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A SIMULTANEOUS STUDY OF POVERTY RATE , CHILD LABOR AND DROPOUT RATE IN INDONESIA

Kusumapuri, I Made Sumertajaya, Farit M Afendi
Statistics Department, Bogor Agricultural University

Abstract

Poverty is a major cause of child labor and dropout case. Poor families usually encourage their children to work looking for additional income as a way to survive. Based on previous research there is a causal relationship of poverty rate, number of child labor and dropout rate. Characteristics of poverty rate, child labor and dropout rate can be assessed from the demographic characteristics and socioeconomic characteristics are interrelated.

This study aims to model the interdependent relationship of poverty rate, child labor and dropout rate in Indonesia and factors that influence them. One appropriate method is used to model the interdependent relationship of these three variables is the simultaneous equation models. From the results of the identification of the model equations were used the method Three Stage Least Square (3SLS) with 3 equations. The number of variables is 11 pieces consist of 3 endogenous variables and 8 predetermined variables.

The result showed that child labor in Indonesia is influenced significantly by poverty rate, dropout rate, and percentage of household heads who worked in agriculture. Poverty rate in Indonesia is influenced significantly number of child labor, dropout rate, and percentage of household heads who worked in agriculture. While dropout rate is influenced significantly by number of child labor, percentage of household with members more than six, percentage of household heads who did not complete primary school and percentage of household head who completed basic education. R-square of system is about 66.28%, meaning that total diversity of poverty rate, number of child labor and dropout rate in Indonesia in 2013 which can be explained by the explanatory variables in the system about 66.28%.

Keywords: 3 bhaSLS, simultaneous equation models, poverty, child labor, dropout.

INTRODUCTION

Poverty is a multidimensional phenomenon which means it can be analyzed from various dimensions , such as the economic, social , political and cultural . The first objective of the Millennium Development Goals (MDGs) in 2015 is to tackle poverty in which one of the main targets is to reduce the national poverty rate of 15.1 % in 1990 to 7.5 % in 2015. The percentage of poor people in Indonesia over the last 4 years showed a downward trend . In 2010 the number of poor people in Indonesia as much as 31.02 million or 13.33 % of the total population of Indonesia . While in 2013 the number of poor people in Indonesia to 28.60 million (11.46 %) . Although the poverty rate in Indonesia has shown a downward trend , but have not been able to achieve the first MDG goal is to lower the poverty rate to 7.5 % .

Poverty is a major cause of child labor and dropout rate. Characteristics of poverty rate, child labor and dropout rate can be assessed from the demographic characteristics and socioeconomic characteristics. Research on the relationship between household poverty and child labor have been done Akarro and Mtweve (2011) using Chi-Square statistical analysis . The results showed that household poverty is a major factor that encourages children to engage in economic activity . Poverty positive effect on child labor . Darusasi and Pitoyo (2013)

conducted an analysis of SUSENAS KOR in 2010 to examine the demographic and socioeconomic characteristics of household child labor .

The phenomenon of poverty rate, number of child labor and dropout rate are interrelated. They have an interdependent relationship. The high number of child labor rates can lead to increasing levels of poverty in the region. Aprilia (2014) conducted a study to find a causal relationship between the number of child labor, poverty, fertility and dropout rates by using Granger causality test. The study concluded that the number of child labor has a reciprocal relationship with poverty, fertility, and dropout rates. The relationship of these variables is a positive relationship, meaning that the higher of poverty rate, fertility, and dropout rates led to the high number of child labor, and vice versa.

The model most frequently encountered in many cases is usually a single equation model (single equation models). Single equation model is a model in which there is only one dependent variable Y and one or more independent variables X. The relationship of cause and effect that occurs in the model take place in one direction, namely from X to Y. However, sometimes in several models often are interdependent or interdependence among variables, where not only the variables X that could affect the variables Y, but also variable Y can affect the variables X that occur in the model two-way relationship. The model as it is called by the simultaneous equations model or system of simultaneous equations.

