

Geography, Technology and Institutions in Poverty Reduction in Surakarta Residency: A Data Panel Approach at Village Level

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Abstract: This study attempts to analyze influence of geography, institution and technology dimensions of poverty problem. Geography variable deputized by rural distance to district, technology variable is proxy with amount of electric customers, while institution variable is deputized by to the number of rural small industry and cooperative bodies. This Research used the Panel Data Analysis. The data used were taken from Podes from BPS in 2003, 2006, 2009, 2011, and 2014. The data used in this study were 1565 villages throughout the Surakarta Residency covering eight districts of Surakarta, Boyolali, Sukoharjo, Karanganyar, Wonogiri, Sragen, and Klaten. The results of this study indicate that geography, technology, and institutions affect poverty alleviation in the region.

Keywords: *poverty, geography, institution and technology*

INTRODUCTION

Some contemporary studies of poverty such as Mc. Arthur and Sachs (2001) and Sachs et.al (2002) emphasized the importance of geographical approaches in the poverty reduction program. According to them, geographical position is crucial to the development of progress or decline of a society. The geographical approach, for example, is a phenomenon which shows that most of the poorest countries are in the tropics stretching from mainland Africa, Asia, to Latin America. Poverty in this region causes no development of technology and development. Instead the developed nations are mostly in four seasons such as the United States, Canada, Western Europe, Russia, Japan and China. Progress in the region is driving technological development and development that can minimize poverty. This phenomenon leads to the conclusion that the problem of geography is an important factor in influencing the progress and poverty of a nation.

Studies in several other areas also point to the importance of geographic factors in mapping poverty issues. The Bloom and Sachs (1998) study outlines the links between geography, demography and economic growth in Africa. Which concludes that geographical factors cause demographic problems that drive poverty in Africa. Meanwhile, the study of Demuger et al (1999) in China also found the same thing, that is, geographic problems caused a regional economic gap which in turn encouraged poverty. A similar study was conducted by Sachs et al (2002) in understanding Indian economic growth, which found that the geographical problems causing poverty are difficult to overcome.

What about poverty studies based on geographical aspects in Indonesia? Some studies of poverty in Indonesia that find the main factors affecting poverty still focus on aspects of income, gap index or gini ratio. So far, poverty studies still ignore the geographical dimension of poverty based on geographic and institutional issues in Indonesia? The main problem lies in the availability of comprehensive data covering geographic, institutional, and infrastructure issues that can describe comprehensively the poverty problem in the region. Even so, the opportunity to conduct studies with data that has been relatively adequate can be done by using data Potensi Desa (Podes) in the survey every 3 years since the early 1990s. Based on the above background here can be formulated the question of this study: the extent to which geographic factors and rural institutions in Surakarta Residency affect poverty?

LITERATURE REVIEW

Poverty Studies

What is poverty? Poverty is a matter of deprivation or problematic lack. Poverty is something of a deficient person or family (Sen and Foster, 1997). From the definition of poverty can be divided into two namely absolute and relative. Absolute poverty is defined as the inability to achieve the minimum standard of life. Understanding the needs of the minimum standards vary by country. Relative poverty on the other hand is defined as the inability to meet the standards of contemporary needs, which are associated with the average welfare or average societal income at the time. In the United States in 1965, for example, people were considered poor if their income was 1.5 of the average income. Similarly in developing countries, the poor are grouped 20 percent of low-income communities in the distribution of national income (Schiller 1998: Pernia and Quibra, 1999: 1869).

There are at least three schools of thought in defining poverty. First, the welfarist school who sees that poverty is a society situation that can not find a certain level of welfare. This understanding is embraced by mainstream economists where the solution is through increased economic growth that will automatically reduce poverty levels. Secondly, the basic need school view holds that the poor are due to inability to meet their basic needs. According to this view the right solution is the state providing assistance to the fulfillment of basic needs such as education, health, and infrastructure and facilities. Third, the capability school view that the problem of poverty because of lack of capabilities owned by the poor, so it could not compete in the labor market. Thus, the step to overcome poverty in this view is to encourage increased community capability (Asselin and Dauphin, 2001; Daly and Fane, 2002; Ravallion, 2005; Coudouel, et al., 2006).

