

Poverty Ratios in Asia and Sub-Saharan Africa based on Logit Models

Kimiko Uno*

The Millennium Declaration was adopted by 191 member states in 2000. The eight measurable Goals derived from the Declaration were to be achieved by 2015. The study analyzes Millennium Development Goals (MDGs) achievement in identifying the problems to meet MDGs, particularly poverty reduction.

The main objective of the paper is to analyze the relationships among MDGs, particularly the interrelationships of the several goals related to global economic setting on poverty reduction. It explains why some countries or some regions succeeded in reducing poverty, while some did not over the decade from 1990s to 2000s. The facts and causes of such phenomena were statistically analyzed using the pooled data of 18 developing countries in Asia and 29 developing countries in Sub-Saharan Africa.

Some studies showed that three exogenous variables, that is, the share of domestic capital formation in GDP, increase rate of employment, and inflation rate, affected the three endogenous variables, namely GDP growth rate, changes in Gini, and poverty incidence (UNO (2009)). The MDG seminar organized by UNDP discussed that poverty incidence in South Asia could be explained by export growth, agriculture growth and employment creation, while inflation did not seem to bear significant effect on poverty.¹ UNCTAD (2004) analyzed the relationship between trade and poverty reduction, by identifying the composition of trade, level of development and structure of production. UNCTAD discussed the nature

*Professor, Tokyo University of Foreign Studies (uno@tufs.ac.jp)

of the interdependence between trade and financial and investment flows, as well as between trade and debt and trade and technology transfer.

Data set and models are discussed, respectively, in the next two sections, and the statistical outcomes are examined in Section III. The linkages between MDGs and poverty reduction, and focuses on their synthesis and implication of Doha development perspectives are discussed in Section IV. The study will assist policy makers in identifying problems and targets to meet MDGs in national, sub-regional and regional levels. The model will contribute as a tool for formulating and implementing the most effective macroeconomic policy to accelerate achievement of the MDGs.

I. THE DATA

Two kinds of definitions are commonly used for poverty data. One definition is the people gaining less than one dollar per day, which is known as the “international data”. The other is the “national data” whose threshold levels are set by individual countries. The 18 developing economies from Asia were selected, i.e., Armenia, Azerbaijan, Bangladesh, Cambodia, China, India, Indonesia, Kazakhstan, Kyrgyzstan, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Sri Lanka, Turkey, Ukraine, and Viet Nam. These countries were selected on the grounds that the poverty ratio is available in at least one year during the study period of 1990 through 2009. This group produces the sum of 46 observations. The 29 developing countries from Sub-Sahara Africa were also selected.

They are Benin, Burkina Faso, Burundi, Cape Verde, Central African Republic, Comoros, Cote d'Ivoire, Ethiopia, The Gambia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Swaziland, Tanzania, Togo, Uganda, and Zambia. This group includes the sum of 54 observations.

The list of variables considered in our study is summarized in Table 1. The first three variables correspond to the target variable representing the

poverty level, and remaining 31 variables are chosen as the candidates for explanatory variables. They are compiled from the data set published by MDG Centre and World Bank's 2010 World Development Indicators (WDI). The 100 observations, or the subset of them, are pooled to derive statistical results. However, the effective number of observations may vary depending on the variables chosen in each model due to frequent emergence of missing values.

Relevant variables

Although we leave the details of analyses to the later sections, some variables are found particularly relevant to poverty ratio. GDP per capita along with the income distribution index such as GINI would directly be related to poverty, for which we basically employ the international standard that those with daily income of US \$1 or less. Figure 1 summarizes the relationships among the variables relevant to the poverty ratio.

There are many variables directly or indirectly related with GDP. When viewing from the expenditure side, it can be decomposed into consumption, investment, government spending, and net exports, which comprise the major portion of current account (CA). In developing economies agricultural raw materials or foods would be one of the important exporting commodities, which we often take as the engines of the growth in some of the least developed countries.

Flow of ODA and FDI affect investment and government components of GDP and current account. Exports, particularly those of agriculture and food related products, imports and external debt affect the current account in developing economies. The deficit in current accounts would be compensated by the capital inflows, or capital account. Such inflows to developing economies, for the most part, take the form of ODA, FDI or other flows including remittance from overseas workers. The former is closely related to the government spending while the latter would become a part of investment. As some of capital inflows would be the loans from outside the country, the interests against the existing balance must be paid

abroad (payment to debt service).