In a simultaneous equations model the dependent variable (Y) in an equation could be the explanatory variables (X) for the other equations. So use Ordinary Least Square (OLS) in the estimation of parameters in the context of simultaneous equations is not appropriate, because there is a correlation between the explanatory variables (X_t) with error stokastiknya (ε_t) so assuming Cov (X_t, ε_t) = 0 can not be met. If forced to use the OLS method will produce biased estimates of the parameters and inconsistent (Vogelvang 2005). Several methods of estimation can be done to overcome the problems of this OLS, one of system approach is through the method of Three Stage Least Square (3SLS). Therefore this study will use Three Stage Least Square (3SLS) method in the model of simultaneous estimation of poverty rate, number of child labor and dropout rate in Indonesia in 2013.

Based on the background described previously, the issues discussed in this research is to know the interrelated relationship of poverty rate, number of child labor and dropout rate in Indonesia. While the purpose of this study is to model a simultaneous equation of poverty rate, number of child labor and dropout rate in Indonesia in 2013. The benefits of this research is enrich the knowledge of interrelated relationship of poverty rate, number of child labor and dropout rate in Indonesia in 2013 by three stage least square approach.

RESEARCH METHOD
Method and Material

Data used in this research is the data generated from National Socioeconomic Survey (SUSENAS) and Labor Force Survey (SAKERNAS) obtained Statistics-Indonesia in 2013. In this study , there are two types of variables. They are predetermined variables and endogenous variables. These are the endogenous variables used in this study :

No	Variables Name	Type	Source
1	Poverty Rate (POV)	Numeric	Statistics-Indonesia
2	Percentage of Child Labor (CHILDLAB)	Numeric	Statistics-Indonesia
3	Dropout Rate (APTS)	Numeric	Statistics-Indonesia

The predetermined variables used in this study are differentiated by demograhic characteristic and socioeconomic characteristic as follows :

No	Variables Name	Type	Source
Demographic Characteristic			
1	Percentage of household whoose member greater than six (ART6)	Numeric	Statistics-Indonesia
Socioeconomic Characteristic			
1	Percentage of household heads who did not completed primary school (KRTP)	Numeric	Statistics-Indonesia
2	Percentage of household heads who completed primary school and junior high school (KRTDSR)	Numeric	Statistics-Indonesia
3	Percentage of household heads who does not work (KRTTB)	Numeric	Statistics-Indonesia
4	Percentage of household heads who worked in agriculture (KRTPERT)	Numeric	Statistics-Indonesia
5	Unemployment Rate (TPT)	Numeric	Statistics-Indonesia
6	Economic Growth (PE)	Numeric	Statistics-Indonesia
7	Human Development Index (IPM)	Numeric	Statistics-Indonesia

Some of the tools used in this study, namely SAS 9.2 and Minitab 16.

Methodology

Simultaneous Equation Model

Simultaneous equation models consist of structural equation and reduced form equation. Structural equation is a model equation formed from the underlying economic theory or result of the previous researches. Structral equation form of the model of simultaneous equations can be written as:

$$
\begin{aligned}
&\gamma_{11}Y_{1i} + \gamma_{12}Y_{2i} + \cdots + \gamma_{1G}Y_{Gi} + \beta_{11}X_{1i} + \beta_{12}X_{2i} + \cdots + \beta_{1K}X_{Ki} = \in_{1i} \\
&\gamma_{21}Y_{1i} + \gamma_{22}Y_{2i} + \cdots + \gamma_{2G}Y_{Gi} + \beta_{21}X_{1i} + \beta_{22}X_{2i} + \cdots + \beta_{2K}X_{Ki} = \in_{2i} \\
&\vdots \\
&\gamma_{G1}Y_{1i} + \gamma_{G2}Y_{2i} + \cdots + \gamma_{GG}Y_{Gi} + \beta_{G1}X_{1i} + \beta_{G2}X_{2i} + \cdots + \beta_{GK}X_{Ki} = \in_{Gi}
\end{aligned}
\tag{1}
$$

where
$Y_1, Y_2, \ldots, Y_G = endogenous\ variables$
$X_1, X_2, \ldots, X_K = predetermined\ variables$
$\in_1, \in_2, \ldots, \in_G = structural\ disturbances$
$i = 1, 2, \ldots, n = number\ of\ observation$

