graphs of exclusion errors, inclusion errors, and Poverty accuracy / Coverage rates for the various PMT scores of the 15th, 20th, 25th, 30th, and 40th percentiles are given in the following figure:
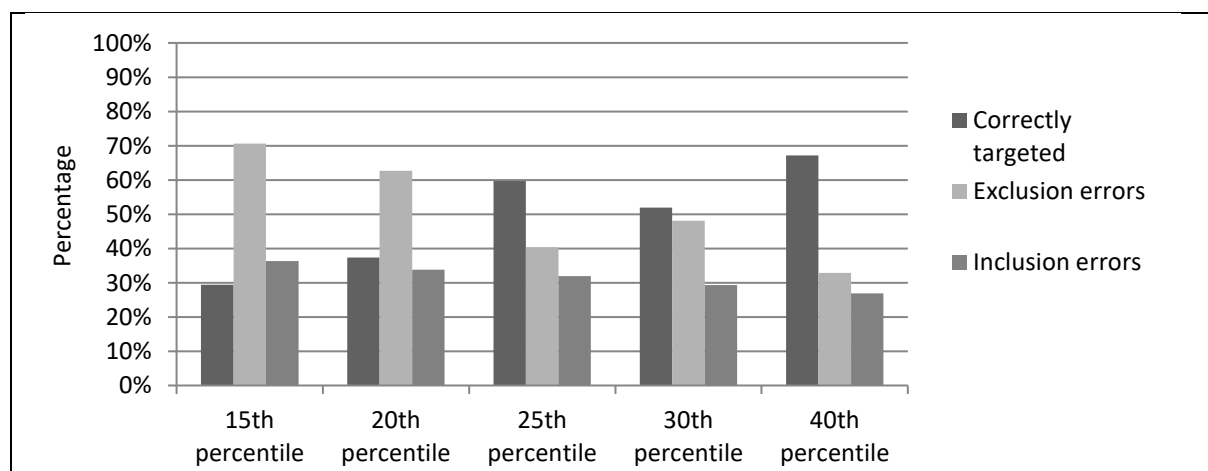
Figure 2 Relation of poverty accuracy rates, exclusion and inclusion errors - Source: Authors' creation

We observe that with the increase of the reference PMT score (from the 15th to the 40th percentile) there is an average increase in poverty accuracy rates, a decrease in exclusion errors and inclusion errors. The following graphs show the actual versus estimated annual per capita household consumption using the FB&H Total Model. In the process of targeting the poor in the FB&H, the benchmark PMT was set at the 15th, 20th, 25th, 30th and 40th percentile values.
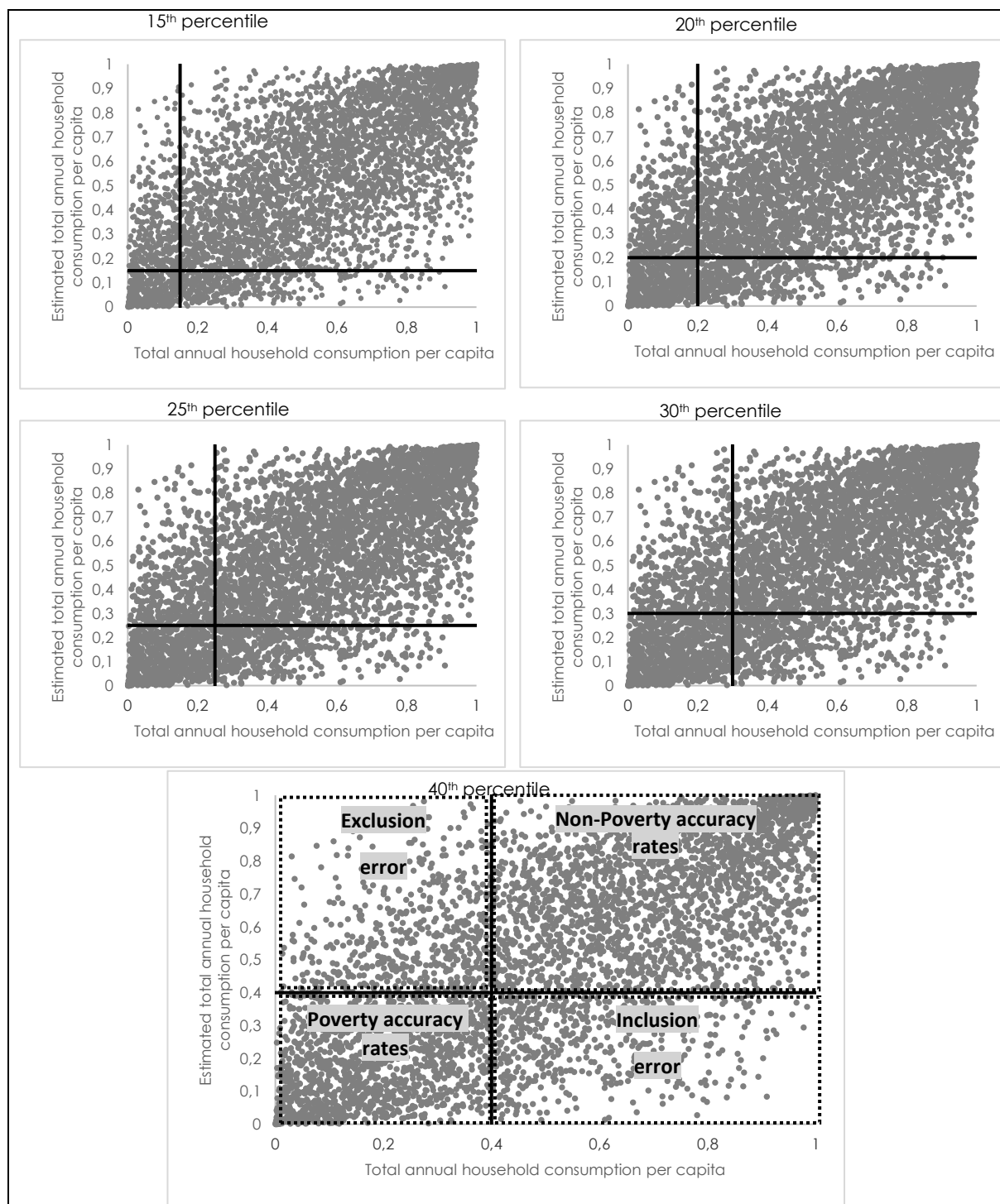
Figure 3 Relation of estimated and actual total annual household consumption per capita for the 15th, 20th, 25th, 30th and 40th percentiles, respectively

