

**Community-Driven Development and  
Poverty Alleviation:**  
an Economic Evaluation of the National Program  
for Community Empowerment  
in Indonesia

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**Community-Driven Development and  
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Community Empowerment in Indonesia

(コミュニティ主導型開発と貧困削減：インドネシアに  
おけるコミュニティ能力強化のための国家プロジェク  
トの経済評価)

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## **ABSTRACT**

As the largest community-driven development (CDD) program in the globe, National Program for Community Empowerment of Indonesia (PNPM Rural) faces a noble target to achieve Sustainable Development Goal (SDG) which is declared in 2015 that formerly named Millennium Development Goal (MDG). In the intervening time, PNPM Rural is transformed to newly-established institution, Village Law, according to the Law no.6 / 2014. For encountering those challenges policy-makers needs to evaluate their existed development program and re- design the blueprint of present institution to favor the marginalized poor to sustain their economic viability. This study seeks to investigate determinants of districts and village budget allocation of PNPM Rural investments from its first earmarked in 2007 and 2011. The attempt is executed in order to find out whether those budget allocation decision has aligned with community needs. An evaluation of their return to investment in terms of poverty mitigation within the time frame, specifically in district and sub-district level is also incorporated within the investigation.

The conceptual framework for the evaluation were made by leveraging the statistical tools named Structural Equation Model (SEM). The model was employ due to its versatility to assess causality in the system of equations simultaneously as well as to remedy the measurement error. The mechanism to discard endogeneity or measurement error was made by confounding the observed variable into suitable components (latent variables). This was equivalent with the way conventional factor analysis encounter it. The object of the analysis were budget allocation invested to health, education, economy, agriculture, energy, transportation, and social activities. The budgets were initially stated in nominal values which subsequently discounted to the real value by Consumer Price Index (CPI) adjustment. Afterwards, the data was assessed into two approaches. The first was the study of PNPM Rural performance in western part of Indonesia. It had utilized district level data in backward area in terms of poverty level or poverty headcount ratio. While, the second was the case study analysis of Aceh Province. It was conducted in village-aggregated sub-district arrangement by means of number of poor reference published in the village over the total household existed in the corresponding village. The associations between village characteristics prior to PNPM Rural establishment and particular budget allocations were elucidated. The investigation of the characteristics to PNPM Rural participation was also elaborated.

It was finally documented that the return to investment of budget allocation invested to productive activities within PNPM Rural to poverty level was negative, or in other words, it helped decreasing poverty level especially on agriculture, and economic activity in the context of western part of rural Indonesia. In the case study of Aceh province, the result resonance the previous finding, that the PNPM investment had negative and significant effect to poverty. The determinant of budget allocation was predominantly significant too, except for the budget allocated to education investment. In terms of participation of the marginal poor, the covariance between empowerment for the poor and PNPM investment has shown positive but weak significance.

The recommendations are divided into two- folds. They are prescription for future compelling research and suggestion to policy-makers. The study incorporates others degree of marginalization such as extent of female-headed household and educational/ primary school attainment background are desirable. The level of elite composition in the community is also recommended to be included into analysis. In terms of policy narrative, the result of the study can be used as a lesson-learnt to sustain Community- Driven Development (CDD) program in Indonesia and to improve the bottleneck that hinder the target achievement. The prospective reform is village/community mapping strategy prior to program start up. It helps to better tailor the program scheme in respect to its associated resources the community has. Another improvement can be done by giving higher incentive to facilitators in order to enhance the skill they perform to help communities or stakeholders aware of their own specific needs and capacities.

Keywords: Community-Driven Development Program, Budget Allocation, Poverty, Economic Evaluation

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## LIST OF ABBREVIATIONS

ADB	Asian Development Bank
APBD	District Budget (Anggaran Pendapatan dan Belanja Daerah)
ALC	Agricultural Land Conversion
AMOS	Analysis of Moment Structure
APBN	National Budget
AusAID	Australian Agency for International Development
BALIMANDRA	The Progressive, Safe, Peace, and Prosperous Bali (Bali Maju, Aman, Damai, dan Sejahtera)
BAPPENAS	National Development Planning Agency (Badan Perencanaan Pembangunan Nasional)
BLM	Block Grant (Bantuan Langsung Mandiri) (Anggaran Pendapatan dan Belanja Negara)
BLT	Direct Cash Transfer/ Unconditional Cash Transfer (Bantuan Langsung Tunai)
BPS	Statistics Indonesia (Badan Pusat Statistik)
BRI	Bank of Indonesian Nation (Bank Rakyat Indonesia)
CARICOM	Caribbean Community
CCT	Conditional Cash Transfer
CDD	Community-Driven Development
CBD	Community-Based Development
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CIDA	Canadian International Development Agency
CPI	Consumer Price Index
CPR	Common Pool Resources
CSF	Critical Success Factor
DANIDA	Danish International Development Agency
DAPM	Community Development Trust Fund (Dana Amanah Pemberdayaan Masyarakat)

ECED	Early Childhood Education and Development
EFA	Exploratory Factor Analysis
EQS	EQuationS
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FHT	Fairness Heuristics Theory
GDP	Gross Domestic Product
GFI	Goodness of Fit Index
GoI	Government of Indonesia
HDI	Human Development Index
HH	Household
IDI	In-Depth Interview
IFLS	Indonesian Family Life Survey
iid	Independent and Identically Distributed Random
Variables	
INDO-DAPOER	Indonesia Database for Policy and Economic Research
JAMKESDA	Regional Health Insurance (Jaminan Kesehatan Daerah)
JAMKESMAS	Health Insurance for the Poor (Jaminan Kesehatan Masyarakat)
KCR	Microcredit for people (Kredit Cinta Rakyat)
LAVAAN	Latent Variable Analysis
LISREL	LInear Structural RELationships
MDG	Millennium Development Goals
MFI	Micro Finance Institution
MHP	Micro Hydro Power
MUSRENBANG	Development Planning Meeting (Musyawarah Perencanaan Pembangunan)
NC	Necessary Condition
NPL	Non-Performing Loan
NSP	National Solidarity Program

NVZ	Nitrate Vulnerable Zone
P2KP	Urban Poverty Alleviation Program (Program Penanggulangan Kemiskinan di Perkotaan)
P3KI	Acceleration and Expansion of Poverty Alleviation in Indonesia (Percepatan dan Perluasan Pengurangan Kemiskinan Indonesia)
P3BM	Planning, Budgeting and Monitoring for the Poor (Perencanaan, Penganggaran, dan Pemantauan yang Berpihak pada Masyarakat Miskin)
PCA	Principle Component Analysis
PDF	Probability Density Function
PEKKA	Women-Headed Household Empowerment Program (Pemberdayaan Perempuan Kepala Keluarga)
PIJAR	Cow, Corn, and Seaweed (Sapi, Jagung, dan Rumput Laut)
PNPM Mandiri	National Program for Community Empowerment (Program Nasional Pemberdayaan Masyarakat) Mandiri
PNPM RIS	PNPM Rural Infrastructure Support
PNPM PISEW	PNPM Regional Infrastructure for Social and Economic Development
PPK	Kecamatan Development Program (Program Pengembangan Kecamatan)
PPLS	Data Collection on Social Protection Program (Pendataan Program Perlindungan Sosial)
PPP	Purchasing Power Parity
PODES	Village Potential Survey
PSAOP	Agricultural Services and Producer Organizations (ProgramProgramme de Services Agricoles et Organisations de Producteurs)
PSF	PNPM Support Facility
RASKIN	Rice for the Poor (Beras Miskin)

RCT	Randomized Controlled Trial
RFL	Revolving Loan Fund
RMSEA	The Root Mean Square Error of Approximation
RNF	Rural Non-Farm
RUTILAHU	Home which unfit from habitable (Rumah Tidak Layak Huni)
SAS	Statistical Analysis System
SC	Sufficient Condition
SDG	Sustainable Development Goal
SEM	Structural Equation Model
SIKD	Regional Finance Information System (Sistem Informasi Keuangan Daerah)
SIMPADU	Integrated Information System (Sistem Informasi Terpadu)
SKPD	The Local Work Unit (Satuan Kerja Perangkat Daerah)
SME	Small Medium Enterprises
SPP	Simpan Pinjam Perempuan (Woman Save and Loan)
SWB	Subjective Well-Being
TNP2K	The National Team for the Acceleration of Poverty Reduction (Tim Nasional Percepatan Penanggulangan Kemiskinan)
UBN	Unsatisfied Basic Needs
UKaid	United Kingdom Aid
UNDP	United Nations Development Program
UPK	Sub-district Activity Management Unit (Unit Pengelola Kegiatan)
UPP	Urban Poverty Project
USAid	United State Agency for International Development
WHO	World Health Organization

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## I. INTRODUCTION

### 1.1. Background

In the midst of development world, MDG is avowed as primary goal for developing countries towards millennium era started in 2000 to 2015. Afterwards, on the beginning of 2016, Millennium Development Goals (MDG) are expanded to Sustainable Development Goals (SDG). In spite of the revision, their ambitious objectives remain the same. In the framework of achieving MDG, Indonesia particularly established the only nation-wide community-driven development (CDD) program named National Program for Community Empowerment (*Program Nasional Pemberdayaan Masyarakat Mandiri: PNPM Rural*) initiated in 2007 to alleviate poverty as well as empower marginalized people. To dates, the program is transformed according to the Law no. 6/ 2014 (ADB, 2016) to newly institution named “Village Law” (dana desa) to ensure a more effective, efficient and neo-institutional design of community-driven program in Indonesia (ADB, 2016, Antlöv et al., 2016). Unlike other CDD program applied; Nigeria (*Fadama II Project*) which was implemented in 12 states (Nkonya et al., 2012) as well as *The KALAHI-CIDSS* operated in 42 poorest provinces in the Philippines (Labonne & Chase, 2009), the PNPM Program is aggregately imposed all across nations. However, the locus of this study was concentrated in rural area (PNPM Rural), because the rural settlement has higher collective action potential than the urban settlement (Beard & Dasgupta, 2006).

The performance of the program has shed light on its effect to poverty eradication. It is reckoned to alleviate poverty (Syukri et al., 2011) by means of increased consumption per capita by 9.1% compare to the control in 2007-2010

(PSF, 2012). Nevertheless, another problem appeared that school enrollment rate that remained low, which suggested that PNPM Rural has shown insignificant effect in return to education investment in regards on mitigating poverty. Although it helped reduce poverty in some of regions, in fact it failed to trigger good local and community governance that disadvantaged people could not be easily participated (Syukri et al., 2011; PNPM, 2012). Moreover it was also echoed by mixed outcome of CDD performance to the community welfare in the global world. (Yalegama, 2016; Botchway, 2001; Cordova & Layton, 2016)

The overall assessment of PNPM Rural impact evaluation is deemed to be hardly successful. Refer to Table 1.1 for further detail. Given this situation, the ‘think tank’ or policymaker is prompted to define to what extent the innovation of institutional arrangement could be induced. In mitigating such challenges, Indonesia needs to critically evaluate its present development program, giving consideration to the international developmental goals while working towards a sustainable re-designing the present institutional blueprint. Therefore reassessment of economic evaluation of this program in both national and provincial level is undoubtedly necessary.

Considerable attentions to CDD (Community-Driven Development) worldwide has been given to impact evaluation (Oktarina & Furuya, 2015; Yalegama et al., 2016; Arcand & Wagner, 2016), elite capture (Dasgupta & Beard, 2007; Lund & Jensen, 2013; Fritzen, 2007; Mansuri & Rao, 2004; Labonne & Chase, 2009), common-property-resources (CPR) management (McCarthy et al., 2004), determinant of cooperation, participation and collective action (Dasgupta & Beard, 2007; Beard, 2007; Okten & Osili, 2004; Botchway, 2001; Labonne & Chase, 2011; Kleemeir, 2000; La Ferrara, 2002), critical success factors

(Yalegama et al., 2016), and performance in term of sense of ownership and trust (Mark & Davis, 2012; Cordova & Layton, 2016; Labonne & Chase, 2011). The above notion were contributed in formulation of the objective of the study.

The Elite capture has emerged as double-edge sword in community-driven development mechanism. It was beneficial when the elite control the decision in allocating resource parallel to the rural needs (Labonne & Chase, 2009; Dasgupta & Beard 2007), moreover elite control would turn out positive performance in term of pro-poor participation conditioned to democratic mechanism in selecting the Board of Village meeting (Fritzen, 2007). However, it was opposed by previous statement in the beginning of the preface that the elite capture in the local extent specific to Indonesia had yield negative outcome. It impeded participation of the marginalized poor, and usually when allocating the resource to strategic sub-project, it did not align with the poor preferences (Syukri et al., 2011). Case study presented by McCarthy (2014) and McCarthy et al. (2014) that specifically exposed the dilemma of participation in the PNPM context in rural Indonesia complemented this finding. In specific to Aceh, local elites constituted those who owned large amount of land (*tuan tanah*). In order to survive from uncertain stream of income, the poor must relied and maintain relationship with the elite. From this viewpoint, it was pervasive that the poor did not have bargaining power compared to the contrary counterpart. At the end, it would hinder them from participating in PNPM project. The reasons of non-participation to some degree was also varied. The lack of initiative from facilitator, reticence of beneficiaries, risk aversion in partaking SPP microfinance, as well as lack of time to comply and commit to overall process were deemed to have considerable effect in causing that dilemma (McCarthy et al., 2014).

Another discourse attracted the attention was the level of capacity of collective action. It was believed that the relationship of collective action and elite capture were somewhat mixed. Dasgupta and Beard (2007) indicated that in the community where the elite control decisions that aligned with the poor aspirations, the capacity for collective action were increased. As the contrast to the collective action, the rent-seeking behavior of free-riding exposure would be limited as a consequence of functionality of community to actively work together.

Therefore, the above notions had culminated into the idea that when the elites controlled the mechanism in allocating budget so that it aligned with poor necessities, inevitably it would induce participation of the marginalized poor to aspired their immediate needs and enacted capacity of the communities to collective action.

If this conditions occurred, it would satisfy necessary condition of program sustainability. In the case of Senegal's PSAOP (Programme de Services Agricoles et Organisations de Producteurs), the inclusiveness of more marginalized group was obvious. However in contrast to its neighboring country, Ghanaian's NORRIP (Northern Region Rural Integrated Program) had stipulated that the beneficiaries had failed to recognize that their local resources were not adequate to meet local necessity. This led to failure of program sustainability eventually.

Hence, to ensure the sustainability of the program, the effort to evaluate PNPM Rural program in terms of return to investment stemmed from agriculture, economic, health, and education sector towards poverty mitigation, as well as to dismantle the determinant of each allocation is critical to articulate the question about whether this program has aligned with local needs as well as to answer the prospect of program future sustainability.

## **1.2. Objective**

The Decision of PNPM budget allocation disbursed in various development programs is processed in local community meeting, where all citizens can have their idea and aspiration to what sort of development activity the fund will be spent with. As the study of Mansuri & Rao (2004) and Fritzen (2007) noted that an efficient CDD program requires project-initiated accountability as well as enabling institutional environment such as support from external agent and state, therefore in order to sustain PNPM Rural for better improvement, this research is objected to evaluate its budget allocations whether they proven to impact poverty reduction in Indonesia. As well as to respond whether the budget allocated to specific investment coherent with community needs. To achieve the latter goal, technically this study seeks to investigate determinants of community budget allocation of PNPM Rural investments from its first earmarked in 2007 and 2011. This framework is sensible, since by recognizing the community resource, the community will direct their preferable allocation respective to community needs. An evaluation of their return to investment in terms of poverty mitigation within the time frame, specifically village-level data aggregated to sub-district level was also incorporated within the study.

Table 1.1 Principal Studies on PNPM Rural Impact Evaluation

Authors & Year	Main Objective	Data, Model, and Methodology	Important Findings
<p>Syukri et al., (2011)</p>	<p>To evaluate the PNPM Rural impact to poverty reduction, community participation, accountability, transparency, and the responsiveness of the village level governance.</p>	<ul style="list-style-type: none"> <li>• A Qualitative study : FGD, IDI, and monitoring</li> <li>• 18 villages in 9 districts in 3 provinces (East java, West Sumatera, and Southeast Sulawesi)</li> <li>• Baseline study in 2007 and End-line study in 2011.</li> </ul>	<ul style="list-style-type: none"> <li>• Save and Loan program for Women (SPP) had highest contribution to the poor.</li> <li>• The women participation in the program remain low due to elite dominance therefore it has insignificant impact on governance system.</li> <li>• Majority of the sample has shown lesser poor people compare to the baseline. However, there are still two villages in East Java bear more people become poor.</li> <li>• Overall, PNPM Rural considered having insignificant role in poverty alleviation.</li> </ul>

<p>PNPM Support Facility (2012)</p>	<p>To grasp insight about PNPM Rural impact evaluation, in term of household welfare both for the poor and disadvantaged groups, access to education, health service, employment opportunities, social dynamics and quality of local governance in the community</p>	<ul style="list-style-type: none"> <li>• Quantitative and Qualitative Study</li> <li>• Quantitative study: difference in difference estimates between 2007 and 2010 by constructing propensity score matching tools to build the counterfactual.</li> <li>• Data: 6319 household households and 26811 individuals from 300 sub-districts across 17 provinces for quantitative studies, and comprises 18 villages in 3 provinces for the qualitative one.</li> </ul>	<ul style="list-style-type: none"> <li>• Increase consumption per capita up to 9.1%</li> <li>• Household move out from poverty 2.1% higher than the control</li> <li>• Increase access to health care 5.1%</li> <li>• Increase employment opportunities 1.4%</li> <li>• It remains some failure in aspects; school enrollment rate, disadvantage group who is not fully participated, poor social dynamics and governance, misperception of PNPM as development program instead of the program to mitigate poverty</li> </ul>
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<p>McCarthy (2014), McCarthy et al. (2014)</p>	<p>To participation of the poor in CDD program in Indonesia and Aceh Province context</p>	<ul style="list-style-type: none"> <li>• Qualitative study</li> <li>• In Aceh Province specifically account for post-tsunami improvement</li> </ul>	<ul style="list-style-type: none"> <li>• Elite capture exposure</li> <li>• Risk aversion of woman to participate in save and loan activity</li> <li>• Participation mostly occurred in labor force, while in planning and decision making process, the poor rarely engaged</li> <li>• Elite capture in Acehnese society characterized by those who own large area of land/ land lords.</li> <li>• Capacity of Acehnese in post-tsunami context remained attenuated.</li> </ul>
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<p>Sugiri et al. (2016)</p>	<p>To elaborate supporting and inhibiting factors of woman participating training program on save and loan activities (SPP) in PNPM Rural as well as analyzing the effect of participation to the woman livelihood</p>	<ul style="list-style-type: none"> <li>• Data: 13 villages in Bendosari Sub-District, Central Java Province</li> <li>• Model: Woman Empowerment trajectory by UNESCO</li> <li>• Methodology: Qualitative approach</li> </ul>	<ul style="list-style-type: none"> <li>• SPP training program has developed beneficiary's daily economic enterprises among 69.44% respondents</li> <li>• The training has positive effect to self esteem</li> <li>• Supporting factors: facilitation, motivation to improve livelihood, capital support from SPP loans, and support from institution</li> <li>• Inhibiting factors: Less optimum social relationship, traditional attitude of society, highly dependence, critics toward the donator, and human resources factor.</li> </ul>
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<p>ADB (2016)</p>	<p>To understand local initiatives and the transition from PNPM to the village law</p>	<ul style="list-style-type: none"> <li>• Study case in Gianyar District and Jombang District</li> <li>• Qualitative study</li> </ul>	<ul style="list-style-type: none"> <li>• Strong sense of ownership at the local government level. It will lead to significant transition in implementing the Village Law</li> <li>• Participatory planning process under CDD has been widely adopted by beneficiary communities</li> <li>• During transition, district government as well as community stakeholder are able to safeguard and sustain positive result from PNPM Rural</li> <li>• The importance of sub-district and inter-village institutional system to the Indonesian context</li> <li>• PNPM was deemed as reputable program</li> </ul>
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The research discussing about development assistance evaluation of rural agriculture institution intervention had shown progress in some of developing countries. As the instances; Rutherford et al. (2016) and Sahara et al. (2016) suggested that participation in agricultural value chain program contributed to improve living standard in the extent of positive farm outcomes.

Besides agricultural investment, PNPM Rural was also realized into economic investment in terms of woman group of revolving save and loan activities (SPP/ Simpan-Pinjam Perempuan). An efficient financial supports that responded to the needs of the stakeholders would enhance economic growth, and created income-generating activities (Aliero & Ibrahim, 2013).

Furthermore, education as precursor of human capital, had shown a significant impact in terms of increasing ability to adapt to new market and innovative requirements, increasing non-agricultural labor supply, and increasing population density on per capita household consumption expenditure (Sahara et al., 2015; Liu & Yamauchi, 2014). The PNPM Rural projected allotment to education sector in the rural communities in order to generate more productive activities that was expected as the evidence from the study above.

In the health sector, PNPM Rural had disbursed its allocation to establish some activities to support health condition of beneficiaries. Those were ranging from building public community health center, free medication, village pharmacist, etc. The advance in health service delivery would support the nation of Indonesia to be more capable and productive and help the poor get out from vicious cycle of poverty traps.

Those dimensions of budget allocated within PNPM Rural were deemed as the engine of national growth, thus they were reckoned to be inputs of factor

production of national production functions. The inputs or capital exerted from PNPM Rural might be distinguished into two locus; Human Capital and Economic Capital.

The capitals created from PNPM Rural played a role as the regressor of production function that was proxied by other measure of wellbeing-ness, which was Poverty Rate.

In attempt to elaborate determinant of budget selection, author was fascinated to look back at the nature of CDD framework. With bottom-up, demand-driven approach, CDD program are perceived to work better than the conventional top-down supply-driven program because its ability to identify priority which specific to the cite narrative. It has been successful in intersecting local knowledges and resources which balancing supply and demand part. From this point of view, the local knowledge does matter as the determinant for budget allocation priority.

Pre-existed local knowledge and resources were critical in the community (Liebowits & Margolis, 1995). The initial indicator in regards of susceptibility of housing location to prone-to-disaster, and level of the peasant, relative quantity of informal were particular *ex-ante* characteristics possess by a disadvantaged society, especially the marginalized poor.

High density of the poor has characterized the group of under developed economies. The poor is mostly prone to negative income shocks due to disasters and health calamities. With the erratic flow of income and the risk of outbreaks of epidemics and catastrophic event, the poor's welfare status was exacerbated. Climatic shock i.e drought, flood, and other natural disasters has caused income volatility and negative income shock owing to out-of-pocket spend in schooling

and healthcare (Lohmann & Lechtenfeld, 2015; Mottaleb et al., 2013). However if the component combined with the relative quantity of the informal school or training, the marginalized extent would be attenuated due to access to increase their capacity through training. In this process, the notion of empowerment of the poor was prevalent.

The author subsequently encapsulated latent variable of “empowerment for the poor” that existed prior to the PNPM program establishment into consideration. The association between empowerment to the investment of budget allocation was also articulated. The budget allocation variables such as health investment, education investment, financial investment and agriculture investment were translated to form a component of PNPM investment factor.

From aforementioned empirical and theoretical bases, the hypothesis for the study could be examined into five points: firstly, whether PNPM Rural investment disbursed in productive activities had negative effect on poverty level of the beneficiaries. Secondly, to test the aspect whether PNPM Rural investment has aligned with community needs. Then, as the third hypothesis; ex-ante community characteristics contributes as the elements of Empowerment for the Poor. Fourth, the Empowerment will affect PNPM investment allocation. This indicated participatory initiative from the marginalized poor that has been empowered to promote PNPM investment both in its implementation activity and its decision making assembly. And the last, the fifth hypothesis: The PNPM Investment and Empowerment for the Poor ideally may decrease poverty level in the community within the time frame.

The conceptual framework for the evaluation were made by leveraging the statistical tools named Structural Equation Model (SEM). The model was

executed due to its versatility to assess the system of equations simultaneously as well as to remedy the measurement error. The mechanism to discard endogeneity or measurement error was made by confounding the observed variable into suitable components (latent variables). This was equivalent with the way conventional factor analysis encounter it. The object of the analysis were budget allocation invested to health, education, economy, agriculture, energy, transportation, and social activities. The budgets were initially stated in nominal values which subsequently discounted to the real value by Consumer Price Index (CPI) adjustment. Afterwards, the data was assessed into two approaches. The first is the study of PNPM Rural performance in western part of Indonesia. It has utilized district level data in backward area in terms of poverty level or poverty headcount ratio. While, the second was the case study analysis of Aceh Province. It was conducted in village-wise arrangement by means of percentage of poor reference published in the village over the total household existed in the corresponding village.

The analysis of the former approach incorporated the extent of two latent variables manifested into human and economic capital. They both were selected because they deemed as the engines of growth or production function. The latter has attempted to do so, yet failed to achieve necessary condition of identification in the validation analysis. Therefore the final framework was only entailing pictorially different structure of latent variable to satisfy confirmatory factor analysis restriction.

The content of this dissertation is organized as follows; chapter two highlights the literature review, chapter three documents methodology incorporated into two conceptual framework; evaluation within national level and

provincial level, chapter four consists of model specification, chapter five presents the data, chapter six integrates the analysis as well as result and discussion, and the last, chapter seven summarizes the important findings into a general conclusion and recommendation for further studies.

## II. LITERATURE REVIEW

### 2.1. Poverty Concept

The World Bank jargon about poverty is “prominent deprivation in well-being” (World Bank, 2005). It is nuanced with approach supported by Amartya Sen (2010) as a relative of deprivation and lack of entitlement and ownership. The poverty term in Indonesia is emphasized on basic need approach. Within this narrative, poverty is believed as the incapability of one person to accomplished basic need in regards of food necessities and non-food necessities which is measured as a proxy for the one expenditure. The people who belong to the poor are those whose average per capita expenditure per month below the poverty line. (Statistics Indonesia, accessed on 2016)

The poverty line itself is a composite index of food-based poverty line and non-food-based poverty line. The former is accounted for the minimum requirement of per capita expenditure spend for food which is equivalent with 2100 kilo-calorie per capita per day. The minimum requirement of the food is represented by 52 commodities such as, rice, tube, fish, meat, milk and egg, vegetables, lentils, fruits, fat, and etc.

The latter index of non-food-based poverty line is accounted for basic needs in terms of housing, clothes, education, and health. The summation of this term with food-based poverty line is imposed by Government of Indonesia as the poverty line. Later, measurement of poverty rate is following below general assumption.

The first measurement assumption is, the poverty should sensitive to income distribution of population. Furthermore, *anonymity* assumption -which means it

does not examine who is the poor and who is not- should be met, the *population independence* – where the population size of a country would not matter- is supposed to be fulfilled, *monotonicity* -which refers to if someone below poverty line has an increment in his/her income (ceteris paribus), poverty will not greater than before- is also one of the particular assumption, and the last property is *distributional sensitivity* (Todaro & Smith, 2012). The generous measurement complies with all of those properties and widely used by Statistics Indonesia as well is Foster-Greer-Thorbecke (1984) index. Below is the formal equation:

$$P_\alpha = \frac{1}{n} \sum_{i=1}^q \left( \frac{z-y_i}{z} \right)^\alpha \dots\dots\dots (1)$$

Where;

$\alpha = 0, 1, 2$

$z =$  Poverty line

$y_i =$  Monthly average per capita consumption those people live under poverty line

$(i = 1, 2, \dots, q), y_i < z$

$q =$  Number of people live under poverty line

$n =$  Total of population (Statistics Indonesia, 2012).

Poverty Measurement explanation per each alpha:

- a.  $\alpha = 0$ ,  $P_0$  is Head Count Index, which measure percentage of the poor live under poverty line
- b.  $\alpha = 1$ ,  $P_1$  is Poverty Gap Index, average scale of each expenditure gap of the poor to the poverty line
- c.  $\alpha = 2$ ,  $P_2$  is Poverty Severity Index, portrayed insight of expenditure distribution among the poor. The higher the index, the higher expenditure gap

among the poor.

The goal to alleviate this statistics is become the main objective of almost all lower-middle to lower income country. It has attracted global institution such as UN (United Nation) and World Bank to take proactive work against this persistent condition. The UN has established MDG (Millennium Development Goal (MDG) that start from 2000 to 2015. Even though the tenure has come to an end, the efforts is remained pervasive. UN has prolonged the noble work and extend it to SDG (Sustainable Development) which start from circa 2015 up to 2030. Notwithstanding its transformation, the main goal of both of the two missions are remained considerably same (ADB, 2016).

The consistent effort is also constantly endeavored by the World Bank, the latest remedy to combat poverty is by mean CDD (Community-Driven Development) and CBD (Community-Based Development) framework (Mansuri & Rao, 2004). This method has emerged since mid-1990s and raise awareness of local nation worldwide due to its success story in poverty alleviation (McCarthy et al., 2014).

Poverty reduction policy within this narrative can be imposed through promoting opportunity, local knowledge, and empowerment of the marginalized poor in order to enable them to make decisions and choices effectively, and income security towards vulnerability of health or economic shocks, natural disasters, and violence.

The calamities due to shock, conflict, and natural disaster, were strongly affiliated with the disadvantaged group. This notion was endorsed by the evidence from Lohmann & Lechtenfeld (2015) and Mottaleb et al. (2013). From their

empirical studies, it was suggested that the rural Vietnam and Bangladesh case of climatic shock were associated with income shock and degradation of human capital. Natural disasters had caused farm household income volatility and negative income shock due to out-of-pocket expense in schooling and healthcare in both of the two study sites. Moreover, in Vietnamese case, it increased the prevalence of illness. Meanwhile, in Bangladesh rural, this income shock was adapted by reducing expenditures on children's education particularly on school admission. These evidences accumulated to lowering human capital as the source of resource endowment in the village domain. And thus perpetuating vicious cycle of poverty traps.

Vicious cycles of poverty traps that perpetuate all through the time would inevitably link to the *path dependence* concept, especially when it was under particular institutional arrangement. An institutions (in this study, a community of interest or object of the study) was constrained by informal constraint such as *path dependence* (North, 1990). As also supported by Liebowits & Margolis (1995) that "the allocations which was selected in present time display a memory; they were conditioned on past decisions. It was mathematically similar with the process expressed by considerably on initial conditions". Thus, the extent of path dependence within this study could not be disregarded.

The path dependence context and vicious cycle of poverty were both relevant to marginalized poor discourse. The poor should break the chain to increase their capacity by empowering themselves and proactively engage in poverty alleviation program imposed by their corresponding authorities.

## **2.2. Poverty Alleviation Policy in Indonesia**

In the context of Indonesia, the conventional poverty alleviation strategy has top-down, supply-driven mechanism. The long-standing framework was commonly acknowledged as poverty-reducing policies were as follows: rice for the poor (Beras Poor: RASKIN), direct/ unconditional cash transfer (Bantuan Langsung Tunai: BLT) and medical insurance for the poor (Jaminan Kesehatan Masyarakat: Jamkesmas) as national poverty reduction programs. These were significantly contributed benefiting the poor so that their misery life would not be exacerbated. The BLT funds, the Jamkesmas card, and the Raskin program were deemed to favor the poor with their day to day needs pertaining immediate cash shock necessities, ailment medication, and food. Those three programs have also been named as top three government programs ubiquitously most benefit the poor. However, the program targeting was out of the poor people control. It apparently managed by a group of village elites who reluctantly promote the poor inclusiveness and transparency (Syukri et al., 2011). Moreover, these grant allotment, mainly for BLT seize negative stigma from public, that it would not help the poor to enhance their quality of life independently, yet it will considerably make them more reluctant to endeavor the hardship or working out of poverty.

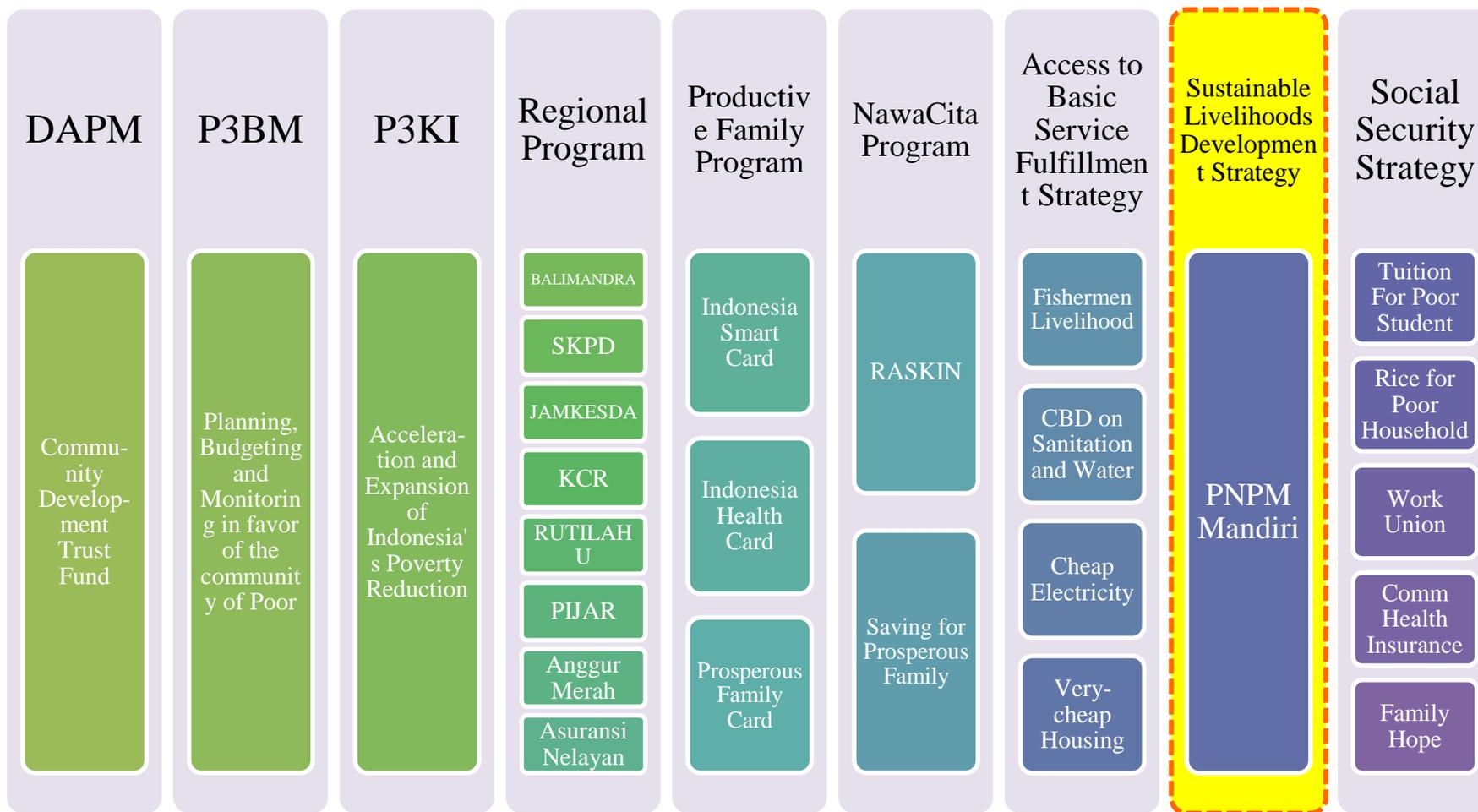
To date, the brand-new poverty alleviation strategy imposed by GoI (Government of Indonesia) under Joko Widodo presidential (2014- onwards) are formulated into nine strategic issues. They are:

1. Community Development Trust Fund
2. Planning, Budgeting and Monitoring in favor of the community of Poor
3. Acceleration and Expansion of Indonesia's Poverty Reduction
4. Regional Program
5. Productive Family Program
6. Nawa Cita (9 Goals) Program
7. Access to Basic Service Fulfilment Strategy
8. Sustainable Livelihoods Development Strategy
9. Social Security Strategy

The issue no.8; Sustainable Livelihood Development Strategy in Table 2.1 contained the prolonged PNPM Mandiri (both rural and urban) program. The program was the typical of CDD framework program that imposed by GoI with coordination from World Bank and other multi-lateral agencies worldwide.

