

A spatial model of community-level poverty: evidence from Indonesian family life survey

B.S. Nazamuddin^{1✉}, A. Sakir², Fakhruddin³, Riswandi⁴

Faculty of Economics and Business, Universitas Syiah Kuala, Banda Aceh.

Abstract

This study is aimed at examining how spatially-related factors affect poverty in the context a developing nation. We explore the following question: Does space matter in affecting poverty in a developing country and does social capital reduce poverty levels? We employed a dependent variable that is spatially lagged. To account for the spatial effect on community-level poverty, spatially-lagged variables are incorporated in this empirical model. Social capital was used as the independent variable. Although there might be endogeneity of poverty rates and social capital level, however, assuming the fact that in the context of a developing nation social capital is inherited rather than affected by the level of poverty, we omitted the effect of poverty on social capital and only considers the effect of social capital on poverty. Five proxies to measure community. The data were sourced from the fifth wave of the Indonesian Family Life Survey (IFLS5), designed and implemented by the RAND Corporation. The results of the study show that, regardless of the proxies used to measure community level poverty, space significantly positively affect poverty. However, the effect of social capital on community level poverty varies in terms of significance and their signs. This implies that any poverty alleviation policy should take into account the importance of bringing marketplaces and related market opportunities closer to poor people at the community level. Positive spatial spillover effects could reduce poverty and therefore granting village-level public investments should be directed toward creating physical market connectivity at the village level. This has policy implication that governments should pay greater attention to providing closer linkage among villages through road infrastructure and providing incentives to building social capital to village communities.

Key words: Community-level poverty; spatial lag model; social capital

INTRODUCTION

The literature on poverty is very extensive and links poverty with so many attributes that cause poverty and comes out with various recommendations on poverty reduction strategies. In general, the literature on poverty can be classified into individual-based poverty, poverty associated with policy impacts, and place-based poverty. A recent study (Zhou and Liu, 2019) shows the increasing importance of such variables as geographical factors and locational types of poverty in affecting poverty and the effectiveness of antipoverty measures. Some case studies of developing countries show the positive causality between geographical space and poverty (Qiu, Liu and Gao, 2017); (Kim, Mohanty and Subramanian, 2016). A recent study on a developed country (Harrison, Montgomery and Jeanty, 2018) shows that communities that have more social capital are associated with lower poverty rates. They also indicate that poverty could be faced with obstacles to social capital formation. Social capital varies across communities. Poverty as a negative welfare indicator is influenced by the many factors that are spatially clustered. By knowing the characteristics of poverty in villages that are very lagging behind, several things can be learned. First, what are the main causes of poverty in terms of geographical aspects, the socio-economic conditions that surround their location, and whether effective poverty reduction programs empower very poor populations in very disadvantaged villages in underdeveloped districts.

Poverty alleviation has become the priority of the Indonesian government from time to time. However, poverty rates have not declined significantly in spite of various poverty alleviation programs. Sustainable poverty reduction policies are needed so that the poor can be empowered and able to get out of the vicious circle of poverty on their own abilities. Poverty is often linked to the stability of the country, indicated by the frequent occurrence of social unrests. Although there have been many poverty reduction programs that have been rolled out by the government, the results of such programs may vary across space, not only because of different socio-economic characteristics of the people in different places, but also because of spatial characteristics in which the poor live. Various types of poverty alleviation programs targeted at poor people often do take into account the fact that the poor are poor because they live in disadvantaged areas. Poverty reduction policies in Indonesia such Raskin (Rice for the Poor, Program Keluarga Harapan, PKH (Family Hope Program), as well as various other direct cash transfers are often generalized to all places and are people-based, rarely place-based. Understanding the characteristics of poverty that differ across space is crucial. Poverty reduction policies may vary between regions, and therefore the extent to which spatial characteristics as well as spatial interactions affect poverty, especially at the community level, need to be investigated.