Primary school enrollment (SCH) and youth literacy rate (LITE) are introduced to represent the human capital. We cannot deny that education is one of key elements to achieve economic development. However, the present level of educational activity is not necessarily related to the current poverty ratio as it will take many years for education to produce some visible results. Meanwhile the literacy rate represents the quality of existing human stock, and thus expected to be more closely related to the poverty ratio.

Due to missing data of LITE in most developing countries in Asia and Sub-Sahara countries, the study uses SCH as the index of human capital.

II. THE MODEL

Functional forms

The simplest way to describe poverty is to formulate a linear model. For example, a typical expression based on variables shown in Figure 1 is given as follows.

$$POV = \alpha_0 - \alpha_1 PCY - \alpha_2 ODA - \alpha_3 FDI + \alpha_4 DEBT - \alpha_5 EXP - \alpha_6 AEXP - \alpha_7 SCH \quad (1)$$

Where POV is the poverty ratio (per head), PCY is the GDP per capita, FDI and ODA are also standardized to the per capita basis. EXP and DEBT are the total export of goods and services and the total external debt, respectively, which are standardized against the GDP. AEXP is the share of agricultural raw materials export against total merchandise exports. SCH is the school enrolment rate (% net).

Besides the above variables, we also consider the share of food export FEXP and the literacy rate LITE. These variables are dropped as the former is virtually parallel to the agricultural export AEXP, but includes processed food which is not directly connected to the level of primary industry. We regard SCH as the proxy for the level of human capital rather

than LITE, due to data availability. By the same token, the flow variables such as FDI and ODA in a single year are not directly related to the present poverty ratio. To ease this problem, the sums of the current and previous years (two-year moving sums) could be used for these variables to smooth out drastic changes. In the study, we did not use the two-year moving sums above.

In equation (1), all the variables but DEBT are assigned the negative signs. This indicates that the increases in per capita income, ODA, or the school enrolment rate are expected to reduce the poverty rate, while the increase in total external debt will increase it. Equation (1) does not guarantee that its prediction takes a value between 0 and 1, where the poverty ratio must stay. Thus we consider a logarithmic formula as an alternative.

$$\log POV = \alpha_0 - \alpha_1 PCY - \alpha_2 ODA - \alpha_3 FDI + \alpha_4 DEBT - \alpha_5 EXP - \alpha_6 AEXP - \alpha_7 SCH \quad (2)$$

By virtue of logarithm, the values predicted by this expression are necessarily positive. However, they can still violate the upper bound condition, $POV \leq 1$.

The probit and logit models are commonly used when the endogenous variable is proportions or probabilities. In this case, the events are dichotomous, where people are classified into the two categories: in poverty or not in poverty. In such a case, the binary probit or binary logit models would be applicable.²

When we introduce some variable representing the general level of welfare U_i , it would be negatively related to the probability that a person in an economy is in poverty. Then the applicable probit model would take the following form, based on normally distributed disturbances.

$$p_i = F(-U_i) = \int_{-\infty}^{U_i} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{z^2}{2}\right) dz \quad (3)$$

In practice, U_i can be described as a function of various variables.

When a linear model is assumed, we are required to estimate the parameters β_j in

$$U_i = \beta_0 + \sum_j \beta_j X_{ji} \cdot \quad (4)$$

Theoretically the probit model provides statistically clear representation of binary event. However, the problem is that it is difficult to estimate the function for U as it involves integration. The logit model is derived when the disturbance follows the Gumbel distribution. In that case, the cumulative distribution follows the logistic distribution.

$$p_i = \frac{1}{1 + \exp(-U_i)} \quad (5)$$

Here we can easily confirm that the poverty ratio $p_i=0$ when $U_i=+\infty$, and $p_i=1$ when $U_i=-\infty$.³ As both probit and logit models give the expressions for probability, their LHS (p_i) always stays between 0 and 1. Apparently, the utility function (4) is much easier to estimate with the binary logit model (5) than with the binary probit model (3). However, we must take note that the distribution it depends on is slightly skewed from symmetric.