World Bank official development assistance to developing countries typically categorized as CBD (Community-Based Development) and CDD (Community-Driven Development) recently. While CBD generally include beneficiaries (community) into program design and management, CDD allows a more flexibility to beneficiaries to have more control over sub-project decision such as budget allocation at the first hand (Mansuri & Rao, 2004). The merits of imposing CDD program under participatory approach to mitigate poverty according to Mansuri & Rao (2004) are claimed in following arrays of features:

Table 2.1 Poverty Alleviation Program in Indonesia



- a. Generate agency and aspire the poor
- b. Permit the poor to have more control of development program
- c. Improve pro-poor targeting
- d. Lead the government to become more responsive
- e. Public goods and service deliveries improvement
- f. Capacity building to exercise self-initiated development into daily practice

### **2.3. Community-Driven Development Program**

#### **2.3.1. History**

Ghandian cooperative movement in 1962 primordially started the path-dependency of CDD process. Mahatma Gandhi proposed village self-reliance (*svadesh*) and small-scale development (Mansuri & Rao, 2004). The notion later on supported by Paulo Freire (1970) who postulated that in order to enhance their livelihood, the oppressed need to unite to find a way to improve it. The context has been created to critic USAid participatory development program in the first-wave at circa 1950s.

Within a decade, institutional economist Olson (1973) and Hardin (1982) established the term; *collective action* and free-rider into the context of CDD. The former indicated simultaneous work of all member of certain group to obtain common interest. The later signified behavior of rent-seeking person who acted against collective action, who would not perform in favor of common interest. Similarly, it was also entitled to those who had little interest in the common resources, they would also tend to act against the common interest.

A decade later, common pool resource (CPR) idea was born from the work

of Hardin (1992), which surfaced the “Tragedy of the Commons” discourse. He suggested managing the commons of the public and the private sector, decentralization to local government, and amenities in the form of goods and services that were pooled by the common Resources. Property right theorist such as Demsetz (1970) and North (1990) also contributed to the body of literature of CDD history in regards of imposing strong state regulation / enclosure in order to control CPR from overexploited due to rising in demand. This notion was departed from negative externalities of “big development” in mid 1980s in which many large-scale government initiated development programs were performing unsatisfactorily, while rapidly degrading CPR and make use of it to its maximum carrying capacity. This was creating significant negative impact in human ecology.

In 1983, Chambers contended on “second-wave of participatory movement” in which it was started to apply small-scale development into localities. It permitted the poor to be well informed and participated in development process while leveraging the help from facilitators and sources of fund as the external agent. This was supported by economist Sen (1999) who urged the shift of development focus from tangible welfare to a general “capability” approach. The locus of this context was strategy to “empower” the marginalized, which eventually enabling them to participate and had aspiration about decision in certain sub-project or development program.

Within millennium era, Narayan (2002) suggested the idea of promoting the poor participation by means of institutions to endeavor them and built their capacities for collective action deliberately. The World Bank subsequently, followed this whole array of history with focused on “empowerment” as its main agenda in development starting the year 2001. (Mansuri & Rao, 2004)

### **2.3.2. Empirical Studies on Community-Driven Development Program**

Having said that CDD has generous benefit in organizing people aspiration and livelihood did not mean that the approach is perfect panacea. It has also caveats which is explained in the following body of empirical studies.

In terms of sustainability of the community-lead development program, Botchway (2001) and Nkonya et al. (2012) suggested negative effect of community-based program to sustainability. The program imposed in such localities are usually on agenda-basis, which prone to be terminated when the donor end up the MoU. In the case of potable water provision through IVWP program (Integrated Village Water Project) in Ghana, Botchway (2012) contested that participation and empowerment within this program did not extend to sustainable fashion. This was due to the fact that the program did not directly channel the community preferable program. The process of decision making are solely under responsibility of project manager and administrator. Another drawback came from the evidence that respondents in Yendi and East Mamprusi District were unable to recognized that their local resources were not adequate to meet local needs. Subsequently, the community were trapped in dependency to the potable water provision without ability to earn income-generating activity from that program.

In order to complement the findings, Nkonya et al., (2012) has served for different story. Even though the FADAMA II program has significant and positive outcomes in terms of increasing income and asset procession, in fact, the project has disadvantages in the following manners: The sustainability was eroded because it did not entail microfinance scheme, as well as impact of the program to the poorest was not significant. This explanations indicated that Nigerian

FADAMA II project has not followed mechanism that pro-poor targeting.

This appealing result apparently contradicted with the work from Labonne & Chase (2009) and Galasso & Ravallion (2005). Both cases of CDD in Philippines and Bangladesh has shown that the program performed better in poverty targeting. The poor in Philippines benefitted from KALAHI-CIDS project. By employing Probit and Conditional Logit Regression, Labonne & Chase (2009) discovered that the poorer and more active village would tend to get their proposal funded, this lead to better pro-poor targeting ultimately. The mechanism of this success story may root form the benevolent role of Elite control within the communities. The elite can move and direct the funds align with necessities the poorest urgently need. The creation of protagonist elite within the study might stemmed from degree of heterogeneity specific to a community. The more heterogeneous society will accrue potential protagonist elite who is capable in winning the proposal bidding.

Consistent with previous finding in Philippines, Bangladesh Food for Education Program (FFE) has positive impact in terms of participation of the poor. Galasso & Ravallion (2005) contested that it has followed pro-poor targeting. However, contrary with the abovementioned study, it has opposite direction of impact in regards of heterogeneity of the people. They suggested that the more heterogeneous (in terms of land ownership) the more susceptible the non-poor capture the benefit. Other dismal failure occurred in terms of degree of isolation of the community and ownership of common social safety program access prior to program establishment. Even though the two cases have agreed on the aspect to pro-poor targeting, however the notion of heterogeneity of both of study were varied.

Dasgupta and Beard (2007) resonance the similar fashion to that of the work of Labonne & Chase (2009) of heterogeneity to the performance of the CDD. There was differentiation of the term of elite to distinguish those who acted benevolent as *elite control* and those whose role was pernicious as *elite capture*. The former prevailed when local leader or elite act in the way parallel to people aspirations. Whereas the latter entitled to the elite who act the opposite way, did not act as the prime mover, in fact they capture the benefit of the program in favor of their rent-seeking behavior. The extent of heterogeneity in the context of four neighborhood in Java island Indonesia, resonance the result from Labonne & Chase (2009) that the more homogeneous community will tend to reduced resources to the poor. With the same manner to that of villages in Philippines, the extent of elite control has acted as predominant factor to successful budget channeled to the poor.

In the extent of participation of the poor, contradicted to the above setting, Okten & Osili (2004) investigated the effect of heterogeneity to the contribution of community-driven activity or social activity in Indonesian cases by utilizing the Tobit analysis. The locus of their study was to dismantle characteristics that determines the monetary and time contribution to community organization. Leveraging microdata of IFLS phase 2 which composed about 7500 HH data, they elucidated that the ethnic diversity has negative and significant effect on contribution and prevalence of community-based activities. They added that the government spending reduced personal monetary contribution which has less effect on time contribution. This might be rooted from high transaction cost to deal with diverse group as well as varied preferences for public goods.

Variety of ethnics entrenched within a community was not only the extent

that might explain the heterogeneity. La Ferrara (2002) explored the case of CDD in rural Tanzania, and elucidated that heterogeneity and wealth inequality has negative effect on group memberships. This lead to the notion that heterogeneity in certain degree impeded participatory initiatives encouraged within CDD framework.

However, the participatory initiatives remained robust in a specific context. In Malawi Rural Piped Scheme Program, Kleemeir (2000) investigated interlinkages between participatory initiative and sustainability on operation and maintenance of the program. The program's ethnography study revealed that the notion of participatory initiative project were more sustainable than those without or less participatory initiatives. The equivalent finding also replicated by study from Mark & Davis (2012). They conducted the research to seek the effect of participation of Rural Water System in Kenya to the sense of ownership of the community. The sense of ownership logically will promote the sustainability of the project. Utilizing project sample of household from Central, Eastern, and Rift Valley province, the result indicated that the household who contributed money at the amount equivalent to its monthly income significantly more likely to articulate a higher sense of ownership. In addition, the participation and contribution in labor forces drive moderate and low sense of ownership. Those who had higher degree of sense of ownership also came from the cohort consist of household who has individual water connection. This water system project were analyzed by employing the principal component analysis and multivariate regression analysis.

Another study exploited multivariate analysis was investigated by Yalagama et al., (2016). Executing Explanatory Factor Analysis, the author attempt to assess the critical success factor (CSF) embedded in a successful CDD program such as

Srilankan's Gemiridiya program. The corresponding CFS within community has shaped by several factors. They are; supporting community environment, measurable project management outcomes for evaluation by village official, and commitment and engagement from community project management. The author recommended more advance tools such as Structural Equation Model to extract more reliable result.

The result above to some degree, emphasized that success story of the program largely depend on community engagement or participation. Furthermore, the study about community engagement and participation has never came to an end especially when it links to local knowledge or characteristics. Supported by Leibowitz & Margolis (1995), the local extent or pre-determined condition of the communities affect the outcome of delivery. Beard (2007) incorporate this notion using IFLS data. It revealed that HH head with lower school attainment spend less time to community governance. So as those with lower expenditure and less valuable assets, they tend to act the same, to relatively less contribute to community development. However, it was also unveiled that the household with highest expenditure prone to contribute less time to participate in community development. The more acute tendency were those household headed by female and recent migrant who were just new to learn their surroundings. The typical of people who will attend or participate and contribute to community development were those household which having larger family size and extent belonging to the dominant ethnics group entrenched in the community.

The community formation of human capital in the above regards has shown its effect to the participation process in the CDD framework. Education variable, as the component of human capital is worth investigating in order to have various

insights about CDD. Pradhan et al., (2003), World Bank (2014), and Jimenez & Sawada (1999) simultaneously sounded appealing result about this matter. In relation to CDD framework, the education program delivered by means of CDD mechanisms has shown positive outcome in terms of cognitive and language development. Utilizing RCT (Randomized Controlled Trial) the result was pervasive in the girl cohort as a group at risk in many poor localities. The others benefits echoed by the evidence that the children who had not previously been involved in any kind of community-based Early Childhood Education and Development (ECED) program in Indonesia received larger benefit compared to other groups. Eventually the outcome has also positive impact in terms of increasing enrollment rate.

The decrease of number of day's students absent was also prevailed in El Salvador context. The county has a remarkable success in bridging education facility to the poor within the era of post- civil war in 1990. The community-based education provider named EDUCO has been successfully increasing student score in linguistic too (Jimenez & Sawada, 1999). The idea of CBD type of school management as compared to the traditional method was fruitful because the CBD type can fully cover the poorer area and the parents through parental communities were actively monitor the performance of the school and encouraging their student not to skip the school. The study has been conducted in 162 municipalities all across El Salvador. Using instrumental variables, the extent of endogeneity could be mitigated. The endogeneity case occurred in the participation of the parents of the student within the EDUCO environment.

Because environment is essential pre-condition of successful CDD management, in order to distinguish the participation extent in rural and urban,

Beard and Dasgupta (2006) conducted FGD (focus group discussion) within 7 cases of UPP (Urban Poverty Project) in Indonesia. It was documented that the rural has greater capacity for collective action compare to their counterpart in the urban. Yet, when the urban societies were given the opportunities to engage in collective action, the result are more socially transformative than that in the case of rural.

Further investigation in urban area, the study of elite capture within CDD framework was complemented by the finding of Fritzen (2007). The research aimed to inspect the relationship of design mechanism of the board to Elite capture in Indonesia. The result eloquently suggested that democratic leadership selection through project-initiated accountability management has good performance to pro poor participation. The results legitimated by analysis in 250 Indonesian sub-district, with the mix method framework. Qualitatively by 7 FGDs (Focus Group Discussion), 15 IDI (In Depth Interview), and self-administered questionnaires compiled with ordered logit model as quantitative analysis.

Using different analysis of Difference in Difference Method and Propensity Score Matching, the extension of study of KALAHICIDSS was occurred. Labonne et al., (2011) has attempted to evaluate the effect of aforementioned CDD to the formation of social capital. It was indicated that KALAHICIDSS program participation in its village meeting has been increased compared to the control. However, the collective action performance and group membership has been decreased. Thus, the extent of trust was also limited.

To seek for relationship of the trust and associated entities, Cordova & Layton (2016) has shed a light on the effort to dismantle the determinant of political trust in local government within CDD program in El Salvador. They

uniquely measure the performance of program delivery and fairness of policy deemed by the society as two dimensions of evaluation. They proposed Fairness Heuristics Theory (FHT) that mentioned that neighborhood inequality is an important heuristics for evaluation to what extent the poor may trust local government. It was finally found that in spite of government high performance, the poorest who live in high disparity gap significantly has lower trust in local government.

The trust norm was essential to strengthen community's institution. The effort had made Casey et al., (2011) attempted to unveil the effect of specific reforms to strengthen village institution of rural Sierra Leone's GoBifo project. It was finally suggested that the intervention has improved local public goods and enhance economic welfare. However, in terms of social capital, capacity for collective action, social norms and attitudes, and the nature of de facto political relation were hard to change.

Furthermore, to grasp the insight of the complete summary of the empirical studies one may refer to Table 2.2.

Tabel 2.2 Empirical Studies of Community-Driven Development Program

Authors & Year	Main Objective	The Data, Model, and Methodology	Important Findings
<p>Labonne et al., (2009), Wong (2012)</p>	<p>To investigate to what extent communities select the proposal and the way they allocate the resources within KALAHY-CIDSS program</p>	<ul style="list-style-type: none"> <li>• Data consist of Philippines 1200 households characteristics in 66 communities</li> <li>• Probit and conditional logit regression</li> </ul>	<ul style="list-style-type: none"> <li>• Heterogeneous village will tend to get the proposal funded</li> <li>• The poorer and more active villages tend to get their proposal granted</li> <li>• Improve poor targeting</li> <li>• Elite capture give benevolent effect as prime-mover in the village</li> </ul>
<p>Labonne et al., (2011), Wong (2012)</p>	<p>To evaluate the effect of CDD to Social Capital formation</p>	<ul style="list-style-type: none"> <li>• Difference-in-Difference and Propensity score matching</li> <li>• Panel data set of 2,100 HH collected in 66 treatment and 69 comparison communities of KALAHY-CIDSS</li> </ul>	<ul style="list-style-type: none"> <li>• Participation of village meeting increased</li> <li>• Collective action performance (<i>Bayanihan</i>) and group membership decreased</li> </ul>

		program	<ul style="list-style-type: none"> <li>• The extent of trust increase, however it was limited</li> <li>• Impact to group membership are negative</li> </ul>
Nkonya et al., (2012)	To determine Fadama II projects performance on income and asset acquisition in Nigeria	<ul style="list-style-type: none"> <li>• Conducted in 12 states of FADAMA II project which lie in three different agro-ecological zone</li> <li>• Total sample is 3,750 HH</li> <li>• Difference-in-difference method, probit model of propensity score matching</li> </ul>	<ul style="list-style-type: none"> <li>• income and productive asset significantly positive</li> <li>• Participation increase the asset</li> <li>• Impact to the poorest is not significant</li> <li>• Sustainability remain low due to the absence of microfinance.</li> </ul>

<p>Arcand and Wagner (2016)</p>	<p>To elaborate performance of Programme de Services Agricoles et Organisations de Producteurs (PSAOP) to assortative-matching and its membership in Senegal</p>	<ul style="list-style-type: none"> <li>• Logistic regression analysis</li> <li>• Dyadic difference-in-difference regression</li> </ul>	<ul style="list-style-type: none"> <li>• Improve program inclusiveness. More marginalized people participated into the program; nomadic person, woman-headed family, and woman peasant group</li> <li>• Reduce homophily in ethnicity and wealth</li> </ul>
<p>Córdova and Layton (2016)</p>	<p>To dismantle the determinant of political trust in local government within CDD program in El Salvador</p>	<ul style="list-style-type: none"> <li>• Measure the performance and fairness as two dimension of evaluations</li> <li>• Fairness Heuristics Theory (FHT): the neighborhood inequality as a method for investigating to what extent the poor may trust local government.</li> <li>• 71 neighborhood in 6 municipalities</li> </ul>	<ul style="list-style-type: none"> <li>• In spite of government high performance, the poorest who live in high disparity significantly has lower trust in local government.</li> </ul>

		<ul style="list-style-type: none"><li>• Dependent: extent of trust (likert scale). Independent: demographic, socio economic status, inequality within neighborhoods, absolute living condition in the neighborhoods</li><li>• ANOVA for variation in trust</li><li>• David McKenzie method to measure the inequality of citizen relative to the neighborhood according to Principal Component Analysis and household asset.</li><li>• UBN (unsatisfied basic needs) index for absolute neighborhood condition, or poverty</li></ul>	
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<p>Lowitt et al., (2015)</p>	<p>To illustrate how a CBD approach in Interlinkages of agricultural value chain could assist stakeholders to identify more resilient practices to better support adaptation and innovation</p>	<ul style="list-style-type: none"> <li>• CARICOM or Caribbean Community comprises many SIDS (Small Island Developing States) equal to 15 countries</li> <li>• 45 key informants interviews in St. Kitts and Trinidad on stakeholders among organizations and Community of Practice</li> </ul>	<ul style="list-style-type: none"> <li>• Inter-linkages of value chain has positive outcome on all stakeholders</li> <li>• Suggestion for improvement; enhance social capital in terms of pattern of relationship, history of interaction, and shared system of learning trough collaboration, trust, and knowledge sharing.</li> <li>• Conditions to foster social capital: clear communication, aggregate participatory initiatives, establishing common goals, honesty and transparency.</li> </ul>
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<p>Dasgupta and Beard (2007)</p>	<p>To investigate determinant of CDD to elite capture in Indonesia and the mechanism how capacity of community to collective action can hinder elite capture.</p>	<ul style="list-style-type: none"> <li>• purposive sampling selection in 4 neighborhood in Java island</li> <li>• group size, homogeneity/heterogeneity extent, and rural/urban status as the variable of interest</li> <li>• FGD (focus group discussion)</li> </ul>	<p>There are 4 factors affecting elite captures:</p> <ul style="list-style-type: none"> <li>• Design of the project</li> <li>• Ex-ante community characteristics: heterogeneity and group contrast, community cohesion, social hierarchy, and power relationships</li> <li>• Community's capacity for collective action</li> <li>• macro social, economic, and political constraint</li> </ul>
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<p>Yalegama et al., (2016)</p>	<p>To determine the CSFs (Critical Success Factor) of the Sri Lankan <i>Gemidiriya</i> CDD project from a community perspective.</p>	<ul style="list-style-type: none"> <li>• Qualitative and Quantitative analysis</li> <li>• Factor analysis; EFA (Exploratory Factor Analysis)</li> </ul>	<p>CFSs:</p> <ul style="list-style-type: none"> <li>• Supporting community environment</li> <li>• Measurable project management outcomes for evaluation</li> <li>• Commitment and engagement from Community project management</li> </ul>
<p>Pardhan et al., (2013) and Worldbank (2014)</p>	<p>To examine the performance of community-based early childhood education and development (ECED) program in Indonesia</p>	<ul style="list-style-type: none"> <li>• RCT (Randomized Controlled Trial)</li> <li>• 5 island, 9 district and province</li> <li>• Implemented in 3 batches; baseline, midline, end line.</li> </ul>	<ul style="list-style-type: none"> <li>• The poorest children showed the greatest impact in cognitive and language development</li> <li>• Positive impacts were greater for girls, a group at risk in many poor communities.</li> <li>• the children who had not previously been enrolled in any kind of ECED</li> </ul>

			<p>service received greatest benefit</p> <ul style="list-style-type: none"> <li>• increase enrollment rate</li> </ul>
Fritzen (2007)	<p>To measure the design mechanism of the board of UPP (Urban Poverty Project) to elite captures in Indonesia, and to emphasize the performance it might bring to poverty</p>	<ul style="list-style-type: none"> <li>• 250 Indonesian sub-districts</li> <li>• 7 FGD and 15 semi-structured, in-depth interviews with UPP community board member, community participant, facilitators, and government official in 2004</li> <li>• Ordered logit model</li> <li>• Variables: contextual factors, democratic selection process, elites status, pro accountability board disposition &amp; effort, project</li> </ul>	<ul style="list-style-type: none"> <li>• UPP can create various degree of elites and non-elite leaders</li> <li>• Elite control of decision making process is prevalent</li> <li>• Author suggested democratic leadership selection through project-initiated accountability arrangement</li> <li>• as long as democratic selection process occurred, the performance will be pro-poor.</li> </ul>

		performance indicator	
Okten & Osili (2004)	To examine the effect of community characteristics and state supports to contributions (monetary and time) to community organization	<ul style="list-style-type: none"> <li>• IFLS2 (Indonesia Family Life Surveys) phase 2 composed of about 7,500 HH data and Community-Facility Survey</li> <li>• Tobit Regression approach and Instrumental Variable</li> <li>• ethnic diversity and central government transfer</li> </ul>	<ul style="list-style-type: none"> <li>• negative and significant effect on contributions of the ethnic diversity variable this is due to high transaction cost and varied preference for public goods in community level</li> <li>• Gov. spending reduce monetary contributions, time contribution has</li> </ul>

			a less convincing result.
Jimenez and Sawada (1999)	To examine the outcome of community-managed school of EDUCO program in El Salvador to affect student outcome	<ul style="list-style-type: none"> <li>• EDUCO was created to expand rural education rapidly in the post-conflict (El Salvador civil war)</li> <li>• Data surveyed in 162 municipalities: 605 students of EDUCO vs 101 students of conventional schools</li> <li>• School production function, responses variables: math &amp; language score,</li> </ul>	<ul style="list-style-type: none"> <li>• EDUCO school has successfully decrease the number of days absent compared to traditional school</li> <li>• EDUCO student has better language score than the traditional</li> </ul>

		<p>and number day of absent within last month. regressor: child &amp; household variables, school variables, teacher &amp; classroom variables, community participation variables</p> <ul style="list-style-type: none"> <li>• Instrumental Variables, instrument: regional school distribution</li> </ul>	
Beard (2007)	<p>To evaluate the effect of household time and monetary contributions to governance, social welfare, and environmental infrastructure</p>	<ul style="list-style-type: none"> <li>• Stratified random sampling both in Urban and Rural. 10,541 data are collected (IFLS3)</li> <li>• 2 steps of analysis; first is urban-rural difference on participation levels and characteristics of HH and</li> </ul>	<ul style="list-style-type: none"> <li>• HH head with lower school attainment spend less time to community governance</li> <li>• HH with lower expenditure and less valuable asset were rarely contribute time and money to community development</li> </ul>

		<p>communities, second is tobit regression model to predict the level of household participations</p>	<ul style="list-style-type: none"> <li>• HH with higher expenditure contribute less to community development</li> <li>• Female headed HH and recent migrants were less likely contributes in the community development activities.</li> <li>• Having larger family and a status belong to the dominant group are positively linked with contribution to community development</li> </ul>
<p>Beard and Dasgupta (2006)</p>	<p>To distinguish Rural and Urban entities in term of cohesion, social capital</p>	<p>Qualitative study of 7 case of UPP (Urban Poverty Project) Communities which decided</p>	<ul style="list-style-type: none"> <li>• Rural area has bigger capacity for collective action than the urban counterparts</li> </ul>

	dynamics and capacity for collective action	purposively	<ul style="list-style-type: none"> <li>• The outcome of collective action will be more socially transformative in urban area</li> </ul>
Botchway (2001)	To analyze participation, empowerment, sustainability and feasibility context on financial rural development project in Ghana	<ul style="list-style-type: none"> <li>• Northern Region Rural Integrated Program (NORRIP) particularly in Integrated Village Water Project (IVWP) through potable water provision within Yendi and East Mamprusi District</li> <li>• Questions to be asked: the participation substitute structural change, the homogeneity and simplicity of the basic of participation, and the feasibility of</li> </ul>	<ul style="list-style-type: none"> <li>• Both of the two districts fail to recognize that their local resources</li> <li>• Communities trapped in dependency without ability to acquire income-generating activity</li> <li>• The project is fail to ensure villagers to define their priority needs.</li> <li>• Ensuring the sustainability of the program needs support from the states.</li> </ul>

		institutionalized structure of empowerment and participation.	
Galasso and Ravallion (2005)	To evaluate Bangladesh Food for Education (FFE) distributional outcome for the poor in terms of specification of how much the performance was contributed from center vs local community, and what determine that performance	<ul style="list-style-type: none"> <li>• Econometric model of local collective action utility maximization and center’s project office utility maximization</li> <li>• Empirical data from 1995-1996 Household Expenditure Survey</li> <li>• Total sample 252 “mauza” (villages) with 3625 household whose children are in the primary school age range (5-16)</li> </ul> <p>Variable groups: Eligibility variables, Structural variables, Openness</p>	<ul style="list-style-type: none"> <li>• Program Poverty-targeting is modestly pro-poor</li> <li>• As the program is continued, the participation of the poor is increased</li> <li>• heterogeneous villages ( in terms of land ownership) are worse in targeting the poor</li> <li>• the performance are worsen in more isolated community.</li> <li>• the program resources go relatively more to the non-poor in the village whose already have social safety net</li> </ul>

		variables, Inequality measure, and Institutions	program. <ul style="list-style-type: none"> <li>• The center is not targeting the poor</li> </ul>
Kleemeir (2000)	To determine interlinkage between participatory and sustainability on operation and maintenance of the Malawi Rural Piped Scheme Program	<ul style="list-style-type: none"> <li>• Ethnographic study and in depth interview in 1997 and 1998</li> </ul> Monitoring assistant's monthly reports from Water Department study of reliability.	<ul style="list-style-type: none"> <li>• Participatory initiative project are more sustainable than those without or with less participatory initiatives.</li> <li>• Less-participatory approach resulted in more input from the state, participatory approach is relatively limited to it</li> <li>• There is fewer preventative maintenance as well as weaker support from external agency in participatory project</li> </ul>

La Ferrara (2002)	To assess determinant of participation in regards of heterogeneity and wealth inequality in rural Tanzania.	<ul style="list-style-type: none"> <li>• World Bank’s The Tanzania Social Capital and Poverty Survey (SCPS) in 1995 and the Tanzania Human Resource Development Survey (HRDS) of 1993.</li> <li>• Two stage least square method</li> </ul>	<ul style="list-style-type: none"> <li>• higher inequality inhibited group membership</li> <li>• The shape of wealth distribution and type of access rule to the group are another determinant of interest</li> </ul>
Marks & Davis (2012)	To dismantle the drivers of sense of ownership for Rural Water System in Kenya	<ul style="list-style-type: none"> <li>• Principal Component Analysis and multivariate regression technique</li> <li>• Stratified sample taking from three provinces: Central, Eastern, and Rift Valley, and randomly select 20 communities, 15 communities, and 15 communities respectively.</li> <li>• Systematic sample of household</li> </ul>	<ul style="list-style-type: none"> <li>• Only HH who contributed money at amount equivalent to its monthly income is significantly tend to articulate a higher sense of ownership</li> <li>• Labor contribution was significantly drive moderate and low sense of ownership.</li> </ul>

		(every n <sup>th</sup> household)	<ul style="list-style-type: none"> <li>• HH that accessed water from the program as well as those who have individual water connection have significantly stronger sense of ownership.</li> </ul>
Casey et al. (2011), Wong (2012)	To unveil the effect of specific reforms to strengthen village institution of rural Sierra Leone's GoBifo project (JSDF)	<ul style="list-style-type: none"> <li>• Exploiting randomly assigned governance intervention, developing objective measure, and PAP (Pre-Analysis Plan)</li> </ul>	<ul style="list-style-type: none"> <li>• Improve local public goods, and enhance economic welfare.</li> <li>• Variable that difficult to change; duration of changes in village institutions, capacity for collective action, attitudes and social norms, and the characteristics of de facto political power</li> <li>• Changes to the rules of formal</li> </ul>

			institution, eg: by female or youth leadership quota might be effective in shifting entrenched de facto power and social formation within the context.
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## **2.4. National Program for Community Empowerment (PNPM Mandiri)**

### **2.4.1. History and Track Record**

PNPM Mandiri erected in 30<sup>th</sup> July 2007. The objective of the establishment is to strengthen and enhance the Indonesian civil society capacity to target and empower marginalized groups to improve their welfare conditions. It embarks with *Sub-district Development Program (Program Pengembangan Kecamatan: PPK)* and *Urban Poverty Alleviation Program (Program Penanggulangan Kemiskinan di Perkotaan: P2KP)* (PNPM, 2012). Both of the programs have shown well performed that makes them to fuse as one ultimate program in mitigating poverty named National Program for Community Empowerment (Program Nasional Pemberdayaan Masyarakat: PNPM), that hereinafter the ruling's president at that moment affix the term "Mandiri" aside the program name which means "independent".

The program encompassed in PNPM Mandiri was challenged to fulfill Indonesia MDG goal to 2015 particularly in alleviating poverty. It was also motivated to generate employment opportunity through community empowerment, by using community participation approach, which every single village entity may deliver what they conceive to reach sustainable development. This also would lead to community institution capacity strengthened, where people gather in one forum, utilize community meeting as platform to share and collect the idea, sum and wrap up what the urgent development aspect more favorable than other village community development priorities at the *Development Planning Meeting (Musyawarah Perencanaan Pembangunan: musrenbang)*. Here, government has no deal with it but let the community itself performed each agenda in self-reliant

fashion. Another feature characterized PNPM Mandiri was positive action for women encouragement. They were engaged in evolving their livelihood via *Save and Loan program for Woman (Simpan-Pinjam Perempuan: SPP)*. The amounts of revolving loan funds used in the SPP were disbursed from national budget disseminated to a group of woman enterprises. They were responsible in returning back the money plus 12 percent of the amount they borrowed per year.

However, due to national budget was shoe-string allotted, the pilot initiative also involved aid supported by multilateral donors from developed country as known as PSF (PNPM Support Facility). The PNPM Support Facility was supported by the Australian Agency for International Development (AusAID), the Canadian International Development Agency (CIDA), the Danish International Development Agency (DANIDA), the U.S. Agency for International Development (USAid), the European Union, the Dutch Government, United Kingdom Aid (UKaid), and managed by the World Bank.

Organically, PNPM Mandiri divided into several major domains. They were;

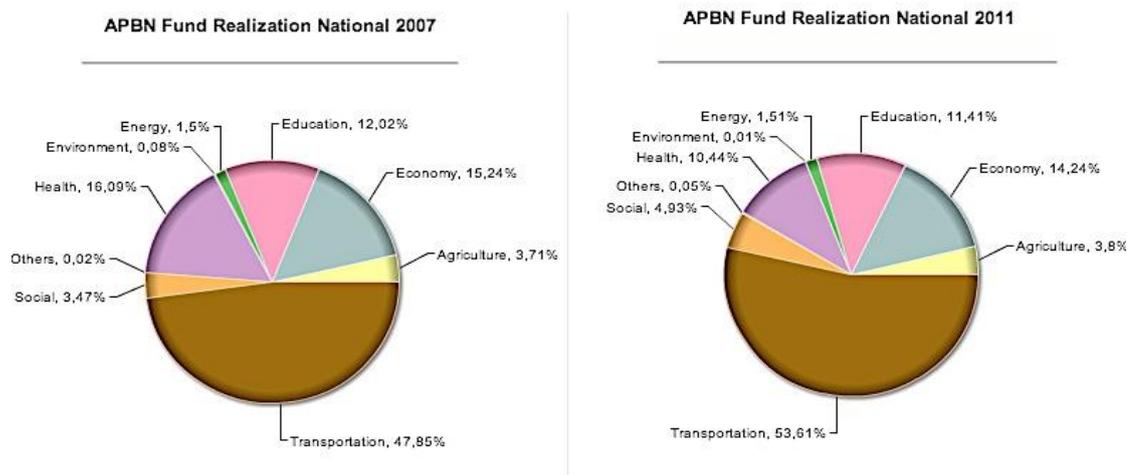
1. PNPM Rural (PNPM Perdesaan)
2. PNPM Urban (PNPM Perkotaan)
3. PNPM Rural Infrastructure Support (PNPM RIS)
4. PNPM Regional Infrastructure for Social and Economic Development (Pengembangan Infrastruktur Sosial Ekonomi Wilayah: PNPM PISEW).

#### **2.4.2. PNPM Rural (PNPM Perdesaan)**

It was firmly acknowledge that developing countries in Asia and Africa spend about 80% of poverty-targeted budget to rural areas (Todaro & Smith, 2012). Compared to urban budget allotment realization (68.13%), PNPM Rural

contribute higher ratio of 89.75% budget disbursed to productive activities (SIMPADU-PK Bappenas, 2013). The program is initially developed and formatted from its precedent *Sub-district development program (Program Pengembangan Kecamatan: PPK)* that has been started since 1998. The PNPM Rural encouraged community participation within the program. Through local development plan deliberation; once the community agrees the plan, the village official subsequently distribute the collected proposals to the sub-district (*kecamatan*) level. At this administrative unit, the block grant from regional account be allocated for disbursement. Each villages within the corresponding sub-district must then compete to prove that the blueprint warrant the grant based on the level of necessities and poverty targeting (Syukri et al., 2011).

According to Figure 2.1, distribution of budget allotment to the PNPM Rural disbursed mostly on transportation sector, follow by Economy, Health, Education, Social, Education, and so on. However from 2007 to 2011, the amount of health and education sector decreased from 2007 to 2011. Different fashion incurred in transportation allocation. It keeps increasing within both period 2007 and 2011.



Source : PNPM Mandiri Management Information System, SIMPADU

Figure 2.1. National Budget Allocation on PNPM Rural in 2007 and 2011

To date, PNPM Rural have spread to more than 77.000 villages in more than 5000 sub-districts, including all rural *kecamatan* in Indonesia (PSF, 2012). The amount of Direct Block Grants (Bantuan Langsung Mandiri: BLM) disbursed in sub-district level is around Rp. 900 million – Rp. 3 billion (US\$ 90,000 – US\$ 300,000 in 2009), which determined by the poor and total population ratio in corresponding sub-district. Each sub-district will receive the BLM at least 3 years. PNPM Rural also supported by other programs associated with notable issue in rural livelihood. They are;

1. PNPM Generation (PNPM *Generasi*)
2. PNPM Rural Environment (PNPM *Lingkungan Mandiri Perdesaan*)
3. PNPM Respect (PNPM *Mandiri Respek/ Rencana Strategi Pembangunan Kampung*) in Papua
4. PNPM Financial Assistance for Village Prosperity Program (PNPM *Mandiri BKPG/ Badan Keuangan Pemakmoe Gampong*) in Aceh

5. PNPM Intregation/ Participatory System Development Program (PNPM *Integrasi/ Program Pembangunan Sistem Perencanaan Partisipatif: P2SPP*)
6. PNPM Agriculture Respect (PNPM *Mandiri Respek Pertanian*)
7. PNPM Post-Disaster (PNPM *Mandiri Pasca Bencana*)
8. PNPM Post-Crisis (PNPM *Mandiri Pasca Krisis*)

As the target of this program dedicated to poor community, the study shows that the PNPM Rural gives positive impact on diminishing poverty ratio; improve people welfare and public services. It is documented that the rate community consumption per capita imposed by the PNPM Rural increases up to 9.1% from the control in its baseline study in 2007. Indeed, in the poorest region of imposed PNPM area, consumption per capita recorded high increment of 12.7% during 2007-2012 periods. In fact, over 500.000 households get out of pauperization. Therewith, more than 300.000 unemployment people revamp their status to get into the job pertaining the PNPM Rural activities (PSF, 2012). PNPM presumed as the largest community development program around the globe which many of foreign countries take glimpse to it for the sake of poverty alleviation. This ubiquitously put the PNPM Rural a good weapon to combat poverty in Indonesia as many of the neighboring country come along and undertake comparative study and adoption CDD (Community-Driven Development) programs applied in Indonesia. Among 33 interested neighboring countries, Afghanistan has intensively prevailed the same program under umbrella program alike named NSP, Afghanistan's National Solidarity Program (NSP) (World Bank article in 2011, accessed on 8<sup>th</sup> July, 2013).