Source: Authors' creation

The targeting accuracy of the PMT model was evaluated in terms of technical errors. The following table shows the calculation of the stated errors for the FB&H total model for the reference PMT score at the fourth decile level.

Table 2 Household poverty status based on the PMT FB&H total model

Household poverty status (PMT threshold at the fourth decile level)			
	Poor	Non-poor	Total
Household excluded from the programme	Exclusion error 85,818 (32.88%)	Accurate Assessment 326,837 (83.55%)	412,655
Household included in the programme	Accurate Assessment 175,146 (67.12%)	Inclusion error 64,328 (16.45%)	239,474
Total	260,964	391,165	652,129

Source: Authors' calculations

Of the 652,129 households, 260,964 households are poor and 391,165 households are not poor. Of the 260,964 poor households, 85,818 households were misjudged not to be poor and excluded from the program (32.88%). On the other hand, of the 391,165 non-poor households, 64,328 households were assessed as poor and included in the program (16.45%). The overall accuracy of the FB&H total model is 76.98% and is higher than the overall accuracy of the FB&H rural model but also of the FB&H urban model. Poverty accuracy is reasonably high in all areas.

Furthermore, the results show that the exclusion rate is relatively the same in all areas. Also, there is no major difference between the inclusion rates in rural and urban areas, while the inclusion rate in the FB&H area is 2 percentage points lower. Although the FB&H rural model has the lowest R^2 value, the model at the same time has the highest accuracy value of poverty forecasts. The following table provides an overview of the accuracy of household poverty (classification) estimates of households (extreme, general, and multiply poor) classified with three PMT models. We see that the lowest percentages of accuracy of household poverty forecasts range from 83.01% (generally poor), over 92.00% (multiple identified) to 94.12% (extremely poor). Based on these results, we can conclude that, on average, more accurate poverty forecasts (better classifications) are provided by the FB&H rural model and the FB&H urban model.

Table 3 Classification of households based on created PMT models

PMT model	Types of poverty	Extremely poor	Generally poor	Multiple identified	Average
FB&H total model	Included in the model	100.00%	83.71%	92.00%	91.90%
	Excluded from the programme	0.00%	16.29%	8.00%	8.10%
FB&H urban model	Included in the model	94.12%	83.01%	100.00%	92.00%
	Excluded from the programme	5.88%	16.99%	0.00%	8.00%
FB&H rural model	Included in the model	100.00%	84.94%	94.00%	93.00%
	Excluded from the programme	0.00%	15.06%	6.00%	7.00%

Source: Authors' calculations

We note that the estimated models are significantly more efficient than the existing targeting model, especially when it comes to the most vulnerable categories of households: extremely poor and multiple-identified households.