By rearranging (5), we have

$$\log\left(\frac{1-p_i}{p_i}\right) = U_i, \quad (6)$$

and the utility function (4) can be estimated linearly. By differentiating the LHS of (6) by p_i , we have

$$\frac{\partial}{\partial p_i} \log\left(\frac{1-p_i}{p_i}\right) = \frac{p_i}{1-p_i} \left(-\frac{1}{p_i^2}\right) = -\frac{1}{p_i(1-p_i)} < 0$$

Thus we know that the LHS decreases with the increase in p_i . In other words, a variable expected to contribute to the decrease in poverty ratio will have a positive sign, while one expected to contribute to the increase will have a negative sign.

Then the working formula for (6) becomes:

$$\log\left(\frac{1-POV}{POV}\right) = \alpha_0 + \alpha_1 PCY + \alpha_2 ODA + \alpha_3 FDI - \alpha_4 DEBT + \alpha_5 EXP + \alpha_6 AEXP + \alpha_7 SCH, \quad (7)$$

where the signs attached to the variables are interchanged from (1).

It must be noted that the estimation results from equation (7) will be biased in real scale in the sense that minimization of logarithms of squared errors does not necessarily imply minimization of squared errors in real scale. To avoid such problems, it is possible to apply maximum likelihood (ML) method to estimate (5) directly. However, as nonlinear estimations are generally time-consuming, ML is not an efficient way to choose particularly when we are to find the appropriate models by testing various combinations of explanatory variables. Thus in the following, we employ (7) as the basic formula for our empirical analyses.

Discussion

The model proposed in the previous subsection (7) is to predict the poverty ratio. While it represents the probability, it can easily be transformed into the poverty headcount when accompanied by the proper projection of population increase. Suppose N gives the population of the country. Then the headcount in poverty can easily be obtained by $POV \cdot N$.

If the policy maker is concerned about the changes in headcount in poverty, it can also be obtained by a simple difference equation.

$$\Delta(POV \cdot N) = \Delta POV \cdot N + POV \cdot \Delta N, \quad (8)$$

where ΔN is the (annual) change in population and ΔPOV is the same for poverty ratio. When the POV function can simply be written as $POV = 1/(1 + \exp(\sum_i \beta_i X_i))$, we have the following result from differentiation with the time.

$$\frac{d}{dt}POV = \frac{-\exp(\sum \beta_i X_i)}{(1 + \exp(\sum \beta_i X_i))^2} \sum \beta_i \frac{dX_i}{dt}$$

By discretizing, we obtain the equivalent difference expression.

$$\Delta POV = -POV(1 - POV) \sum \beta_i \Delta X_i \quad (9)$$

Thus the policy maker can easily evaluate how changes in the exogenous variables ΔX_i , such as FDI or agricultural export, affect the poverty rate, and the poverty headcount. It is clear from (8) that curbing population growth is a key element for controlling the poverty in terms of headcount. In any case, equation (7) on which (9) is based, effectively provides a tool for evaluating the significance of respective policies on the MDG goal to halve the people in poverty.

III. EMPIRICAL RESULTS

As discussed in (UNO (2009)), the log-linear formulae are better than the linear ones due to their positive nature. However, predicted values from both formulae could exceed one, another restriction that a proportion, or probability, must satisfy. Following discussion in the previous section, we adopt the binary logit model (5) as our basic formula, which can be estimated linearly by a logarithmic transformation shown in equation (7).

Asia and Sub-Sahara Africa

The result of the model with the pooled data of Asia and Sub-Sahara Africa is follows:

$$\log\left(\frac{1-POV}{POV}\right) = -0.7432 + 0.0002PCY - 0.0008ODA - 0.0000FDI - 0.0028DEBT$$

(2.73)	(3.85)	(0.54)	(0.16)	(2.29)
+ 0.0077EXP - 0.0013EXP + 0.0118SCH				R ² = 0.5964 (F = 19.42)
(2.56)	(0.35)	(3.68)	DF = 92	

(10)

The variables contributing to poverty reduction should have positive

parameters. In this sense, ODA, FDI and EXP have incorrect signs, but all of them are insignificant. Among the rest of variables, PCY and SCH are significant at 1% and DEBT and EXP are significant at 5%. The backward elimination method is applied to obtain the following result.

$$\log\left(\frac{1-POV}{POV}\right) = -0.7883 + 0.0002 PCY - 0.0030 DEBT + 0.0075 EXP + 0.0121 SCH$$

(3.26) (4.67) (2.74) (2.60) (3.98)

R² = 0.5941 (F = 34.77)
DF = 95

(10a)

The sign conditions are satisfied, and all of PCY, DEBT and SCH are highly significant at 1% level. EXP is also significant at 5% level.