To date, there are empirically evidences from the PNPM impact evaluation

studies carried out in Indonesia. One sort of it is the qualitative study has been carried out by the SMERU Research institute, using focus group discussion, in-depth interview and monitoring of the PNPM Rural activities. Sampling frame is recalled from 3 *districts (kabupaten)* in East Java, 3 *kabupaten* in West Sumatera, and 3 *kabupaten* in Southeast Sulawesi. The study is the prolonged research conducted in comparison to its counterfactual in baseline studies performed in 2002 and 2007 in corresponding 3 aforementioned districts. It was suggested that the PNPM Rural apparently, to some extent, help decrease poverty level. PNPM Rural considered participating more indirectly in poverty reduction by enhancing access to variety of public goods and services. As it is recorded as well that allocation of block grant mostly spent on infrastructure construction. (Syukri et al., 2011)

#### **2.4.3. PNPM Rural Decision Making Process**

The decision making process within PNPM Rural circumstances depicted on Figure 2.2 promoting participatory initiatives among villagers. The cycle implemented initially at sub-district level where the inter-village orientation meeting was held. The representative of each village belongs to the marginalized group, female-headed household group and village official are responsible to attend this meeting in order to acknowledge the forthcoming agenda of PNPM Rural within a year. The nomination of village facilitators and committees are also decided in this meeting. Soon after the meeting is done, the representative from inter-village meeting are required to circulate the findings of the meeting held in the sub-district to the common villagers in the village orientation meeting where it is supervised by appointed facilitator and committees. Subsequently, village group

discussion are being undertaken to collect and prioritize the village individual project proposal. This assembly comprises special meeting for woman group who has privilege to select two proposals and send three eligible representatives to the inter- village meeting. Eventually, this village assembly will agree to prioritize three proposals in which two of them are idea from woman group. Afterwards, the second phase of inter-village meeting is held to prioritize submitted proposal. This include task to form verification team in order to record and verify the proposal validity, reliability, and feasibility. In the next inter-village meeting will discuss about the final proposal design and cost estimation of selected proposal. Later the result of this meeting again is circulated to the intra village meeting, where villagers task are to define and discuss work plan and report.

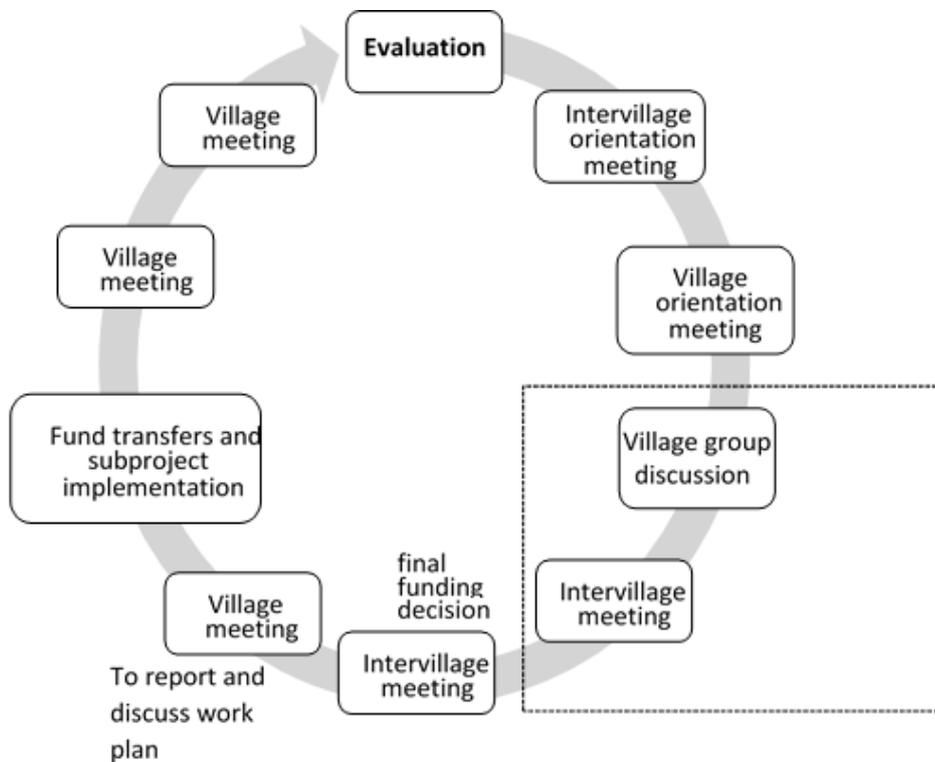


Figure 2.2. PNPM Rural Program Subproject Implementation Cycle (modified from ADB (2016))

The preparation of subproject implementation are consist of three –phase fund transfers which monitored through intra-village meeting in between. After the third phase funds transfer has been distributed, the evaluation of the whole program is occurred to assess the overall performance and maintenance of PNPM Rural public goods and service delivery. (ADB, 2016)

#### **2.4.4. Mechanism of Budget Distribution in PNPM Rural**

The Table 2.3 portrayed the mechanism of national organizer of TNP2K in arranging the block grant to particular localities. It was apparent, that amount of money received by the sub-district highly associated with total population occupied in the region, the level of poverty entrenched in the authorities and geographical location/ proximity of certain Island to the central/ capital. The more populous the region, the more money they will receive from the central. The more severe the poverty level, the more grants will be disbursed to the region. (TNP2K, 2011)

#### **2.4.5. Impact Evaluation**

With bottom-up direction of community-driven mechanism, villagers are able to decide their own preferable investment activities, These activities were evaluated as Syukri et al., (2011) pinpointed some of the PNPM Rural drawbacks, From beginning of the PNPM Rural initiated, people did not perceive it as poverty reduction program, yet it is solely general development program personified with cutting-edge physical facilities in rural area, It drives circumstances where the poor did not have to be prioritized even to take part in democratically local government environment, Because of rural elite’s dominance and villager’s lack

of initiatives, the poor are not involved in participation, transparency, accountability, and decision-making of the PNPM Rural practices, This exacerbates the poor's primary needs and their fulfillment that unable to be met because they don't have access to job opportunities, capital and skill upgrade by not proactively partaking the PNPM program.

Table 2.3 Criteria of Block Grant Allocation across Region, Number of Population and Severity Condition of Poverty.

<b>Region</b>	<b>Number of Population</b>	<b>Poverty Category</b>	<b>Block Grant Allocation (Rp)</b>
JAVA and BALI	<40,000	Not Poor	1,000,000,000
		Medium Poor	1,500,000,000
		Poor	3,000,000,000
	40,000 – 60,000	Not Poor	1,250,000,000
		Medium Poor	2,000,000,000
		Poor	3,000,000,000
	>60,000	Not Poor	1,500,000,000
		Medium Poor	2,500,000,000
		Poor	3,000,000,000
Outside JAVA and BALI	<7,500	Not Poor	750,000,000
		Medium Poor	1,000,000,000
		Poor	1,750,000,000
	7,500 – 15,000	Not Poor	1,000,000,000
		Medium Poor	1,250,000,000
		Poor	3,000,000,000
	15,000 – 25,000	Not Poor	1,250,000,000
		Medium Poor	2,000,000,000
		Poor	3,000,000,000
	>25,000	Not Poor	1,500,000,000
		Medium Poor	2,250,000,000
		Poor	3,000,000,000

Source: TNP2K, 2011

In regards PNPM Rural democracy custom, one depicted sounding and parallel result, A research carried out by PNPM Support Facility (PSF) on their own acknowledged that PNPM was most effective at reducing poverty and benefiting poor households when the needs of the poor were aligned with those of the major community, This was supported with the findings that commonly community did not regard the PNPM as a poverty reduction program, yet it was a program for entire community instead, They assigned infrastructure project (transportation at most) for the sake of far-reaching impact for the collective community evenly rather than a prospect to target the poor. Moreover, in fact that qualitative study attempted on measurement impact of social dynamics and government within the program successfully undertook, the impacts do not spillover into larger village discussion processes that involving marginalized group. This group, named; female-headed household, household with head lacking of education attainment and physical endowment, eventually benefit less in real per capita consumption compare to the control, thus may constraint them moving out of poverty. Even so, it was documented that by employing difference-in-difference method analysis, apart from enhancement in per capita consumption, it was claimed that the proportion of household moving out of poverty in poor sub-district was 2,1 percent higher in areas where the PNPM Rural imposed compare with control areas. In addition, betterment in health care occurred by the proportion of individuals gaining access to outpatient care increases 5.1% higher than control areas as well (PSF, 2012). The recent result generally profound good performance of the program.

Another case study pertaining social dynamics of the beneficiaries has been centered to dilemma of participation in the project. McCarthy et al. (2014) and

McCarthy (2014) mentioned in one of the case study in Aceh that Participatory initiatives was hindered due to obvious elite capture exposure. Specifically in Aceh, in the community where concentration of land ownership was essential, the poor would survive if they maintained good relationship with those local elites for sustaining their economic viability. It was also exacerbated by the evidence that the facilitator was generally overworked (ADB, 2016). One facilitator may responsible of 4 to 10 villages on average (Syukri et al., 2011). The low quality of facilitator would not work in accordance to people needs. Therefore, the marginalized did not participating. Even when the people participated, they only engage during implementation phase. The remaining phases such as Socialization meeting, Planning meeting, Evaluation and Monitoring meeting gained lower participation rate compare to the implementation phase. This was sensible because they could accrue immediate income from engaging in labor force to construct the public goods decided by the program. The result was consistent all across the sample within the study (McCarthy et al., 2014)

The case of lack of participation might be stemmed from the reticence, risk aversion, and lack of time to commit. In the case of the first reason, it was elucidated by the research from World Bank (2013) that mostly woman representative had attend the meeting, as much as 65% report “only listening” during the PNPM BKPG meeting. Another prominent reason in term of risk aversion illustrated by findings from McCarthy (2014), Acehnese people in the context of post-tsunami intervention especially in SPP microfinance because they have lack of secure assets and also lack of guidance from facilitator. Moreover, they are not in a state of having stable income stream from small medium enterprises as the basic requirement for SPP group membership.

## **2.5. Block Grant Allocation**

### **2.5.1. Economy/ Financial**

The PNPM Rural resources disseminated amidst economy sector comprise 96.94% on the RLF (revolving loan fund) towards the SPP microfinance, and the remaining 3.06% account for trade amenities to support the poor having better capital investment for their small and medium entrepreneurship (SIMPADU, 2012)

Many premises doomed the poor are natural-borne entrepreneurs (Duflo & Banerjee, 2011). Once they are stipulated incentive to extend their investment, they are able to improve their production technology. The micro portion of cash given to the poor to smoothen their financial needs is portrayed as feature of microfinance (MFI, microfinance institution). Microfinance is one sort of credit provided in small size installment to people who have no access to them due to not having collateral or have access only on very unfair terms for example from the loan-shark. This allotment include micro-savings and micro-insurances as well as microcredit (Todaro & Smith, 2012),

Microfinance may cater those who lack of access to financial capital, notably the poor who are not equipped with adequate endowment as perquisite to intensify capital asset they have in favor of their welfare enhancement by giving them injection of micro portion of fund allocated to their existing *small-medium enterprises* (SME) or in another term, Rural non-farm employment.

The practice of the *Woman Group of Save and Loan* (SPP) itself more or less imitated what Grameen Bank (The remarkable biggest MFI in Bangladesh) has compelled. The SPP program imposed in joint-liabilities schemes for woman

groups, which those people having assortative - matching sense will gather into one group represented by one leader. Loans are withdrawn to individual woman, but only through local groups that provide social pressure for repayment to avoid group default (Perkins, 2006).

Date back in the past, it was recorded that Indonesia's *unit desa* system of the Bank Rakyat Indonesia (BRI) was condemned as the largest financially sustainable micro-banking system in the world. Since 1984, the BRI had succeeded in transforming a rural banking system dominated by stated-subsidized agricultural credit into a profitable microfinance business.

It featured a bonus system rewarding timely repayment, a flexible micro-saving scheme allowing small deposits and rapid withdrawals, a wage system of performance-based for branch managerial staff, and the commercial rates, which therefore resulted in roughly 97% of the loans were repaid on time (Goenka, et, al, 2009). These competitive rates revised due to high inflation in the Reformation era in 1997-1998, but the basic rate-setting principles remained unchanged. Even though rates of 30% on loans might seem high, but they were considerably below the rates charged by informal moneylenders (Perkins, 2006).

To get more detail picture of the poor who could not access credit market, Rosa Rolle a FAO specialist mention that most of peasant did not engage in farming communities, such as union, cooperatives, and farmers group. Hence, they are lack of financial backup, inadequately represented in the public, and not motivated to participate in any democratic and political village meetings. They also utilized traditional means in rural infrastructure, insufficient of decent storage amenities, thus culminated to aggravate their productivity. And this will be more severe in the case of woman farmers, who is responsible to household food

process, food market transaction, agriculture production, guaranteeing family nutrition sufficiency for the sake of increase agricultural output and as well improve food security (FAO, 2016). This become the reason of save and loan group activity (SPP; *Simpan Pinjam Perempuan*) to be imposed to a set of woman group.

The money disbursed in SPP program are supposed to be used to finance woman productive activities both in farm and off-farm employment (RNF; Rural non-farm). The prominent determinants of the RNF activities are education, financial/ credit market, and responsiveness to relative price (FAO, 1998)

### **2.5.2. Health**

Health was not solely related to the nonappearance of disease. But it was broad-based situation of comprehensive physical, mental, and social well-being. Along with sanitation and education, those items belong to basic services to measure human development. Health is a precondition for enhancing productivity, and sufficient health associated with fruitful education as well. Thus, both of them consider as valuable compound of growth as the input to national production function. Consequently they considered being yardsticks of human capital indicator, the HDI. The United Nations Development Programme (UNDP) has released the Human Development Index (HDI) since 1990 to gauge a meter that represent quality of life. It is composed by three indicators; life expectancy at birth (infant & child mortality), educational attainment, and per capita income (Ray, 1998).

Another feature pertaining health and education facet is human capital. Todaro & Smith (2012) translate it as productive investment personified in human

body. The nexus between its constructed materials (health and education) include similar analytical treatment; the dual impacts of health devoting on the educational system efficacy and so as the inverse way. Health and education may be disseminated highly unevenly, but improved health and education help families move out from the vicious cycles of poverty trap.

Due to lack of nutrition, people cannot do their best to walk on their life. They could not get more income, afford proper goods and services, and when it comes to the illness, they even couldn't pay the medicine. Duflo & Banerjee (2011) called this situation as nutrition-base poverty trap also; the inability of the poor to eat themselves properly. That means the poor cannot afford to eat enough, this makes them less productive and keeps them poor. This would be exacerbated for household living in prone to disaster area, where they were prone to perpetuate vicious cycle of poverty. Because of this, after-all UN (United nation) set to fight extreme poverty and hunger at the first place.

Hence, conditioned to the urgency of health investment, the PNPM Rural arranged its allocation composed on the PNPM Budget allowance in Health sector (prominently embodied in the PNPM Health and Smart Generation /PNPM Generasi Sehat dan Cerdas): 41.42% account for clean water, 40.99% for community health center, the rest 17.59% contributed to sanitation.

### **2.5.3. Education**

The Government of Indonesia has committed to enhance education quality to its people. It subsequently proved with dedication the PNPM Rural had performed. The bottom-up demand-driven program scheme refer to the BLM block grant compositions of the PNPM Rural were disseminated 5.11% to

Education aid by giving poor students scholarship, 12.59% teaching media, and the rest 82.3% disbursed for construction of school infrastructure.

In the term of school enrollment, one more characteristic can be grasped from rural-poor feature is that they are sensitive to *return to education rate* that they would probably acquire, and the cost they will bear solely to the most decent spouse (Duflo & Banerjee, 2011).

Furthermore, the return to education investment aggregately may spillover the economic growth. And it was not only that, but it also induces progress in other sectors. Health is sort of the domain that mutually interlink-aged with education, as both also assess the human development index. Increasing investment in education could mount the return to the increase of health investment in a subsequent fashion: health facility and amenities generally required one to read and to count, which usually the skill could be accrued at school. Moreover, school also teach how to live in better sanitation and how to maintain hygiene. In the others side, education is the prerequisite in any profession. Healthcare official is one of the particular. Thus, the relationship might be concluded that advancement in productive education investment escalates the return on health investment.

#### **2.5.4. Energy**

Approximately 1.4 billion people around the globe have not owned access to electricity. Indonesia is without an exception (Cook, 2013). Recently according to national electricity ratio, electrification condition in Indonesia has not met the equity. It can be understood that electricity availability always less than the increasing demand by the time. Until 2009 it is reported that Indonesian

electrification ratio cover about 66%, whereas in more eastern part of Indonesia in the same year it even has not achieved 45%,

Here the PNPM Rural played its role in Rural Electrification that covers 1.23% of national realization of revolving fund (SIMPADU, 2012), it recorded the percentage in 2007 around 1.56% and decreased at percentage of merely 0.99% in 2011 to promote rural electrification,

Cook (2013) explained the impact of rural electrification has obtained on SME, income-generating activities, and on access affordability. Electrification is deemed to be a mean of infrastructure, which can improve welfare and reducing poverty in the long run. There are direct and indirect evident to be considered. In direct fashion, it works as the input of production function framework. In indirect fashion, it would lead to an increase in productivity of other factors. For instance, supplying the electricity to SME would surface the development of other investments. This process was replicative to other infrastructural investment in production activities.

Electricity provision as consumption and quasi-fix factor/ goods is associated with the dynamics of income and therefore dual causality persisted between income and the electricity investment. If income increases, then the demand for electricity as well as supply of electricity will increase. This also will prompt to poverty reduction. There are two role of electricity in poverty alleviation; First It enables livelihood in several ways raise productivity and bring people out of poverty through stimulating employment, and income-generating activity which eventually turns out to be better cash flow earning. It works in a mechanism by putting electricity as one of vital input production faced by a firm. Second, it is a safeguard and livelihood prevention of decline in welfare,

immediate income shock and vulnerable of losses of well-being. It is reckoned as well as improving education, health, and environment quality, and promote gender equality. The better the light intensity for study, the better the academic performance in school, Lessens eye strain will benefit health. Moreover the electricity can altered kerosene and other fuel-based energy since electricity supplied better quality in bringing brighter illumination and longer endurance. In the meantime, it was suggested that electrification may reduce local pollution (cleaner energy) (Howels et al., 2005 in Bhattacharyya, 2013).

#### **2.5.5. Transportation**

Datt and Ravallion (1988) in Hussain & Hanjra (2004) documented that compare to the poorly endowed states, the states with greater initial investment in physical and human resources have better performance in generating growth and reducing poverty. Olivia & Gibson (2009) also remarked that infrastructure affects employment pattern and inflow cash rural non-farm activities in rural Indonesia. The result suggested that the rural non-farm enterprise might be restrained in the absence of decent infrastructure or inadequate access to it. Therefore village infrastructure improvements such as dirt road upgrade and connection to strategic sector was necessary to raise the propensity of households having non-farm employment. This eventually will turn to income and employment generating which will help rural poor move out from extreme poverty and pauperization.

Sachs (2005) emphasized that the very basic key for eliminating extreme poverty is to allow the poorest get basic investment in favor of development. They were lack of assets and therefore need a boost up to the first step. The extreme poor require major capital such as infrastructure capital. The infrastructure capital

in terms of transportation and access in particular is significant inputs for occupational productivity. This productivity could be leveraged to combat poverty.

In order to combat the poverty trap, Indonesian context has attempted to break the chain through construction of vivid transportation infrastructure upon the PNPM Rural. Realization of the national PNPM Rural in 2011 budgeted for 72.81% of Transportation sector is allocated for road pavement, 20.13% accounted for supporting roads, 6.29% for bridge/ girder, 0.01% enumerated for vehicle, the remaining 0.76% jetty/ pier/ terminal.

According to McCawley (2015) infrastructure policy in Indonesia was following consistent with supply and demand framework. As the demand side; household, industrial, and commercial played major role to be channeled by supply side in the form of financial issue, technical issue, governance and management, environmental issue, maintenance and sustainability issue. Meanwhile, to highlight significance of infrastructure, Pretty (2003) in Bourguignon & Pleskovic (2008) suggested that local knowledge and social capital could be improve through civil society organization in order to strengthen watershed/ catchment, irrigation, integrated pest, and wildlife management, as well as farmers research group. On the top of that, if it is complemented with education improvement, it may increase non-agricultural labor supply and income in remote area (Yamauchi et al., 2011). It seems acknowledged that infrastructure is essential for economies in order to smoothen access to input and output market as well as provide intermediate service to facilitate interaction between income-generating activities.

However, the infrastructure effects to productive activities might be

ambiguous. Revitalizing infrastructure, instead of increasing activity of RNF (Rural non-farm), would inhibit RNF when the quality improvement or maintenance are poor (FAO, 1998). Moreover, it may to some extent increase sectoral income inequality. Even though costs for market products (farm and non-farm) are relatively lower, and availability of inputs at a competitive cost are easily accessed, careful examination of return on investment in infrastructure within rural context should be meticulously addressed.

#### **2.5.6. Agriculture**

Indonesia is agrarian country. Most of Indonesian people especially in rural areas do farming to support their livelihood. Farmers rely heavily on the availability of water for their crops. Thus the existence of irrigation is necessarily desirable by rural communities. An excellent irrigation system will help expedite the production process that impact to increasing income and purchasing power of the rural communities. In efforts to achieve it, PNPM Rural has built as many as 5,340 irrigations spread over a number of villages in 30 provinces.

As known that the PNPM is a government program, which is based on community empowerment; in practice, community is facilitated to determine the most urgent type of development in the village, ranging from planning, implementation, monitoring and maintaining the results of development in a participatory. The PNPM Rural under the guidance of the Directorate General of Community and Village Empowerment, Ministry of Home Affairs, in 2013 covers 5,146 sub-districts includes the spread in 393 districts in 32 provinces. Allocation of the national BLM block grant budgeted for 99.5% of agricultural sector is channeled for irrigation, the remaining 0.5% of the agricultural infrastructure.

Labor-intensive nature of irrigation contributes to increase on-farm and off-farm employment opportunities and rural wages, and stabilization of employment opportunities. All of these summed up apart from poverty mitigation, resulted in indirect effects such as reduction out migration, increase resources for *health* and *education*, and improved overall resource base. In the long run, poverty will be alleviated because irrigation infrastructure improvement can could economic growth.

However, irrigation also may offer negative externality impact to the *environment*. The main concerns that we need to pinpoint are the drainage, waterlogging and salinity problem due to high incidence of irrigation-induce alkalinity owing to bad irrigation system (it can be seen from the water pooled on the ground/ there are puddles of water on the surface/ low surface run off) prompt Calcium Carbonate ( $\text{CaCO}_3$ ) soluble so that pH rises. If the soil profile is opened, a lot of concretions (rusting) emerged due to oxidized iron soil.

The merits of irrigation that help farming activity explained by Hussain & Hanjra (2004) that it has role in poverty alleviation by means of production, income/ consumption, food security, employment, and other indirect effects. Irrigation help to increase farmer production by accruing crop yield, crop areas, cropping intensity, and crop diversification. Irrigation also benefits farmers the opportunity for high value crops, multiple cropping and year round crop production. In terms of income and consumption, having access to good irrigation water turn out to increased income from crop production, increase purchasing power of family consumption of the food, smoothen or stabilize farm family income, and reduced level of consumption shortfall or food prices. Whereas in the context of food security it may enhance food availability so that it will complete

MDG goal no.1 eradicating extreme hunger as well as poverty, reduce level of consumption shortfall, risk of crop failure, seasonality effect, increased opportunity to produce and retain food from home consumption, and stability of income consumption and employment.

In order to sustain employment in agricultural sector, FAO (2016) suggested that rural farmers required to expand their product through channeling to modern value chain such as on line shop and supermarkets in order to revitalize rural economies.

Revitalizing the rural regions rural economy associated with support from public incentives and investment to construct an enabling environment to ensure inclusiveness of peasant, the marginalized, and the vulnerable groups to engage in value chains.

#### **2.5.7. Social**

Rural sector have relatively more dynamics social capital than the urban. Ray (1998) stated that social capital imposed in rural rely on two features; information and low mobility. The high mobility will induce local people to do migration, which will consequence to social capital erosion.

One of manifestation of the social capital applied in Indonesia is “gotong-royong”. It expresses Indonesian peasant households attached of great importance to good relations with neighbor and relatives in their community. The social capital encompassed institutions, relationship, attitudes, and values which direct and motor interpersonal interaction and contribute to social and economic development. In accordance to World Bank (1998) the social capital is not only deal with summation of institution established by community, yet it also as glue

that adheres and unite them simultaneously. All social-economy local people activity behaves adhere to social relation networks. Social capital and trust enable economic transaction getting more efficient by means of opportunity to related entities to 1) access more information, 2) allow to mutually coordinate activities for common interest, 3) reduce or even get the opportunistic behavior eradicated via transaction that repeatedly occur during long period (Subejo, 2008).

Implementation of the PNPM Rural funds allocated for the social capital sector 14.2% held in the form of community capacity building and 85.98% for public facilities, The beneficiaries are ranging from local community development training and outreach to supporting woman's saving and loans group for woman-headed family in Lombok –Women-Headed Household Empowerment Program (Pemberdayaan Perempuan Kepala Keluarga: PEKKA). A community-based environmental awareness organization that govern mediation between the land people, the Bajau, and the environment that people in Southeast Sulawesi share. Pulih Foundation – an organization that provides trauma counseling to help woman who ever suffered from domestic violence. Self-Care for Leprosy-Related Disabilities in South Sulawesi. Kampung Halaman – organization that encourages the youth express themselves and about communities in which they live through film or documentaries – in Jogjakarta, and so on (Kortschak & Sitanggang, 2009). These expectantly will reduce the poverty and improve human welfare in return.

### III. METHODOLOGY

The motivation to perform Structural Equation Model (SEM) or also known as Covariance Structure Analysis was inspired by the fact that the tools can determine causality of a series of variables. The author endeavored to find the causality of PNPM Rural in improving people welfare in terms of poverty. In addition, the model was executed due to its versatility to assess the system of equations simultaneously as well as to remedy the measurement error. The mechanism to discard endogeneity or measurement error was made by confounding the observed variable into suitable components (latent variables). This was equivalent with the way conventional factor analysis encounter it. Furthermore, it was encouraged by in the latest empirical study of CDD program by Yalagama et al. (2016), they recommended to exercise the tool to emphasize the critical success factor of CDD provision.

Covariance Structure Analysis engaged in estimating variance components associated with the latent variables was defined by hypothesized model. According to Cuttance & Ecob (1987), basic objective of the SEM is to provide a means of estimating the relationships among this underlying constructs of a hypothesized substantive model.

The SEM practice carries out on simple variance-covariance matrix in which the observation reflects the random classes, and the variables manifest the fixed classes (Bock & Bargmann, 1966). The specification of the estimates of variance components to represent reliability of the latent variables score is analyzed.

The variance structure itself featured causality, which determine the occurrence of one to induce the production of another (Haise, 1975). This briefly

explained the advantage covariance analysis may have, it engages with latent variables, which one cannot directly observe, and elaborate the causal relationship among both of the latent variable and manifest variable (observable variables). This tool presumably can be applied since each of variable addressed on this assessment are probably may have causal relationship that cause each of certain variable allotment influenced by the other particular variables.

Framework assumption:

1. The relationship among variables is linear
2. The effects of the latent explanatory variables on the latent outcome variables are additive.
3. The relationship between latent explanatory and latent outcome variable is stochastic
4. The observed variables are continuous and measured on an interval scale.
5. The data are represented by the means, variance, and covariance of the observe variables.

Statistical assumption:

1. The disturbances in all equations have mean zero
2. The disturbances are uncorrelated with the exogenous variables
3. The error of measurement are uncorrelated with the construct
4. The measurement errors and the disturbances are all mutually uncorrelated
5. The observed variables are jointly distributed by multivariate normal distribution.

Steps for conducting Structural Equation Modeling:

1. From theory, draw up a set of structural equation
2. Choose a measurement and design model

3. Re-specify the structural model to conform to design and measurement specification
4. Check the status of identification of the model. Identification is used to state the model, whether it is just identified, over identified, or under identified.
5. Estimates the covariance matrix and model parameter, and test over-identifying restriction (Kenny, 1979).
6. Investigate the result. Such as result of maximum likelihood estimation, likelihood ratio test, and model goodness of fit. (Bock & Bargmann, 1966).

Covariance Structure Analysis or SEM is a versatile tool ubiquitously applied in various studies such as psychology, economics, tourism, sport management, engineering, etc. Economic evaluation associated with covariance-structured has exhibited by Ping Deng et al. (2013). They explored the nexus between port supply, port demand, and regional economy in logistics basis to support government strategic port policy. The analysis executes Chinese data of 46 port authorities of the 2010 coastal port layout. The author preoccupies four latent variables; port supply and demand, port value added activity, and regional economy. SEM initially yielded unsatisfied result as it shown in the poor Goodness of Fit indices. However, the authors re-specify and simplify the model until it is produced as good as estimable, efficient, unbiased estimator of the model. Eventually, it is suggested that port supply has positive significant relationship with port demand. Port demand positively significant with value added activities in port as well. At the end, port value added activity would positively effective in supporting regional Economy.

Another application of SEM engaged in economic evaluation is the one emphasize impoverish risk evaluation of population displacement post disaster

outbreak in Cambodia. Eng & Hirobata (2008) aimed to determine the scale and analyze the impoverish risk of population displacement towards directly and indirectly affected zone in favor of better regulation system. The analysis involved 439 households from both of the zone and entail landlessness, joblessness, marginalization, loss access to common properties, morbidity, food insecurity, and social disarticulation that contribute to community satisfaction latent constructs. The authors documented both of the resettlement areas are vulnerable to crime and economic losses. Apart from it, it is suggested that economic marginalization has strong effect to joblessness, and joblessness strongly contributes to community satisfaction. After all, landlessness which affects joblessness and food insecurity give impact to community living satisfaction.

Discussion about satisfaction, welfare, and well-being is often engrossing. As one empirical study has been carried out in Taiwan, Lu (2011) employed four latent constructs; sport participation, emotional well-being, psychological well-being, and social well-being and examine the impact of the latent variables to subjective well-being (SWB). The attempt to measure its relative monetary value of SWB was also investigated. The Survey involved mass sampling frame (1075 respondent) resulted the notion that there are no significant differences on 3 type of well-being. Yet, emotional and psychological well-being has positive relationship with the participation in sport.

Going deeper to rural development domain studies, it is Yabi and Omolehin (2009) who try to address socio-economic determinant of modern technology adoption for sustainable management of Benin natural resources. The data was probed from 120 households both in Adja and Nagot area. The model designed four latent variables affecting decision of participation. They were human capital,

perception on satisfaction of production and consumption, perception on satisfaction on soil fertility, and availability of access to production input. Decision of adoption itself is gauged from decision of participation latent construct. The two areas suggest that adoption can be sustained through participation in agricultural project and frequent contact with project agent. In Adja area; Socio-Economic factor pertaining human capital, availability and access to production input, and soil fertility induced people to partake in project management and adoption. Nagot showed different ideas that soil fertility did not affect participation instead.

A more sophisticated and advance tool originated from covariance-structured analysis is MECOSA-Mean Covariance Structured Analysis. The tool can tolerate endogenous non-metric observation, a kind of Probit/ Logit/ Tobit analysis hybrid with factor analysis. Paxton and Thraen (2004) documented a hand on applying the tool to repayment problem of group-lending program in Burkina Faso. The study incorporating 140 women registered in the program. Model involved non-metric data of group default problem, sector default problem, and sector domino effect. The latent variables comprised domino effect and homogeneity. Eventually, authors do comparison of the MECOSA and simple Probit model without latent variables. Both latent variables are significant in determining repayment problem. However, homogeneity becomes insignificant when simple Probit analysis is taken into account.

In order to investigate the relationship between attitude and practice of farmers towards nitrate reducing behavior in Scottish NVZ (Nitrate Vulnerable Zone), Toma et al., (2008) collected farmers data in Scotland's' four regional NVZ. To complement the analysis, they incorporated six latent variables, such as farmers nitrate reducing behavior, nitrate reducing propensity, profit maximizing propensity,

risk perception, and socio-economic latent variables into account. The most significant determinant of farmer towards nitrate reducing behavior is access to information. Environmental risk perception, nitrate reducing behavioral propensity, and profit maximizing behavioral propensity were also other significant drivers yet the effect was slighter.

At the subsequent year, Toma et al., (2009) utilizing the same tool, they attempted to assess factor influencing British consumer's behavior towards animal welfare. The research was executed on personal depth interview with 654 consumers in England. It employed seven latent variables: free-range/ organic chicken meat consumption, welfare attitudes, socio-economic status, perception of the price, reason for buying chicken meat, access to information, and number of children aged below 18 years. It was finally documented that all of the latent variables were significant except for the reason of buying chicken meat.

In terms of agriculture, further analysis to identify driving force behind agricultural land conversion was worth noting. Azadi et al., (2015) exhibited their research in Northeast Iran. The sample was drawn from 101 multi-stakeholders. The respondents underwent both qualitative and quantitative mix method approach. The agricultural land conversion was assumed to have considerable association with five latent variables. They were economic, political, technological, social, and environmental aspects. Significant drivers of agricultural land conversion were the notion that non-agricultural sector promises higher profitability, the land price hike, the erratic flow of farmer income, the land fragmentation, the urban expansion, and the inheritance mechanism.

Table 3.1 Principal Studies on the Application of Covariance Structured Analysis

Authors & Year	Main Objective	The Data, Model, and Methodology	Important Findings
Ping Deng et al. (2013)	To explore the nexus between port supply and demand and regional economy in logistics basis to support government strategic port policy	<ul style="list-style-type: none"> <li>• Utilizing Chinese data of 46 port authorities in the 2010 coastal port layout.</li> <li>• SEM constructed four latent variables (Port Demand, Port Supply, Port Value added activity, and Regional Economy)</li> <li>• The model is adjusted from initial discredited model through re-specification</li> </ul>	<ul style="list-style-type: none"> <li>• Relationship between port supply and port demand was significantly positive</li> <li>• The port demand positively significant on Port Value added activity.</li> <li>• At the end, port value added activity will result effectively well in supporting Regional Economy.</li> </ul>
Eng and Hirobata (2008)	To determine the scales and analyze the impoverish risk of population displacement by zone	<ul style="list-style-type: none"> <li>• Survey conducted in the relocation site and indirectly affected villages due to flood in Urban and Rural Cambodia, and it yielded 439 data</li> </ul>	<ul style="list-style-type: none"> <li>• The resettlement areas are vulnerable to threats and economic pitfall.</li> </ul>

		<ul style="list-style-type: none"> <li>• Latent constructs embed: landlessness, joblessness, marginalization, loss access to common properties, morbidity, food insecurity, and social disarticulation that contribute to community satisfaction</li> </ul>	<ul style="list-style-type: none"> <li>• Economic marginalization has strong effect to Joblessness, and Joblessness strongly contributes to Community Satisfaction.</li> <li>• Landlessness affecting Joblessness and Food insecurity give impact to Community satisfaction.</li> </ul>
Paxton and Thraen (2004)	To implement Mean-Covariance Structure Model (MECOSA) to repayment problem of group-lending program in developing countries.	<ul style="list-style-type: none"> <li>• Data probed from 140 woman registered in group lending program in Burkina Faso</li> <li>• Model involved non-metric data of group default problem, sector default problem, and sector domino effect.</li> <li>• Latent variables comprise domino effect, and Homogeneity</li> </ul>	Both latent variables are significant in determining repayment problem. However, Homogeneity becomes insignificant when simple Probit analysis is carried out.

