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Xenia van Edig, “Indicator based poverty assessment among rural households in Central Sulawesi, Indonesia”

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Supervisor: Prof. Dr. Manfred Zeller

Summary

Problem setting and research goal

As it is well known, poverty is a pervasive problem in our world. The reduction of severe poverty and hunger is therefore defined in the first Millennium Development Goals formulated by the United Nations (World Bank 2005). In practice a precise targeting of the poor is decisive for the success of poverty reduction strategies. Therefore, there is a need for low-cost, time-saving and easy-to implement poverty assessment tools. In this context the IRIS Center at the University of Maryland and the Institute of Rural Development (now part of the Department for Agricultural Economics and Rural Development) at the University of Gottingen are developing and testing models to assess absolute poverty. In my Diploma thesis, two of these tools were adapted for Indonesia. It was therefore searched for two different sets of 15 indicators which are able to predict the daily per capita expenditures of a rural household.

The empirical data was gathered during a household survey in the vicinity of Lore Lindu National Park in the Province of Central Sulawesi. The research was embedded in STORMA, an interdisciplinary research project on the stability of rainforest margins which is funded by the German Research Foundation (DFG).

In the research area the tropical rainforest is threatened mostly by smallholder conversion of forestland into farmland (The Nature Conservancy 2005). A strong linkage between this process and the poverty incidence in the region is assumed. Thus the reduction of environmental degradation as well as the improvement of people's livelihoods through rural development should be important goals of poverty reduction strategies of future development programs and projects in the region. It is therefore particularly important that local NGOs have easily applicable, inexpensive and time saving tools for poverty assessment in Central Sulawesi.

Methodology

The study is based on a household-level survey which consists of data from 281 households from 13 villages. In my research two questionnaires were used, namely the composite questionnaire, with which information on different dimension of poverty was collected and the expenditure or benchmark questionnaire, which is derived from the consumption module of the Living Standard Measurement Survey of the World Bank (Grosh and Glewwe 2000) and with which detailed information about consumption expenditures were obtained. As aforementioned, the composite questionnaire collects information about different aspects of poverty. These aspects are: household demographics, health, socio-economic status (education, occupation), assets (land, livestock, farm assets, durables, housing, access to public services, credit and financial assets, selected single expenditure items (food, transport etc.). Furthermore a self-assessment module was included in the composite questionnaire. For the data analysis different multivariate regression analyses were applied. In the regression analysis the natural logarithm of the variable "daily per capita expenditures", derived from the benchmark questionnaire, was used as dependent variable. In total, 278 potential poverty indicators were derived from the composite questionnaire. They acted as independent variables in the model estimation. Out of them 9 control variables were forced into each step of the regression analysis: The variables "household size", "household size squared", "age of the household head", "and age of the household head squared" control for important demographic factors. Additional, five regional dummies (for each district) refer to agro-ecological differences. For the analysis the number of regressors had to be reduced in order to have enough degrees of freedom for the model estimation. Ordinary Least Square Regressions were used for the variable selection. Additionally, MAXR technique which seeks for an optimal R^2 within a set of 15 indicators was applied. For the variable selection, the coefficients, for example, had to be checked for whether their sign concurs with what one would expect from theory.

In the analysis of indicators two main problems occur: First, information might be difficult to obtain, especially regarding the aspects of time, social costs and money. Second, indicators might be difficult to verify (especially when they are recall-related) (Zeller et al. 2005). To refer to these difficulties, two different models, called Model 1 and Model 7, were selected to be tested in Central Sulawesi. Every indicator had the chance to be included in Model 1. A pre-selection based on the MAXR technique for the different dimensions of poverty was done. Finally, 86 variables were included in Model 1. Model 7 instead only includes variables which were ranked as "easy-to-verify" by the enumerators. In case of Model 7, the pre-selection was therefore purposeful. Here 92 variables were included.

As aforementioned, the variable selection was done with ordinary least square regressions. As to the fact that one-step OLS regressions provide very low accuracy results, two step OLS was applied in order to improve the tool's accuracy. Two step OLS improves the accuracy by using a smaller sub-sample where the 'richest' households are excluded. Further achievements in the accuracy performance of the models were gained by applying quantile regressions. In quantile regressions, the absolute sum of errors at a certain quantile, for example the median, is minimized. Therefore, Koenker et al. (undated) also name them absolute value models.