$\gamma_{11}, \gamma_{12}, \dots, \gamma_{GG} = endogenous\ coefficient$
$\beta_{11}, \beta_{12}, \dots, \beta_{GK} = predetermined\ coefficient$

Since model (1) is complete, it may be generally solved for endogenous variables. The solution is called reduced-form model and it is written as:

$$Y_{1t} = \pi_{11}X_{1t} + \pi_{12}X_{1t} + \cdots + \pi_{1K}X_{Kt} + v_{1t}$$
$$Y_{2t} = \pi_{21}X_{1t} + \pi_{22}X_{2t} + \cdots + \pi_{2K}X_{Kt} + v_{2t} \qquad (2)$$
$$\vdots$$
$$Y_{Gt} = \pi_{G1}X_{1t} + \pi_{G2}X_{2t} + \cdots + \pi_{GK}X_{Kt} + v_{Gt}$$

where π's are reduced form coefficient, and $v's$ are reduce form disturbances. The reduce form coefficient show the effects on the equilibrium values of the endogenous variables from a change in the corresponding exogenous variables after all feedbacks are taken place.

To examine interdependent relationship between poverty rate, number of child labor and dropout rate in Indonesia used simultaneous equation models. There are three structural equations used in this study. Structural equation of each endogenous formulated as follows:

$$CHILDLAB = \beta_{10} + \gamma_{12}APTS + \gamma_{13}POV + \beta_{11}KRTTB + \beta_{12}KRTPERT \qquad (3)$$

$$APTS = \beta_{20} + \gamma_{21}CHILDLAB + \gamma_{23}POV + \beta_{23}ART6 + \beta_{24}KRTPR + \beta_{25}KRTDSR \qquad (4)$$

$$POV = \beta_{30} + \gamma_{31}CHILDLAB + \gamma_{32}APTS + \beta_{32}KRTPERT + \beta_{36}PE + \beta_{37}IPM \qquad (5)$$

In a system of simultaneous equations consist of G endogenous variables in the whole equation, g endogenous variables in an equation, K exogenous variables in the overall equation and k exogenous variables in an equation. In a group of simultaneous equations G, called the identified if the number of exogenous variables that are not included in the equation should not be smaller than the number of endogenous variables are included in the equation minus 1 (Seddighi, Lawler, & Katos, 2000).

From structural model formulated in (3), (4) and (5) were known that the number of endogenous variables as 3 and predetermined variables as much as 7. Total of variables included in the model are 10.

Structural Equation	K	k	g	K-k > g-1	Identification Result
CHILDLAB	8	2	3	Yes	*Overidentified*
APTS	8	3	3	Yes	*Overidentified*
POV	8	4	3	Yes	*Overidentified*

Based on the order condition, all structural equation is overidentified. Then do the rank criteria condition and the results of all the equations can be identified.

Three-Stage Least Squares (3SLS) Method

This method use Generalized Least Squares (GLS) technique to all structural equations estimated by two-stage least squares method. There are three steps in the 3SLS method:
1. Regress all variables endogenous on all the exogenous variables of the model and keep their prediction
2. Substitute the prediction of the endogenous variables found in step 1 in place of the corresponding endogenous variables on the right hand side of each equation and apply Ordinary Least Square (OLS). Then having estimated consistent 2SLS estimator which according to the following:

$$d_{SLS} = (\hat{Z}'\hat{Z})^{-1}\hat{Z}'Y \qquad (6)$$

Where $\hat{Z}_i = [\hat{Y}_i X_i]$

3. Use the results obtained in steps 1 and 2 and use the GLS estimators to obtain 3sls estimator.
GLS estimator which is:

$$d_{GLS} = \left(\hat{Z}'\Omega^{-1}\hat{Z}\right)^{-1}\hat{Z}'\Omega^{-1}Y \tag{7}$$