		<ul style="list-style-type: none"> <li>• Eventually, authors do comparison of the MECOSA and simple Probit model without latent variables</li> </ul>	
Yabi and Omolehin (2009)	To evaluate socio-economic determinant of modern technology adoption for sustainable management of natural resource	<ul style="list-style-type: none"> <li>• 120 data collected from Adja and Nagot area of Benin Republic.</li> <li>• Model incorporated 4 latent variables affecting decision of participation: human capital, perception on satisfaction of production and consumption, perception on satisfaction on soil fertility, and availability of access to production input.</li> </ul>	<ul style="list-style-type: none"> <li>• The two areas suggest that adoption can be sustained through participation in agricultural project and frequent contact with project agent</li> <li>• In Adja area; socio-economic factor pertaining human capital, availability &amp; access to production input, and soil fertility induced people to partake in project management and adoption.</li> </ul>

		<ul style="list-style-type: none"> <li>• Decision of adoption itself is gauged from decision of participation latent construct.</li> </ul>	<ul style="list-style-type: none"> <li>• Nagot showed different ideas that soil fertility did not affect participation instead.</li> </ul>
Lu (2011)	To examine the impact of sport participation on SWB (Subjective Well-Being) as well as measurement of its relative monetary value of SWB	<ul style="list-style-type: none"> <li>• Sampling frame ranged from nationwide Taiwanese college student which eventually resulted 1075 valid respondents collected.</li> <li>• Employ four latent constructs; emotional well-being, psychological well-being, social well-being, and sport participation</li> </ul>	There are no significant differences on three type of well-being. Yet, Emotional and psychological well-being has positive relationship with the participation in sport

Toma et al. (2008)	To investigate the relationship between attitude and practice of farmers towards nitrate reducing behavior in Scottish NVZ (Nitrate Vulnerable Zone)	<ul style="list-style-type: none"> <li>• 4 regional NVZ (Nitrate Vulnerable Zone) in Scotland</li> <li>• 6 latent variables: farmers nitrate reducing behavior, nitrate reducing propensity, profit maximizing propensity, risk perception, and socio-economic latent variables</li> </ul>	<ul style="list-style-type: none"> <li>• The most significant determinant is access to information</li> <li>• Environmental risk perception, nitrate reducing behavioral propensity, and profit maximizing behavioral propensity were also other significant drivers</li> </ul>
Azadi et al. (2015)	To identify driving force behind conversion of agricultural land in Northeast Iran	<ul style="list-style-type: none"> <li>• Multi stakeholder analysis of 101 respondents</li> <li>• Mix method approach (qualitative and Quantitative)</li> <li>• 5 latents: economic, political, technological, social, environmental</li> </ul>	<p>Significant drivers of ALC:</p> <ul style="list-style-type: none"> <li>• non-agricultural sector promises higher profitability</li> <li>• land price hike</li> <li>• Erratic flow of farmer income</li> <li>• Land fragmentation</li> <li>• Urban expansion</li> <li>• Inheritance mechanism</li> </ul>

Toma et al. (2009)	To assess factor influencing British consumer's behavior towards animal welfare	<ul style="list-style-type: none"> <li>• Personal depth interview with 654 consumers in England.</li> <li>• Latent variables: free-range/ organic chicken meat consumption, welfare attitudes, socio-economic status, perception of the price, reason for buying chicken meat, access to information, number of children aged below 18 years.</li> </ul>	All the latent variables were significant except for the reason for buying chicken meat.
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In the case of Indonesian economy, the author attempt to utilize the SEM analysis to dismantle the effect of PNPM Rural in poverty alleviation. In order to reduce poverty rate, GoI (Government of Indonesia) has set enormous programs. One of particular is to increase the economic growth through increment of the production sector. According to microeconomic theory, it is crucial to take  $y =$  production into account:

$$y = f(Labor, Capital, Land) \dots\dots\dots (2)$$

Todaro & Smith (2012) suggested the notion of Labor or Human capital as people value of productive investments in terms of skills and health that accrued from health-care and both education in formal and informal expenditure (Todaro & Smith, 2012). It is regarded as productive investment embodied in the person that worth noting to be addressed into labor domain.

$$\left\{ \begin{array}{l} Poverty\ rate = \lambda_1 Human\ Capital + \lambda_2 Economic\ Capital \\ Human\ Capital = f(Education\ inv., Health\ inv.) \\ Eco\ Capital = f(Ene\ inv., Fin\ inv., Trans\ inv., Agr\ inv.) \end{array} \right. \dots\dots\dots (3)$$

Likewise human capital, economic capital also contributes to escalate the production. Under domain capital in previous Equation (3), Economic capital represented as economic instrument that ascertain the stakeholder engaged into the system benefit the value of economic transaction persisted in the form of physical or non-physical merits. In physical facet, it might be well represented by means of

physical amenities such as transportation and agriculture investment in terms of construction and improvement of irrigation system. Subsequently, non-physical capital forming economic capital encompassed energy/ rural electrification that benefit people through better illumination and power supply, and economic/financial provision by means of microfinance activity that may help the poor from income shock as well as smoothen their micro-business production cycle. Therefore, it is viable to put it together with human capital in capital umbrella to support economic technological production objective function, as well as minimizing nation-wide mass poverty. In this study, each respective human and economic capital is composed from development program established in Indonesia rural backward area. The program is funded by the PNPM Rural budget allocation disseminated on the base of cite-specific needs of the local community itself. Through development planning meeting, people gathered and decide which one is the best investment activity they will spend the money for. According to nation-wide PNPM database, for rural domain, the fund is expended on energy, economy, transportation, agriculture, social, education, and health dimensions.

### **3.1. Evaluation in Western Part of Indonesia**

The conceptual framework for evaluation of PNPM Rural performance in western part of Indonesia using sub-district budget allocation can be easily digested as depicted in Figure 3.1 below.

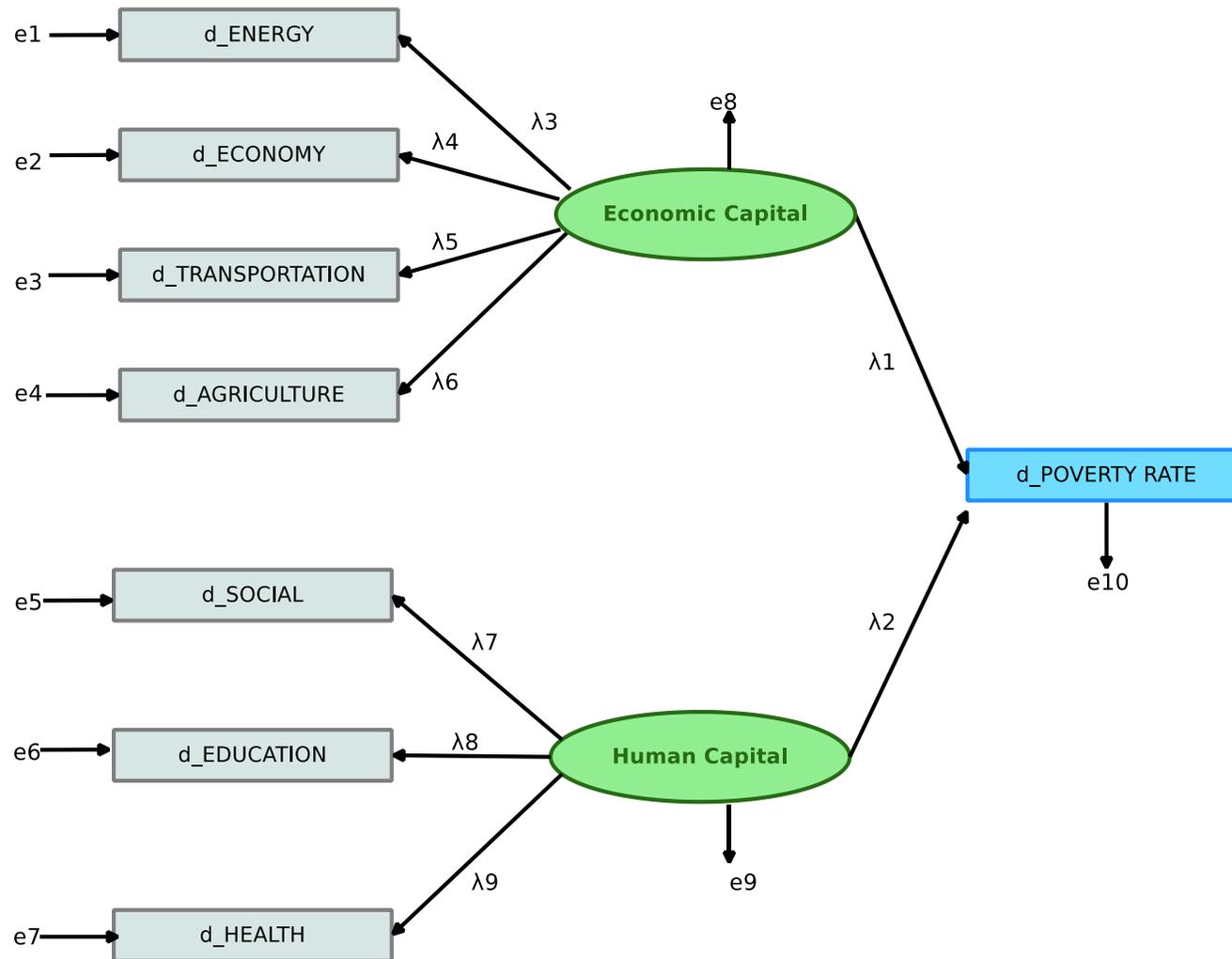


Figure 3.1. Initial Structure Path

### 3.1.1. Research Hypotheses

#### Hypothesis 1:

$$H_0: \lambda_1 = 0$$

$$H_1: \lambda_1 \neq 0$$

#### Hypothesis 2:

$$H_0: \lambda_2 = 0$$

$$H_1: \lambda_2 \neq 0$$

Economic capitals, together with human capital improve quality of production that in turn will reduce poverty rate.

#### Hypothesis 3:

$$H_0: \lambda_3 = 0$$

$$H_1: \lambda_3 \neq 0$$

#### Hypothesis 5:

$$H_0: \lambda_5 = 0$$

$$H_1: \lambda_5 \neq 0$$

#### Hypothesis 4:

$$H_0: \lambda_4 = 0$$

$$H_1: \lambda_4 \neq 0$$

#### Hypothesis 6:

$$H_0: \lambda_6 = 0$$

$$H_1: \lambda_6 \neq 0$$

Energy, Economy, Transportation, and Agriculture are correlated each other as a manifest of Economic Capital, which can diminish poverty rate

#### Hypothesis 7:

$$H_0: \lambda_7 = 0$$

$$H_1: \lambda_7 \neq 0$$

#### Hypothesis 9:

$$H_0: \lambda_9 = 0$$

$$H_1: \lambda_9 \neq 0$$

#### Hypothesis 8:

$$H_0: \lambda_8 = 0$$

$$H_1: \lambda_8 \neq 0$$

Social, Education, and Health, has closeness each other and therefore grouped into Human Capital that may affect poverty alleviation.

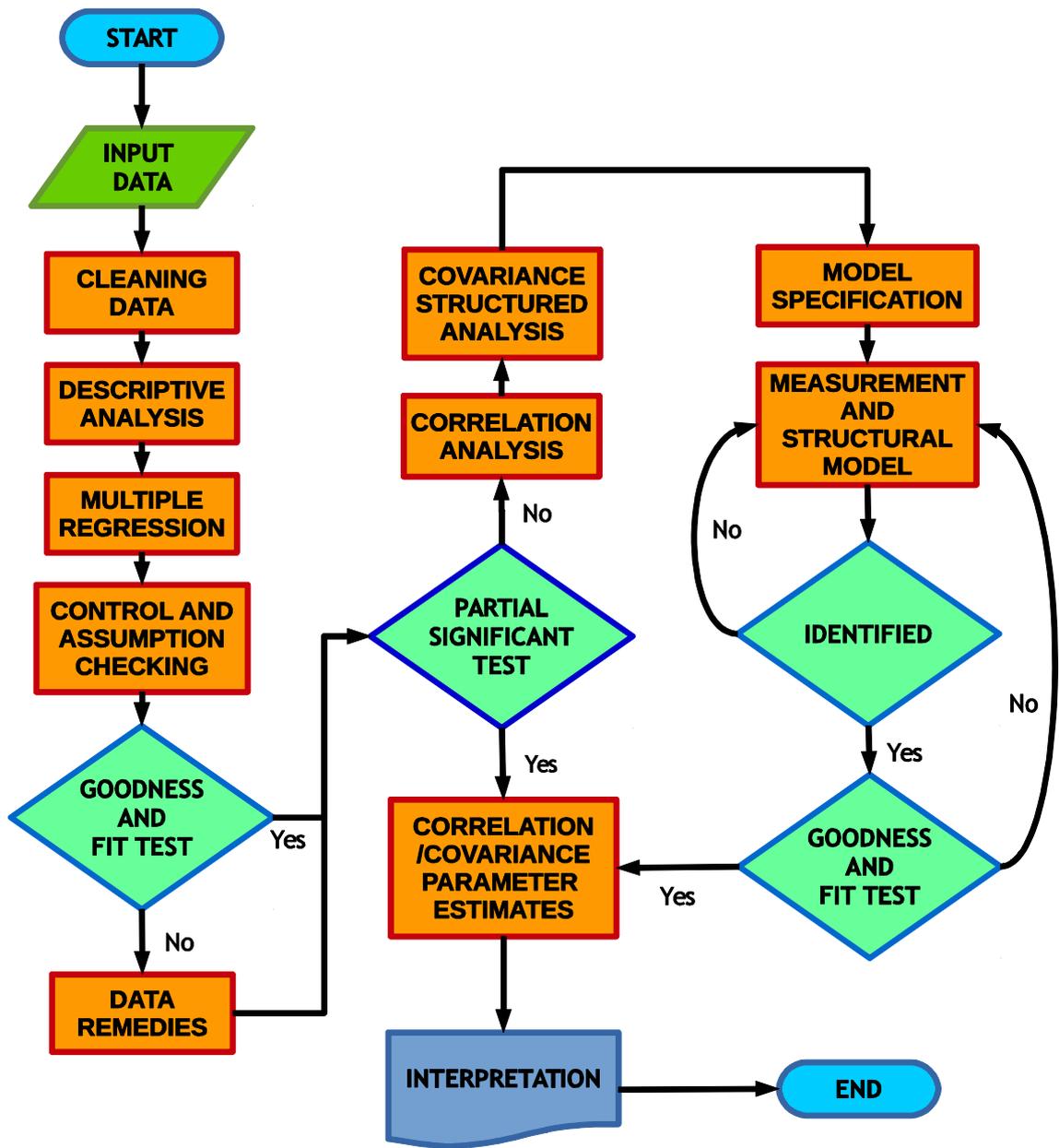


Figure 3.2. Research Flow Chart (1)

### **3.1.2. Method**

The flow chart of this research algorithm can be explained as follow:

#### *Descriptive and Multiple Regressions*

1. Imputation of cross sectional data from 2007 and 2011
2. Construct dummy variables of island, as the inter-region variability is presumably high
3. Execute descriptive analysis to describe dynamics of poverty distribution among region year by year
4. Conduct multiple regression to infer island variability findings in order to conform previous descriptive analysis
5. Merging data from consecutive poverty rate and percentage of budget allocation in 2007 and 2011
6. Do multiple regression analysis of each consecutive data in 2007 and 2011
7. Infer the estimates of each year regression result
8. Do data exploration for diagnostic, cleaning, and outlier checking towards all variables such as; social, education, agriculture, health, energy, economy and transportation.
9. From the step 8. The insight about island variability has been fruitful in selecting specific region that favor the next analysis

#### *Covariance Structure Analysis*

1. From the result of Multiple Regression and Descriptive analysis, the author decided to select region in Western Part of Indonesia as the domain of the study due to distribution in poverty performance prior and post PNPM Rural activated.
2. Imputation of poverty data in 2007 and 2011 within backward districts

3. Employ Covariance Structure Analysis for both 2007 and 2011 data incorporating budget expenditure per capita and poverty rate for those two years.
4. Adjust the nominal amount of expenditure into real money by incurring CPI discount factor for all expenditure per capita variable.
5. Construct measurement and structural model align with abovementioned conceptual framework
6. Re-specify the structural model to conform to design and measurement specification
7. Check the status of identification of the model. A model is identified if it has a unique estimate of its parameter. Over-identified if it has numerous estimates, and under-identified if there is no possible estimates.
8. Check the goodness of fit test resulted from the analysis
9. If the model fit well, do estimate the parameter of the measured.
10. If the goodness has not shown a better performance, do re-specify the model according to the theory, and reduce equation form into a simpler formulation.
11. Once all the assumption and goodness fit requisitions are satisfied move to step 11, otherwise back to steps number 7.
12. Record the interpretation of the model and state the statistical inference according to it.
13. If the estimate is not estimable, do compute allocation budget expenditure per capita in 2011 and 2007, set the difference as newly exogenous variable
14. Calculate difference value of poverty rate in 2011 and 2007, and set as response variable
15. Back to step number 4.

## **3.2. Economic Evaluation in a Case Study of Aceh Province**

### **3.2.1. Conceptual Framework**

While the previous section examine the performance of PNPM Rural in sub-district level, the latter part would dismantle the effect within the village level. Following the same conceptual framework discussed in the earlier part of the chapter. This approach was simplified to ignore economic and human capital latent variable in order to satisfy identification requirement. The extent of budget allocated to social, and energy investment were excluded since in 2007 Aceh Province didn't have these particular activities in its villages. In addition, the transportation investment was omitted due to stigma that it didn't represent pro-poor activity, which the benefit is not solely for the poor but for development in village community in general (Syukri et al., 2013). Further explanation will be served in the next chapter of model specification (Chapter 4.)

The interlinkage between regional and village level analysis can be explained as follows: The research of the former analysis was focusing on backward-district in Western Part of Indonesia. It merely assess the effect of budget disbursed in the district to poverty alleviation. However, the modest analysis is not enough to unveil the budget effect to poverty because the decision of budget to be spent to particular investment were set and decided in the village assembly individually. Each villages has their own intrinsic preference (potentially *endogeneous*) in selecting their investment activity. Therefore the latter analysis (village level analysis) was engrossing to solve this problem.

The village-level characteristics, however to some extent may have similarity within their spatial or neighboring proximity. One village located in one area may behave the same to one another within one sub-districts. By this notion, central

government has set the Sub-District level as the management center of PNPM through the establishment of UPK (Unit Pengelola Kegiatan/ Activity Management Unit). This coordinator center was also regarded as unique feature that differentiate PNPM Rural with other CDD program worldwide (ADB, 2016). Therefore, eventually the analysis were executed in Sub-District level which utilized village's average characteristics as our main variable of interests.

Furthermore, we postulated those variables into testable hypothesis. The hypothesis for this section could be examined as three points: firstly, whether PNPM Rural investment disbursed in agriculture, economic, education, healthcare activities had negative effect on poverty level of the beneficiaries. Secondly, to test whether the *ex-ante* village characteristics before PNPM-Rural establishment, such as; number of informal schools / training existed in village, percentage of peasant, percentage of household, and percentage of household living in prone-to-disaster areas, constituted to form *poverty empowerment*, and assess whether this extent affect PNPM budget allocation as well as poverty performance . Then, as the continuum of the third hypothesis; whether PNPM Investment has aligned with what people needs. Equivalently, to test: (i) if the community has more death prevalence, they would prioritize health investment, (ii) if the community has more formal school, they tend to allocate the budget to education activity, (iii) when the community has abundant land of irrigated-cultivated land, automatically the PNPM resources would be channeled to agricultural activity, and the last (iv) if a community has sufficient access to credit by means of cooperatives/ union, the community will reduce the allocation priority to financial activity.

Primal budget investment priorities were set initially by the village community as the smallest unit of a decentralized government system. In the local

context, the decision making process of the subproject implementation in a village groundwork was designed as a cyclical iterative process. It incorporated village and inter-village meeting in the sub-district to discuss and prioritize development proposal, final funding, program implementation, and evaluation (ADB, 2016). Thus, the process of the decision-making was potentially *endogenous*. It might be determined by such characteristics that embedded within village society. In addition, the system of this iterative process would work efficiently conditioned to participatory initiative of the beneficiaries. The contribution of targeted beneficiaries was essential to the extent of best practice of CDD framework. Moreover, according to Okten and Osili (2004), ethnic diversity had a negative effect on both monetary and time contributions as well as on the prevalence of CDD-ground program. From this base of justification, the author motivated to select Aceh province because of its homogeneity in terms of religion and ethnography. It was occupied by more than 98% Muslim and 70% Aceh ethnicity. The high degree of homogeneity would benefit the inference process, additionally. As the province received special government system apart from central government, it was assumed that the province conducted specific governance mechanism mutually-exclusive from neighboring province, which was anticipated to control other externalities that might harm reliability of the analysis.

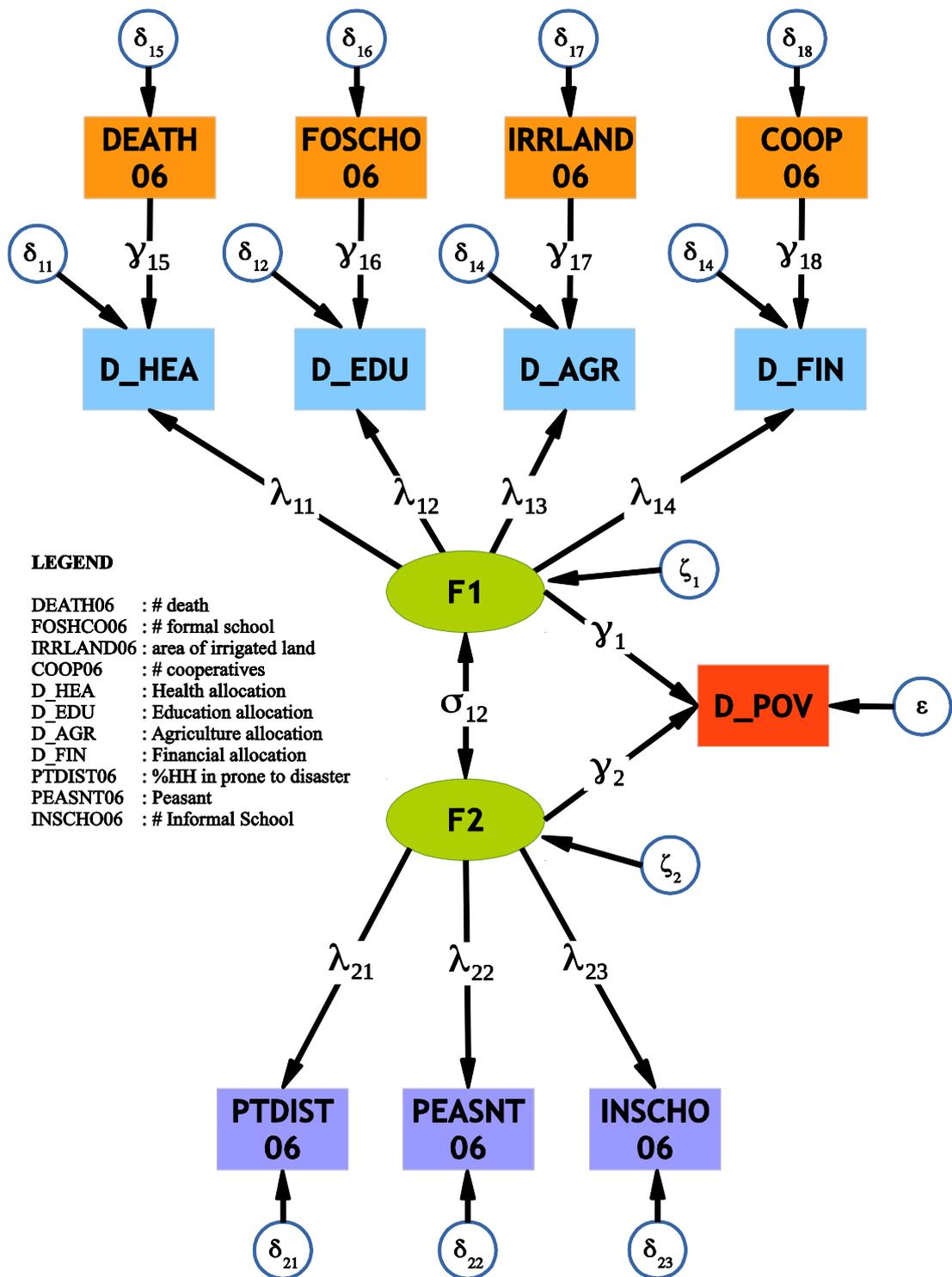


Figure 3.3. Hypothesized Structural Path of PNPM-Rural Evaluation

### 3.2.2. Research Hypotheses

#### Hypothesis 1:

$$H_0: \lambda_{11} \leq 0$$

$$H_1: \lambda_{11} > 0$$

#### Hypothesis 2:

$$H_0: \lambda_{12} \leq 0$$

$$H_1: \lambda_{12} > 0$$

#### Hypothesis 3:

$$H_0: \lambda_{13} \leq 0$$

$$H_1: \lambda_{13} > 0$$

#### Hypothesis 4:

$$H_0: \lambda_{14} \leq 0$$

$$H_1: \lambda_{14} > 0$$

Health, Education, Agriculture, and Financial Activity has contributed to form infrastructure and public service provided by PNPM Investment. Later on, the latent F1 will refer to *PNPM Investment* latent variable.

#### Hypothesis 5:

$$H_0: \gamma_{15} \leq 0$$

$$H_1: \gamma_{15} > 0$$

#### Hypothesis 6:

$$H_0: \gamma_{16} \leq 0$$

$$H_1: \gamma_{16} > 0$$

#### Hypothesis 7:

$$H_0: \gamma_{17} \leq 0$$

$$H_1: \gamma_{17} > 0$$

#### Hypothesis 8:

$$H_0: \gamma_{18} \leq 0$$

$$H_1: \gamma_{18} < 0$$

The abovementioned hypotheses represent the aspect whether PNPM Rural investment has aligned with community needs. Initial distribution of death record, number of formal school existed in the village, area of irrigated land, and number of cooperatives affect community decision in budget allocated to health, education, agriculture, and financial activity.

**Hypothesis 9 - 11:**

$$\mathbf{H_0: \lambda_{2i} \leq 0 \quad i= 1,2,3}$$

$$\mathbf{H_1: \lambda_{2i} > 0}$$

Initial percentage of household located in fragile area, percentage of peasant, and number of informal school or training in the village, constituted as elements that articulate empowerment level of the marginalized poor. The *Poverty Empowerment* term will then replace F2 latent variable onwards.

**Hypothesis 12:**

$$\mathbf{H_0: \sigma_{12} \leq 0}$$

$$\mathbf{H_1: \sigma_{12} > 0}$$

The *poverty empowerment* will affect *PNPM investment* allocation. This indicated participatory initiative from the marginalized poor that has been empowered to promote PNPM investment both in its designated activity and its decision making assembly.

**Hypothesis 13:**

$$\mathbf{H_0: \gamma_i \geq 0 \quad i= 1, 2}$$

$$\mathbf{H_1: \gamma_i < 0}$$

The *PNPM Investment* and *Empowerment for the Poor* ideally may decrease poverty level in the community within the time frame.

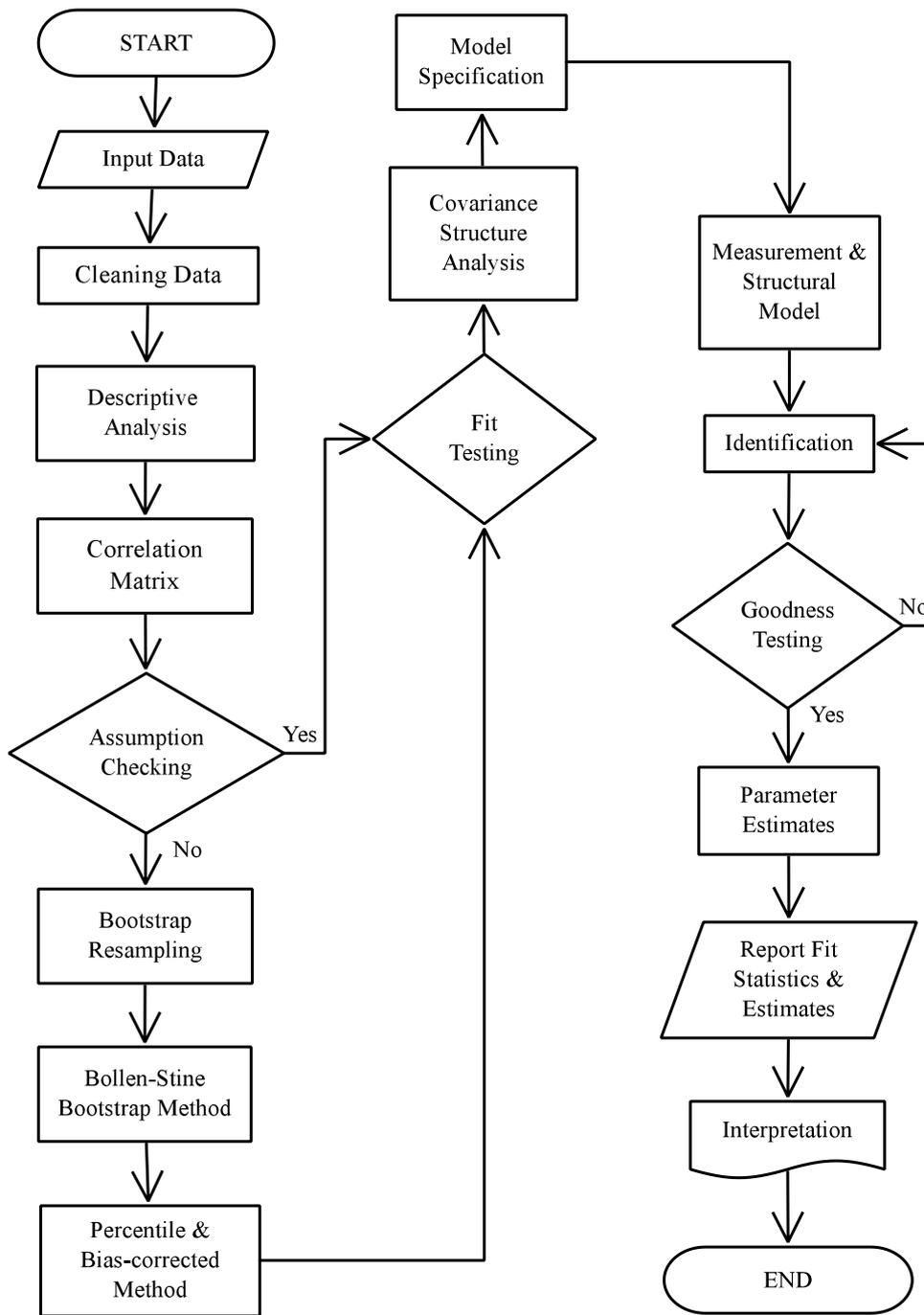


Figure 3.4. Research Flow Chart (2)

### 3.2.3. Method

The flow chart of the second research algorithm can be explained as follow:

1. Obtained the insight from proceeding descriptive and multiple regression result in district level analysis. The implication that can be used as foundation for the next analysis
2. The result suggest to select Sumatera island as sampling frame of the subsequent investigation due to its informed dynamics of poverty distribution
3. Select one province in the Sumatera Island that meet research criteria. In this case Aceh Province is selected do to its homogeneity extent that perceived to be able to control negative externality of the analysis.
4. Clean and pool data form PODES Survey and BAPPENAS PNPM Rural budget allocation data and set the corresponding village name, sub-district name, and district name as primary key so that fit data frame outline requirement in the specific statistical software.
5. Make differencing by subtracted the value that stated in 2011 to that recorded in 2007
6. Produce Correlation Matrix as well as basic statistics for all available variables
7. Infer preliminary causality relationship from the matrix
8. Check assumption of normality, heteroscedasticity, autocorrelation, and multicollinearity of the variables
9. Employ monotonic transformation for some ill-conditioned variables to smoothen the analysis. Transformation that have been made are changing the unit of nominal value investment discounted by Index of Consumer Price Faced by the Farmers in 2011: 130.79 (Based 2007=100)

10. Assess validity and reliability of the preliminary causality path by conducting factor analysis.

*Covariance Structure Analysis*

11. Check the model specification.
12. Perform covariance structure analysis based on preliminary causality path
13. Construct measurement and structural model
14. Re-specify the structural model to conform to design and measurement specification
15. Employ Covariance Structure Analysis
16. Check the status of identification of the model. A model is identified if it has a unique estimate of its parameter. Over-identified if it has numerous estimates, and under-identified if there is no possible estimates
17. Evaluate goodness of fit testing. If satisfied go to procedure 27, otherwise proceed to the step 18
18. Re-specify and check model assumption.
19. If it is violated, performed Bootstrap resampling
20. Perform Bollen-Stine Bootstrap method for goodness of fit resampling
21. Check the goodness of fit test resulted from the analysis
22. If the model fit well, do estimate the parameter of the measured.
23. If the goodness has not shown a better performance, do re-specify the model according to the theory, reduce equation form into a simpler formulation or do transformation.
24. Repeat the initial step until it sounds better performance.
25. Report the statistics of the model
26. Interpret the statistical inference according to the result and existing literature.

## IV. MODEL SPECIFICATION

### 4.1. Model Hypothesis Testing

$$H_0: \Sigma = \Sigma(\theta)$$

$$H_1: \Sigma \neq \Sigma(\theta) \dots\dots\dots(4)$$

$\Sigma$  is population covariance matrix of the observed variables (both  $y$  and  $x$ ), while  $\Sigma(\theta)$  is implied covariance matrix generated by a particular model, and  $\theta$  is vector containing estimates of interest, that is the free parameters of the model. If identification and distributional assumption was satisfied, one can use statistical testing with chi-square distribution in order to test the null hypothesis that the implied covariance matrix leads to similar replication of the population covariance matrix of the observed variables. Otherwise, if chi-square is significant, by means of exceeding its corresponding critical point, the  $H_0$  is rejected. This would raise a doubt on model specification and therefore another implied covariance matrix can better fit the population covariance matrix.

### 4.2. The Implied Covariance Matrix

As mentioned in the previous section, assuming that  $\theta$  is free model parameter in the hypothesized model, the basic measurement of the general SEM compares population covariance matrix constructed from observed variables and covariance matrix installed by a function of  $\theta$ . Hereinafter, the specific  $\Sigma(\theta)$  implied covariance matrix might be composed by three parts:

- (1). Covariance matrix of  $y$  variables
- (2). Covariance matrix of  $x$  variables with  $y$  variables
- (3). Covariance matrix of  $x$  variables

### 4.3. Model Specification of Western Part of Indonesia

#### 4.3.1. Evaluation of Western Part of Indonesia

Kenny (1979) pinpointed that model is the set of assumptions about how data were generated. Structural models require a blend of mathematics and theory related featured by translation of theory into equation/ *specification*. In this model, parameters are called *structural parameters* that often type in lower case symbol. The endogenous variable as conventionally is written in the left side and sometimes are called left-hand variable. On the other hands the exogenous variable perceived as right-hand variable.

$$y_i = \mu + A\xi_i + \varepsilon_i \dots\dots\dots(5)$$

$\varepsilon_i \sim$  Multinormal  $(\mathbf{0}, \Psi)$ ,  $y_i \sim$  Multinormal  $(\mu, \Sigma)$ , which;

$$\Sigma = A\Phi A' + \Psi \dots\dots\dots(6)$$

Where;

$y_i$  = Response observe for a sample of subject

$\mu$  = Population mean

$\xi_i$  =  $m \times 1$  vector/ matrix of latent score for subject  $i$ .  $m$  indicated the number of latent variables

$A$  =  $p \times m$  matrix, each element  $a_{jk}$  measured the contribution of  $k$ th latent component ( $k=1,2,3,\dots,m$ ) to the  $j^{\text{th}}$  observed measure ( $j=1,2,\dots,p$ ).

$\varepsilon_i$  =  $p \times 1$  vector/ matrix for subject  $i$  of measurement error

$\Psi$  = Variance-covariance matrix of measurement error

$\Phi$  = Variance-covariance matrix of latent variable

$\Sigma$  = Variance-covariance matrix of  $y_i$  (Thum, 2005).