Literature Review

The relationship between poverty and geographical location is very close and has long been an important issue studied in developed countries. The importance of location in its relationship with social exclusion in social welfare discourse has been suggested by several researchers, for example (Milbourne, 2004). A synthesis conducted by (Blank, 2005) provides a good summary of the literature on the relationship between local characteristics and the nature of poverty. Some important variables that may cause poverty include natural environment, economic structure, institutions - both public and community, social norms, and demographic characteristics. One good description of the importance of geographical factors in understanding poverty is also done by (Bonds, 2015). Geographical research on poverty has an important place in development studies, where ideas about poverty categorize and differentiate the impoverished places and the poor.

Some case studies of developing countries show the positive causality between geographical space and poverty. (Liu, Liu and Zhou, 2017) show that poverty in China is highly spatially concentrated. The poor concentrate in rocky and deep mountainous regions. Most of them also live in border areas and minority residential areas in central and western China and gradually extends to the southwest region. Such factors as lack of resource availability, unfriendly geographical conditions and vulnerable ecology are among the important determinants of poverty persistence. Furthermore, for the case of India (Kim, Mohanty and Subramanian, 2016) reveal that poverty is not only determined by how poor household clusters are distributed, but there are multiple factors related to place at the village level. They found that 13% of poverty variation was caused by state factors, 12% village factors, 4% district (district) factors, and 3% regional factors, after taking into account household characteristics.

Meanwhile, (Harrison, Montgomery and Jeanty, 2018) show that in the western United States region communities having more social capital tend to be associated with lower poverty rates. The formation of social capital could contribute to declining poverty. The findings of this study are particularly prominent in communities living in persistent poverty. Such conclusions are obtained after the endogenous and spatial relationships are taken into account. Variables that determine the welfare of people may have simultaneous effects when welfare and space are clustered according to locations.

Poor people are people or households that have a level of consumption below the poverty line (Mai and Mahadevan, 2015). Therefore, public spending targeted at the poor can have a positive impact on poverty reduction through its effect on aggregate consumption. (Sommers and Oellerich, 2013) suggest that the provision of health insurance programs can reduce poverty rates, housing expenses are found to be very helpful for the poor (Gilbert, 2014). From some of the literature described above, it can be concluded in general that government spending can affect poverty through various transmission effects, both directly and indirectly. Furthermore (Johnson, Kovarik and Meinzen-dick, 2016) show that even economic expenditure for agriculture can reduce poverty. Any measure to improve infrastructure combined with efforts to sustain growth, to better distribute income, and to improve education is crucial in alleviating the incidence of poverty (Marinho, Campelo and Araujo, 2017).

METHOD

Data

We utilized the data from the fifth wave of the Indonesian Family Life Survey (IFLS5) produced by the RAND Corporation. The fifth wave survey was conducted between late October 2014 and the end of April 2015 with long distance tracking extending through the end of August 2015. The data cover household as well as community observations. For the purpose of this study, we used community survey results documented in Book 1A, 1B, 1C and Book 2. We used village-level data on the variables described in Table 1. The dependent and independent variables will be described below.

The cross-sectional data used in this study cover 169 villages or townships. The focus is on the spatial interdependencies among those villages/townships and social capital. It is assumed that marketplaces are the places through which communities from different villages/townships interact with one another. For that purpose, we assess the spatial relationships by using the spatial lag model similar to the one used by (Harrison, Montgomery and Jeanty, 2018) and (Wandani et al., 2017).

Table 1.

Description of community-level variables used in the study

Variable	Notation	Description	Calculations
Pov1	Y1	Percentage of poor households	The number of poor households in a village/township (question S37c-a) divided by the total number of households in the village/township (question S32).
Pov2	Y2	Percentage of poor population	The number of poor people in the village/township (question S37c-b) divided by the total population in the village/township (question S31).
Pov3	Y3	Percentage of household recipients of Raskin (Rice for the poor)	The percentage of households that received Raskin rice in the village since 2007 (question PAP8).
Pov4	Y4	Percentage of household recipients of PKH or Keluarga Harapan (Conditional Cash Transfer) Program.	The percentage of households that received PKH transfers in the village since 2007 (question PAP8).
Pov5	Y5	Percentage of household recipients of BLSM (Direct Cash Assistance for the People).	The percentage of households that received BLSM in the village since 2007 (question PAP8).
Pov6	Y6	Percentage of household recipients of BSM (Cash transfer for poor student).	The percentage of households that received BSM in the village since 2007 (question PAP8).
SC	X81	Social Capital	The number of social programs/activities currently actively and regularly implemented,

Variable	Notation	Description	Calculations
			either presently conducted on a routine basis or has been conducted before but no longer present (questions in Section PMKD).
DDecay	X12	Distance Decay	1 divided by the distance of nearest market from the office of the head of village in kilometers (question A1).