Finally, since the poverty rates of the FB&H rural model and the FB&H urban model are higher than the poverty rate of the FB&H total model, it is proposed to use two targeting models: the FB&H PMT rural model for rural areas and the FB&H PMT urban model for urban areas.

Based on statistically significant property indicators in the urban and rural models, a questionnaire is created to be filled in by the applicants for the social services program. Each question in the questionnaire is answered by a dichotomous indicator indicating the presence or absence of a particular household characteristic, which in the corresponding model proved statistically significant. Therefore, yes or no questions are offered for the questions in the questionnaire, making the questionnaire easy and understandable to fill and minimizing the time required to complete it. For each household, the corresponding PMT score is calculated based on the data from the completed questionnaire. Based on the comparison of the PMT score obtained by the household and the targeting line, it is determined whether or not the household is eligible for the social services program.

Conclusion

Considering the lack of the legal framework for uniform social protection at the national level and complicated and dysfunctional system in FB&H, this study was intended to test the efficiency of social service targeting. The analysis is based on the constructed three models of social security minimum in FB&H, that included unidimensional and multidimensional asptects of poverty, and the permanent financial assistance as a basic assistance to the poorest parts of the population. General framework for this type of assistance is regulated by the federal legislation, while the benefits are regulated in detail by the cantonal laws.

The results of the analysis undoubtedly proved that permanent financial assistance doesn't reach the most vulnerable population groups: extremely and generally poor such as multiple identified poor households in FB&H.

The main reason for the identified inefficiency is identified in the federal regulation that specifies eligibility of a household for permanent financial assistance. Besides not having enough income to support themselves, it is also required that none of the household members are able to work. Additional reasons for the inefficiency were also found in the inconsistency of laws and practices across the cantons within the FB&H. The cantonal laws introduce additional restrictions, such as: owning a car, size of a housing unit, etc. The long-term solution is the revision of laws and the harmonization by the cantons. Until these changes are implemented, the policy makers should seriously consider the objective and scientifically based solutions suggested by this study.

Aiming to recommend the unbiased and appropriate targeting model, this study utilizes the Proxy Means Testing or PMT model, which is recommended to the societies with the large informal sector. Objectivness of this model is guaranteed by performing the estimation of the linear regression model, and by assessing households' wellbeing through the set of the objective and observable indirect indicators. Three PMT models were estimated: the overall model for all households, the model for urban households and the model for rural households. The quality of the estimated models was assessed through the poverty accuracy/coverage rate and it was found that the models predict households' consumption at the satisfactory level.

Even though PMT targeting model is scientifically based and strongly more efficient than the existing one, it is worth noting that its application requires serious additional capacities in the local social protection offices. Until these capacities are developed, we propose softening the requirements in the current system. For example, application

of the conditions for the financial and material assistance individually (not cumulatively), with the consideration of the alternative conditions (family size > 5, share of employed family members < 0.2, share of dependent family members > 0.5, number of children in family > 3, owning of a car – no). It should be emphasized that, based on HBS data, these alternative conditions are more strongly correlated with poverty than conditions defined by the Federal Law.