Synthesis of MDGs

The logit model with international pooled data showed significant results, and it guarantees the condition that the predicted values of poverty ratio to stay between zero and one. Thus we employ the logit model for synthesis of MDG.

We also present the sub-regional MDG syntheses using two regional groups including 1) Asia and 2) Sub-Sahara Africa.

Asia

We first see if the poverty structures in these two regions are different from the rest. Chow test is employed as an insufficient number of samples are available for them. The model (10) is considered for Asia.

$$\log\left(\frac{1-POV}{POV}\right) = -0.5613 + 0.0002 PCY + 0.0051 ODA + 0.0015 FDI + 0.0001 DEBT$$

(1.11) (3.52) (2.02) (2.48) (0.03)

$$+ 0.0053 EXP - 0.0224 AEXP + 0.0084 SCH$$

(1.42) (1.79) (1.35) R² = 0.6419 (F = 9.73)
DF = 38

(11)

Among the rest of variables, PCY and FDI are significant at 1% and 5%, respectively, and ODA is barely significant at 10%.

The backward elimination method is applied to obtain the following result.

$$\log\left(\frac{1-POV}{POV}\right) = 0.0781 + 0.0002PCY + 0.0054ODA + 0.0015FDI + 0.0072EXP - 0.0236AEXP$$

(0.48) (3.98) (2.14) (2.47) (2.13) (1.94)

$R^2 = 0.6245$ (F = 13.31)
DF = 40

(11a)

PCY is significant at 1%, while ODA, FDI and EXP are significant at 5%. By dropping insignificant variables including DEBT and SCH, the statistical difference shows that ODA and EXP, which were insignificant in model (11), become significant in model (11a).

The same formula is fitted to the Sub-Sahara Africa.

Sub-Sahara Africa

$$\log\left(\frac{1-POV}{POV}\right) = -0.5695 + 0.0002PCY + 0.0013ODA - 0.0000FDI - 0.0014DEBT$$

(2.22) (2.69) (0.75) (0.19) (1.23)

+ 0.0059EXP + 0.0020AEXP + 0.0028SCH $R^2 = 0.5849$ (F = 9.26)

(1.57) (0.64) (1.21) DF = 46

(12)

Only PCY is significant at 1%. The backward elimination method is applied to obtain the following result.

$$\log\left(\frac{1-POV}{POV}\right) = -0.2533 + 0.0002PCY - 0.0015Debt + 0.0061EXP \quad R^2 = 0.5601(F = 21.22)$$

(2.05) (4.51) (1.52) (1.74) DF = 50

(12a)

The result is unlikely different between models (12) and (12a). It is more likely that the poverty is explained by only PCY in Sub-Sahara Africa, while poverty in Asia is explained by several variables including PCY, ODA,

EXP and FDI. Are there significant differences of two regions to explain poverty? Chow test is applied to answer the question.

Chow test can be summarized as follows. Suppose the two sets of data comprise n_1 and n_2 observations, respectively. After the normal regression procedures, the sums of squared errors SSE_1 and SSE_2 are obtained with the common set of k variables corresponding to two sets, as well as SSE for the combined data. The null hypothesis that the structures of two data sets are statistically indifferent can be tested using the following F-statistic.

$$\frac{\{SSE - (SSE_1 + SSE_2)\} / (k + 1)}{(SSE_1 + SSE_2) / (n_1 + n_2 - 2k - 2)} \sim F_{n_1 + n_2 - 2k - 2}^{k+1}, \quad (13)$$

where k is the number of explanatory variables commonly used in the regressions for the two data sets.