Dependent Variables

The dependent variables are the community-level poverty rates measured in four different proxies; Pov1, Pov2, Pov3 and Pov4. As summarized in Table 1, Pov1 is the household poverty rates variable, namely the percentage of poor households in a village, Pov2 is the headcount poverty rate, Pov3 through Pov6 are the poverty rates proxied by the percentage of recipients of Raskin, PKH, BLSM, and BSM. By looking at different dependent variables, we could identify the relative importance of each to use as the appropriate measurement of poverty at the community level.

Independent Variables

The variable of interest in this study is the interaction between villages through the marketplace. The interaction between communities is assumed to occur not only between neighboring villages, but also through trading among the people from remote villages as far as the marketplaces are accessible, regardless of the geographical distance between villages. The interaction is captured by the multiplication of distance decay and the measure of poverty rate. The distance decay is 1 divided by the distance of nearest marketplace from the office of village head - which commonly represents the centroid of village economic activities. The closer the marketplace, the greater the spatial spillover effect on other villages. If a marketplace is close to the office of village head, the possibility is greater that the village is related to others. The distance decay, then, indicates that the spatial spillover effect becomes smaller, the farther the marketplace. The cross-village border movement of people and merchants is the mechanism through which the poverty level of one village affects the poverty level of other village(s), which makes a sense to use a spatial lag model.

Furthermore, to prevent from the possibility of having a spurious regression, we included social capital as a control variable. It is assumed that village communities with relatively greater social capital are inclined to be more empowered and hence have lower poverty rates. The social capital is measured by the number of programs or activities that presently exist in a community or has once existed but no longer exist. The programs or activities are the mechanisms through which the people are in general involved and interact with one another through their participation in those public institutions. The interaction results in positive effects and hence poverty level would be reduced. There are 18 community programs or activities covered in the IFLS questionnaire, i.e. village cooperative, youth group (Karang Taruna), village mobile library, neighborhood watch program, community public works, activities associated with P2KP/PPK/PNPM (Program Penanggulangan Kemiskinan Perkotaan-Urban Poverty Alleviation Program/Program Pengembangan Kecamatan-Kecamatan Development Program/Program Nasional Pemberdayaan Masyarakat-National Program for Community Empowerment in Urban Areas), Kampung (village) improvement program, water management system, solid waste management system, infrastructure development program for underdeveloped village (P3DT), religious activities, medical herb garden (Apotek Hidup), Child development program (Bina Keluarga Balita), Youth development program (Bina Keluarga Remaja), program for the elderly (Bina Keluarga Manula), health fund (Dana Sehat), family group (Desa Wisma), village savings/loan. In general, community engagement in those programs or activities indicate high social capital investments and hence may reduce poverty, in addition to poverty-reducing market-linked opportunities.

The means and standard deviations of the variables used in the study are listed in Table 2.

Table 2.

Meand and standar deviation of variables used in the study

Variable	Mean	Standard deviation	Minimum	Maximum
Pov1	0.261049	0.159773	0.023583	0.750782
Pov2	0.245019	0.164201	0.019056	0.869565
Pov3	28.37748	28.77864	0	100
Pov4	6.682119	28.77864	0	70
Pov5	15.01325	15.18156	0	95
Pov6	12.86755	17.6996	0	99
SC	9.353333	3.477901	2	17
DDecay	0.911874	1.01049	0.037037	5

Model

This study uses a model that can represent community-level poverty rates in various measurements. By doing so, we attempt to inquire into the characteristics of poverty and the spatial connection and influence from one community to another. The failure to take into account of spatial connection and influence if present may result in parameter estimates that are unstable and incorrect statistical inference (Crandall and Weber, 2004); (Harrison, Montgomery and Jeanty, 2018). We model the relationship as follows:

$$Pov_i = f(DDecay_i, SC_i)$$

Where Pov_i is the dependent variable in village i and SC_i is the social capital in village i . Empirical testing is conducted to find the effects of the two variables on poverty. Poverty is measured in four different proxies. The purpose is to find the relative effects of the independent variables on poverty in different measurements.