One of the unique characteristics of this analysis is that structural equation modeling can be viewed as a hybrid of two approaches to model: multiple regression and factor analysis as they embodied respectively to structural model and measurement model. The *structural model* relates the latent variable to one another, and the *measurement model* connects the latent construct to the observed variable. The latent construct may be referred to as factors or construct that is not directly measured. It exists with the support of an observed manifest variable or indicator (Kline, 1998).

Furthermore, the model hypothesis could be performed by constructing implied covariance matrix. First of all, it is necessary to define each budget allocation variables ( $x_i, i = 1, 2, 3, 4, 5, 6, 7$ ) into a function of its corresponding latent variable of  $\xi = \text{Economic Capital}$ . Please refer to Table 5.2 for corresponding budget location mathematical symbol. Equation (7) to (11) denoted as function of budget allocated to energy, financial, transportation, agriculture, and poverty alleviation in respect to latent variables, Economic capital.

$$x_1 = \lambda_1 \xi + \delta_1 \dots\dots\dots(7)$$

$$x_2 = \lambda_2 \xi + \delta_2 \dots\dots\dots(8)$$

$$x_3 = \lambda_3 \xi + \delta_3 \dots\dots\dots(9)$$

$$x_4 = \lambda_4 \xi + \delta_4 \dots\dots\dots(10)$$

$$y = \gamma_1 \xi + \gamma_2 x_7 + \varepsilon \dots\dots\dots(11)$$

$$x_5 = \beta_1 y + \delta_5 \dots\dots\dots(12)$$

$$x_6 = \beta_2 y + \delta_6 \dots\dots\dots(13)$$

Equation (12) and (13) indicated a function of budget allocated to social and education activity in terms of poverty rate ( $y$ ), respectively.

Derive  $x_7$  into a function of  $\xi$

$$y = \gamma_1 \xi + \gamma_2 x_7 + \varepsilon$$

$$\gamma_2 x_7 = y - \gamma_1 \xi + \varepsilon$$

$$x_7 = \frac{-\gamma_1}{\gamma_2} \xi + \left( \frac{y - \varepsilon}{\gamma_2} \right)$$

$$x_7 = \lambda_7^* \xi + \delta_7^* \dots \dots \dots (14)$$

Equation (14) signified a function of health budget allocation to latent variable, Economic Capital.

Derive  $x_5$  and  $x_6$  into a function of  $\xi$

$$x_5 = \beta_1 y + \delta_5$$

$$x_5 = \beta_1 (\gamma_1 \xi + \gamma_2 x_7 + \varepsilon) + \delta_5$$

$$x_5 = \beta_1 \gamma_1 \xi + \beta_1 \gamma_2 x_7 + \beta_1 \varepsilon + \delta_5$$

$$x_5 = \beta_1 \gamma_1 \xi + \beta_1 \gamma_2 (\lambda_7^* \xi + \delta_7^*) + \beta_1 \varepsilon + \delta_5$$

$$x_5 = \beta_1 \gamma_1 \xi + \beta_1 \gamma_2 \lambda_7^* \xi + \beta_1 \gamma_2 \delta_7^* + \beta_1 \varepsilon + \delta_5$$

$$x_5 = (\beta_1 \gamma_1 + \beta_1 \gamma_2 \lambda_7^*) \xi + (\beta_1 \gamma_2 \delta_7^* + \beta_1 \varepsilon + \delta_5)$$

$$x_5 = \lambda_5^* \xi + \delta_5^* \dots \dots \dots (15)$$

Equation (15) related a function of social budget allocation to latent variable, Economic Capital.

$$x_6 = \beta_2 y + \delta_6$$

$$x_6 = \beta_2 (\gamma_1 \xi + \gamma_2 x_7 + \varepsilon) + \delta_6$$

$$x_6 = \beta_2 \gamma_1 \xi + \beta_2 \gamma_2 x_7 + \beta_2 \varepsilon + \delta_6$$

$$x_6 = \beta_2 \gamma_1 \xi + \beta_2 \gamma_2 (\lambda_7^* \xi + \delta_7^*) + \beta_2 \varepsilon + \delta_6$$

$$\begin{aligned}
x_6 &= \beta_2\gamma_1\xi + \beta_2\gamma_2\lambda_7^*\xi + \beta_2\gamma_2\delta_7^* + \beta_2\varepsilon + \delta_6 \\
x_6 &= (\beta_2\gamma_1 + \beta_2\gamma_2\lambda_7^*)\xi + (\beta_2\gamma_2\delta_7^* + \beta_2\varepsilon + \delta_6) \\
x_6 &= \lambda_6^*\xi + \delta_6^* \dots \dots \dots (16)
\end{aligned}$$

Equation (16) associated a function of education budget allocation to latent variable, Economic Capital.

Re-write equation (5) into a function of  $\xi$

$$\begin{aligned}
y &= \gamma_1\xi + \gamma_2x_7 + \varepsilon \\
y &= \gamma_1\xi + \gamma_2(\lambda_7^*\xi + \delta_7^*) \\
y &= \gamma_1\xi + \gamma_2\lambda_7^*\xi + \gamma_2\delta_7^* \\
y &= (\gamma_1 + \gamma_2\lambda_7^*)\xi + (\gamma_2\delta_7^*) \\
y &= \gamma^*\xi + \varepsilon^* \dots \dots \dots (17)
\end{aligned}$$

Equation (17) signified a function of poverty rate to latent variable, Economic Capital.

Re-arrange equation (7)-(10), (15), (16), and (14) into matrix representation.

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \end{bmatrix} = \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \\ \lambda_4 \\ \lambda_5^* \\ \lambda_6^* \\ \lambda_7^* \end{bmatrix} [\xi] + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5^* \\ \delta_6^* \\ \delta_7^* \end{bmatrix} \Rightarrow X = \Lambda\xi + \delta \dots \dots \dots (18)$$

$$X = \Lambda\xi + \delta \dots \dots \dots (19)$$

$$y = \gamma\xi + \varepsilon \Rightarrow y = \Gamma\xi + \varepsilon \dots \dots \dots (20)$$

Equation (18) and Equation (20) respectively signified matrix representation of budget allocation to latent variable (Economic Capital) and matrix representation of poverty rate equation.

### 4.3.2. Evaluation in a Case Study of Aceh Province

Like econometrics methods, covariance structure analysis or SEM allow to analyze simultaneous equation with considerable number of *endogeneous* variables. Different with most econometric methods, SEM enabled measurement error in the exogenous and endogenous variables through incorporating factors that defined by corresponding constituent variables. Here are characteristics of SEM analysis according to Bollen and Long (1993).

- ✓ Similar with factor analysis, multiple indicators of latent construct and estimation of reliability and validity estimation can be consider within SEM approach.
- ✓ It is also allow researcher to specify structural relationships among the latent variables a priori.
- ✓ Can be applied to study in econometrics, sociometrics, and psychometric.

The analysis of the former approach (district-level/ regional level data) incorporated the extent of two latent variables manifested into human and economic capital. They both were selected because they deemed as the engines of growth or production function. The latter (sub-district level data) has attempted to do so, yet failed to achieve necessary condition of identification in the validation analysis.

The permissible latent variable; the PNPM investment and Empowerment for the Poor, has worked as determinant of poverty reduction in the community. The author encapsulated the poverty empowerment as the latent variable motivated by the evidence that once the marginalized poor (those who stay in fragile-prone to disaster-area, and who worked as blue collar/ peasant) get access to increase their

capacity by attending informal school or training alike, they will be empowered and face better economic viability. To this extent, empowerment for the poor was accomplished.

$$x_{11} = \gamma_{15}x_{15} + \delta_{15}\dots\dots\dots(21)$$

$$x_{12} = \gamma_{16}x_{16} + \delta_{16}\dots\dots\dots(22)$$

$$x_{13} = \gamma_{17}x_{17} + \delta_{17}\dots\dots\dots(23)$$

$$x_{14} = \gamma_{18}x_{18} + \delta_{18}\dots\dots\dots(24)$$

Equation (21) - (24) indicated respectively budget allocation of health, education, agriculture, and financial as a function of consecutively, number of death, number of formal school, area of irrigated land, and number of cooperatives.

$$x_{11} = \lambda_{11}\xi_1 + \delta_{11}\dots\dots\dots(25)$$

$$x_{12} = \lambda_{12}\xi_1 + \delta_{12}\dots\dots\dots(26)$$

$$x_{13} = \lambda_{13}\xi_1 + \delta_{13}\dots\dots\dots(27)$$

$$x_{14} = \lambda_{14}\xi_1 + \delta_{14}\dots\dots\dots(28)$$

Equation (25) - (28) respectively signified budget allocation of health, education, agriculture, and financial as a function of latent variable PNPM Investment ( $\xi_1$ ).

$$y = \gamma_1\xi_1 + \gamma_2\xi_2 + \varepsilon\dots\dots\dots(29)$$

Equation (29) denoted percentage of poor measured by latent variable PNPM Investment and Empowerment for the Poor.

$$x_{21} = \lambda_{21}\xi_2 + \delta_{21}\dots\dots\dots(30)$$

$$x_{22} = \lambda_{22}\xi_2 + \delta_{22}\dots\dots\dots(31)$$

$$x_{23} = \lambda_{23}\xi_2 + \delta_{23}\dots\dots\dots(32)$$

Equation (30) - (32) successively represented percentage of household live in prone to disaster areas, percentage of peasant, and number of informal school per capita as the constituent of latent variable Empowerment for the Poor.

Make reduced form of equation (21) – (24) and (25)-(28)

$$x_{11} = \gamma_{15}x_{15} + \delta_{15} = \lambda_{11}\xi_1 + \delta_{11} \dots \dots \dots (33)$$

$$x_{12} = \gamma_{16}x_{16} + \delta_{16} = \lambda_{12}\xi_1 + \delta_{12} \dots \dots \dots (34)$$

$$x_{13} = \gamma_{17}x_{17} + \delta_{17} = \lambda_{13}\xi_1 + \delta_{13} \dots \dots \dots (35)$$

$$x_{14} = \gamma_{18}x_{18} + \delta_{18} = \lambda_{14}\xi_1 + \delta_{14} \dots \dots \dots (36)$$

Equation (33) - (36) respectively indicated reduced-form of budget allocation to health, education, agriculture, and financial as the constituent of latent variable PNPM Investment.

From equation (33)

$$\gamma_{15}x_{15} + \delta_{15} = \lambda_{11}\xi_1 + \delta_{11}$$

$$\gamma_{15}x_{15} = \lambda_{11}\xi_1 + \delta_{11} - \delta_{15}$$

$$x_{15} = \frac{\lambda_{11}}{\gamma_{15}}\xi_1 + \left(\frac{\delta_{11} - \delta_{15}}{\gamma_{15}}\right)$$

$$x_{15} = \lambda_{15}^*\xi_1 + \delta_{15}^* \dots \dots \dots (37)$$

Equation (37) identified number of deaths case as a function of latent variable PNPM Investment.

From equation (34)

$$\gamma_{16}x_{16} + \delta_{16} = \lambda_{12}\xi_1 + \delta_{12}$$

$$\gamma_{16}x_{16} = \lambda_{12}\xi_1 + \delta_{12} - \delta_{16}$$

$$x_{16} = \frac{\lambda_{12}}{\gamma_{16}}\xi_1 + \left(\frac{\delta_{12} - \delta_{16}}{\gamma_{16}}\right)$$

$$x_{16} = \lambda_{16}^* \xi_1 + \delta_{16}^* \dots \dots \dots (38)$$

Equation (38) signified number of formal school as a function of latent variable PNPM Investment.

From equation (35)

$$\gamma_{17} x_{17} + \delta_{17} = \lambda_{13} \xi_1 + \delta_{13}$$

$$\gamma_{17} x_{17} = \lambda_{13} \xi_1 + \delta_{13} - \delta_{17}$$

$$x_{17} = \frac{\lambda_{13}}{\gamma_{17}} \xi_1 + \left( \frac{\delta_{13} - \delta_{17}}{\gamma_{17}} \right)$$

$$x_{17} = \lambda_{17}^* \xi_1 + \delta_{17}^* \dots \dots \dots (39)$$

Equation (39) related area of irrigated land as a function of latent variable PNPM Investment.

From Equation (36)

$$\gamma_{14} x_{14} + \delta_{18} = \lambda_{14} \xi_1 + \delta_{14}$$

$$\gamma_{14} x_{14} = \lambda_{14} \xi_1 + \delta_{14} - \delta_{18}$$

$$x_{18} = \frac{\lambda_{14}}{\gamma_{18}} \xi_1 + \left( \frac{\delta_{14} - \delta_{18}}{\gamma_{18}} \right)$$

$$x_{18} = \lambda_{18}^* \xi_1 + \delta_{18}^* \dots \dots \dots (40)$$

Equation (40) associated number of cooperatives as a function of PNPM Investment.

Construct Matrix Form of Equation (25) – (28), (37) – (40), (30) – (32), and (29):

$$\begin{bmatrix} x_{11} & x_{21} \\ x_{12} & x_{22} \\ x_{13} & x_{23} \\ x_{14} & 0 \\ x_{15} & 0 \\ x_{16} & 0 \\ x_{17} & 0 \\ x_{18} & 0 \end{bmatrix} = \begin{bmatrix} \lambda_{11} & \lambda_{21} \\ \lambda_{12} & \lambda_{22} \\ \lambda_{13} & \lambda_{23} \\ \lambda_{14} & 0 \\ \lambda_{15}^* & 0 \\ \lambda_{16}^* & 0 \\ \lambda_{17}^* & 0 \\ \lambda_{18}^* & 0 \end{bmatrix} \begin{bmatrix} \xi_1 & 0 \\ 0 & \xi_2 \end{bmatrix} + \begin{bmatrix} \delta_{11} & \delta_{21} \\ \delta_{12} & \delta_{22} \\ \delta_{13} & \delta_{23} \\ \delta_{14} & 0 \\ \delta_{15}^* & 0 \\ \delta_{16}^* & 0 \\ \delta_{17}^* & 0 \\ \delta_{18}^* & 0 \end{bmatrix}$$

$$X = \Lambda^* \xi + \delta \dots \dots \dots (41)$$

$$y = [\gamma_1 \quad \gamma_2] \begin{bmatrix} \xi_1 \\ \xi_2 \end{bmatrix} + \varepsilon$$

$$y = \Gamma \xi + \varepsilon \dots \dots \dots (42)$$

Equation (41) and Equation (42) correspondingly signified matrix representation of observed variables (x) to latent variables (PNPM Investment and Empowerment for the poor), and matrix representation of percentage of poor associated with latent variables (PNPM Investment and Empowerment for the poor).

Assembly Implied Covariance Matrix by decomposing its covariance component:

$$\begin{aligned} \Sigma_{yy}(\theta) &= E(yy') \\ \Sigma_{yy}(\theta) &= E[(\Gamma \xi + \varepsilon)(\Gamma \xi + \varepsilon)'] \\ \Sigma_{yy}(\theta) &= E[(\Gamma \xi + \varepsilon)(\xi' \Gamma' + \varepsilon')] \\ \Sigma_{yy}(\theta) &= E[\Gamma \xi \xi' \Gamma' + \Gamma \xi \xi' + \xi \xi' \Gamma' + \varepsilon \varepsilon'] \\ \Sigma_{yy}(\theta) &= \Gamma E(\xi \xi') \Gamma' + 0 + 0 + E(\varepsilon \varepsilon') \\ \Sigma_{yy}(\theta) &= \Gamma \Phi \Gamma' + \Psi \dots \dots \dots (43) \\ \Sigma_{xx}(\theta) &= E(xx') \\ \Sigma_{xx}(\theta) &= E[(\Lambda \xi + \delta)(\Lambda \xi + \delta)'] \end{aligned}$$

$$\begin{aligned} \Sigma_{xx}(\theta) &= E[(\Lambda\xi + \delta)(\xi'\Lambda' + \delta')] \\ \Sigma_{xx}(\theta) &= E[\Lambda\xi\xi'\Lambda' + \Lambda\xi\xi' + \xi\xi'\Lambda' + \delta\delta'] \\ \Sigma_{xx}(\theta) &= \Lambda E(\xi\xi')\Lambda' + 0 + 0 + E(\delta\delta') \\ \Sigma_{xx}(\theta) &= \Lambda\Phi\Lambda' + \theta_{\delta} \dots \dots \dots (44) \end{aligned}$$

$$\begin{aligned} \Sigma_{xx} &= E(xx') \\ \Sigma_{xy}(\theta) &= E[(\Lambda\xi + \delta)(\Gamma\xi + \varepsilon)'] \\ \Sigma_{xy}(\theta) &= E[(\Lambda\xi + \delta)(\xi'\Gamma' + \varepsilon')] \\ \Sigma_{xy}(\theta) &= E[\Lambda\xi\xi'\Gamma' + \Lambda\xi\xi' + \xi\xi'\Gamma' + \delta\varepsilon'] \\ \Sigma_{xy}(\theta) &= \Lambda E(\xi\xi')\Gamma' + 0 + 0 + E(\delta\varepsilon') \\ \Sigma_{xy}(\theta) &= \Lambda\Phi\Gamma' \dots \dots \dots (45) \end{aligned}$$

$$\begin{aligned} \Sigma_{yx} &= [\Sigma_{xy}]' \\ \Sigma_{yx}(\theta) &= (\Lambda\Phi\Gamma')' \\ \Sigma_{yx}(\theta) &= \Gamma\Phi'\Lambda' \dots \dots \dots (46) \end{aligned}$$

Equation (43) - (46) respectively signified covariance matrix of y, covariance matrix of x, covariance matrix of xy, and covariance matrix of yx.

Combine equation (43) – (46) as the element of Implied Covariance Matrix

$$\Sigma(\theta) = \begin{bmatrix} \Sigma_{yy}(\theta) & \Sigma_{yz}(\theta) \\ \Sigma_{xy}(\theta) & \Sigma_{xx}(\theta) \end{bmatrix} = \begin{bmatrix} \Gamma\Phi\Gamma' + \Psi & \Gamma\Phi'\Lambda' \\ \Lambda\Phi\Gamma' & \Lambda\Phi\Lambda' + \theta_{\delta} \end{bmatrix} \dots \dots \dots (47)$$

Equation (47) indicated Implied Covariance matrix of hypothesized model.

#### 4.4. Identification

After model specification, it was eventually documented that the variance and covariance are function of free model parameters. The next thing to proceed is the identification issue. It should be employed in order to define unique values that fit these parameters functions.

To evaluate the model, necessary condition that satisfied the identification rule is t-Rule, with t is number of free and unconstrained elements in  $\theta$ , and  $p+q$  is number of observed variables. The requirements are as follows:

$$t \leq \frac{1}{2} (p + q)(p + q + 1) \dots \dots \dots (48)$$

Equation (48) formulated necessary condition for identification.

#### 4.5. Estimation and Model Evaluation

The model estimation was derived from how far the similarity of the population observed variable covariance matrix to that of the covariance matrix composed by structural parameters. Since to compute population covariance matrix is highly unlikely, we form the estimates of the covariance matrix ( $\mathbf{S}$ ) and extract the sample estimates of the unknown parameter  $\theta$  based on that sample covariance matrix. Once, we got the element of  $\mathbf{S}$  matrix, substitute the value of element in sample covariance matrix into  $\mathbf{\Sigma}$  in terms of structural parameter. By doing this, we obtained implied covariance matrix  $\widehat{\mathbf{\Sigma}}$ , that is implied covariance matrix  $\Sigma(\theta)$  with  $\hat{\theta}$  substituting  $\theta$ . We select values of estimators that makes  $\widehat{\mathbf{\Sigma}}$  is as close as possible to  $\mathbf{S}$ . Residual  $(\mathbf{S}-\widehat{\mathbf{\Sigma}})$  indicates the distance. Our goal is to minimize this value or in other words, to minimize the values between each element in  $\widehat{\mathbf{\Sigma}}$  and

that in  $\mathbf{S}$  as lower as possible.

The objective function was postulated by  $F(\mathbf{S}, \Sigma(\theta))$  statistics which follow chi-square statistical distribution. With assumption that  $\mathbf{S}$  and  $\Sigma(\theta)$  are non-singular or positive definite, using maximum likelihood estimator, the function that was minimized was denoted in Equation (49):

$$F_{ML} = \log|\Sigma(\theta)| + \text{tr}(\mathbf{S}\Sigma^{-1}(\theta)) - \log|\mathbf{S}| - (p + q) \dots \dots \dots (49)$$

Below is the detail derivation of maximum likelihood fitting function of Equation (49).

Supposed that  $Z$  independent and identically random variable which distributed normal, with parameter  $\theta$ :

$$Z \stackrel{iid}{\sim} MN(\theta) \dots \dots \dots (50)$$

The jointly probability density function of  $Z$  was denoted by multiplication of individual probability density function of  $Z_i$  mutually exclusively.

$$f(Z_1, Z_2, \dots, Z_N; \theta) = f(Z_1; \theta)f(Z_2; \theta) \dots f(Z_N; \theta) \dots \dots \dots (51)$$

In order to estimate the parameters, Maximum likelihood estimator was performed. The objective of this method was to maximize the likelihood function of as a series of events associated with specific parameter  $\theta$ . The likelihood function was denoted as follows:

$$L(\theta; Z_1, Z_2, \dots, Z_N) = L(\theta; Z_1)L(\theta; Z_2) \dots L(\theta; Z_N) \dots \dots \dots (52)$$

The basic requirements for maximization objective function should satisfy the the necessary condition (NC) of first order derivative of the objective function equal to zero and sufficient condition (SC) of second order derivative of the objective

function should be negative.

$$NC = \frac{d \log(L(\theta))}{d\theta} = 0$$

$$SC = \frac{d^2 \log(L(\theta))}{d\theta^2} < 0$$

..... (53)

The basic probability density function (PDF) for random variable  $X$  with parameter mean of  $\mu$  and variance of  $\sigma^2$  :

$$P(X; \mu, \sigma^2) = \frac{1}{\sqrt{2\sigma^2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

... .. (54)

Assume that  $Z$  was standardized variables of  $X$ :

$$Z = \frac{(X - \mu)}{\sigma}$$

..... (55)

The PDF of  $Z$  with mean 0 and variance 1:

$$P(Z; 0,1) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}Z^2}$$

..... (56)

Which mean that  $Z$  has standardized normal distribution denoted by

$$Z \sim N(0,1)$$

..... (57)

Supposed that  $Z$  distributed by normal distribution with parameter mean zero and

variance:

$$Z \sim N(0, \Sigma) \dots\dots\dots (58)$$

The PDF of transformed Z was as followed:

$$\begin{aligned} Z = P(Z = z) &= \frac{1}{\sqrt{2\pi\Sigma}} e^{-\frac{z^2}{2\Sigma}} \\ &= (2\pi)^{-\frac{1}{2}}(\Sigma)^{-\frac{1}{2}}e^{-\frac{1}{2}z^2\Sigma^{-1}} \end{aligned} \dots\dots\dots (59)$$

Or in matrix forms it was equivalent with:

$$Z_i = (2\pi)^{-\frac{1}{2}}(\Sigma)^{-\frac{1}{2}}e^{-\frac{1}{2}Z_i'\Sigma^{-1}Z_i} \dots\dots\dots (60)$$

Following general formulation of maximum likelihood estimator, the maximum likelihood estimator of  $Z_i$  was measured as multiplication of independent and identically distributed PDF of  $Z_i$ :

$$\begin{aligned} F_{ML} &= \prod_{i=1}^N f(Z_i; \theta) \\ F_{ML} &= (2\pi)^{-\frac{N(p+a)}{2}}(\Sigma(\theta))^{-\frac{N}{2}}e^{-\frac{1}{2}\sum_{i=1}^N Z_i'\Sigma^{-1}Z_i} \end{aligned} \dots\dots\dots (61)$$

Taking logarithmic function of  $F_{ML}$  for ensuring linear additive relationship, the following equation was obtained:

$$\log L(\theta) = -\frac{N(p+a)}{2} \log(2\pi) - \frac{N}{2} \log|\Sigma(\theta)| - \left( \frac{1}{2} \sum_{i=1}^N Z_i' \Sigma^{-1} Z_i \right)$$

..... (62)

On the right hand sided equation, the last element on the right hand sided equation, could be simplified as the following equations:

$$-\frac{1}{2} \sum_{i=1}^N Z_i' \Sigma^{-1} Z_i$$

$$\Leftrightarrow -\left(\frac{1}{2}\right) \sum_{i=1}^N \text{tr} [Z_i' \Sigma(\theta)^{-1} Z_i] = -\left(\frac{N}{2}\right) \sum_{i=1}^N \text{tr} [N^{-1} Z_i Z_i' \Sigma(\theta)^{-1}]$$

$$= -\left(\frac{N}{2}\right) \text{tr} [S^* \Sigma^{-1}(\theta)]$$

..... (63)

Where, the S sample covariance matrix was accounted for:

$$S^* = \frac{Z_i Z_i'}{N}$$

$$S^* = \left( \frac{(N-1)}{N} \right) S$$

..... (64)

Incorporating Equation (63), The log-likelihood function could be written as:

$$\log L(\theta) = \text{constant} - \left(\frac{N}{2}\right) \log|\Sigma(\theta)| - \left(\frac{N}{2}\right) \text{tr} [S^* \Sigma^{-1}(\theta)]$$

$$= \text{constant} - \left(\frac{N}{2}\right) \{ \log|\Sigma(\theta)| + \text{tr} [S^* \Sigma^{-1}(\theta)] \}$$

..... (65)

Utilizing the following matrix algebra of sample covariance matrix S:

$$S = \frac{Z_i Z}{N} \quad \text{or} \quad S = \frac{ZZ}{(N-1)} \dots\dots\dots (66)$$

The final estimator function equivalently written as

$$F_{ML} = \log|\Sigma(\theta)| + tr[S^* \Sigma^{-1}(\theta)] - \log(S) - (p + q) \dots\dots\dots (67)$$

Where the necessary and sufficient condition for estimation should be satisfied:

$$\frac{\partial^2 f(\theta)}{\partial \theta \partial \theta'} \geq 0 \dots\dots\dots (68)$$

**4.6. Bollen and Stine Bootstrap Statistical Resampling**

Bootstrapping has been developed as a remedy to non-normal data. Bollen and Stine (1993) suggested that non-normality of the observed variables might stemmed from model nature, excessive kurtosis, and small size of the sample. If the non-normal data incorporated into analysis, the assumption of chi-square test of model fit would be violated. The Chi-square statistics would act peculiarly inflated and the standard error hence would be deflated. These would result in rejecting the overall fit test and test of individual parameter estimates and leads to Type 1 error (false positive) or the condition where null hypothesis was rejected, in fact the null hypothesis was true. Specifically Bentler & Bonett’s (1980) indicated that basic test of hypothesis, comparison of fit indice significances, or confidence interval were not possible to be employed in the case of unknown distribution of goodness of fit indices. Thus, non-parametric inferential is urgently needed conditioned to this circumstances.

Bollen & Stine Bootstrapping offered different facet of resampling compared to the traditional one. The naïve bootstrapping of the test statistics engages in repeating the following steps B times:

- 1) Resample the original data and extract the covariance matrix for the bootstrap sample ( $S^*$ ).
- 2) Minimize the  $F_{ML}(S^*, \Sigma(\theta^*))$  along the  $\theta^*$  values. Then, fit the hypothesized model to  $S^*$
- 3) Calculate  $T^* = (N-1) F_{ML}(S^*, \Sigma(\hat{\theta}^*))$ , where  $\hat{\theta}^*$  is optimum value of  $\theta^*$  which minimizes  $F_{ML}(S^*, \Sigma(\theta^*))$
- 4) Compare T statistics from the original sample to that of bootstrap distribution of  $T^*(1), T^*(2), \dots, T^*(B)$  and test for significant differences.

Bollen & Stine (1993) signal a warning that the above-mentioned traditional bootstrap generally did not work. Their analytical approximation have explained why this happened through a series of simulation examples. Hence they proposed a modified Bootstrap procedure that applies to model hypothesis testing. Through that fashion, one can make inference of their sample with non-normal data or moderate sample size. The modification was made on factorization of covariance matrix:

$$Z = YS^{-\frac{1}{2}}\hat{\Sigma}^{\frac{1}{2}}$$

..... (69)

The modified bootstrapping algorithm occurs as following:

- 1) Prepare the modified data and factorized covariance matrix (Z), then resample them and calculate the bootstrap sample of modified data covariance matrix ( $S_m^*$ )

- 2) Minimize the  $F_{ML}(S_m^*, \sum(\theta^*))$  along the  $\theta_m^*$  values. Then, fit the hypothesized model to  $S_m^*$
- 3) Calculate  $T_m^* = (N-1) F_{ML}(S_m^*, \sum(\theta_m^*))$ , where  $\hat{\theta}_m^*$  is the optimum value of  $\theta^*$  which minimizes  $F_{ML}(S_m^*, \sum(\theta^*))$

## V. DATA

The details of block grant allocation disbursement could be explained by the following:

- Social: Community capacity building encompassed extension and outreach on farm practice, livestock, carpentry skill, health, disaster management, life skill and financial management.
- Agriculture: irrigation via canal, simple dam, artesian wells, water gate, and other agricultural infrastructure such as seed procurement and agriculture equipment and machinery.
- Education: construction of school building classrooms, staff room, laboratory, and library. Means of supporting schools via procurement of books, teaching aids, textbooks, uniform, schools, children's play facilities, *meubelair* and educational assistance in the form of scholarships
- Health:
  1. Public health; health community building, village clinics, village drug posts, immunization, maternal and child health, nutrition, free medication.
  2. Sanitation drains, toilets, garbage disposal and trash.
  3. Clean water; dug wells, hand pump wells, rainwater harvesting, installation/ piping clean water, spring catcher, simple water treatment system, building tapper/ intake, slow sand filter, transmission and distribution piping, bathtub divider, etc.
  4. Healthy housing improvements
- Energy: electrification through micro hydro power (MHP), diesel generators,

and electrical wiring.

- Finance:
  1. Direct assistance; benefit the poor, subsidized low-cost market.
  2. Revolving fund; industry households, micro small and medium enterprises, Savings and Loans for women, household industry.
  3. Trade infrastructure; market facility, market stalls, fish markets.
- Access and Transportation:
  1. Roads; dirt road, pavement rebates concrete, gravel pavement, *telford* pavement, *macadam* road, hot mix asphalt.
  2. Road Support.
  3. Bridges; iron bridges, wooden bridges, concrete bridges, composite bridges, bamboo bridges, suspension bridges, arch bridges.
  4. Boat moorings; 1-floor moorings, 2-floor moorings

Complete description of PNPM Rural activity was depicted on Table 5.1;

### **5.1 Economic Evaluation in Western Part of Indonesia**

National budget allocation for the PNPM Rural activity was collected from the PNPM Management Information System (Sistem Informasi Terpadu PNPM: SIMPADU PNPM) documented the record from year 2007 and 2011. The secondary data is drawn from backward region all across Indonesia except for Papua and Papua Barat. The data from both areas are not available due to certain data management recovery. The CPI data for correcting inflation factors as well as population for corresponding district in associated years are derived from Statistics Indonesia.

Table 5.1 Details of Activity in PNPM Rural Productive Investment

Investment	Activity Name	Investment	Activity Name
FINANCE	Productive Economic Bussiness	EDUCATION	incentives for students
FINANCE	Revolving Loan Fund for Woman	EDUCATION	Teacher incentives
FINANCE	Market Stalls Construction	EDUCATION	School training
FINANCE	Market Kiosk Improvement	EDUCATION	Health training
FINANCE	Fish Auction Activity	EDUCATION	Village Hall Improvement
HEALTH	Health Post Building	EDUCATION	Multi-purpose building
HEALTH	Free Medication	AGRICULTURE	Irrigation
HEALTH	Mother and Child Care	AGRICULTURE	Simple Dam
HEALTH	Policlinic	AGRICULTURE	Sluice Gate
HEALTH	Medication Post	AGRICULTURE	Harvested Crop Activity
HEALTH	Subsidiary Comm. health Center	AGRICULTURE	Agriculture Barnyard
HEALTH	Healthcare Infrastructure	AGRICULTURE	Rice Milling
HEALTH	Pharmacy	ENERGY	MicroHydro Power Plant
HEALTH	incentives for health cader	ENERGY	Diesel Power Plant
HEALTH	incentives for Doctor/ Med. Asst	ENERGY	Electricity Cable
HEALTH	Public Toilet	TRANSPORTATION	Dirt Road Improvement
HEALTH	Garbage Can	TRANSPORTATION	Concrete Pavement
HEALTH	Waste Management Improvement	TRANSPORTATION	Gravel Pavement
HEALTH	Dug Wells with hand pumps	TRANSPORTATION	Telford Pavement
HEALTH	Dug Wells with engine pumps	TRANSPORTATION	"Telasah" Road
HEALTH	Drilled Wells with hand pumps	TRANSPORTATION	Asphalt Road
HEALTH	Drilled Wells with engine pumps	TRANSPORTATION	Conblock Pavement
HEALTH	Rain Water Reservoir	TRANSPORTATION	Sewer Construction
HEALTH	Public Hydrant	TRANSPORTATION	Retaining Wall
HEALTH	Water Pipes Installation	TRANSPORTATION	Gabion
HEALTH	Water Springs Shelter	TRANSPORTATION	Drainage System
HEALTH	Transmission and Distrib Piping	TRANSPORTATION	Roadside
HEALTH	Reservoir	TRANSPORTATION	"Ojeg" station
EDUCATION	Class Room Construction	TRANSPORTATION	Steel girder
EDUCATION	Teacher Room Construction	TRANSPORTATION	Wood girder
EDUCATION	Laboratorium Improvement	TRANSPORTATION	Concrete girder
EDUCATION	Library	TRANSPORTATION	Bamboo bridge
EDUCATION	School Toilet	TRANSPORTATION	Suspension bridge
EDUCATION	School Textbooks Procurement	TRANSPORTATION	Arch Bridge
EDUCATION	Teaching Property Procurement	TRANSPORTATION	Concrete Beam bridge
EDUCATION	Kids Playground	TRANSPORTATION	Flooring Mooring
EDUCATION	School mebelair	TRANSPORTATION	Wooden Boat
EDUCATION	School Infrastructure	TRANSPORTATION	Cleaning Activity
EDUCATION	Sholarships	TRANSPORTATION	Widening Activity
		TRANSPORTATION	Normalizing Activity

Eventually post-data clearing execution, 58 district level data of Sumatera island, Java island, and Nusa Tenggara island has been mined. Budget allocated towards the PNPM activity ranged over multi-facets; such as Social, Agriculture,

Education, Health, Energy, Financial, and Access/ Infrastructure both in 2007 and 2011 has also been extracted respectively. The head-count poverty rate ranged from 2008 until 2010 was also taken in favor of descriptive statistics.

Table 5.2 Data and Variable Definition of Economic Evaluation in Western Part of Indonesia

Sym	Variable	Definition	Unit
$y$	d_P0	Difference district poverty rate between 2011 and 2007	percent
$x_1$	d_ENE	Difference nominal/ real value of budget allocated in energy activities per capita from 2007 and 2011	million IDR
$x_2$	d_FIN	Difference nominal/ real value of budget allocated in financial activities per capita from 2007 and 2011	million IDR
$x_3$	d_TRANS	Difference nominal/ real value of budget allocated in transportation activities per capita from 2007 and 2011	million IDR
$x_4$	d_AGR	Difference nominal/ real value of budget allocated in agriculture activities per capita from 2007 and 2011	million IDR
$x_5$	d_SOC	Difference nominal/ real value of budget allocated in social activities per capita from 2007 and 2011	million IDR
$x_6$	d_EDU	Difference nominal/ real value of budget allocated in education activities per capita from 2007 and 2011	million IDR
$x_7$	d_HEA	Difference nominal/ real value of budget allocated in health activities per capita from 2007 and 2011	million IDR
$\xi$	Economic_ Capital	Latent variable of district economic capital	-

## **5.2 Economic Evaluation in a Case Study of Aceh Province**

Aceh Province which geographically located between  $01^{\circ}58' 37,2'' - 06^{\circ} 04' 33,6''$  north latitude and  $94^{\circ} 57' 57,6'' - 98^{\circ} 17' 13,2''$  east longitude is the most-western part of Indonesia archipelago. Since centuries ago, Aceh benefitted from having a strategic position at the intersection of international commerce between the East and the West. Through its boundary, Chinese, European, Indian and Arabian trader came across the island for exchanging their product within the Aceh ports. The close ties between Aceh and the countries were not merely based on exchange motives, but also for spreading beliefs and religions. It was indicated by the influence of Hindusim and Budhism from Indian in the 7<sup>th</sup> century, and subsequently Islam religion from Gujarat traders in the 9<sup>th</sup> century. Since then on, Aceh bestowed with majority of Muslim civilian up to nowadays.