From the regressions (10), (11) and (12), F is calculated as 6.8868, which is larger than one percent critical value of 2.7305. Therefore we can conclude that two regions are significantly different.

IV. PERSPECTIVE OF DOHA DEVELOPMENT AGENDA INTO MDG

Doha Development Agenda

The Doha development agenda has set the stage for a development round of trade liberalization, establishing modalities for negotiations on agriculture and providing greater substance to special and differential treatment for developing countries. While tariffs and agricultural support in developed countries have been reduced, the process has been still slow.

The focus of future negotiations under Doha Development Agenda will be summarized as follows:⁴

- ◇ Agriculture: substantially improve market access; reduce all forms of export subsidies, with a view to phasing them out; and substantially reduce trade-distorting domestic support.

- ✧ Services: further liberalize all categories of services and modes of supply.
- ✧ Industrial goods: further reduce tariffs, including tariff peaks, high tariffs, and tariff escalation, as well as nontariff barriers, particularly on products of export interest to developing countries.
- ✧ Antidumping measures and subsidies: clarify and improve disciplines, while preserving the basic concepts, principles, and effectiveness of these agreements and their instruments and objectives.
- ✧ Regional trade agreements: clarify and improve disciplines and procedures under existing WTO rules applying to regional trading agreements.
- ✧ TRIPS: establish a multilateral system of notification and registration of geographical indications for wines and spirits. Protection of geographical indications of other products addressed under review of implementation of TRIPS agreement.
- ✧ Dispute settlement mechanism: improve the implementation of rulings and participation of the developing countries.
- ✧ The environment: negotiations limited to the relationship between existing WTO rules and specific trade obligations set out in multilateral environmental agreements and to the reduction or elimination of tariff and nontariff barriers to environmental goods and services.
- ✧ Singapore issues: Possible negotiations on investment, competition policy, transparency in government procurement, and trade facilitation. Last July, it was decided that only trade facilitation would be went ahead in the round.

MDG 8: Develop a global partnership for development

The Millennium Declaration establishes a mutual accountable partnership between developed and developing countries.⁵ Goal 8 addresses the way developed countries can assist developing countries to achieve poverty reduction through more development assistance, improved

market access, and debt relief. To achieve Goal 8: Develop further an open trading and financial system that is rule-based, predictable and non-discriminatory; includes a commitment to good governance, development and poverty reduction—nationally and internationally, the following actions on trade, investment, ODA and debt, among others, are targeted.

- ✧ Market access: Address the special needs of LDCs, LLDCs and SIDS. This includes tariff- and quota-free access for their exports.
- ✧ Debt: Enhanced debt relief for heavily indebted poor countries; cancellation of official bilateral debt; deal comprehensively with developing countries' debt problems through national and international measures to make debt sustainable in the long term.
- ✧ ODA: More generous official development assistance for countries committed to poverty reduction
- ✧ FDI: Technology transfer and employment creation through private sector development.

Trade, Per Capita Income, Market access, Technology, Agriculture and Poverty

The relationships between trade, per capita income, market, agriculture, and poverty have been studied by many researchers and seem to be summarized as follows: a) Increased export opportunities and specialization in productive activities that can exploit comparative advantages; b) Higher economic growth and real income through better access to ideas, technology, goods, services and capital; c) More efficient use of resources leading to higher productivity as a result of increased international and domestic competition; d) Long-term effect on increased inflow of foreign direct investment and technology transfer; e) increased opportunities to produce competitive goods and services in global demand and incentives to adopt new business practices develop new products and markets; f) Enlarged market for local producers, allowing them to better

exploit economies of scale, which increases income levels and the efficiency of resource allocation; g) Developing countries might be more competitive in low-skill intensive sectors and these sectors might expand and increase the demand for low-skilled workers, who typically belong to the poorer segments of the population; and h) Increased access to cheaper imported products (UNIDO(2003)). It is also pointed that i) Increased trade on agriculture and processing food products derived from SPS and TBT conformity will be leading to poverty reduction, as the majority of poor people depend on agriculture in developing countries; and j) The target of halving the poor people earning less than \$1 per day is likely to be achieved by improving farmers' capacity in production and processing food, followed by marketing in national and international and export.