Ordinary least squares method is used to estimate the following equation:

$$Pov_i = \beta_0 + \beta_1 DDecay_i + SC_i + u_i$$

To account for spatial effect on village-level poverty, spatially lagged variable distance decay is incorporated in the empirical model. We incorporate the multiplication of poverty rate and distance decay to account for the spatial-lag or spatial-autoregressive variable. Social capital is used as the control variable. It is assumed that poverty rates in a village could have correlation with poverty rates in another, not necessarily neighboring or nearby village if there is a market that links the people between those villages, for example through trading. This incorporation of this spatial lag term is to avoid biased coefficients and serial correlation due to dependence of errors among those villages. $DDecay$ is basically an inverse distance decay weights (Harrison, Montgomery and Jeanty, 2018) where the more remote a marketplace from the centroid of the people - represented by the office of the village head, the less influence of poverty rates of one village on the other. Social capital is used as the independent variable. However, although poverty and social capital can both be treated endogenous (Harrison, Montgomery and Jeanty, 2018), for the purpose of this study, we omit the possibility that poverty affects social capital and only considers the effect of social capital on poverty. This is because in the context of a developing nation, there may be a possibility that social capital is inherited rather than affected by the levels of poverty, and hence it is assumed exogenous.

RESULTS AND DISCUSSION

We estimated the model in six specifications, i.e. six different measurements were used as the dependent variables. From the goodness-of-fit measures, R2, we found that the models with different dependent variables have the power to explain between 24% to 68% of the community poverty rates variation. The interaction variable or spatial lag variable is significantly positive at $p < 0.01$. This suggests that there exists cross-sectional spatial relationship between poverty rates and distance. The closer the marketplaces to the village center (village head office) means a greater influence of one village's poverty on another. So, if one villages poverty rate fall, then the other villages' poverty rates that are closer to one another also fall. In all specifications, except for Pov4, poverty rates are significantly negatively affected by social capital. This explains that social capital is crucial in poverty alleviation.

Little attention is usually given to linking poverty alleviation to physical infrastructure, especially the construction of roads to connect one community to another or to connect one community to another. Similarly, social capital strengthening is often neglected in poverty alleviation measures by the government. Poverty is cross-border and therefore should be overcome through cross-border intervention as well. However, in many cases, especially in countries like Indonesia, community-based empowerment pays more attention to a uniform intervention, while in fact different communities may require different strategies to strengthen social capital. In addition, because a decentralized approach is often adopted in such a way that a community is empowered by providing them with means to empower themselves, for example, by giving them cash transfers, the one similar measure is applied across the board.

In Indonesia all the poverty alleviation measures undertaken by the national government can be categorized into three broad categories: namely assistance and social protection; community empowerment; and small and medium enterprise (SME) business development (Sodo & Utari, 2013). The first category includes Direct Cash Transfers (BLT), Family Hope Program (PKH), Rice for the Poor (Raskin), Community Health Insurance (Jamkesmas), and School Operational Assistance (BOS). The second category is PNPM Mandiri. The third category is assistance to small businesses.

Direct cash transfers (BLT) was first carried out in 2005. It is a program of Indonesian government targeting the poor. It was earlier designed to be a form of cash compensation for the poor in response to the increase in world fuel prices, so that they could afford to meet their daily needs. The cash assistance was provided to prevent a rise in poverty rates as the result of increases in the prices of commodities caused by rising fuel prices. As an effort to accelerate poverty reduction, since 2007 the Indonesian Government has implemented PKH. The PKH is a social protection program - internationally known as Conditional Cash Transfers (CCT) - introduced in 2007 to tackle poverty by providing conditional social assistance to beneficiary households. It provides cash to the very poor and hence opens access for poor families, especially pregnant women and the newborn, to utilize various health care facilities and educational service facilities available around them. It also covers persons with disabilities and the elderly so that they afford to maintaining their level of social welfare. Rice for the Poor is a subsidy program for low-income communities aimed at helping people meet their rice needs. As part of a household food security, the program that began in 1998 is implemented by Indonesian State Logistics Agency (BULOG) through selling rice in a market operation at prices below market prices to the targeted recipients. The allocation of rice per household is limited to a certain number of kilograms and may change from time to time depending on need and financial capacity of the government. Raskin is a strategy to lessen the burden of the poor by providing affordable rice because the share of the main staple food in the calculation of the poverty level is far greater than the level for non-food goods.