Aceh also received special autonomy from central government according to the Law no. 18 in 2002 and change its name to Nanggroe Aceh Darussalam as government response due to the uprising and insurgency of GAM (Free Aceh Movement/ Gerakan Aceh Merdeka). The separatist movement has born as a protest of centralized system that deemed to be injustice across the nation and lead to a lot of riots. The rebellion has fought for the independency for about 29 years, after eventually they agreed to negotiate with central government and signed peace agreement of Helsinki MoU in August 2005. The motivation of GAM negotiation surfaced after catastrophic incident hit the province. In 26 December 2004 Aceh Province was devastated by Indian - Ocean Earthquake and Tsunami that caused approximately 170,000 civilian died.

Subsequently, in 2012 the Aceh administrative region comprised 18 districts and 5 cities, 289 sub-districts, 778 *mukims* and 6,493 *gampongs* or villages. The province was surrounded by territorial boundaries: Malacca Straits in the north and east, North Sumatera Province in the south, and Indian Ocean in the west. Total Area of Aceh land is 5,677,081 ha. (Aceh in Figures, 2013)

Acehnese poverty condition post-tsunami and post-conflict has been worse that attracted many attentions from local and global institutions. From World-Bank itself, Aceh received special treatment assistantship in term of PNPM Rural budget allocation. Since 2009, PNPM Rural in Aceh has been transformed to PNPM BKPG (Badan Keuangan Pemakmue Gampong/ Financial Assistance Pemakmue Gampong), a financial assistant for village prosperity (World Bank, 2010). This brand new approach allowed each of 6,000 villages in Aceh received 100 million IDR (Indonesian Rupiah) equally regardless to its status of poverty severity.

The research utilized data from Integrated Management Information-Poverty Mitigation BAPPENAS (Simpadu-PK BAPPENAS) for realization of budget allocation data on investment in agriculture, finance, health, and education sector in 2007 and 2011, and national census take place in villages all across Indonesia, namely PODES (Village Potential) in 2006 as villages characteristics indicators.

The Village Potential result is usually employed to describe the potential such Indonesian domain/ village has. It has been conducted initially since 1980 along with 1980 Population census. Within 10 years, PODES data collection originally has been executed 3 times, as part of some series activities such as: Population census, Agriculture census, and Economic Census. However, since 2008 its data collection has been conducted independently from those series of

census. The PODES census activity covers all village-level administrative area (village, *nagari*, *lorong*) throughout Indonesia (BPS, 2011)

The village-level analysis was required to progress next stage of study. While the former study encompassed the budget allocation of backward district in western part of Indonesia, the latter will discuss the extent of impact evaluation more specifically to sub-district level data (using mean aggregation of village level data) in certain province in Indonesia. Sumatera Island which located in far west part of Indonesia, was ultimately selected as the candidate of the province because it portrayed better performance in poverty dynamics in circa 2007-2011. The appointed province then went to Aceh province because it has special autonomy specific from the other provinces. The homogeneity extent was preferable because it would benefit through assortative-matching within communities. Moreover, it supported by Okten & Osili (2004), who suggested that the ethnic diversity has negative and significant effect on contribution and prevalence of community-based activities. Therefore, conducting the research in more equal community would benefit the outcome and minimize the harm of the externality mentioned above.

In total, data of 226 sub-district level data in Aceh Province was exerted from aggregating the mean of 5,968 village-wise data. However, since all villages' data at Bener Meriah District, Syiah Utama sub-district had shown anomaly in its poverty distribution, the corresponding sub-district data was excluded. The said-to-be-outlier data was not included because the data was not monotonically coherent with distribution of other proxies of poverty, such as number of un-prosperous family and number of family having JAMKESMAS (health insurance for the poor program). Thus, the total observations to be employed

become 225 sub-district cases.

The variables extracted from the data sources were consisted of: villages poverty percentage (measured by number of Poor Statement Letter issued in the village divided by total existing household) from 2006 and 2011 in PODES census, as well as village initial characteristics before PNPM Rural established which revolved around number of formal and informal schools, percentage of household living in prone to disaster area, percentage of peasant, number of death due to epidemics case, area of irrigated land, and number of cooperatives in 2006. Realized value of PNPM Rural budget allocated in agriculture sector, education sector, finance sector, and health sector in 2007 and 2011 was incorporated as the explanatory variables measured by million IDR (Indonesian Rupiah). Table 5.3 provided the description of each variable, along with Table 5.4 as the insight to track data transformation process from original data to final or ready-to-execute data.

Table 5.3 Data and Variable Definition of Economic Evaluation in Case Study at Aceh Province

Symb	Variable	Definition	Unit
$y$	D_POV	Difference percentage of Letter of Poor Statement issued in the village divided by total existing household from 2006 and 2011	percent
$x_1$	D_HEA	Difference real value of budget allocated in healthcare activities from 2007 and 2011 per capita	million IDR
$x_2$	D_EDU	Difference real value of budget allocated in education activities from 2007 and 2011 per capita	million IDR
$x_3$	D_AGR	Difference real value of budget allocated in economic activities from 2007 and 2011 per capita	million IDR
$x_4$	D_FIN	Difference real value of budget allocated in agriculture activities from 2007 and 2011 per capita	million IDR
$x_5$	PTDIST06	Percentage of household live in prone-to-disaster areas in 2006	percent
$x_6$	PEASNT06	Percentage of peasant in 2006	percent
$x_7$	INSCHO06	Number of informal school/ training in 2006 per capita	unit
$x_8$	DEATH06	Number of Death cases due to epidemics in 2006	case
$x_9$	FOSCHO06*	Number of formal school in 2006	unit
$x_{10}$	IRRLAND06	Area of irrigated cultivated land in 2006	Ha
$x_{11}$	COOP06	Number of cooperatives/ union in 2006	unit
$\xi_1$	PNPM investment	Latent variable of investment stemmed from PNPM Activity	-
$\xi_2$	Poverty empowerment	Latent variable of empowerment for the poor	-

\*The formal school that became the main attentions was the private schools. This was because in rural areas, the private school usually received less supports from government and it generally attended by poor students.

Table 5.4 Data Dictionary of Economic Evaluation in Case Study at Aceh Province

ORIGINAL VARIABLE DESCRIPTION	YEAR	SYMBOL	FUNCTION 1	FUNCTION 2	FUNCTION 3	FINAL VARIABLE DESCRIPTION
PNPM Rural budget allocated to agriculture investment	2007	AGR07	Nominal Value of Investment were discounted by Index of Consumer Price Faced by the Farmers in 2011: 130.79 (Based 2007=100)	$AGR07PC = AGR07 / TP06$	D_AGR = AGR11PC - AGR07PC	Difference of budget allocated in agriculture activity per capita between 2007 and 2011
PNPM Rural budget allocated to agriculture investment	2011	AGR11		$AGR11PC = AGR11 / TP11$		
PNPM Rural budget allocated to financial investment	2007	FIN07		$FIN07PC = FIN07 / TP06$	D_FIN = FIN11PC - FIN07PC	Difference of budget allocated in finance activity per capita between 2007 and 2011
PNPM Rural budget allocated to financial investment	2011	FIN11		$FIN11PC = FIN11 / TP11$		
PNPM Rural budget allocated to education investment	2007	EDU07		$EDU07PC = EDU07 / TP06$	D_EDU= EDU11PC - EDU07PC	Difference of budget allocated in education activity per capita between 2007 and 2011
PNPM Rural budget allocated to education investment	2011	EDU11		$EDU11PC = EDU11 / TP11$		
PNPM Rural budget allocated to health investment	2007	HEA07		$HEA07PC = HEA07 / TP06$	D_HEA = HEA11PC - HEA07PC	Difference of budget allocated in health activity per capita between 2007 and 2011
PNPM Rural budget allocated to health investment	2011	HEA11		$HEA11PC = HEA11 / TP11$		
Cultivated Irrigated Land Area	2006	IRRLAND06				Area of irrigated land in 2006

Table 5.4 Data Dictionary of Economic Evaluation in Case Study at Aceh Province (Continued)

Number of “Poor Reference Letter” released in the last one year	2006	TOP06	$PCPO06 = TOP06 / TOHH06$	$D\_POV = (PCPO11 - PCPO06) * 10$ 0%		Change in percentage of poor between 2007 and 2011
Number of “Poor Reference Letter” released in 2010	2011	TOP11	$PCPO11 = TOP11 / TOHH11$			
Number of families living in riverbanks	2006	TOHHRiv06	$TOHHPTD06 = TOHHRiv06 + TOHHPInt06 + TOHHSlu06$	$PTDIST06 = TOHHPTD06 / TOHH06$		Percentage of household live in prone-to-disaster area
Number of families living under high-voltage powerlines (> 500 KV)	2006	TOHHPInt06				
Number of families living in slums	2006	TOHHSlu06				
Population of men	2006	TOM06	$TP06 = TOM06 + TOW06$			Total Population in 2006
Population of women	2006	TOW06				
Number of Man Population on January 2011	2011	TOM11	$TP11 = TOM11 + TOW11$			Total Population in 2006
Number of Woman Population on January 2011	2011	TOW11				
Total Household	2006	TOHH06				Total Household in 2006
Total Household	2011	TOHH11				Total Household in 2011
Number of cooperatives	2006	COOP06				Number of cooperatives in 2006

Table 5.4 Data Dictionary of Economic Evaluation in Case Study at Aceh Province (Continued)

Number of Training Institution : a. Language	2006	IN_LING06	INFORMS06 = IN_LING06 + IN_ACC06 + IN_COM06 + IN_CUL06 + IN_FAS06 + IN_BEA06 + IN_MEC06 + IN_ELE06 + IN_OTH06	INSCHO06= INFORMS06 / TP06		Number of informal school/ training per capita in 2006
Number of Training Institution: b. Accounting	2006	IN_ACC06				
Number of Training Institution: c. Computer	2006	IN_COM06				
Number of Training Institution: d. Cooking/culinary	2006	IN_CUL06				
Number of Training Institution: e. Sewing/fashion	2006	IN_FAS06				
Number of Training Institution: f. Beauty	2006	IN_BEA06				
Number of Training Institution: g. Mechanics	2006	IN_MEC06				
Number of Training Institution: h. Electronic	2006	IN_ELE06				
Number of Training Institution: i. Others	2006	IN_OTH06				
Number of people working as peasant/ rice field labor	2006	TOPea06	PEASNT06 = TOPea06 / TP06			Percentage of Peasant in 2006

Table 5.4 Data Dictionary of Economic Evaluation in Case Study at Aceh Province (Continued)

Number of death due to epidemics disease: Diarrhea	2006	DEA_DIAR	DEATH06			Number of case of death due to epidemics or disease in 2006
Number of death due to epidemics disease: Dengue Fever	2006	DEA_DF06				
Number of death due to epidemics disease: Measles	2006	DEA_MEA06				
Number of death due to epidemics disease: Upper Respiratory Tract Infection	2006	DEA_ISP06				
Number of death due to epidemics disease: Malaria	2006	DEA_MAL06				
Number of death due to epidemics disease: Others	2006	DEA_OTH06				
Number of Elementary School and equivalent Private Schools	2006	ES_p06	FOSCHO06= ES_p06 + JH_p06 + SH_p06 + VS_p06			Number of formal school in 2006
Number of Junior highschool and equivalent Private Schools	2006	JH_p06				
Number of Senior highschool and equivalent Private Schools	2006	SH_p06				
Number of Vocational private	2006	VS_p06				



## VI. RESULT AND DISCUSSION

### 6.1 Descriptive Analysis

Since its first establishment in 2007, PNPM deemed has shown profound results in community development and empowerment, notably in mitigating poverty. Initially the program has not as evenly scattered than to date, especially in the backward and eastern part of Indonesia that covers the highest percentage of poor people all across the archipelago.

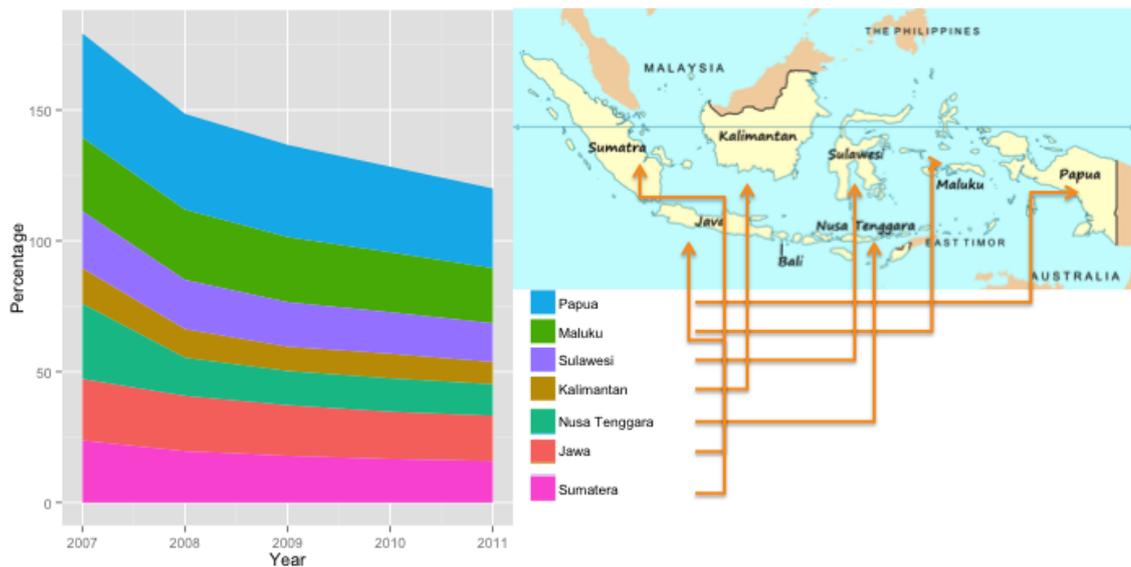


Figure 6.1. Dynamics on Poverty Reduction across Island in 2007-2011 (1)

Source: BPS (Statistics Indonesia)

Overall trend on the graph in Figure 6.1 showed that poverty reduction velocity getting slower, it is portrayed by slope of percentage of poverty across island. The highest reduction is occurred in between 2007-2008. The poorest island, namely Papua and Moluccas (Maluku) benefit the highest margin of poverty alleviation in that period. Sulawesi is coming up to shows same sounding result as well. Sumatera Island perceived not really work out to combat poverty,

proven from the flatter slope it has all over the time (2007-2011). Even so, poverty headcount ratio in this island crowned as one of the poor island in Indonesia as well. The same trend exists in Java Island. As it is the densest island in Indonesia, the decrease of poverty was never seemed satisfactorily enough. Meanwhile, Borneo (Kalimantan) as the richest island in Indonesia has performed acceptable rate of progress in mitigating poverty.

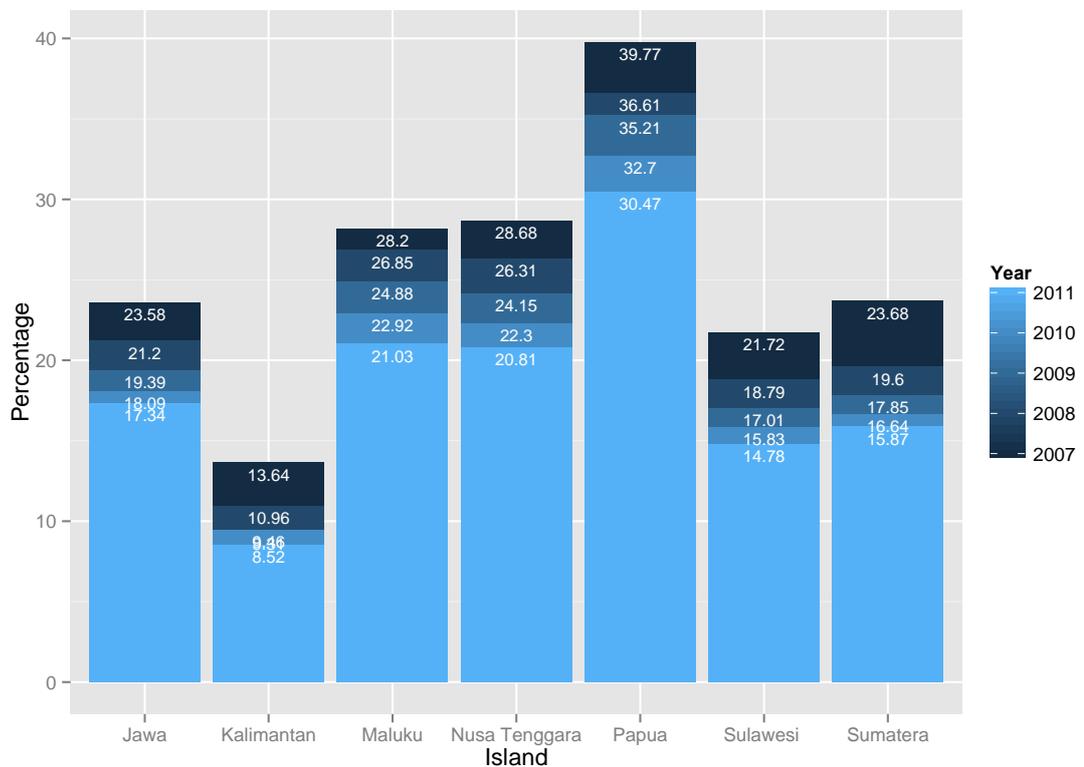


Figure 6.2. Dynamics on Poverty Reduction across Island in 2007-2011 (2)

Source: BPS (Statistics Indonesia)

According to Figure 6.2, each island depicts its best performance in particular period. Sumatera Island has highest decrease of poverty rate in 2007, followed by Papua Island, Sulawesi and Kalimantan. The insignificant progress is seemingly incurred in Moluccas (Maluku).

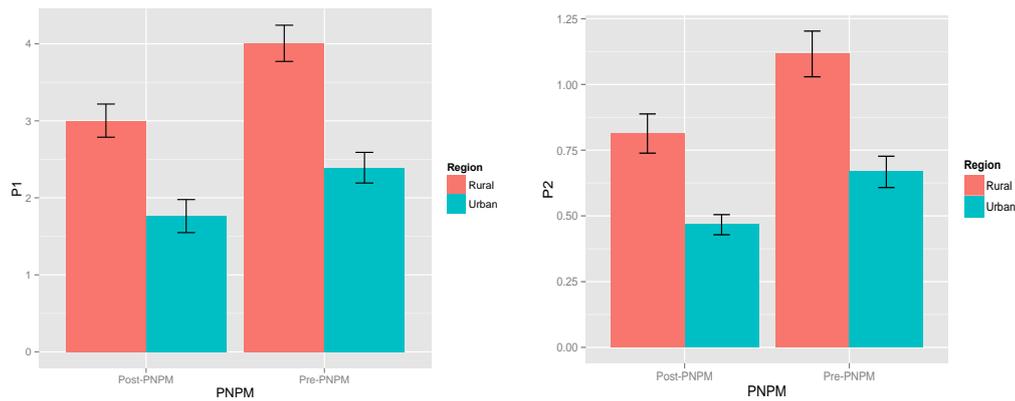


Figure 6.3. Descriptive analysis of prior and post PNPM establishment across Poverty Indices

Source: BPS (Statistics Indonesia)

Figure 6.3 portrayed a simple illustration to grasp impact evaluation of the PNPM Rural both in rural and urban area in respect to other poverty measurement other than poverty head count ratio. There are P1 or poverty gap index and P2 or squared poverty gap or poverty severity index. One expects to have the smaller the value of these statistics, the better the economic growths will the country obtain. Designated from data provided by the Statistics Indonesia, it suggested that the PNPM Rural has performed better both in Rural and Urban Indonesia. It is proven with diminishing trends of both P1 and P2 post and prior to establishment. This output is essential, particularly when we deal with other economic development features of inequality. From this chart we also may firm that rural system accustomed with the notion that it bestowed exceptionally larger gap of income inequality compare to its neighbor in urban areas. Income inequality is the uneven distribution of total national income among specific entities (Todaro & Smith, 2012). It can be a trigger of why decision in type of allocation chosen in community development program is chosen. According to Labonne & Chase (2009), it is worth noting to argue that income inequality

featured the decision on proposal selection. A village with more heterogeneous villager's compound will tend to have the final decision in line with the local leader - which usually is the elites; people with high social capital, either wealthiest in the community - instead of aggregate villager's desire. This might nearly generous when it comes to municipality competition. Since the program leader proposes agenda that really promotes his/her needs, he/she might know well the project and kind of capable to defend what he/she thinks right in order to get the proposal funded. And this "elite captures" phenomenon will become a bias in our estimates if it founds statistically significant. The inequality in income can be reflected from Gini coefficient, it is pictorially equipped in Lorenz curve that measure the income inequality ranging from 0 (perfect equality) to 1 (perfect inequality). The higher the coefficient, the larger the inequality of income distribution; In contrast, the lower it is the more equal the distribution of income (Todaro & Smith, 2012).

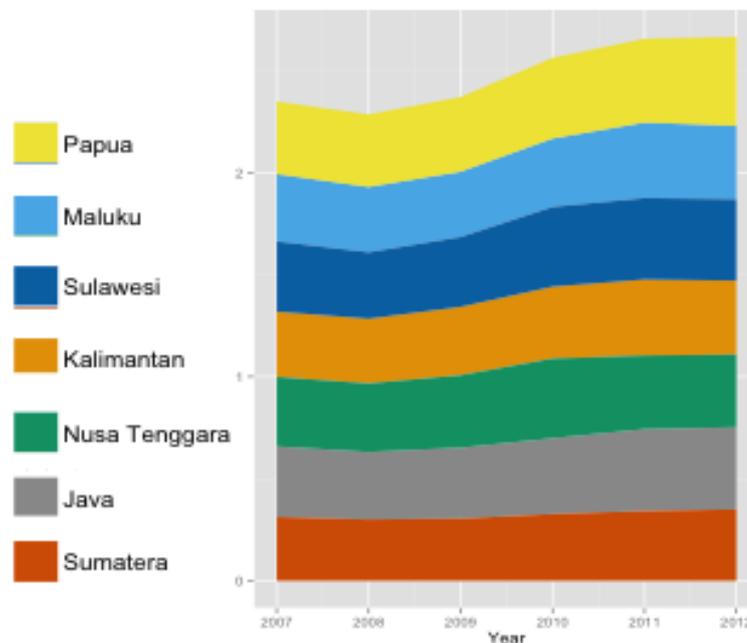


Figure 6.4. Dynamics of Gini Coefficient across Island in 2007-2012

Source: BPS (Statistics Indonesia)

Afterward, we are heading to the next figure of dynamics of Gini coefficient revealed in Figure 6.4. During 2007 to 2012, each island individually has shown nearly same trend. Particularly Kalimantan, Nusa Tenggara, and Java. Strangely, Sumatera Island is deemed to have no effect on economic disparity within the time frame. It is illustrated on almost flat line on the base of the chart (red color) that refers to Sumatera Island per se. Move further to the east; the trio eastern part of Indonesia comprises Papua, Maluku, and Sulawesi display nearly same likelihood of Gini coefficient dynamics across 2007-2012 time span. Starting at 2008, those three islands has remarkably mounted Gini coefficient, after previously they have sheer deflated inequality. All in all, we may sum up that the region in the western part obtain Gini coefficient which is tend to be steady all years around. The more move forward to the eastern part of Indonesia, the Gini dynamics tend to be fluctuated.

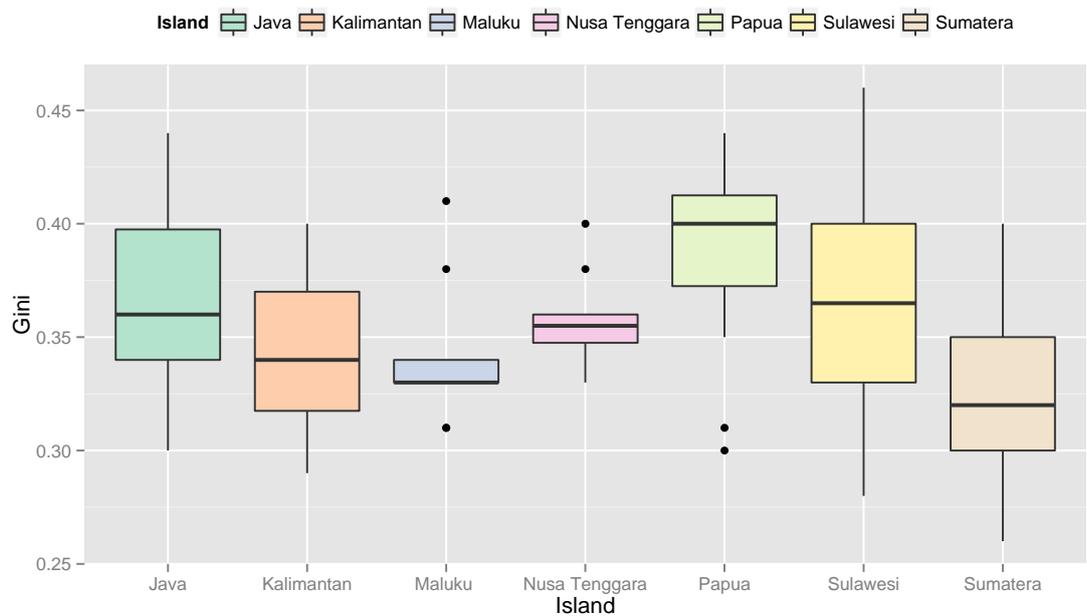


Figure 6.5. Distribution of Gini Coefficient across Island in 2007-2012

Source: BPS (Statistics Indonesia)

Thoroughly, in order to enrich our findings, we can derive each island specific distribution via box and whisker plot presented in Figure 6.5. The island with higher variability is Sulawesi island as it ranged longer than any other islands. The island that has lowest Gini coefficient was Sumatera Island. Another issue is the highest Gini coefficient median that is condemned to Papua Island.

## **6.2 Multiple Regression Analysis**

In favor of confirming prior result of descriptive analysis, multiple regression is performed with respect to region differences. By previously adjusted to its CPI factor, multiple regression is conducted by engaging two levels of regions, that are western part and eastern part.

Table 6.1 compared the summary analysis of western and eastern variability within year 2011. The trend showed somewhat different circumstances. In the western part of Indonesia, education and health sector has shown significant result in decreasing poverty level, however the transportation investment yield a contrast result. This was speculatively due to adverse effect generated by advance infrastructure and transportation construction that may result to urbanization. Furthermore, in the eastern part of Indonesia, agricultural improvement has shown good impact to poverty alleviation, that every 1 million rupiah budget allocated into agricultural sector, will diminish poverty rate on average 0.0048%.

However, due to some of the explanatory suspected to have closeness relationship. Statistically speaking, the multicollinearity among variables will lead the individual parameters not precisely estimable. It is indicated with some of the parameter of our interest not resulted generous estimates. Thus, the test for correlation among all variables or multicollinearity test is worth trying.

Table 6.1 Multiple Regression Summary of Poverty across Western and Eastern Part of Indonesia in 2011

Coefficient	Western Region				Eastern Region			
	Estimates	Std. Error	t-value	Elasticity	Estimates	Std. Error	t-value	Elasticity
Social	-3.77E-05	7.59E-04	-0.05	-0.03	1.03E-03*	4.60E-04	2.242	0.08
Agriculture	-4.85E-04	7.12E-04	-0.681	-0.03	-4.82E-03*	1.88E-03	-2.567	-0.07
Education	-9.42E-04*	4.50E-04	-2.093	-0.09	2.84E-04	3.47E-04	0.82	0.04
Health	-1.63E-03*	7.97E-04	-2.04	-0.14	4.80E-04	3.77E-04	1.274	0.06
Energy	2.81E-03	2.60E-03	1.083	0.02	9.77E-04	1.11E-03	0.884	0.03
Economy	6.30E-04	4.25E-04	1.482	0.15	9.75E-05	1.90E-04	0.514	0.02
Transportation	1.76E-04*	8.57E-05	2.05	0.17	2.41E-04	1.36E-04	1.771	0.14
Inflation	1.51E+00	1.05E+00	1.435	0.35	-2.80E+00***	6.80E-01	-4.125	-0.73

F-statistic: 1.928 on 8 and 39 DF, p-value: 0.08305 (Western Region)  
F-statistic: 5.837 on 8 and 78 DF, p-value: 0.000007742 (Eastern Region)

The data partaking into this matrix correlation is still difference of budget allocation in each exogenous variable. It is documented that some of the pairwise variable has shown significant  $\rho$  variable (correlation), especially for health and education (See Table. 6.2). This idea in line with Todaro & Smith (2012) that there is dual relationship among them that would affect each other's. Other statistically significant case are economy paired with education, economy paired with health, economy paired with agriculture, and economy paired with transportation. Transportation is also having same fashion with economy that it has relationship with education, health, and agriculture. The former is likely to occur when people get better school attainment, they acknowledge on how to manage the money well, how to maximize the production system through microfinance fund provision, so that they could enhance their living standard. The second relation, could be provided by the explanation that the healthier the person, the more he/she could

earn for a living. Conversely, the less healthy a person, the less money they have in their pocket due to it is already given up to pay some of ailment cost.

Table 6.2 Pearson Correlations between Variables

	d_SOC	d_AGR	d_EDU	d_HEA	d_ENV	d_ENE	d_FIN	d_TRANS
d_SOC	1							
d_AGR	0.04	1						
d_EDU	0.27	0.09	1					
d_HEA	0.38	0.15	0.40	1				
d_ENV	0.05	-0.08	0.08	-0.01	1			
d_ENE	0.31	-0.09	0.11	0.29	0.10	1		
d_FIN	0.21	0.48	0.53	0.44	0.05	-0.07	1	
d_TRANS	0.27	0.46	0.31	0.50	0.11	0.02	0.49	1

The latter is relation between economy and transportation. It is argued that transportation rehabilitation may escalate other sector improvement. For instance the better the access for going in and out of city, the more capable farmers, traders, worker to commute and sell the product/service to the city in faster and efficient time. The product they are selling will likely turn out to decayed if the rural area is not supported with decent access or transportation infrastructure. The more people get access and purchasing power to market, the higher propensity for them to expand their production scale by purchasing some fix input by means of provision of microfinance fund.

### 6.3 Economic Evaluation in Western Part of Rural Indonesia

As one already discussed in the previous chapter, Covariance Structured Analysis is Multivariate Analysis that represent a mixture between multiple

regression and factor analysis. Following all the procedure documented in chapter 3 (Methodology), eventually this analysis only supported western region of Indonesia that loaded 58 ready data. It is casted Sumatera island, Java island, and Nusa Tenggara island. The casted region is selected in regards of their descriptive analysis as well as multiple regression performance in which relatively feasible to generate identified outcome.

The prior data is truncated due to some trends exhibit by island characteristics. The western part of Indonesia has different pattern on poverty rate decrease compare to the fellows in the Eastern part. Moreover this assumption is consistent with our prior discussion on descriptive analysis about inequality trend (Gini coefficient) in Figure 6.4 that The eastern part of Indonesia has viably more fluctuated trend on economic gap.

Some transformation of our exogenous is also performed. Instead of having difference budgets as the explanatory, we managed to find the difference of the share of budget allocation disseminated per capita. This procedure is conducted in order to smoothen the unit problem that presumably unveiled during estimation. Moreover, the assessment using difference value makes the data easier to be analyzed so that the matrix forms out of ill conditioned.

The covariance structure analysis performed in this study is generated from R software with “lavaan” package. Broadly, there are various softwares able to encounter this problem, such SAS, Amos, MPLUS, LISREL, EQS, etc.

Initially the original proposed model could not be executed due to identification problem. The problem is indicated from uneven number of estimates to number of observation that engaged in. Therefore, re-specification is highly potential to be conducted in order to reduce the form into simpler and estimable

output. The first specification model to be conducted is by applying two kinds of latent variables; human capital and business or economic capital. The former is embarked with the notion that health together with education and social are contingent to embodied HDI (human development index) which is used to gauge human capital status of one certain country (McGillivray, 1991). Nevertheless, engaging both of two *latents* simultaneously has shown unsatisfactorily sounding result since the model is not adequate and estimable enough to yield the valid result.

After all, by eliminating latent construct of human capital, the final hypothesized path of covariance structure analysis is depicted in Figure 6.6. Covariance structured analysis has performed following result; the partial test of the analysis has shown a good performance. The *Economic capital* factor has negative sign to poverty rate. It means that increasing the unit of *Economic capital* compound will contribute to decrease poverty level. Inward the factor compound; the investment in energy, economy, and agriculture generally shows logical and consistent interpretation. Through the nexus intra-latent construct, one can notice the causality/ correlation problem facing the variables. For instance in respect of economic investment by means of microfinance, the increment of 1% budget allotment per capita (in million rupiah) to transportation investment, will probably increase the budget allotment per capita (in million rupiah) to microfinance as much as 0.31%. And so as agriculture, in the same manner, agriculture per capita spend will increase as much as 0.76% (in million rupiah). These two variables are deemed to have impressive closeness (covariance) that can be explained from the illustration of the farmer and market access instance. Since this empirical study was conducted in rural area that mostly farmer occupied there, the program

decision to where the money will be spent for is decided by acclamation. Number of famers who ever suffer from agriculture pitfall are unsurprisingly vary and proactively will join the program and deliver development program in irrigation system at the first place. When it aligns with transportation program, the farmer will benefit even more since they have a better access to the market (Hussain & Hanjra, 2004).

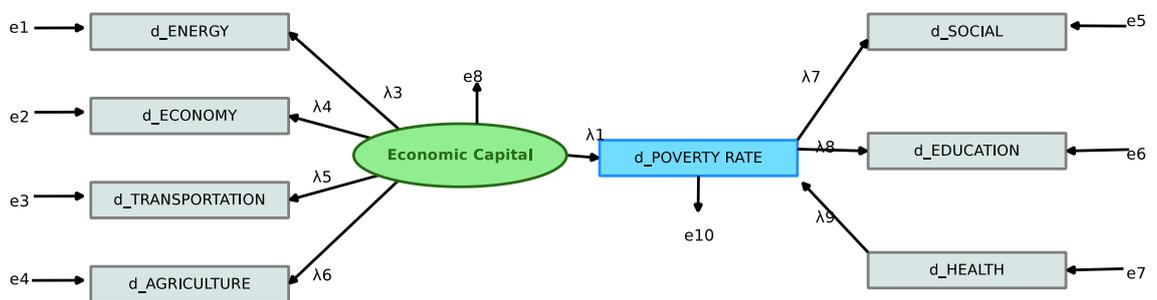


Figure 6.6. Adjusted Covariance Structure Paths

The economic interpretation is also addressed into account. When the budget per capita (in million rupiah) for transportation allotment increases 1%, it will tend to increase economy provision per capita budget to 0.31% (in million rupiah). The notion of this idea also promote the previous finding that when people have better access to market, they could enhance their production system, and voluntarily escalate and smoothen their production system through employment and income generating (Olivia & Gibson, 2009) either provision of the loan by microfinance of PNPM Rural.