As Doha development agenda is reducing export subsidies with a view to phasing them out and as a part of global partnership as in MDG 8, the special needs of the least developed countries including tariff and quota-free access must be addressed for the least developed countries' exports competitiveness. The benefits that developing countries may derive from a phasing-out of agricultural support provided by advanced countries are likely to be underestimated (UNCTAD (2004)).

With the background above, the study analyzed the perspective of Doha development agenda into MDG, using results in the previous chapter in two regions with pooled data, viz. (1) Asia and (2) Sub-Sahara Africa. The major inference from our empirical analyses will be summarized in the next section.

V. CONCLUDING REMARKS

In general, the theoretical foundations for recent empirical studies of growth relies on dynamic models with physical and human capital depending on initial conditions and the institutions and policies that affect the return to saving and investment with growth rate of per capita GNP as the dependent variable. Policy improvements are likely more potent if a

country receives aid with good governance and institutional capacity building. The estimated impact of aid on growth in a good policy environment is likely positive.

Our statistical results indicate that the FDI per capita and ODA are significantly related to the poverty in Asia.

On the other hand it was not conclusive if the reduction of the debt burden will help LDCs and developing countries in reducing poverty. It is noted that poverty reduction and debt burden are less likely related in all models. Our results were not conclusive whether ODA will bring positive impact on poverty reduction in Sub-Sahara Africa.

Investment climate including domestic and foreign is central to growth and poverty reduction (World Bank (2005)). A good investment climate may enhance the lives of people as employees, entrepreneurs, and consumers in Asia. FDI and other sources of financial flow will help in mitigating poverty in Asia. Governments must influence the investment climate through the impact of their policies and behavior on the costs, risks, and barriers to competition facing firms. However, FDI did not show any clear relationship with poverty reduction in empirical analyses in Sub-Sahara Africa. Other flows including remittances of overseas workers may have a potential for productive use leading to the poverty reduction.

The relationship between trade and poverty reduction was not conclusive. The data on market access from supply side are generally unavailable in developing economies. As an alternative, TBT and PSP conformity costs, for example, could be utilized as the explanatory variables.

We found that Asia and Sub-Sahara Africa are statistically different. Thus we might conclude that such a difference is likely to be resulted from differences in the basic economic structures such as socio-economic background inherited from two continents.

Finally, rigorous statistical analyses are important in understanding the economic structures. In particular, the significance of the level of ODA and FDI is found very robust in poverty reduction in Asia, while Sub-Sahara

Africa is less likely utilizing such flows to reduce poverty. Such a strong statement is only possible with certain statistical evidence. Of course the present study might not be satisfactory in the sense that the statistical observations are associated with a lot of missing observations. As economic statistics are an indispensable resource for every development plans, it is hoped that we can conduct more extensive studies in the near future, when the expanded data set sufficient for the panel analyses becomes available.

Notes

- 1) MDG seminar in Bangladesh 2004
- 2) The endogenous variable can be discrete. In fact, the probit or logit models have been developed in conjunction with the discrete choice problems. The number of events (or alternatives) can exceed two. In such cases, the applicable models are called either multinomial probit or multinomial logit models.
- 3) It must be noted that if p_i is positively related to the utility, we will have
$$p_i = 1/(1 + \exp(-U_i)).$$
- 4) From ICT's web pages, 2004.
- 5) The Monterrey consensus has confirmed the partnership on global development. In order to halve the poverty, it approached financing development with trade, debt, ODA, FDI and technical cooperation.

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Table 1: List of variables considered in the study