In 2004, National Law No. 40/2004 was enacted and then a national health coverage (Jaminan Kesehatan Nasional - JKN) was established as an implementation of the country's social security system (SJSN - Sistem Jaminan Sosial Nasional). The national health coverage is deemed to have been very beneficial to the poor because their premium is paid for by the government and thereby lessens the financial burden of the poor. One part of the universal coverage that affects the poor is the Community Health Insurance (Jaminan Kesehatan Masyarakat - Jamkesmas), introduced in 2008. It is a social security program targeting poor households and disadvantaged persons. The government pays the premium on their behalf so that they have access to health care services.

School Operational Assistance (BOS) fund, introduced in 2005, is the national program to provide funding for non-personnel operations for primary and secondary schools. (Sulistyaningrum, 2016) shows that BOS as a kind of school subsidy that can increase student performance, and in turn has a long-term impact on poverty. This is because, on the one hand, the cost burden of the households for their children's education is reduced. On the other hand, it provides an incentive for poor households to keep their children in schools.

PNPM Mandiri, introduced in 2007, is a continuation of the previously known as subdistrict development program (PPK) and the urban poverty alleviation program (P2KP) funded through the World Bank loans. The program targets all poor villages and subdistricts by providing basic infrastructure for rural and underdeveloped areas. Through a participatory approach in making decision on what the needs would be, rural communities PNPM Mandiri creates projects that are useful and have impact on poor community empowerment.

In the 2010s, in the effort to further improve the effectiveness of poverty alleviation, the Indonesian government issued the Presidential Regulation 15/ 2010 on Poverty Reduction Acceleration, which is targeted to cut the poverty rates to between 8 and 10 percent by 2014. The efforts evolve around strategies to enhance social protection, improve access of the poor to basic services, empower communities, and promote inclusive development. A national team for the acceleration of poverty reduction (TNP2K) was introduced in 2010 with the task to make cross-institution poverty reduction programs more effective. Part of the role is to establish a unified database and improving the effectiveness of various poverty alleviation programs to ensure the real beneficiaries are truly identified and catered to. The unified database containing information on 24 millions of Indonesia's poorest households has been launched (Qibthiyah & Utomo, 2016). As a result, the Indonesia's poverty rate was reduced to 10.64 percent in early 2017 from 13.33 percent in 2010.

Except for PNPM Mandiri that usually empowers communities through infrastructure projects in villages, all other poverty reduction measures are of individual human capital type strategy. Another strategy where community as a whole is empowered through higher social capital and across village border spillover effects should also be adopted in order to accelerate poverty reduction in a developing nation like Indonesia.

Table 3.
Estimation results for six specifications

Indep. Var:	Dependent variable:					
	Pov1	Pov2	Pov3	Pov4	Pov5	Pov6
Constant	4.115305 (7.547068)	87.98256 (88.80036)	35.39269* (5.513641)	0.607482 (1.930648)	17.05739* (2.998516)	10.95838* (2.721609)
Pov1*DDecay	1.054254* (0.056774)	0.727505* (0.051892)	0.282632* (0.035891)	0.20173* (0.020618)	0.363867* (0.051825)	0.332267* (0.024784)
SC	-6.92649 (13.57033)	-40.699 (159.6159)	-28.3847* (9.861781)	6.662927** (3.30589)	-13.7608** (5.305141)	-6.06445 (4.867277)
R^2	0.677354	0.543671	0.294349	0.245201	0.251353	4.867277
Adjusted R^2	0.673443	0.538139	0.285796	0.240084	0.242278	0.517744
N	168	168	169	298	168	168

-standard errors in parentheses

* p < 0.01

** p < 0.05

CONCLUSIONS

When a spatially lagged dependent variable is introduced in the poverty rates estimation, the effect of space or spatial linkage between villages is significantly positive. This suggests that closeness is important in spillovers between one village and another in terms of poverty reduction. Social capital also reduces poverty rates. This has policy implication that governments should pay greater attention to providing closer linkage among villages and providing incentives to building social capital to village communities.