The model illustrated in Figure 4.8 depicted that the right-handed variables shown insignificant result, as the education and health sectors worked in long run fashion that will not directly yield the return to investment in a short time during

this time range of observation (2007-2011). Education budget disbursed to the poor did not appear significant that might be rooted from the notion that expenditure for education is not equally distributed to all children in the poor family, since the parents are fond of giving up the money to the smartest kid in favor of higher return to education (Duflo & Banerjee, 2011). In term of social aspect, Subejo (2008) pinpointed that social capital is formed by information accessibility, proactive coordination for common interest and minimization of optimistic behavior. The phenomena of elite dominance who marginalized the disadvantaged group exacerbated social dynamic within community that resulted in imbalance access of information and violated the value of social capital to combat poverty in rural community itself (Fritzen, 2007; Mansuri & Rao, 2004). Furthermore, in health sector, allotment to support public health provider faced such drawbacks in sort of health care delivery and structural barrier to access the service itself. The vulnerable group found difficulty in accessing the service while their out-of-pocket expenditures are higher among other wealthier one. In addition, shortage of medication, absence of doctor, low managerial performance of the staff, are conditions that worsen this structural barriers induced insignificance of health development in alleviating poverty (Trani et al., 2010).

Albeit economic capital latent has shown significantly different, however, the energy and transportation extent per se did not sound parallel result. Energy budget allocated to rural electrification need to be implemented with complementary infrastructure as well as educational initiative that enables the poor to diversify their livelihood for productive utility. This initiative is necessary precondition for better and effective electricity power utilization in rural community (Bastakoti, 2006; Cook, 2013). Transportation allotment itself even

though contribute highest share across other sector, deemed unsuccessful to mitigate poverty. This might be induced with the absence of its supported public transport facility. Rural entities normally rely on scarce and expensive transportation mode named *ojek* that made this inadequate transport mode problem remain unexplained (Syukri et al., 2011).

Table 6.3 Summary of Covariance Structure Analysis

Path	Result			
	Factor loading	S.E	Z-value	P-value
Economic Capital =~				
d_TRANS	1.00			
d_FIN	0.31	0.04	2.031	0.04+
d_AGR	0.76	0.03	3.380	0.01*
d_ENE	0.07	0.01	0.505	0.61
d_PO~				
Economic Capital	-0.32	9.851	-2.115	0.03*
d_HEA	-0.16	37.75	-1.278	0.20
d_EDU ~				
d_PO	-0.01	0.000	0.098	0.92
d_SOC ~				
d_PO	-0.09	0.000	0.973	0.33

Signif. codes: 0 '\*\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '+' 0.1 '.' 1

Fit indices:  $\chi^2(19) = 107(p = 0.00)$ , CFI = 0.32, RMSEA = 0.2759, GFI = 0.72

Even though the model showed a good partial estimate, however as we can see in summary in Table 6.3, Chi-square is significant, less than 5% means that model has not fitted well. The considerably good models are those who have smaller Chi-square value and p-value of the model exceed 5%. Moreover, the indices of RMSEA is 0.28 (the least one is preferable), and CFI = 0.32 (the bigger, the

better). However, the value GFI=0.72. The higher GFI the more considerable the model is. Overall, the model fitted test has shown poor significance except for the value of GFI.

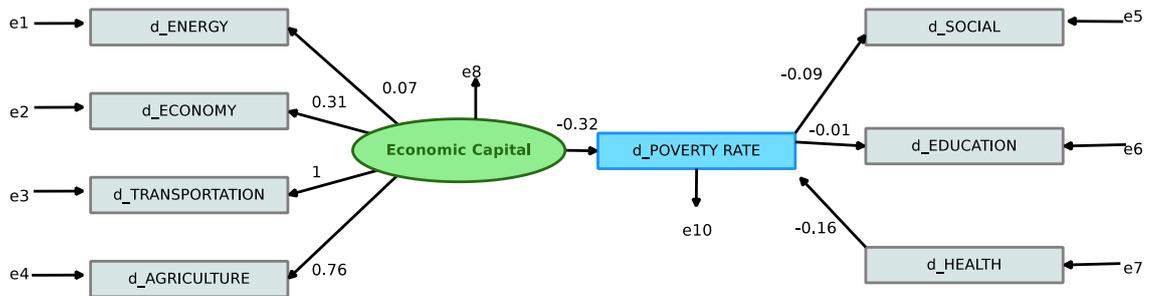


Figure 6.7. Adjusted Covariance Structure Paths with the Factor Loading

Table 6.4 Summary of Covariance Structure Analysis (Adjusted)

Path	Result			
	Factor loading	S.E	Z-value	P-value
Economic Capital =~				
d_TRANS	1.00			
d_FIN	0.08	0.04	2.202	0.03*
d_AGR	0.10	0.03	3.528	0.00**
d_ENE	0.03	0.01	0.459	0.65
d_PO~				
Economic Capital	-21.06	9.851	-2.140	0.03*
d_HEA	-46.00	37.75	-1.195	0.23
d_EDU ~				
d_PO	-0.00	0.000	-0.113	0.91
d_SOC ~				
d_PO	-0.00	0.000	-0.728	0.47

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Fit indices:  $\chi^2(19) = 115(p = 0.00)$ , CFI = 0.31, RMSEA = 0.296, GFI = 0.71

Therefore, we can have relax and turn back at the framework to what proxy the PNPM is operated. Since the PNPM is community driven development program, a proxy where local people managed to allocate the resource and decide the priority, it is highly likely that the leader and local community support design the proposal budget parallel with the price level, which it is dynamics over the time due to inflation factor. Hence, further study is worth to do by correcting the budget allowance to its corresponding CPI in the year 2007 and 2011. Adjusting the record in 2007 to the base of the 2011. Supported from data of Statistics Indonesia, it is published that the CPI 158.26 and 126.29 gauged respectively in 2007 and 2011. Taken the ratio of 2007 CPI over 2011 CPI resulted a discount factor to adjust a budget value of those recorded in 2007 allocation budget. Afterwards, treating the data as usual manner, it is yielded the estimates of the new approach are not far different with the former.

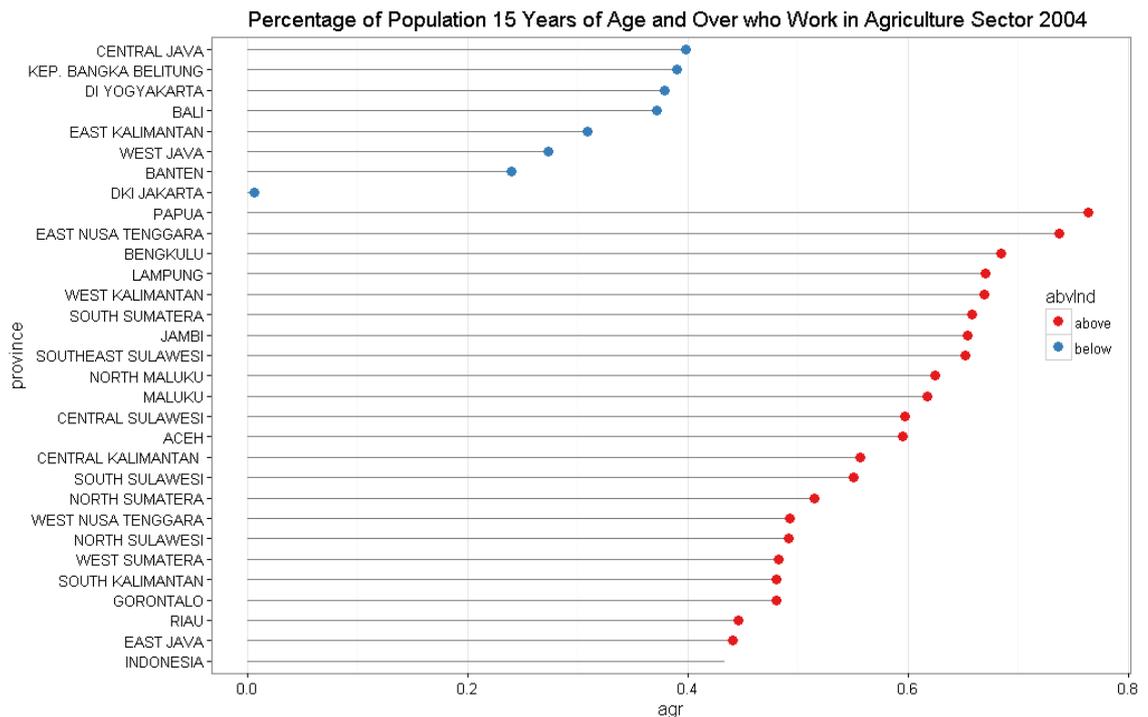
The summary analysis presented in Table 6.4 is slightly different with the previous one. However in order to have valid estimation, roughly speaking it is allowed to choose the better one through comparison of goodness of fit test the model may obtain. Nevertheless, since the estimation also articulated logical, estimable, and sounding interpretation, it is still worth noting to document the result of this study that the findings revealed the appraisal of the program. It emphasized on the drawbacks and strength of each investment program. To those, which have already performed well, can be administered efficiently by having its branch single program with specific agenda respect to its concentration (e.g.: PNPM Agriculture Respect). While to those which still need revision, this evaluation hopefully can be a guideline to manage more efficient next budgeting strategy in order to mitigate mass poverty.

#### **6.4 Economic Evaluation in Case Study of Aceh Province**

Inspired by previous finding of PNPM Rural evaluation on budget allocation disbursed in district level, the attempt to examine the extent of program performance was continued. While the former only emphasize on backward area in district level and solely measure the outcome of the program to poverty incident, the next challenge will revolve about determinant of village preferences in selecting particular budget allocation and also in the meantime analyzing its impact to the prosperity of the community. The sub-district level data made a contrast to the former data, which was executed in district level.

To dismantle the background underpinned villager to decide certain allocation is potentially *endogeneous*. As a remedy to the measurement error of endogeneity phenomena, the classical treatment that is usually undertaken is Instrumental Variable or Two Stage Least Square Estimator. To make the current analysis more novel and intriguing, the author performed another counter-analysis named structural equation model/ covariance structure analysis. The motivation of constructing the structural equation model was supported by the versatility of the tools to address causality and confirmatory analysis of latent variables. As the counter-analysis, the instrumental variable which often heavily performed to mitigate omitted variable bias due to measurement error in the analysis, was beyond of this study. This was stemmed from the fact that to find best instrumental variable that has zero covariance with other explanatory and control variables as well as explained variables, was tediously challenging, at least within this sample of observations. The unobserved latent variables inevitably emerged as a proxy to the instrument variables indicating *endogeneous regressor* of budget

allocation investment. Furthermore, it was empirically encouraged by lesson learned from Yalegama et al. (2016) that to find critical determinant in CDD application needed thorough statistical analysis such as structural equation modeling due to subtle portion of inter-correlation between the factors.

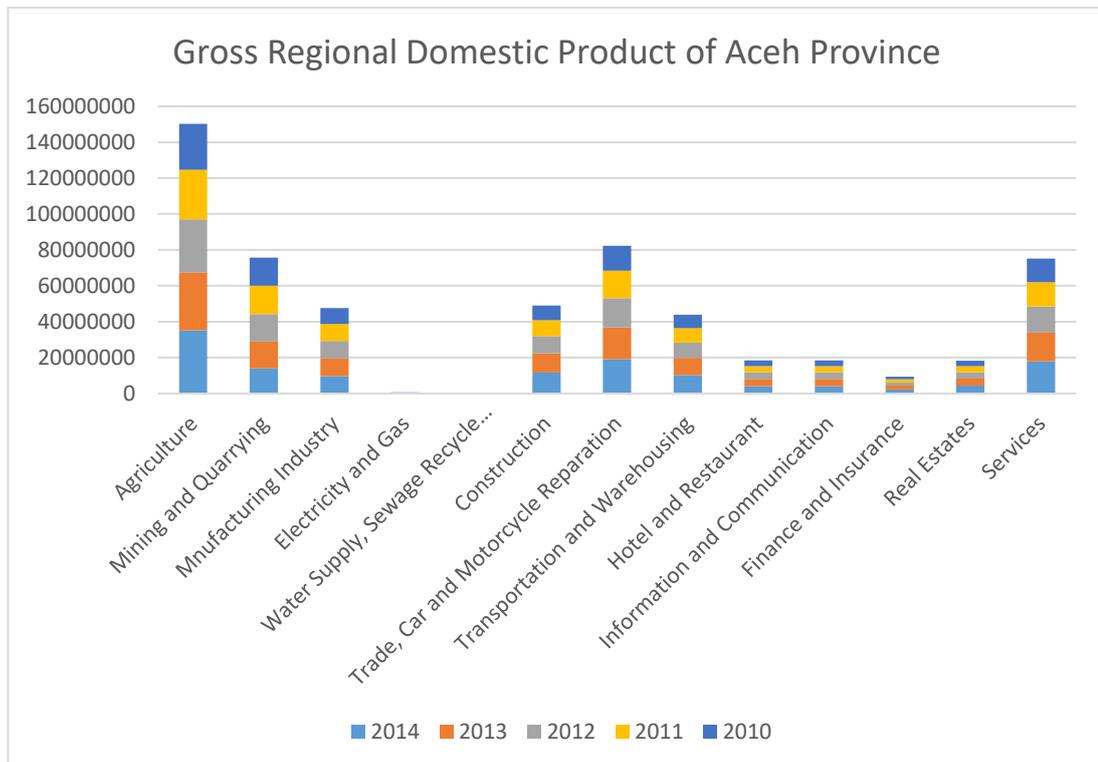


Source: Indonesia Statistical Year Book 2005

Figure 6. 8 Percentage of Population 15 Years of Age and Over who work in Agriculture Sector in 2004

The context of the study would be made along the case study of Aceh Province. Aceh Province was selected as the case study not only because it has special autonomy, but also their distribution of number of working-age population who work in Agriculture sector. Referring the Figure 6.8, one might infer that in 2004 Aceh province has reasonably higher percentage of population 15 years of

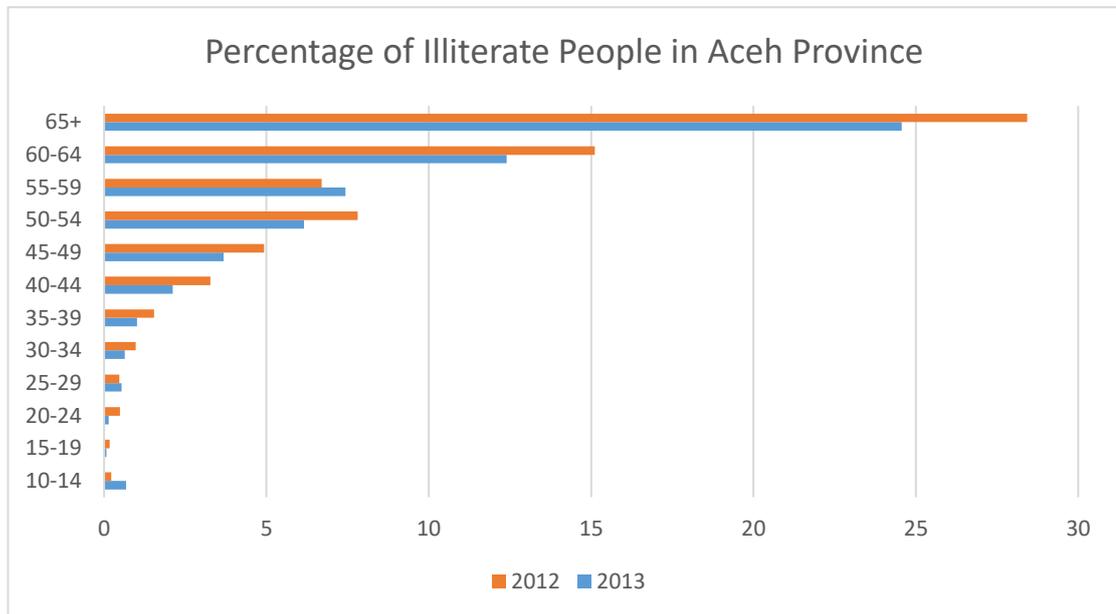
age and over who work in agriculture sector than that of Indonesian average. It means that Aceh province might belong to agriculturalist entity that specific to rural communities provided by PNPM Rural.



Source: Indonesia Statistical Year Book

Figure 6. 9 Gross Regional Domestic Product of Aceh Province

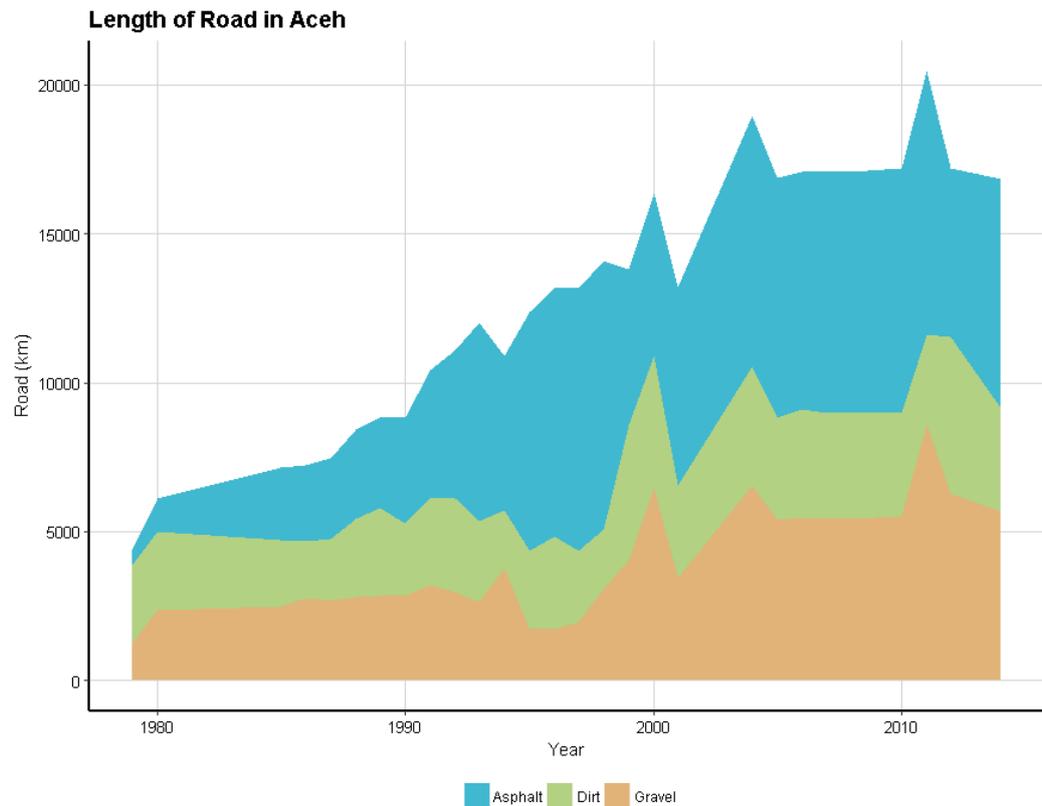
This notion is also supported by the figure of Distribution of Gross Regional Domestic Product of Aceh Province. Figure 6.9 gave insight that Aceh is heavily relied on Agriculture to support its economies. It followed by Trade, Car and Motorcycle Repairation, Services, and Constructions as second, third, and fourth rank.



Source: Aceh in Figures

Figure 6. 10 Percentage of Illiterate People of Aceh Province in 2012 and 2013

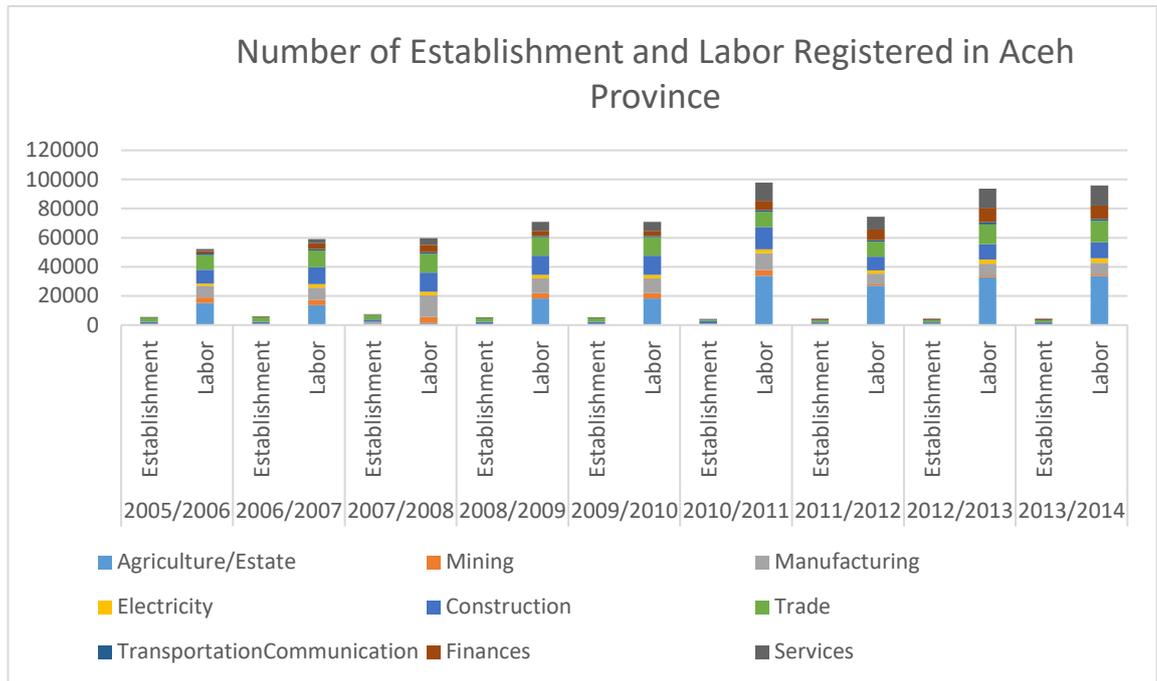
In terms of Human Capital Resources, from Figure 6.10, we can see that Aceh significantly has reduced its distribution of illiterate people from 2012 and 2013 generally for all range of ages. The highest illiterate people were coming from the group of people age 65 years and over. This cohort is originally born from the old time when Poverty Indices in Indonesia was still pervasive. However, the younger ages tend to have better performance due to modernization and government policy. It means that human capital development in Aceh was prevalent that make it sufficient enough to follow regulation and mechanism pertaining PNPM Rural management.



Source: Aceh in Figures

Figure 6. 11 Length of Road in Aceh from 1979 to 2013

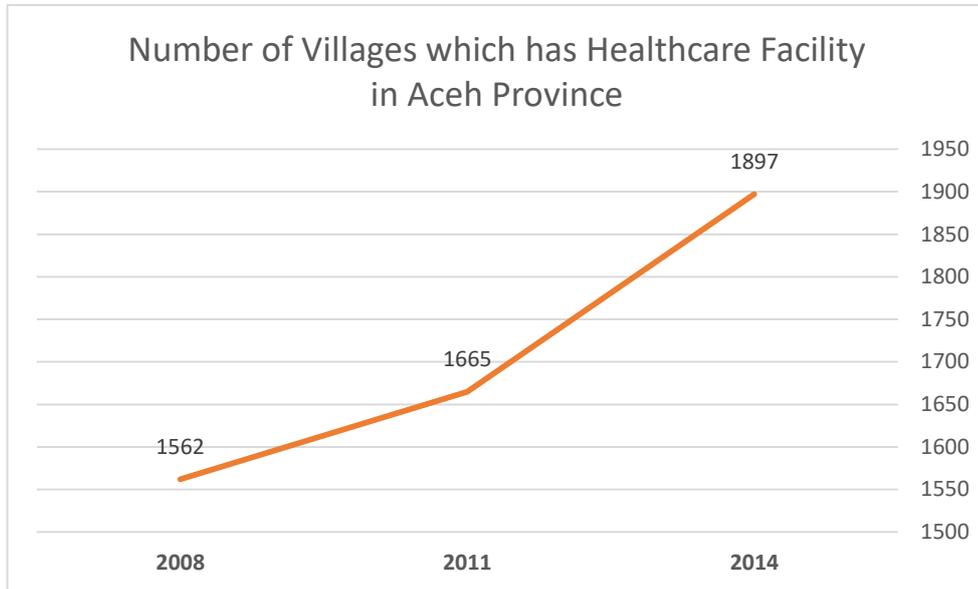
In the context of physical infrastructure, since 1979 to 2013, Aceh province has shown impressive progress. The length of Asphalt road is significantly increased year by year. The highest gradient of the increase happened during 1995 to 2007. The transportation improvement is beneficial in trade and other sector of economies; because it may cut the transaction, monetary, and time cost that subsequently enhance efficiency and productivity. This progress has been portrayed on Figure 6.11.



Source: Manpower Services in Nanggroe Aceh Darussalam

Figure 6. 12 Number of Establishment and Labor Registered in Aceh Province

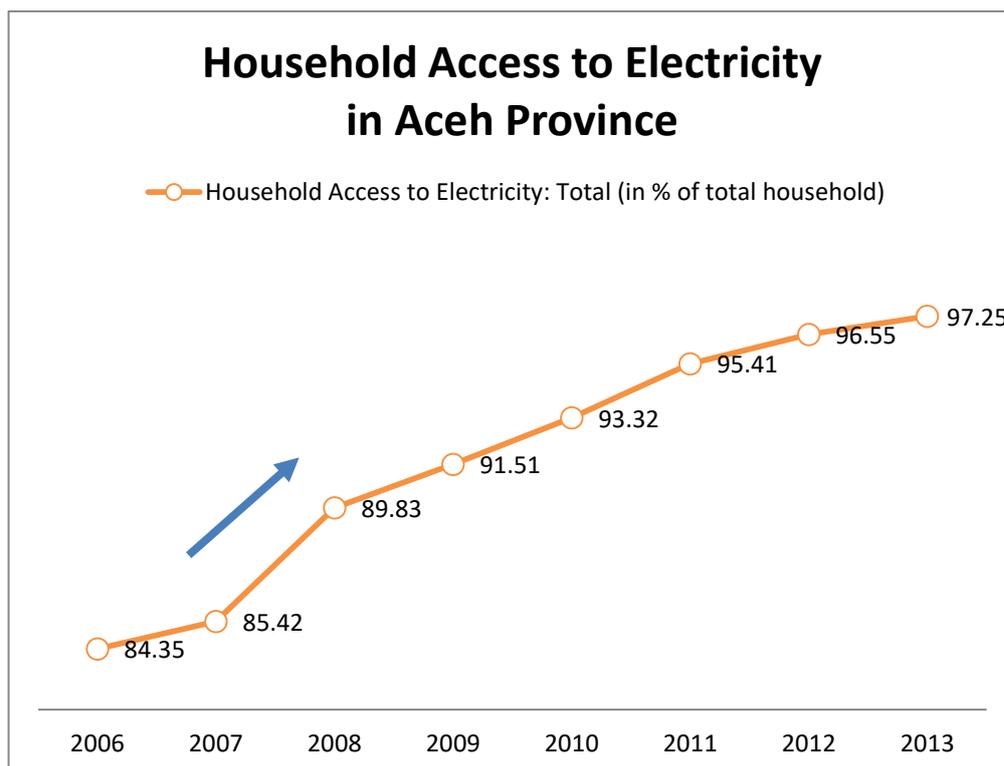
Based on the Figure 6.12, the number of labor in agriculture sector was seasonally increased. The significant increase occurred during period 2009-2011. However, the numbers of establishment, as well as number of labor in the sector other than agriculture were quite steady all year round.



Sources: Indonesia Statistical Year Book

Figure 6. 13 Number of Villages which has Healthcare Facility in Aceh Province

To support progress of human resource in Aceh, according to Figure 6.13, the insight about number of villages which has healthcare facility was also worth noting. Since 2008 to 2014, there was notable gain of that number. This might be suspiciously rooted from massive PNPM supported program such as PNPM Rural working on health activity, or PNPM Generasi that specifically more focus on health and education extent of communities.



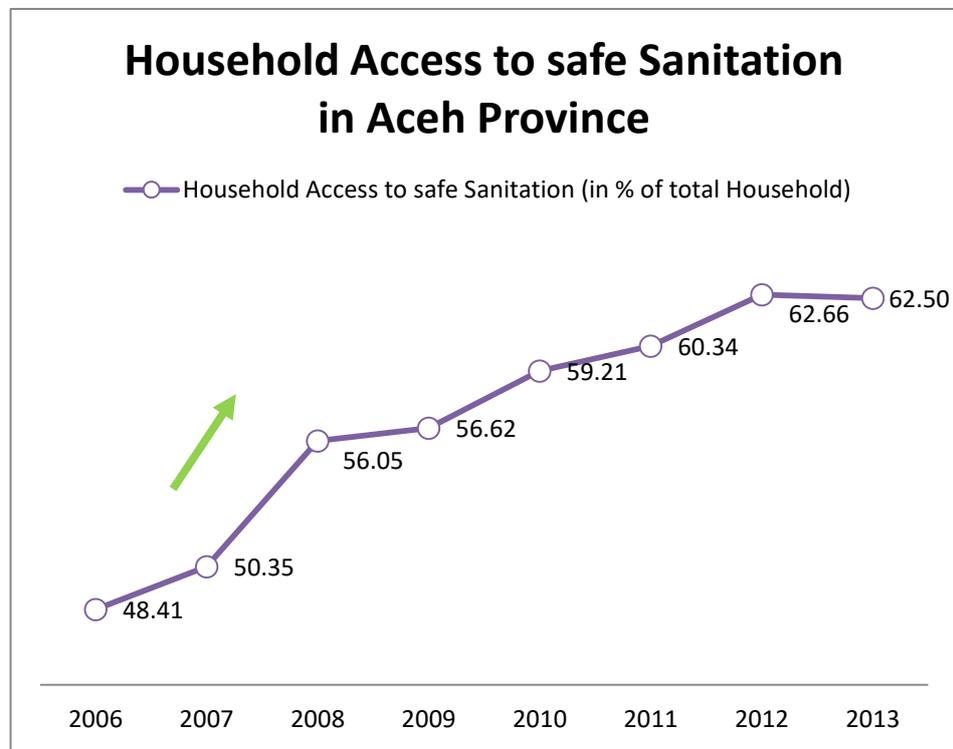
Source: INDO-DAPOER, World Bank based on Statistics Indonesia,  
National Social Economic Survey (SUSENAS)

Figure 6. 14 Household Access to Electricity in Aceh Province

In terms of rural electrification ratio, according to Figure 6.14, it can be seen from the graph above that the trend is continuously increased. The substantial hike took place particularly in the year 2007 to 2008. While using the same source of data, it was displayed on Figure 6.15. It was suggested that additional information was about the rate of household's safe environment, Household access to safe sanitation also shown equivalent trend with that of the ratio of electrification within the same time frame.

PNPM Rural resources distributed to agriculture, financial, education, and health strategic activities were believed may enhance people livelihood. In the long run, the accumulation of these resources would inevitably construct stock of the capital in the community itself. People noticed this typical

investment as the capital stemmed from PNPM Rural budget disbursement.



Source: INDO-DAPOER, World Bank based on Statistics Indonesia, National Social Economic Survey (SUSENAS)

Figure 6. 15 Household Access to Safe Sanitation in Aceh Province

The PNPM investment possessed by the people, according to basic microeconomic theory would enable people to work more productive and efficient. Consequently, it is increase their productivity of the sector existing in the economies as well as growing other income-generating activities. By the end, the return to investment from PNPM Rural will yield net surplus in people welfare, or in other words, it will necessarily decrease poverty incidence.

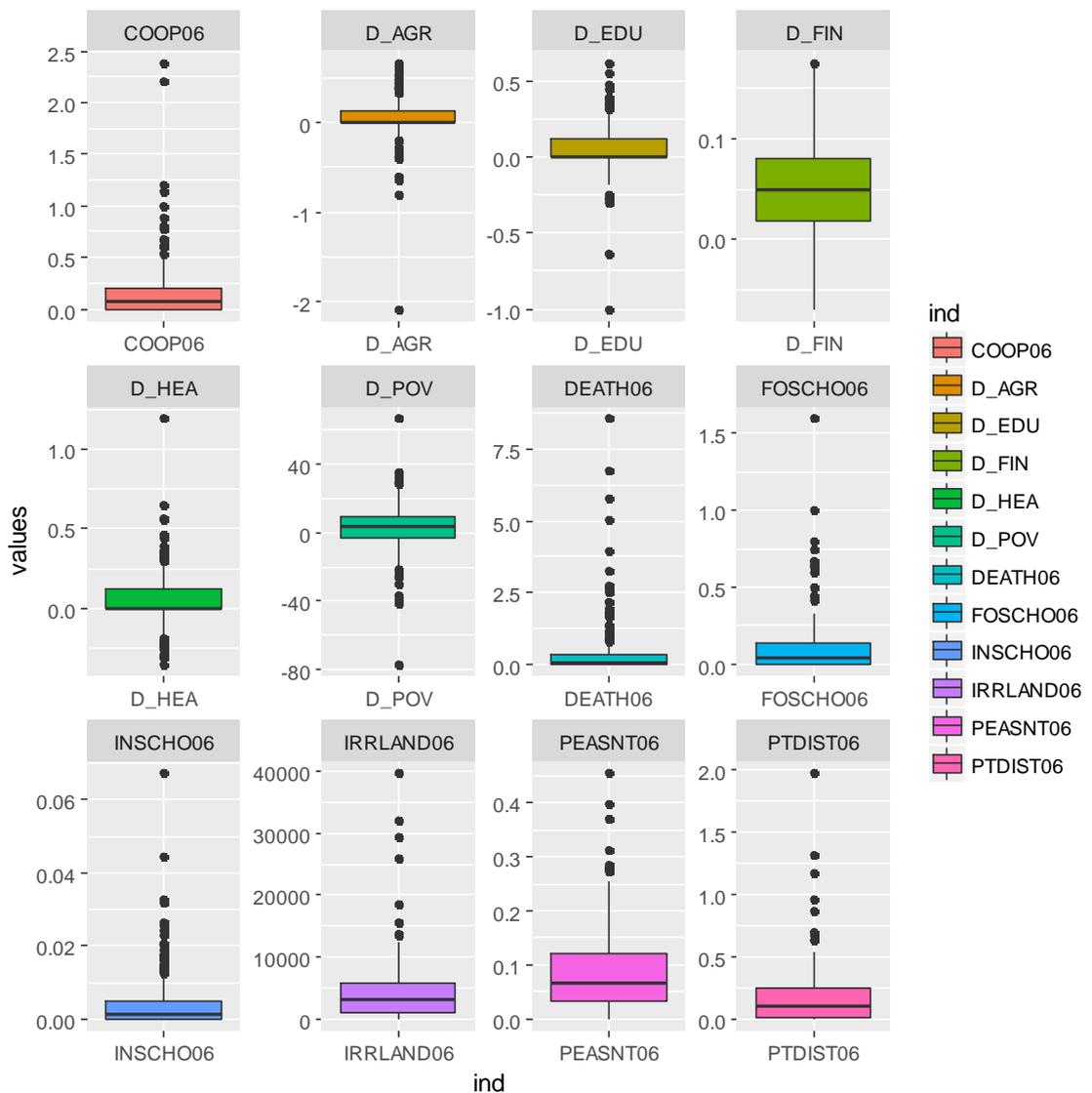


Figure 6. 16 Boxplot of Variables in Case Study of Aceh Province

To elaborate initial distribution of variable of interest within the study, the basic boxplot and histogram plot were employed. The box and whisker plot presented in Figure 6.16 depicted that generally the distribution of majority of variables are not normally distributed. It was also featured with obvious outliers scattered on the graph. However, there is one exception, variable of D\_FIN which exhibited normal distribution with least outlier existed.

In order to confirm normality status of the data distribution. One may

leverage exploratory tool named histogram analysis. After mapping the frequency distribution of the variables, the result was displayed on Figure 6.17. It eventually justified the previous notion that the distribution of data was not normally distributed due to its skew-to-the right feature of distributions.