Where matrix $\Omega = E(\eta\,\eta')$ is an estimate of the variance-covariance matrix of the disturbances. However knowing the 2SLS consistent estimator in (6), we use it in order to compute a consistent estimate W of Ω as follows:

$$W = \begin{bmatrix} w_{11}I_n & w_{12}I_n & \cdots & w_{1G}I_n \\ w_{21}I_n & w_{22}I_n & \cdots & w_{2G}I_n \\ \vdots & \vdots & \ddots & \vdots \\ w_{G1}I_n & w_{G2}I_n & \cdots & w_{GG}I_n \end{bmatrix}$$

where

$$w_{ij} = \frac{1}{n-g_i+1-k_i}(Y_i - Z_i d_{i,2SLS})'(Y_i - Z_i d_{i,2SLS}) \tag{8}$$

for i,j=1,2,…,G and $g_i + k_i \geq g_j + k_j$

By substituting (8) into (7) we obtain the 3SLS estimator which is:

$$d_{3SLS} = \left(\hat{Z}'W^{-1}\hat{Z}\right)^{-1}\hat{Z}'W^{-1}Y \tag{9}$$

With var-cov $(d_{3SLS}) = \left(\hat{Z}'W^{-1}\hat{Z}\right)^{-1}$ (10)

RESULT AND DISCUSSION

Table 1 Coefficient, Standard Error, P-value and *VIF of variables affected Child Labor*

Predictor	Coef	SE Coef	T	P	VIF
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Intercept	1.133	1.133	0.85	0.4025	
POV	0.151	0.067	2.28	0.0305	1.519
APTS	1.158	0.348	3.33	0.0025	1.378
KRTTB	-0.044	0.049	-0.90	0.3747	1.317
KRTPERT	-0.075	0.022	-3.41	0.0020	2.226
KS=0.098 (p-value > 0.150)					

$$CHILDLAB = 1.133 + 0.151\,POV + 1.158\,APTS - 0.044\,KRTTB - 0,075\,KRTPERT$$

Having obtained the model, first tested the assumptions of the model are obtained including normality test, homoscedasticity test, and multicollinearity test. From Table 1 shows that the assumption of normality using the Kolmogorov-Smirnov statistic is met. VIF value is less than 5 indicates no multicollinearity. Based on Glesjer Test showed that there was no heteroscedasticity.

From table 1, child labor in Indonesia is influenced significantly (at alpha 10%) by poverty rate, dropout rate, and household heads who worked in agriculture. Poverty rate and dropout rate have positive influence on the number of child labor. If poverty rate increase 1% then the number of child labor will increase 0.151%. When dropout rate increase 1% then the

number of child labor will increase 0.158%. While household heads who worked in agriculture has negative influence on the number of child laborers. When percentage of household heads who worked in agriculture increase 1% then it will decrease the number of child labor 0.075%. Household head who does not work do not have a significant effect on the number of child labor in Indonesia in 2013.

Table 2 Coefficient, Standard Error, P-value and *VIF of variables affected Dropout Rate*

Predictor	Coef	SE Coef	T	P	VIF
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Intercept	-4.336	1.907	-2.27	0.0311	
POV	-0.117	0.074	-1.59	0.1238	1.383
CHILDLAB	0.967	0.236	4.10	0.0003	1.216
ART6	0.051	0.028	1.81	0.0816	1.081
KRTPR	0.063	0.028	2.24	0.0335	1.374
KRTDSR	0.081	0.030	2.67	0.0127	1.170
KS=0.102 (p-value > 0.150)					

$$APTS = -4.336 - 0.117\ POV + 0.967\ CHILDLAB + 0.051\ ART6 + 0.063\ KRTPR + 0.081\ KRTDSR$$

From Table 2 shows that all classic assumption of regression are met. Based on normality test using the Kolmogorov-Smirnov statistic shows that p-value > 0.150, it indicates normality assumption is met. VIF value is less than 5 indicates no multicollinearity. Based on Glesjer Test showed that there was no heteroscedasticity.