For the poverty assessment tools the most important accuracy measures are: First, the poverty accuracy which is defined as the percentage of households correctly predicted as being poor. Second, the exclusion error named undercoverage. The undercoverage expresses the percentage of poor households wrongly predicted as being non-poor. Third, for the inclusion error leakage, the opposite is the case: it expresses the percentage of non-poor household,

which are wrongly predicted as poor. Finally, the balanced poverty accuracy criterion, abbreviated as BPAC, which is the poverty accuracy minus the absolute difference between undercoverage and leakage (Zeiler et al. 2005, The IRIS Centre 2005), was considered the most important accuracy measure for the study.

To use the tools in practice one has to multiply the regression coefficients of each variable with the corresponding variable value and add the constant regression coefficient.

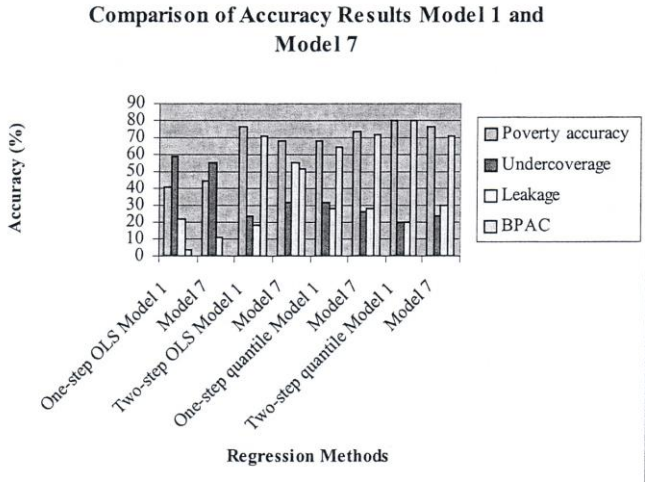
$$Y = \beta_0 + \sum_{i=1}^{N} \beta_N * x_N \quad \text{, where}$$

β_0 is the constant regression coefficient (y-intercept),
N is the number of variables included,
β_N is the regression coefficient for variable N, and
x_N is the value of the variable N.
The result of the equation is the natural logarithm of the predicted per capita expenditures the corresponding household.

Results

It was found that 19.4 % of the population in the area are living with less than 1US$ per person per day in purchasing power parities and can be therefore classified as extremely poor. Almost half of the population in the research area fall short of the international poverty line of 2 US$ (in purchasing power parities).

As to the models, the variables from Model 1 are either difficult to survey or difficult to verify. The following two examples, out of the 15 indicators for Model 1, should illustrate this: The subjective indicator "Household feels that its healthcare expenditures are above its needs" is very difficult to verify because of its subjectiveness. "The average clothing expenditures per capita in the last 12 month" instead is an objective indicator. Nevertheless, the required information might be difficult to obtain and is difficult to verify. Model 7 instead includes only indicators which are "easy to verify". The following examples are 3 indicators out of the 15 indicators used for the tool: "The total number of rooms in a dwelling" can be obtained by the enumerator during the interview. Also the "access to electricity" normally is apparent. The variable "cow ownership" could be latest verified by asking a neighbour.



Source: own results

Figure 1 displays the accuracy results of both models for direct comparison. Here one can see how both models' accuracies improve due two step OLS as well as quantile regressions. The most accurate regression procedure for Model 1 is two step quantile regression. Here the poverty accuracy is 79.6%, the both prediction errors are 20.4% and therefore the BPAC equals the poverty accuracy. For Model 7 the best accuracy results were gained with one-step quantile regressions. The poverty accuracy is 74%. The undercoverage is 24% and the leakage 30%. The BPAC is quite high with 72.2%

As final conclusions, it has to be stated that Model 1 is the better choice regarding the accuracy results, but it includes a number of less operational indicators. Hence, a trade-off between accuracy and practicability of the tools occur. The main problem of Model 1 is the verifiability of the included indicators. This is mainly related to recalls and expenditure related indicators. Regarding Model 7, the main problem is that the indicators included are less suitable to explain the daily per capita expenditures. Despite its weakness concerning the accuracy performance, Model 7 is considered to be more likely to be applied by local NGOs, because of its very easy implementation. Hence the 15 indicators found for this model could be used to identify absolute poor household in rural Central Sulawesi.

Thus, the econometric analysis showed that in order to develop low-cost, time-saving and easy-to-implement poverty assessment tools, the regression analysis presented in this thesis offers good possibilities of finding suitable indicators for poverty prediction in Central Sulawesi.

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