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Appendix 1 PMT model rating

Table A1 PMT model coefficients and weights estimated

No.	Explanatory variables	FB&H total model		FB&H (urban) model		FB&H (rural) model	
		Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
1	Rural	**-0.0684**	**0.001**	Omitted	Omitted	Omitted	Omitted
2	Female	0.0317	0.259	0.0447	0.240	0.0107	0.798
3	Separate kitchen	**0.1024**	**0.000**	**0.0761**	**0.014**	**0.1075**	**0.000**
4	Garage	0.0262	0.095	**0.0739**	**0.003**	0.0279	0.183
5	Balcony	**0.0687**	**0.000**	**0.0911**	**0.000**	0.0408	0.074
6	Garden	**0.0560**	**0.001**	-0.0142	0.573	**0.1232**	**0.000**
7	Second home	**0.2832**	**0.000**	**0.2807**	**0.000**	**0.2837**	**0.000**
8	Dishwasher	**0.1751**	**0.000**	**0.1345**	**0.000**	**0.2048**	**0.000**
9	Air conditioner	**0.0948**	**0.000**	0.0637	0.078	**0.1364**	**0.000**
10	Internet	0.0406	0.060	0.0280	0.408	0.0417	0.137
11	Phone (lanline and/or mobile)	**0.0751**	**0.000**	**0.0899**	**0.001**	**0.0540**	**0.016**
12	Computer or laptom	**0.1333**	**0.000**	**0.1626**	**0.000**	**0.1135**	**0.000**
13	Car	**0.2807**	**0.000**	**0.2435**	**0.000**	**0.3065**	**0.000**
14	Bathroom	-0.0142	0.805	0.1773	0.181	-0.0268	0.684
15	Toilet	**0.0794**	**0.017**	0.0347	0.600	**0.0965**	**0.015**
16	Running water at home	0.0162	0.634	0.3188	0.068	-0.0031	0.932
17	Electricity	0.2888	0.151	-0.6696	0.162	0.3971	0.099
18	Fridge	-0.0912	0.148	-0.0757	0.517	-0.1464	0.058
19	Cleaning equipment	**0.1636**	**0.000**	**0.1891**	**0.000**	**0.1477**	**0.000**
20	Age of head of household (less than 30 years)	0.0477	0.386	0.0413	0.580	0.0358	0.665
21	Age of head of household (from 30 to 50 years)	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
22	Age of head of household (more than 50)	0.0008	0.967	0.0046	0.882	-0.0017	0.949
23	Employed	0.0295	0.778	0.0627	0.705	0.0494	0.715
24	Unemployed	0.0030	0.976	-0.0430	0.783	0.0685	0.592
25	Housewife	0.0369	0.619	-0.0078	0.947	0.0865	0.372
26	Pensioner	0.1113	0.118	0.0492	0.662	0.1513	0.102
27	Unfit for work	0.0309	0.698	-0.0089	0.948	0.0750	0.459
28	Other (employment)	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
29	No formal education	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
30	Elementary school	**-0.0535**	**0.035**	-0.0549	0.298	-0.0543	0.072
31	Secondary school	0.0505	0.057	0.0849	0.106	0.0425	0.188
32	College	0.0723	0.096	**0.1446**	**0.028**	-0.0267	0.692
33	Faculty	**0.1693**	**0.000**	**0.2021**	**0.001**	0.0806	0.248
34	MA Degree; Master study	0.0973	0.319	0.0851	0.455	0.2077	0.335
35	PhD	0.2176	0.170	0.3208	0.057	-0.4069	0.379
36	No formal education	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
37	Elementary school (spouse)	-0.0228	0.180	-0.0337	0.289	-0.0201	0.325
38	Secondary school (spouse)	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
39	College (spouse)	0.0558	0.248	**0.1258**	**0.027**	-0.0268	0.753
40	Faculty (spouse)	**0.0892**	**0.006**	**0.1125**	**0.003**	0.0196	0.742
41	MA Degree; Master study (spouse)	**0.1784**	**0.047**	0.1583	0.125	0.2071	0.220
42	PhD (spouse)	0.2711	0.405	0.2860	0.356	Omitted	Omitted
43	Single	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
44	Married	0.0229	0.543	0.0053	0.922	0.0438	0.406

Table A1 PMT model coefficients and weights estimated (continued)