From table 2, dropout rate in Indonesia is influenced significantly (at alpha 10%) by number of child labor, percentage of household with members more than six, percentage of household heads who did not complete primary school and percentage of household head who completed basic education. The number of child labor, percentage of household with members more than six, percentage of household heads who did not complete primary school and percentage of household head who completed basic education have positive influence in dropout rate. If number of child labor increase 1% then dropout rate will increase 0.967%. When percentage of household with members more than six increase 1% then dropout rate will increase 0.051%. When percentage of household heads who did not complete primary school increase 1% then dropout rate will increase 0.063%. When percentage of household head who completed basic education increase 1% then dropout rate will increase 0.081%. While poverty rate has negative influence in dropout rate. When poverty rate increase 1% then dropout rate will decrease 0.117%.

Table 3 *Coefficient*, *Standard Error*, *P-value and* VIF of variables affected Poverty Rate

Predictor	Coef	SE Coef	T	P	VIF
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Intercept	-0.831	40.272	-0.02	0.9837	
CHILDLAB	4.898	2.628	1.86	0.0737	1.950
APTS	-5.062	1.913	-2.65	0.0136	1.508
KRTPERT	0.420	0.105	3.99	0.0005	2.011
TPT	0.580	0.791	0.73	0.4698	1.749
PE	0.123	0.765	0.16	0.8738	1.746
IPM	-0.092	0.449	-0.21	0.8392	1.926
KS=0.127 (p-value > 0.150)					

$$POV = -0.831 + 4.898\,CHILDLAB - 5.062\,APTS + 0.420\,KRTPERT + 0.580\,TPT \\ + 0.123\,PE - 0.092\,IPM$$

From Table 3 shows that all classic assumption of regression are met. Based on normality test using the Kolmogorov-Smirnov statistic shows that p-value > 0.150, it indicates normality assumption is met.VIF value is less than 5 indicates no multicollinearity. Based on Glesjer Test showed that there was no heteroscedasticity.

From table 3, poverty rate in Indonesia is influenced significantly(at 10%) by number of child labor, dropout rate, and percentage of household heads who worked in agriculture. Number of child labor, percentage of household heads who worked in agriculture have positive influence in dropout rate.When number of child labor increase 1% then poverty rate will increase 4.898%. When percentage of household heads who worked in agriculture increase 1% then poverty rate will increase 0.420%. While dropout rate has negative influence in poverty rate. When dropout rate increase 1% then poverty rate will decrease 5.062%. Unemployment rate, economic growth and human development index do not have significant influence on poverty rate.

R-square that generated by the system is about 0.6628. It means that total of diversity of poverty rate, number of child labor and dropout rate in Indonesia in 2013 which can be explained by the explanatory variables in the system about 66.28%. It is about 33.72% that influenced by other factors out of system.

CONCLUSION AND SUGGESTION

From this research we can conclude several things:
1. Child labor in Indonesia is influenced significantly by poverty rate, dropout rate, and household heads who worked in agriculture. Poverty rate and dropout rate have positive influence on the number of child labor. While household heads who worked in agriculture has negative influence on the number of child laborers.
2. Dropout rate in Indonesia is influenced significantly by number of child labor, percentage of household with members more than six, percentage of household heads who did not complete primary school and percentage of household head who completed basic education. The number of child labor, percentage of household with members more than six, percentage of household heads who did not complete primary school and percentage of household head who completed basic education have positive influence in dropout rate.
3. Poverty rate in Indonesia is influenced significantly by number of child labor, dropout rate, and percentage of household heads who worked in agriculture. Number of child labor, percentage of household heads who worked in agriculture have positive influence in dropout rate. While dropout rate has negative influence in poverty rate.

Suggestion for further research:
1. It is necessary to add more endogenous or exogenous variables that influence poverty rate, number of child labor and dropout rate in indonesia.
2. Need to be done a study of the structure changes of poverty, number of child labor and dropout rate in Indonesia between 2013 with a few years back.

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