REFERENCES

- Blank, R. M. (2005) 'Poverty, Policy, and Place: How Poverty and Policies to Alleviate Poverty are Shaped by Local Characteristics.', 464(October), pp. 441–464. doi: 10.1177/0160017605278999.
- Bonds, A. (2015) 'Poverty, Geography of', International Encyclopedia of the Social & Behavioral Sciences, Second Edi, pp. 722–727.
- Crandall, M. S. and Weber, B. A. (2004) 'Local Social and Economic Conditions, Spatial Concentrations of Poverty, and Poverty Dynamics', Poverty, Policy and Place: Spatial Analysis of Poverty Dynamics, 86(5), pp. 1276–1281.
- Gilbert, A. G. (2014) 'Free housing for the poor: An effective way to address poverty?', Habitat International. Elsevier Ltd, 41, pp. 253–261. doi: 10.1016/j.habitatint.2013.08.009.

- Harrison, J. L., Montgomery, C. A. and Jeanty, P. W. (2018) 'A spatial , simultaneous model of social capital and poverty', *Journal of Behavioral and Experimental Economics*, (July 2017), pp. 183–192.
- Johnson, N. L., Kovarik, C. and Meinzen-dick, R. (2016) 'Gender , Assets , and Agricultural Development : Lessons from Eight Projects', *WORLD DEVELOPMENT*. Elsevier Ltd, xx. doi: 10.1016/j.worlddev.2016.01.009.
- Kim, R., Mohanty, S. K. and Subramanian, S. V (2016) 'Multilevel Geographies of Poverty in India', *World Development*. Elsevier Ltd, xx, pp. 1–11. doi: 10.1016/j.worlddev.2016.07.001.
- Liu, Y., Liu, J. and Zhou, Y. (2017) 'Spatio-temporal patterns of rural poverty in China and targeted poverty alleviation strategies', *Journal of Rural Studies*. Elsevier Ltd, 52, pp. 66–75. doi: 10.1016/j.jrurstud.2017.04.002.
- Mai, T. and Mahadevan, R. (2015) 'A Research Note on the Poverty Dynamics and Cost of Poverty Inequality : Case Study of Indonesia', *Economic Analysis and Policy*. Elsevier Ltd. doi: 10.1016/j.eap.2015.12.003.
- Marinho, E., Campelo, G. and Araujo, J. (2017) 'Impact of infrastructure expenses in strategic sectors for Brazilian poverty', pp. 1–17. doi: 10.1016/j.econ.2017.01.002.
- Milbourne, P. (2004) 'The local geographies of poverty : a rural case-study', 35, pp. 559–575. doi: 10.1016/j.geoforum.2003.11.005.
- Qiu, S., Liu, X. and Gao, T. (2017) 'Do emerging countries prefer local knowledge or distant knowledge? Spillover effect of university collaborations on local firms', *Research Policy*. Elsevier, 46(7), pp. 1299–1311. doi: 10.1016/j.respol.2017.06.001.
- Sommers, B. D. and Oellerich, D. (2013) 'The poverty-reducing effect of Medicaid', *Journal of Health Economics*. Elsevier B.V., 32(5), pp. 816–832. doi: 10.1016/j.jhealeco.2013.06.005.
- Wandani, F. P. et al. (2017) 'Spatial econometric analysis of automobile and motorcycle traffic on Indonesian national roads and its socio-economic determinants: Is it local or beyond city boundaries?', *IATSS Research*. International Association of Traffic and Safety Sciences. Production and hosting by Elsevier Ltd. doi: 10.1016/j.iatssr.2017.07.001.
- Zhou, Y. and Liu, Y. (2019) 'The geography of poverty : Review and research prospects', (April 2018). doi: 10.1016/j.jrurstud.2019.01.008.