In addition, in developing poverty reduction strategies geographical approach. This approach states that the problem of poverty is closely related to geographical issues (Sach, et al, 2002). According to Mc Arthur and Sachs (2001: 14) there are four transmission patterns of geographic and institutional approaches in influencing development. First, the geography will have an effect on the institutional, while the institutional will influence development. Second, the geography to influence technology, while technology affects institutional and ultimately impacts development. Third, The geography approach is divided into two lines. The first path is geography - technology - development, while the second line, geography and technology influence the institutions that affect development. Fourth, the main process is the same as third above, but at the end of the line, development will affect technology and so on.

In addition, there are causes of poverty in rural and urban areas. Rural poverty is comprised of (i) limited access to land and irrigation facilities; (ii) the slow pace of adaptation to modern technology; (iii) too much of a burden; (iv) limited human capital; (v) concentrated in the periphery; (vi) concentrated on ethnic minorities (Pernia and Quibra, 1999: 1882). Urban poverty consists of (i) having limited access to resources and services; (ii) the limitations of qualified human resources; (iii) too much of a burden; (iv) low wages earned; (v) the number of unorganized small enterprises (vi) the number of unstable groups (Pernia and Quibra, 1999: 1887).

The Previous Studies

There have been many studies on poverty in Indonesia over a considerable period of time. In the first generation that is the period of the 1970s there are studies of poverty is quite monumental of which is Singarimbun and Penny (1976) who raised the case in Yogyakarta Special Region (DIY) that is Sriharjo Village. This study has succeeded in building an awareness of the problem of poverty in rural areas with complex dimensions of economic,

social and demographic. A more general and conceptual study of poverty was written by Sajogyo (1978) in the very famous Prisma magazine. In that paper Sajogyo proposed the criteria of poverty in Indonesia by using the approach of per capita rice equivalent consumption level. For rural areas, if one consumes only a rice equivalent of less than 240kg / person / year and for urban areas of less than 360kg / person / year, then the concerned is classified as very poor. Esmara (1986) also proposed that poverty line determination be based on the amount of expenditure to meet the basic needs per capita for a year. What is meant by basic needs is the need for basic goods such as rice, cassava, meat, vegetables, housing, education, and health.

Meanwhile, in the 1980s, there were studies by Arief (1978) and Arief and Sasono (1981) who saw poverty as a result of phery-pherial constraints facing major states that practice neo colonialism. This book attempts to apply the dependent thesis as applied to scientists in Latin America such as Andre Gunder Frank and Samir Amin, for the case of Indonesia. The work of Arief and Sasono (1981) suggests an endemic view of dependent thesis which sometimes leads to new left views among intellectuals and critical students in Indonesia. The general criticism of this new left view is very good as an analysis, but very weak in providing alternative solutions. This is the focal point of Sjahrir (1986) - one of the socialist activists - to seek other approaches beyond the thesis of dependence by offering basic needs. In his book, Sjahrir argued that with the basic needs approach, at least there are solutions to overcome the problem of poverty by taking the case in Indonesia, namely the agricultural credit program (Bimas / Inmas), education (SD Inpres), health (Puskesmas). Another fairly comprehensive study of inequality and poverty for each province in Indonesia is edited by Hal Hill (1989). This book can be considered as a portrait of "inequality" in every province in Indonesia.

The next phase of poverty studies took place in the 1990s, an era where poverty reduction programs were more focused, especially with more foreign aid. Sumodingirat (1990) analyzed several poverty reduction programs such as Presidential Instruction (Inpres) Program, Regional Development Program (PPW), Integrated Areas Development Program (PPWT Swadana), Integrated Area Development Program (PKT). In general this study concludes that these programs have succeeded in reducing poverty. Similarly, the writings of Kartasasmita, (1997) also highlighted the success of the anti-poverty program that the government had implemented in the 1990s. Other anti-poverty programs of this era are also conducted by foreign observers between Akita and Szeto (2000), Booth (2000). This paper evaluates the Underdeveloped Village Inpres Program (IDT) implemented in 1994 -1996, with the findings that this program has a positive effect on the increase of regional income. The most abundant study of poverty occurred precisely in the aftermath of the 1997 economic crisis. Studies in this era have a very diverse focus. However, most of these studies are still struggling with poverty calculation problems such as those employing descriptive approaches in times of crisis, such as Pradhan et al. (2000); Alatas, et. al (2003); Octaviani, (2003); Alisjahbana and Yusuf (2003); Balisacan et, al (2003); Timmer (2004); Sumarto, et. al (2004); and Suryadarma, et.al (2005, 2006). Several studies focusing on the evaluation of poverty programs have been undertaken by Mubyarto (2000) focusing on the evaluation of the Social Safety Net (JPS). Hastuti (2006) specifically evaluated the BLT / SLT program. Study of Hakim et. al (2005) and Sumadi et.al (2005) are limited to economically descriptive discussions of poverty programs, but do not lead to the preparation of program evaluation models.