USID ¹ : Poverty ratio less than 1993 US \$1	CA: Current account balance (BoP, current US\$)
POV: Poverty headcount ratio at \$1.25 a day (PPP) (% of population)	FDI ³ : Foreign direct investment, net (BoP, current US\$)
NAHC ¹ : Poverty headcount, national (% of population)	ODA ³ : External debt stocks (% of GNI)
GINI: GINI index	DODA: ODA increase = (ODA-ODA ₋₁)/ ODA ₋₁
POP ⁴ : Population, total	AIDG: Aid (% of GNI)
UPOP: Urban population (% of total)	DEBT ³ : External debt, total (DOD, current US\$)
FLF: Labor force, female (% of total labor force)	GDEB: Total debt service (% of GNI)
TLF: Labor force, total	EXDEB: Total debt service (% of exports of goods and services)
UNEM: Unemployment, total (% of total labor force)	AGRV: Agriculture, value added (current US\$)
YUNEM: Unemployment, youth total (% of total labor force ages 15-24)	AGRR: Agriculture, value added (% of GDP)
FERT: Fertility rate, total (births per woman)	AEXP ² : Agricultural raw materials exports (% of merchandise exports)
NENR: School enrollment, primary (% net)	FEXP: Food exports (% of merchandise exports)
SCH: School enrollment, primary (% net)	FA: Forest area (% of land area)
LITE ² : Illiteracy rate, youth total (% of people ages 15-24)	EGDP: energy use per GDP (PPP \$ per kg of oil equivalent)
G2B: Ratio of girls to boys in primary and secondary education (%)	WATER: Improved water source (% of population with access)
PCY: GDP per capita (constant 2000 US\$)	SANI: Improved sanitation facilities (% of population with access)
EXP: Exports of goods and services (% of GDP)	TELE: Telephone mainlines (per 1,000 people)
IMP: Imports of goods and services (BoP, current US\$)	

Notes:

1. Employed as the LHS variables;
2. Employed as the RHS variables;
3. Used as the RHS variables in modified forms; and
4. Used to calculate the per capita variables.

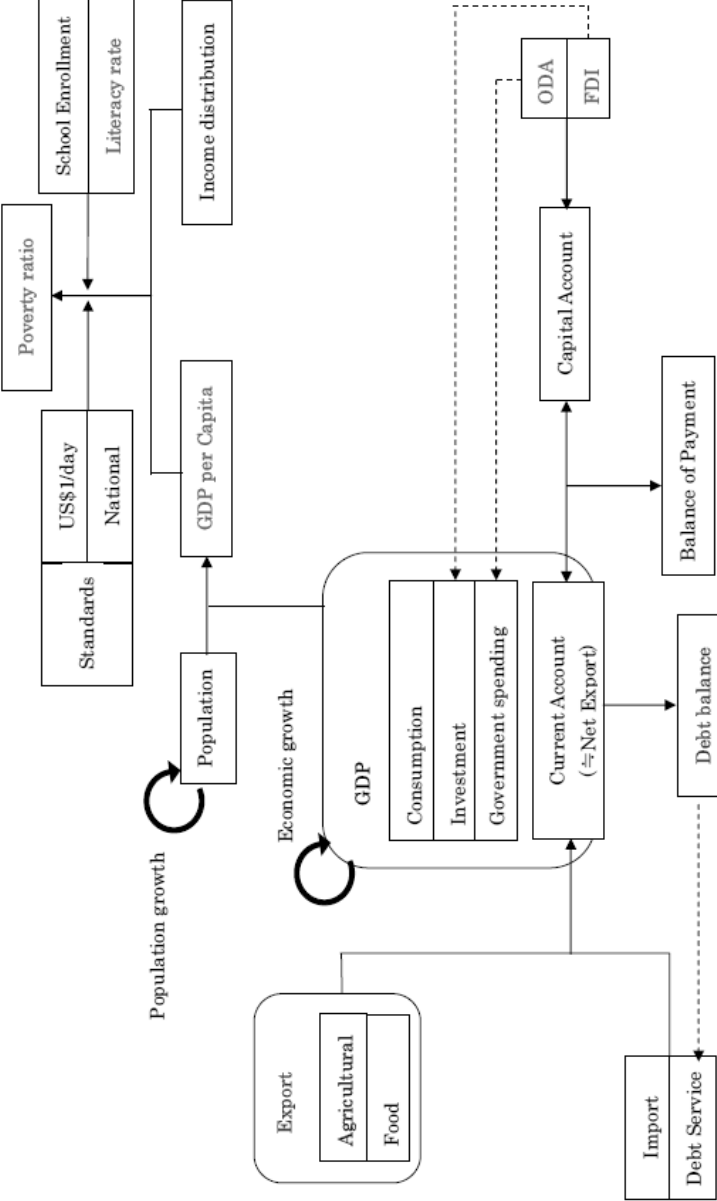


Figure 1. Economic indicators relevant to poverty ratio.