No.	Explanatory variables	FB&H total model		FB&H (urban) model		FB&H (rural) model	
		Coef.	P>|z|	Coef.	P>|z|	Coef.	P>|z|
45	Informal marriage	0.0453	0.677	0.0506	0.684	0.0537	0.800
46	Divorced	0.0504	0.303	0.0441	0.485	0.0602	0.442
47	Widow/widower	0.0122	0.750	-0.0111	0.838	0.0455	0.399
48	Number of household members = 1	1.3226	**0.000**	**1.5378**	**0.000**	**1.3004**	**0.000**
49	Number of household members = 2	0.7893	**0.000**	**0.9407**	**0.000**	**0.8079**	**0.000**
50	Number of household members = 3	0.4554	**0.000**	**0.6601**	**0.002**	**0.4449**	**0.000**
51	Number of household members = 4	0.2871	**0.000**	**0.4800**	**0.023**	**0.2895**	**0.000**
52	Number of household members = 5	0.1734	**0.010**	0.3526	0.091	**0.1853**	**0.012**
53	Number of household members = 6	0.0096	0.890	0.2127	0.311	0.0124	0.872
54	Number of household members = 7	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
55	Number of household members = 8+	-0.0083	0.934	0.4757	0.424	-0.0310	0.775
56	Permanent employment	0.0748	0.328	-0.0139	0.911	0.1038	0.289
57	Temporary employment	0.0053	0.944	-0.1235	0.320	0.0634	0.521
58	Non-contractual job/work	0.0101	0.898	-0.1178	0.363	0.0395	0.694
59	One-time job	-0.0795	0.363	-0.1268	0.387	-0.0791	0.473
60	Season job	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
61	Other (not mentioned)	0.0988	0.351	0.0778	0.662	0.0782	0.560
62	Canton1	**-0.2532**	**0.000**	-0.1038	0.229	**-0.2593**	**0.000**
63	Canton2	0.0525	0.398	**0.3299**	**0.030**	0.0040	0.955
64	Canton3	**-0.1739**	**0.000**	0.0780	0.371	**-0.2298**	**0.000**
65	Canton4	**-0.2871**	**0.000**	-0.0592	0.488	**-0.3454**	**0.000**
66	Canton5	**-0.5617**	**0.000**	-0.2113	0.074	**-0.7193**	**0.000**
67	Canton6	**-0.1257**	**0.002**	0.0374	0.672	**-0.1570**	**0.001**
68	Canton7	**-0.1316**	**0.001**	0.0807	0.354	**-0.1800**	**0.000**
69	Canton8	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
70	Canton9	-0.0703	0.092	0.1368	0.102	**-0.1453**	**0.019**
71	Canton10	-0.0599	0.240	0.0688	0.508	-0.0814	0.177
72	Number of children = 0	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
73	Number of children = 1	-0.0425	0.101	-0.0086	0.820	0.0521	0.379
74	Number of children = 2	**-0.1379**	**0.000**	-0.0788	0.108	0.0530	0.626
75	Number of children = 3	-0.1017	0.080	-0.1517	0.076	0.2549	0.120
76	Number of children = 4	-0.1794	0.083	-0.1409	0.518	0.2545	0.258
77	Number of children = 5	0.0620	0.757	-0.0176	0.970	0.5837	0.097
78	Number of children = 6	**-1.1240**	**0.000**	**-2.3792**	**0.002**	0.0259	0.955
79	Number of children = 7	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
80	Number of children = 8+	**-0.9313**	**0.012**	-1.5436	0.105	Omitted	Omitted
81	Average number of employed members	**0.2507**	**0.000**	**0.2686**	**0.000**	**0.2303**	**0.000**
82	Number of children*Rural	**0.0393**	**0.012**	Omitted	Omitted	-0.0714	0.176
83	Number of children*Female	0.0102	0.632	-0.0058	0.865	0.0125	0.678
84	const.	6.9679	0.000	7.1446	0.000	6.8203	0.000
	R²	0.4943		0.5471		0.4398	
	Poverty accuracy (Coverage rate)	67.12%		67.28%		68.25%	
	Under-coverage rate	32.88%		32.72%		31.75%	
	Leakage rate	16.45%		18.46%		18.74%	
	Non-poverty accuracy	83.55%		81.54%		81.26%	
	Total accuracy	76.98%		75.83%		76.05%	

Adela Delalić is an Assistant Professor at the Department for Quantitative Economics, School of Economics and Business, University of Sarajevo, Bosnia and Herzegovina. Her fields of interests are poverty and inequality analysis, statistics, applied mathematics etc. She is the author of two university textbooks, numerous scientific papers published in domestic and international journals and conferences, the leader or participant in several domestic and international projects and the member of several scientific and editorial teams. The author can be contacted at *adela.delalic@efsa.unsa.ba*.

Ademir Abdić has a doctoral degree in economics and works at the School of Economics and Business of the University of Sarajevo. He is an Assistant Professor for the following modules: Statistics in Economics and Management, Business Statistics, Applied Statistical Analysis and Econometrics. His scientific interests include statistics, econometrics, quantitative economics. He has been a co-author of two university textbooks and has published several scientific papers. He has been a member of the organizing committee of the International Conference on Official Statistics: Challenges, Opportunities and Future Directions (ICOS2017) and International Conference on Official Statistics: Emerging trends in statistical methodologies and data dissemination (ICOS2019). The author can be contacted at *ademir.abdic@efsa.unsa.ba*.

Muamer Halilbašić is an Associate Professor at the Department of Economics, School of Economics and Business, University of Sarajevo, Bosnia and Herzegovina. He is also a Director of the Sarajevo Institute of Economics. His fields of interests are economic development, international competitiveness, etc. He is an author/co-author of two university textbooks and numerous scientific papers published in domestic and international journals and conferences. He was a team leader/key expert in more than fifty domestic and international research projects. The author can be contacted at *muamer.halilbasic@efsa.unsa.ba*.

Lamija Šćeta is an Assistant Professor at the Department for Quantitative Economics, School of Economics and Business, University of Sarajevo, Bosnia and Herzegovina. Her fields of interests are number theory, theory of summability and applied mathematics. She is the author of one university textbook, and numerous scientific papers published in domestic and international journals and conferences. The author can be contacted at *lamija.sceta@efsa.unsa.ba*.