RESEARCH METHODOLOGY

Panel data refers to pooling observation for N a cross section (e.g. countries, households, firms, individuals, etc.) over several T time periods (e.g. annually, quarterly, monthly, etc.).

According to Baltagi (2003) explore several benefits of panel data. First, panel data can be controlling for individual heterogeneity usually panel data suggest that individuals, firms, states or countries are heterogeneous. Time-series and cross-section studies no controlling for this heterogeneity run the risk of obtaining biased result. Second, panel data give more informative data, more variability, less collinearity among the variables, more degree of freedom and more efficiency. Time series studies are plagued with multicollinearity. Third, panel data are better able to study the dynamics of adjustment. Cross sectional distribution that look relatively stable hide a multitude of change. Spells of unemployment, job turnover, residential and income mobility are better studied with panels. Panel data are also well suited to study the duration of economic states like unemployment and poverty, and if these panels are long enough. Fourth, panel data are better able to identify and measure affects that are simply not detectable in pure cross-section or pure time series data. Fifth, panel data models allow us to construct and test more complicated behavioral models than purely cross-section or time data. Sixth, panel data are usually gathered on micro units, like individual, firms and households. Many variables can be more accurately measured at the micro level, and biases resulting from aggregation over firms or individuals are eliminated.

Meanwhile, according to Baltagi (2003) exhibits several limitations of panel data method. First, design and data collection problems include problems of coverage (incomplete account of the population of interest), non response (due to lack of cooperation of the respondent or because of interviewer error), recall (respondent not remembering correctly), frequency of interviewing, interview spacing, reference period, the use of bounding and time in sample bias. Second, short time series dimension problem because typical panels involve annual data covering a short span of time for each individual. This means that asymptotic argument rely crucially on the number of individual tending to infinity. Increasing the time span of the panel is not without cost either. In fact, this increase the chances of attrition and increases the computational difficulty for limited dependent variable panel data model.

The basic framework of the panel data is a regression model of the form

$$Y_{it} = \alpha_i + \beta X_{it} + u_{it} \quad (1)$$

Where the variables Y and X have both *i* and *t* subscripts for *i* = 1,2,..., *N* sections and *t* = 1,2,..., *T* time periods. The data set is called *balanced* if nest data both across section and across time is full. Otherwise, when observations are missing for the time periods of some of the cross sectional units then the panel is called *unbalanced*. In the static model consist of a common constant, fixed effect and random effect, the following will explain one by one (Asteriou & Hall, 2007):

The common constants method

The common constants method also called the pooled OLS method as in equation 1. The assumption of the model are no differences among the data matrices of the cross sectional dimension (*N*). In others words the model estimates a common constant *a* for all cross sections or commons constant for countries.

Practically, this method implies that there are no differences between the estimated cross section and it is useful under the hypothesis that the data set is a priori homogeneous. However, this case is quite restrictive and case of more interests involving the inclusion of fixed and random effects in the method of estimation.

The Fixed Effects Method

The fixed effects method, the constant is treated as group or section specific. This means that the models allows for different constants for each group. The effects estimator is also known a the least squares dummy variables (LSDV) estimator because in order to allow for different constants for each group, it includes a dummy variable for each group. To understanding this better consider the following model:

$$Y_{it} = a_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + u_{it} \quad (2)$$

which can be written in a matrix notation as:

$$Y = D_\alpha + X\beta' + u \quad (3)$$

Where the dummy variable (D) is the one that allow us to take different group-specific estimates for each of the constants for every different section. The standard F-test can be used to check fixed effect against the simple common constants OLS method.

The Random Effect Method

The random effect method is an alternative method of estimating a panel data model. The difference between the fixed effect and the random effects method is that the latter handles the contains for each section not as fixed, but as random parameters. Hence the variability of the constant for each section comes from the fact that:

$$a_i = a + v_i \quad (4)$$

Where v_i is zero mean standard random variable. The random effect model takes the following form:

$$Y_{it} = (a + v_i) + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + u_{it} \quad (5)$$

$$Y_{it} = a + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + (v_i + u_{it}) \quad (6)$$

In general, the difference between the two possible ways of testing panel data models is this the fixed effect model assume that each country differs in its intercept term, whereas the random effect assume that each country differs in its error term. Usually, when the panel is balanced or contains all existing cross sectional data, one might expect that the fixed effects model will work best. In other case, where the sample contains limited observations of the existing cross sectional units, the random effect model might be more appropriate. In the random effect model used to the Breusch-Pagan test is the counterpart to the F-test.

In making a choice between the fixed effect and random effect approaches used to the Hausman tests. This test investigates whether random effect estimation could be almost good. Thus we actually test H_0 , that random effects are consistent and efficient, versus H_1 that random effects are inconsistent, as the fixed effect will be consistent. A large value of the Hausman statistic, so we reject the null hypothesis that the random effect

Model

This research used the panel data analysis. In general, the standard model used in this studies above is to follow the model developed by Baltagi (2003) are as follows:

$$Y_{it} = a_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + u_{it} \quad (7)$$

Where Y_{it} is the number of poor people, X_{1t} is village distance to district X_{2t} is number of electric customers, X_{3t} is number of small businesses, and X_{4t} is number of cooperatives.

The data used were taken from Podes from BPS in 2003, 2006, 2009, 2011, and 2014. The data used in this study were 1565 villages throughout the Surakarta Residency covering eight districts of Surakarta, Boyolali, Sukoharjo, Karanganyar, Wonogiri, Sragen, and Klaten.

RESEARCH RESULT

The regression result of model is presented in table 1. We compared three (3) model consist of OLS model, fixed effect model and random effect model. Base on the Hausman test, fixed effect model is efficient, so the model could used to the main analysis of this study.

Table 1. The Result of Research

Dependent variable number of poor people

VARIABLES	(1) OLS Model	(2) Fixed Effect Model	(3) Random Effect Model
village distance to district	14.04*** (3.287)	70.18*** (8.775)	14.04*** (3.287)
number of electric customers	0.598*** (0.0676)	-0.122 (0.162)	0.598*** (0.0676)
number of small industries	0.366* (0.187)	0.335 (0.255)	0.366* (0.187)
number of cooperatives.	-15.80*** (1.752)	-8.646*** (2.717)	-15.80*** (1.752)
Constant	906.7*** (72.99)	1,171*** (93.33)	906.7*** (72.99)
Observations	7,821	7,821	7,821
R-squared		0.004	
Number of obs	1,565	1,565	1,565

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Many relationship variables of the model passed t-statistic test. The village distance to district variable indicated significantly and appropriate with theory. number of electric customers was non significantly but appropriate with theory. The number of cooperatives. indicated significant and appropriate with theory. In general, The results of this study indicate that geography, technology, and institutions affect poverty in the region.

CONCLUSION

This study attempts to analyze influence of geography, institution and technology dimensions of poverty problem. Geography variable deputized by rural distance to district, technology variable is proxy with amount of electrics customers, while institution variable is deputized by to the number of rural small industry and cooperative bodies. This Research used the Panel Data Analysis. The data used were taken from Podes from BPS in 2003, 2006, 2009, 2011, and 2014. The data used in this study were 1565 villages throughout the Surakarta Residency covering eight districts of Surakarta, Boyolali, Sukoharjo, Karanganyar, Wonogiri, Sragen, and Klaten. The results of this study indicate that geography, technology, and institutions affect poverty alleviation in the region.

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Appendix of Hausman test

---- Coefficients ----

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fixed	.	Difference	S.E.

x3	70.1763	14.04047	56.13583	131.0232
x5	-.1219835	.5976724	-.7196559	.041985
x6	.3352893	.3656595	-.0303702	.2004596
x7	-8.646248	-15.80428	7.158034	2.155854

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = 294.46
 Prob>chi2 = 0.0000