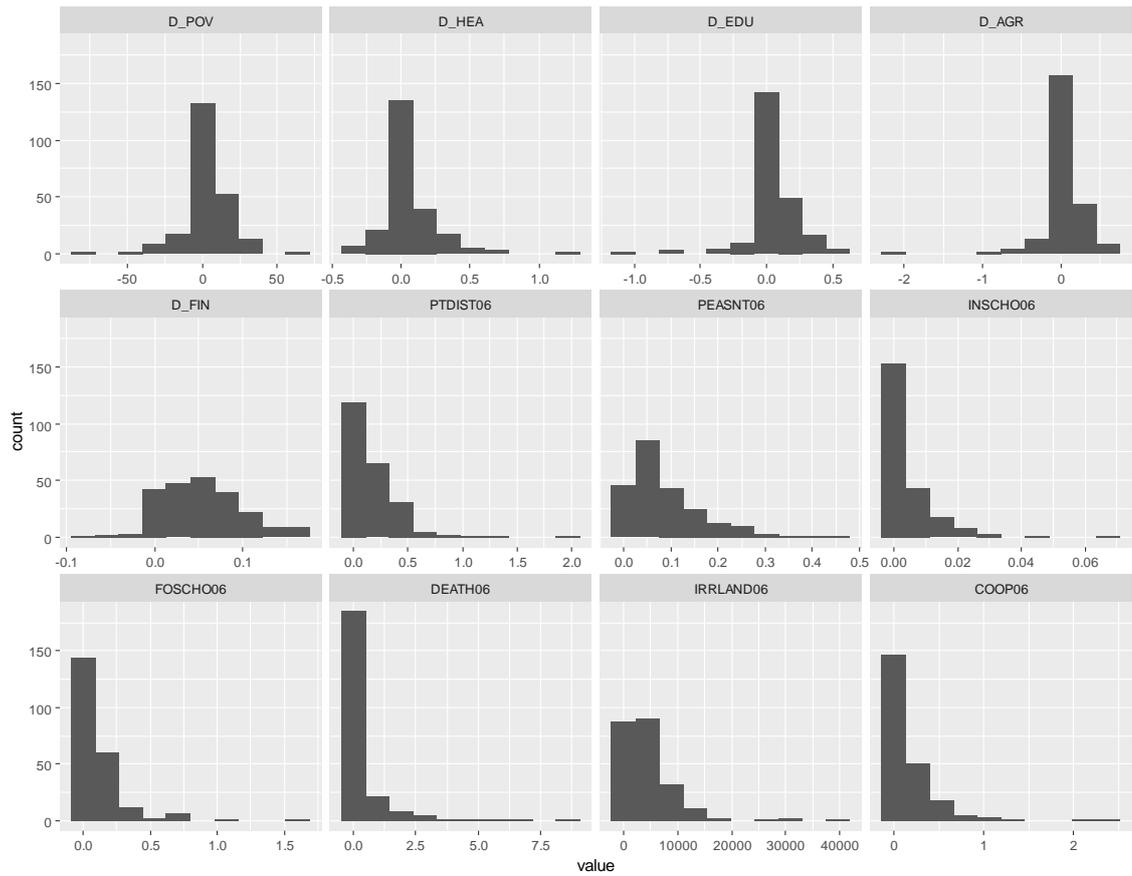


Figure 6. 17 Histogram of Variables in Case Study of Aceh Province

Table 6.5 Matrix Correlation of Variable of Interest in Case Study of Aceh Province

	D_POV	D_AGR	D_FIN	D_EDU	D_HEA	PEASN	PTDIS	INSCH	FOSCH	DEATH	IRRLA
D_POV	1										
D_AGR	0.00	1									
D_FIN	-0.11	0.05	1								
D_EDU	-0.03	0.26	0.11	1							
D_HEA	-0.06	0.17	0.35	0.17	1						
PEASNT06	-0.03	0.08	0.01	-0.01	0.02	1					
PTDIST06	-0.08	0.04	0.02	0.03	-0.02	0.29	1				
INSCHO06	-0.07	0.03	0.00	0.11	-0.05	0.10	0.22	1			
FOSCHO06	0.10	0.03	-0.10	0.03	0.08	-0.13	-0.04	-0.05	1		
DEATH06	-0.02	-0.22	0.06	-0.11	0.10	-0.09	0.06	-0.02	0.22	1	
IRRLAND06	-0.12	0.11	-0.08	-0.08	-0.02	0.03	-0.07	-0.05	-0.09	0.08	1

To obtain more speculative relationship of other variables of interest upon this study, one may refer to the correlation matrix presented in Table 6. 5. The matrix depicted that associations between variables were somewhat scant. However, the sign condition of PNPM investment in terms of agriculture, finance, education, and health has shown negative interrelation. In another way, the above figure gave a diagnose that the existing data did not suffer from multicollinearity, thus it was still likely to proceed to next exploration.

To contribute further investigation, multi variable analysis came to tackle these weak correlations. It was supported by Bollen (1989) who ever indicated that a lack of correlation does not imply no causality. Hence, Using Factor Analysis in Figure 6.18 and Non-graphical Solutions to Scree Plot in Figure 6.19 were worth noting. From the figure, one finally could acquire the potential number of factor/ latent variable that we might employ as well as prospective indicator for each component/latent. This analysis initially incorporated other variables such as budget in transportation and number of market without permanent building (MNOB). However at the end of analysis, both of variables were excluded because the anomaly of transportation as general development project instead of priority for the poor (Syukri et al., 2011) and the low motivation of the marginalized poor to engage in entrepreneurship at the Aceh context (McCarthy, 2014).

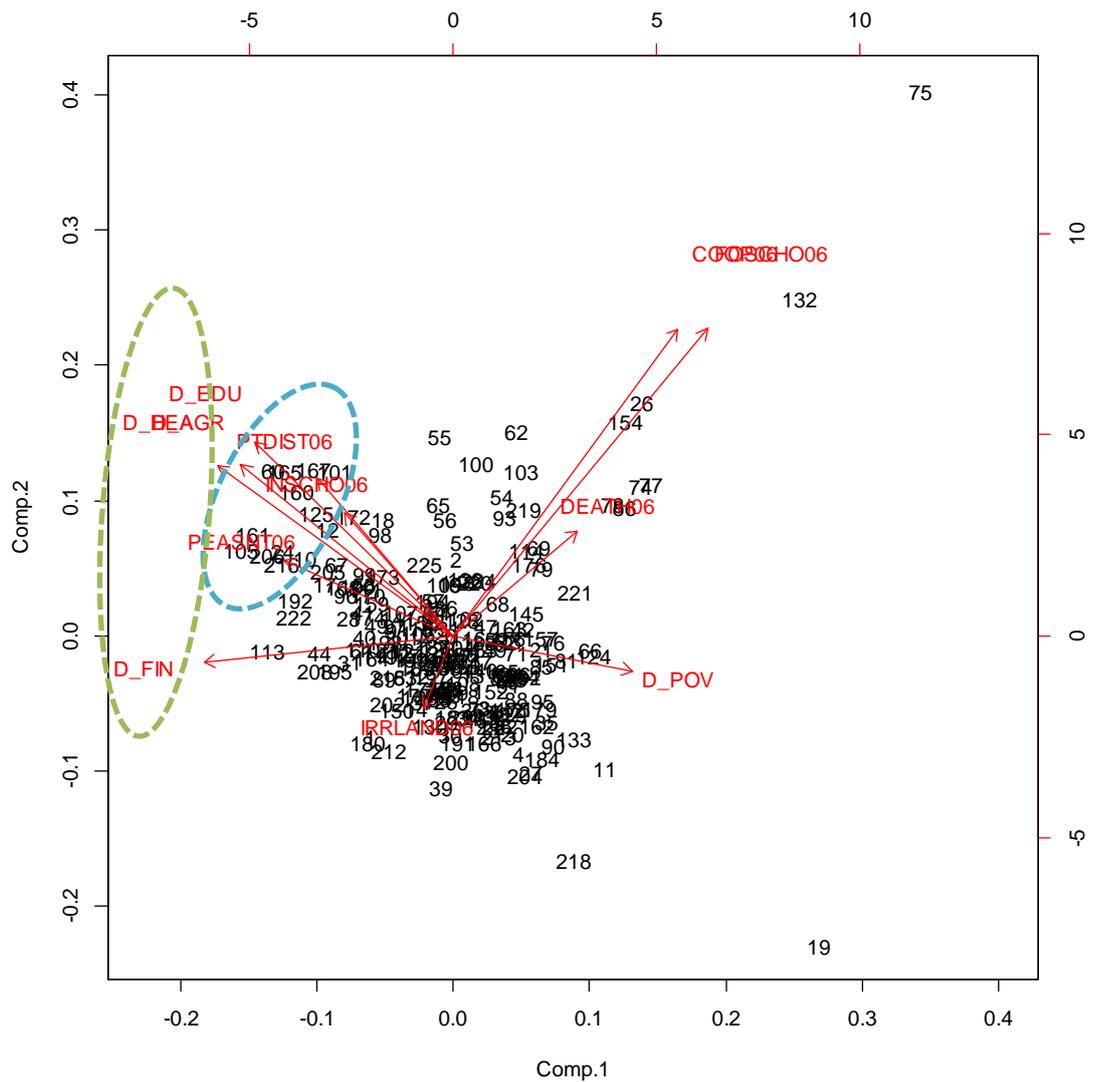


Figure 6. 18 Biplot Analysis (Factor Analysis)

Factor analysis is interdependence technique whose primary purpose is to define the underlying structure and relation among variables. More specifically, it is executed to condense the information contained in a number of original variables into smaller set of new composite dimensions or variates (factors) with minimum loss of information. Besides, the result of Non Graphical Solutions to Scree Test has resonance the similar inference. Comparing indicator of Biplot, Eigen values,

Parallel Analysis, Optimal Coordinates, and Accelerator Factor by the rule of thumb, it was suggested to have 2 component/ latent variables into further analysis

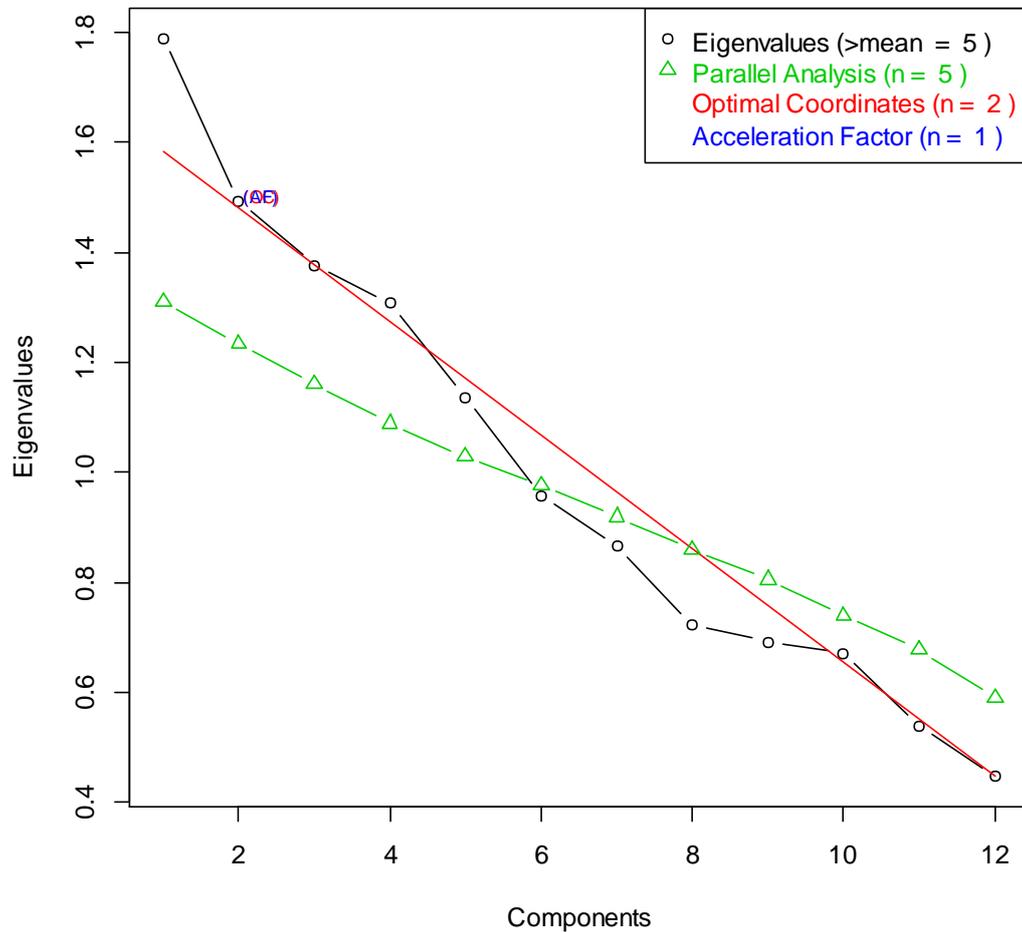


Figure 6.19 Non Graphical Solutions to Scree Test

Theoretically, empirical studies suggested the association between disaster and education as indicators of social economic status. Lohmann & Lechtenfeld (2015) and Mottaleb et al. (2013) has found the evidence from rural Vietnam and Bangladesh case of climatic shock associated with income shock and degradation of human capital. Natural disasters had caused farm household income volatility and negative income shock due to out-of-pocket expense in

schooling and healthcare in both of the two study sites. Moreover, in Bangladesh rural, this income shock was adapted by reducing expenditures on children's education particularly on school admission. These evidences accumulated to as the indicator of deprivation of marginalized poor that suffered when hit by disaster shock. The level of marginalization was attenuated if they merely work as smallholder farmers. However, if they are having access to school or involving in capacity building training, they will be prevented from falling too deep into poverty, as well as they can empower their livelihood. Ultimately, the author fascinated to group these three notions of prone-to-disaster environment, peasant, and informal school into one component of *poverty empowerment* latent variable.

Furthermore, in the analysis part, we will treat the latent variables incorporating into this analysis as the unrestricted variables, which is the one in which coefficients are freely determined by the series of data.

The result of Structure Equation Model corrected by Bollen-Stine Bootstrap resampling in Table 6.6 has shown reliable goodness of fit ( $\chi^2_{(46)} = 60$  (p value=0.28)). It means that Hypothesis Null of Implied Covariance Matrix was not rejected. It is inferred that the implied model significantly represented the population.

The other goodness of fit index also reflected identical inference. The CFI = 0.86, and TLI = 0.82 met the threshold of satisfying fitness. Additionally, the value of RMSEA = 0.037 was less than 0.05, which also revealed sufficient fitness of the implied model. Once the overall goodness of fit test has been screened out, the interpretation of each factor loading/ estimates of SEM path are formally allowed

Table 6.6 Summary of Structure Equation Model

Path	Result			
	Factor loading	S.E	Z-value	P-value
F1 =~				
D_HEA	0.110***	0.019	5.855	0.000
D_EDU	0.065***	0.015	4.456	0.000
D_AGR	0.108***	0.022	4.841	0.000
D_FIN	0.012**	0.004	3.202	0.001
F2 =~				
PTDIST06	0.170***	0.047	3.657	0.000
PEASNT06	0.031**	0.01	3.214	0.001
INSCHO06	0.002*	0.001	2.843	0.004
D_POV ~				
F1	-2.919 <sup>+</sup>	1.265	-2.307	0.021
F2	-1.151	1.254	-0.918	0.359
D_EDU ~				
FOSCHO06	0.036	0.055	0.656	0.512
D_HEA ~				
DEATH06	0.034**	0.01	3.329	0.001
D_AGR ~				
IRRLAND06	0.001 <sup>+</sup>	0	1.961	0.05
D_FIN ~				
COOP06	-0.029*	0.01	-3.039	0.002
F1 ~				
F2	0.113	0.121	0.935	0.35

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '+' 0.1 '.' 1

Fit indices:  $\chi^2(46) = 60(p = 0.28)$ , CFI = 0.863, RMSEA = 0.037, TLI = 0.821

A factor loading virtually represents the estimated direction and strength of association between an observed variable and a latent variable. In other words, a factor loading represents how central that observed variable is to the manifestation of its associated latent variable. In terms of first set of latent

variable F1= PNPM investment. It was indicated that all factor loadings are statistically prominent by significant level of  $\alpha = 0.1\%$ , *ceteris paribus*. It could be translated that if *PNPM investment increase* by 1%, then the budget distributed to health, education, agriculture, and financial activity will also increase by consecutively 0.11, 0.065, 0.108, and 0.012 million IDR per capita or in other metrics 110,000 IDR; 65,000 IDR; 108,000 IDR; and 12,000 IDR per capita respectively.

To articulate the second latent variable of interest (F2 = empowerment for the poor), formally it was suggested that percentage of household living in near to prone to disaster area, the percentage of peasant and ratio of informal school per capita were deemed as the indicators of latent variable F2= *empowerment for the poor*. Roughly speaking, if a person live in prone-to-disaster area and worked as a peasant, then he/she constitutes as the poor. And if among this cohort, people had the accessed to increase their capacity through training and informal school, then the level of poverty empowerment has been achieved. If *empowerment for the poor* increases by 1%, then it could be translated that the percentage of household living in near to prone to disaster area, the percentage of peasant and ratio of informal school per capita will increase 17% 3%, and 0.2 unit per capita respectively. The factor loading of this statistics were both significant at  $\alpha = 6\%$ , *ceteris paribus*.

To assess whether PNPM program has aligned with people necessities in the domain, one may relate to the next estimates of PNPM Rural activity determinant. Logically, the hypothesis that has been formulated argued that if they are more school, it means that they are a lot of pupils, teacher, and low quality infrastructure of school available in the community (since the rural private school

usually are of lower quality than the state schools due to lack of financial support from local government). If those criteria are abundant, then the budget allocated to provide scholarship for students, the incentives for teacher and student to present at school, and the procurement of library and school supplementary media will also increase. By referring to the summary of the output, it was indicated that the direction of estimates is parallel; 1 unit increase in formal school will lead to 0.036 million IDR (36,000 IDR) per capita increase of budget for education activity. Yet, the significance of the estimates was not convincing. The insignificance of this estimates might be supported by PSF (2012) finding that during the time of investigation, the impact of PNPM Rural was not effective in increasing school enrollment rate. It means that even though number of school was adequate, the pupils were generally of low motivated to go to school. The alternative discourse might departed from the fact that in rural, sometimes the number of student is exceeding the school capacity. It resulted to division of school duration into morning-class and afternoon-class. For example morning-class for first to third grader, and the afternoon-class for the otherwise. Ultimately, in rural entity the number of school did not generally reflect the number of students coherently. Thus, the better determinant for budget allocated to education activity (in terms of giving scholarship and incentives) might prospectively defined by variable of number of students, instead of number of school.

In spite of that, another results stemmed from determinant of health, agriculture, and finance activity entailed appealing interpretation. If there is increase in 1 case of death due to epidemics and 1 ha irrigated cultivated land in the community, then the budget disbursed in health, and agriculture activity will

increase successively 0.034 million IDR (30,000 IDR) per capita and 0.001 million IDR (1,000 IDR) per capita, *ceteris paribus*. The more prevalent the case of death, the more people supposed to prioritized and increase health budget allocation. The aware community will respond to increase budget allocation to health activity in terms of provision of safe sanitation and clean drink water, improvement of healthcare infrastructure, accessible medication and pharmacy. The things are obvious with agriculture activity. If there are more wetland need to be regularly irrigated, the community will put their aspiration in village assembly and opt for agriculture activity to intensify farm production. Among these two facets of budget allocation, it was statistically significant that the activity has coincided with the people need.

In addition, the factor loading that relates the path of number of cooperative to financial activity echoed the same notion. It is said that financial activity disbursed from PNPM Rural budget has conformed to people necessity. If there is adequate number of cooperatives/ union/ other financial institution available, then the allocation of budget distributed to SPP microfinance is limited. One unit increase in number of cooperatives in the community will decrease amount of money allocated to financial investment as much as 29,000 IDR per capita. The interpretation has been statistically significance at  $\alpha = 1\%$ , *ceteris paribus*.

Afterwards, to assess the overall performance of PNPM Rural specific to Aceh Sub-District, the last estimates might be gauged to test the hypothesis. To answer whether there is dilemma in participation of the marginalized poor, one might recall to the path that associate *poverty empowerment* latent variable to *PNPM investment* latent variable. The risk aversion behavior of the poor would be

attenuated if they were empowered. Thus, it was expected that the factor loading supposed to be positive. Eventually, the summary of the result has noted 0.113 as the factor loading yet the effect size was not statistically significant. This emphasized that there was obvious dilemma of participation of the poor to involve in budget allocation decision making process.

Finally, to cast a doubt about the PNPM performance toward Acehnese wellbeing, one might point to the paths connecting latent variables with difference of poverty rate variable. The estimates were negative and its factor loadings were logically sensible. The PNPM Rural investment has shown significant effect to decrease poverty, as many established empirical study has suggested (PSF, 2012; Sugiri et al., (2016); ADB, 2016). The 1% increase of PNPM investment, will expectedly lead to decrease of poverty rate approximately 3%. The estimates was significant regardless insignificance of empowerment for the poor as another determinant. It was suspected that because the marginalized poor were of low bargaining power, they could not proactively choose their preferable investment, and it led to the insignificance of this variable. Another potential caveat might be due to elite capture that persistent in the community (Syukri et al., 2011; McCarthy, 2014; McCarthy et al., 2014). Even though the marginalized has been empowered, they were still reluctant to direct their aspiration because there were already some elite who was better in acknowledging villagers necessity, mapping villagers conformed needs, the know-how in managing community, and delivering general villagers aspirations. Thus, the dilemma of participation in Aceh specific was still persistent.

## VII. CONCLUSIONS AND RECOMMENDATION

The attempt to evaluate the PNPM Rural performance in the national level and western part of Indonesia can be summarized on finding that agriculture and economic sector were perceived to have significant role to reduce poverty level. While the remaining energy, transportation, social, education, and health allocations were deemed not significant in lowering poverty level even though the sign condition was satisfactorily.

Specifically, the return to investment in PNPM Rural in a case study of Aceh Province has also been examined. Consistent with the above findings, the effect of PNPM Rural allocation channeled to PNPM Investment activity has portrayed significantly negative to poverty. It means that increment of the investment would return to decrease poverty in the context of the analysis.

The determinant of specific budget allocation selection was also investigated to answer susceptibility that the project did not conform to community needs. The determinant of budget allocated to respectively health, financial, and agriculture has shown significant effect to the amount of budget allocated. However, in term of education investment, the knowledge about formal school resource did not express significant effect.

It was also suggested that the participation extent of the poor was limited. It was indicated by insignificance of covariance between poverty empowerment and PNPM investment. The PNPM investment turn out to have significant degree to decrease poverty, however the extent of poverty empowerment was fail to act so. It was suspected that because the marginalized poor could not proactively choose their preferable investment as well as unable to recognize adequacy of community resources, their voice was not echoed, and it lead to the insignificance of this latent variable. Another potential caveat might be due to elite capture that persistent in the community. Even though the marginalized has been empowered, they were still reluctant to direct their aspiration because there were already some elite who knows better about know-how in acknowledging villagers necessity, mapping villagers conformed needs, and delivering general villagers aspirations. Thus, the dilemma of participation in Aceh specific was still persistent.

In order to grasp precise analytics, the study incorporate others degree of marginalization such as extent of female-headed household and educational/primary school attainment background were desirable. The level of elite composition in the community is also recommended to be included into analysis.

Moreover, expanding the number of data is also crucial in order to obtain good estimates. Driving from proceeding descriptive analysis result, it is valuable to try to incorporate other poverty indices, named Unsatisfied Basic Needs approach, Poverty gap index, poverty severity index, as well as Gini coefficient to be partaken into consideration to construct other compelling analysis or model.

In terms of policy narrative, the result of the study can be used as a lesson-learnt to sustain Community- Driven Development (CDD) program in Indonesia and improve the bottleneck that hinder the target achievement. The prospective reform is village/community mapping strategy prior to program start up. It helps to better tailor the program scheme in respect to its associated resources the community has. Another improvement can be done by giving higher incentive to facilitators in order to enhance the skill they performed to help communities or stakeholder aware of their own specific needs and capacities.

# **APPENDIX**

Table 6.7 Basic Statistics of Variable of Interest: Multiple Regression Data Set (Western Part of Indonesia)

	mean	sd	median	mad	min	max	skew	kurtosis	se
Social	785.07	989.28	484.13	588.31	0	5700.99	2.73	10.22	142.79
Agriculture	1010.53	1746.85	232.66	344.95	0	10252.35	3.31	13.83	252.14
Education	1595.25	2026.36	822.56	982.19	0	11572.9	2.86	10.16	292.48
Health	1436.27	1448.25	1005.55	1032.43	0	5485.77	1.23	0.5	209.04
Energy	97.41	300.06	0	0	0	1638.91	3.89	15.33	43.31
Economy	3883.04	3697.8	2789.01	2900.91	74.29	14929.8	1.23	0.58	533.73
Transportation	16755.05	12827.53	13144.4	9866.32	0	45629.61	0.8	-0.56	1851.49
Inflation	3.88	0.84	3.75	0.43	2.76	6.79	2.5	6.27	0.12

Table 6.8 Basic Statistics of Variable of Interest: Multiple Regression Data Set (Eastern Part of Indonesia)

	mean	sd	median	mad	min	max	skew	kurtosis	se
Social	1316.18	1745.71	735.81	1043.71	0	10102.68	2.37	7.16	187.16
Agriculture	230.43	470.89	0	0	0	2435.49	2.84	8.4	50.48
Education	2245.02	3012.29	1330.61	1136.02	0	18908.05	3.03	11.17	322.95
Health	2092.42	2884.28	1387.37	1233.72	0	20668.44	4.18	21.69	309.23
Energy	471.04	951.03	149.76	222.04	0	6218.69	3.85	17.43	101.96
Economy	3738.02	4644.69	2083.77	1976.85	0	29364.4	2.94	11.44	497.96
Transportation	9191.21	7131.38	7660.09	5377.45	0	38081.36	1.6	3.05	764.56
Inflation	4.25	1.23	4.47	1.46	0.67	6.34	-0.44	-0.74	0.13

Table 6.9 Basic Statistics of Variable of Interest: Economic Evaluation in Western Part of Indonesia

	mean	sd	median	mad	min	max	skew	kurtosis	se
d_Social	0.01	0.01	0	0	0	0.08	4.09	17.42	0
d_Agricultur e	0	0.01	0	0	0	0.04	3.16	10.61	0
d_Education	0.01	0.01	0	0	-0.01	0.07	2.79	9.25	0
d_Health	0.01	0.01	0	0.01	-0.02	0.06	2.13	7.25	0
d_Energy	0	0	0	0	-0.01	0.01	0.98	8.55	0
d_Financial	0.01	0.01	0.01	0.01	0	0.04	0.83	-0.78	0
d_Transp	0.05	0.06	0.03	0.03	0	0.38	3.61	18.21	0.01
d_P0	-7.79	3.42	-8.12	3.05	-15.55	0.41	0.18	0.15	0.45

Table 6.10 Basic Statistics of Variable of Interest: Economic Evaluation in Case Study of Aceh

	mean	sd	median	mad	min	max	skew	kurtosis	se
D_PO	2.6	14.15	3.31	9.33	-76.66	66.64	-0.73	6.11	0.94
D_HEA	0.05	0.18	0	0.05	-0.36	1.2	1.79	8.38	0.01
D_EDU	0.05	0.16	0.01	0.05	-1	0.62	-1.24	10.57	0.01
D_AGR	0.04	0.24	0	0	-2.08	0.66	-3.04	26.43	0.02
D_FIN	0.05	0.04	0.05	0.05	-0.07	0.18	0.39	0.02	0
PTDIST06	0.17	0.23	0.1	0.15	0	1.97	3.32	17.59	0.02
PEASNT06	0.09	0.08	0.06	0.06	0	0.45	1.55	2.95	0.01
INSCHO06	0	0.01	0	0	0	0.07	3.65	19.57	0
FORSCHO06	0.11	0.19	0.04	0.06	0	1.6	3.87	21	0.01
DEATH06	0.41	1.05	0.04	0.06	0	8.6	4.62	25.73	0.07
IRRLAND06	42.74	51.57	31.32	34.05	0	396.95	3.23	15.34	3.44
COOP06	0.17	0.3	0.07	0.11	0	2.38	4.14	23.48	0.02

Table 6.11 Data Frame of Multiple Regression Analysis (Western Part of Indonesia)

ID	Social	Agriculture	Education	Health	Energy	Financial	Transportation	Inflation	P0
1	1111.77692	596.861539	1273.22308	351.023077	0	2585.34	8980.32	3.435	18.93
2	1464.18462	2639.32308	1563.69231	4255.13846	0	11069.52	37625.28	3.435	18.01
3	138.642308	608.553846	631.865385	564.384615	0	3319.195	10105.92	3.435	19.58
4	683.076923	928.615385	496.615385	947.076923	0	6052.8	13972.8	3.435	23.81
5	2243.67692	1695.4	3646.30769	1423.92308	0	8407.8	14480.1	3.435	18.36
6	1312	2939.7	426.4	2952	0	12157.73	31217.81	3.435	23.19
7	412.892308	1710.55385	576.738462	1441.84615	0	9606.3	27613.32	3.435	19.06
8	481.384615	10252.3462	681.961539	813.769231	0	14929.8	43671.9	3.435	22.89
9	5700.99231	226.315385	644.819231	752.588462	0	5176.695	8653.51	3.435	19.49
10	194.276923	1048.38462	496.353846	966.646154	0	3263.26	8619.38	3.435	23.38
11	657.138462	0	1632.41539	120.823077	0	2773.02	5393.49	3.435	17.49
12	328.253846	396.684615	959.1	1679.76154	0	3342.95	6182.72	3.435	25.5
13	1332.9947	0	754.073071	1132.03146	0	730.1	19492.2	4.04	19.11
14	0	0	0	3253.69304	0	1396.72	45629.61	4.04	15.96
15	760.85337	0	755.299695	1449.50897	0	3918.78	16740.3	4.04	9.48
16	500.206946	0	1535.92956	4198.79595	1638.91335	74.29	28558.64	4.04	19.71
17	1974.26346	892.76442	249.576702	0	0	301.95	12054.9	4.04	13.16
18	387.553148	2910.52414	145.33243	1044.45573	0	5103.65	14682.65	4.04	15.67
19	79.5565211	440.707169	486.328564	110.345344	0	719.4	789.6	2.76	9.1
20	1186.42137	0	1806.05034	1123.97814	427.495959	3466.32	21677.76	3.78	15.06
21	772.361635	239.011623	174.832576	2421.09922	0	2245.375	21815.5	3.78	17.92
22	777.65376	153.802633	2688.95389	817.400508	1195.85867	3284.435	11849.11	3.78	18.25
23	661.057655	124.286044	889.816027	906.02725	0	4532.58	15516.54	3.78	11.66

ID	Social	Agriculture	Education	Health	Energy	Financial	Transportation	Inflation	P0
24	1241.97521	0	1587.09876	467.208067	0	237.9	10729.9	3.78	10.84
25	2279.51274	0	2079.22793	1121.93442	0	1766.205	13166.055	3.78	13.18
26	173.019547	202.520576	247.968107	287.037037	0	1356.25	8255.765	3.96	22.55
27	123.809524	181.70194	0	0	0	492.96	6892.08	3.96	16.79
28	2046.89521	735.471781	1573.37228	1168.69489	225.007349	1903.405	13122.755	3.96	14.4
29	0	78.7037037	677.976191	136.044974	448.611111	1582.02	11892.69	3.96	20.9
30	0	0	378.152557	274.713404	0	519.945	1141.635	3.96	13.28
31	65.0720165	0	0	0	0	644.105	3116.96	3.96	12.43
32	159.226191	77.0833333	0	380.357143	113.988095	861.03	2195.1	3.96	15.02
33	0	0	550.529029	1432.05097	0	600.534	0	5	7.13
34	977.958064	0	1340.65844	1361.70488	258.871252	803.71	3120.865	3.54	4.06
35	94.8909661	1288.51943	5933.18251	4859.41632	0	12050.76	36831.105	3.37571429	10.28
36	130.337475	3785.21752	5083.16154	4751.88713	0	9708.43	42791.61	3.37571429	13.47
37	0	0	1894.25209	758.78018	0	1719.72	8876.79	3.75285714	18.13
38	76.3608428	26.8876207	688.32309	58.0772608	0	2199.4	10694.6	3.75285714	14.9
39	284.624671	988.696225	4446.13696	5485.76602	0	7577.7	16836.3	3.75285714	16.66
40	475.442274	1885.045	3633.90803	2116.79324	0	4304.24	16237.31	3.75285714	15.11
41	693.608428	816.308165	1688.38894	482.686567	0	2805	5603.4	3.75285714	14.37
42	79.7410009	77.0829675	1940.36436	217.958736	0	1072.6	30513.74	3.75285714	26.22
43	412.694249	210.737489	702.458297	196.102941	0	2045.97	34072.83	3.75285714	30.21
44	584.701749	2266.91744	4538.62751	3656.78225	148.571756	7398.225	40693.375	2.97	9.8
45	2081.64668	1038.18835	11572.9016	3046.05514	36.8899412	8894.1	36825.3	2.97	9.2
46	486.869045	2823.4494	913.123871	2438.25582	0	3182.28	15014.4	6.785	18.14
47	1974.5528	4172.17952	1924.01261	1275.70401	181.247565	3446.46	7702.26	6.785	21.71
48	79.2320499	46.9271368	662.420743	240.756615	0	755.04	2592	6.785	19.88

Table 6.12 Data Frame of Multiple Regression Analysis (Eastern Part of Indonesia)

ID	Social	Agriculture	Education	Health	Energy	Financial	Transportation	Inflation	P0
1	0	0	4335.8385	1689.22487	0	1799.875	3392.125	5.455	29.84
2	421.307378	692.44579	5506.19544	4125.47522	2014.76697	11293.05	29838.3	5.455	19.54
3	1891.52492	0	11053.0848	5926.77809	1579.01211	10754.6756	38081.364	5.455	26.96
4	402.017038	918.896086	18908.0541	15033.6701	0	7523.725	5139.225	5.455	14.61
5	4253.21036	0	4603.90383	5111.70797	196.388341	6463.67	13266.065	5.455	19.97
6	0	0	1471.98676	2883.50113	0	4106.2	10657.265	5.455	25.17
7	431.117995	283.990425	6141.72064	5320.54351	0	10589.94	20713.32	5.455	12.63
8	299.21853	595.219656	6775.85187	2216.79105	0	7142.91	24508.91	5.455	20.37
9	564.277668	0	1057.71262	821.775556	0	1841.875	3437.875	5.455	11.36
10	603.210363	1243.38215	1330.6111	1744.57899	0	5294.1	8715	5.455	19.27
11	3028.66493	218.730007	333.066147	1275.09652	50.9541494	2083.77	8145.8	5.815	9.38
12	1295.5473	0	150.402618	2920.1934	810.089348	2705.4	10507.725	5.815	7.25
13	1098.34173	450.005515	292.708755	3210.22172	410.339376	3188.04	7984.98	5.815	13.13
14	1300.00368	0	1119.81836	1987.37728	1223.92543	531.795	9960.72	5.815	4.67
15	1927.10961	214.501599	2534.86414	2953.65298	1018.0314	3051.17	8343.26	5.815	12.75
16	1487.66408	0	1003.86072	2251.49833	210.023164	1371.9	8892.7	5.815	9.07
17	1772.58521	0	1230.4666	2409.21793	3406.0742	3096.725	9161.65	5.815	10.61
18	299.992646	0	257.267346	460.517704	0	455.255	2311.135	5.815	6.3
19	1784.90275	0	1568.40828	2562.63559	232.966871	2537.6	5102.4	5.815	12.93
20	0	0	0	345.499813	0	482.79	1905.795	4.44	7.56
21	40.7008611	0	306.057656	512.125796	142.933733	620.6	2321.472	4.44	5.9
22	74.4515163	0	988.880569	537.603894	386.417072	1047.98	2397.3	4.44	5.18
23	25.4361662	0	1029.86896	636.495695	0	1395.14	4244.67	4.44	8.82

ID	Social	Agriculture	Education	Health	Energy	Financial	Transportation	Inflation	P0
24	1695.09547	0	1461.58742	993.785099	0	925.05	4033.05	4.44	6.47
25	227.263197	0	189.385998	944.668663	0	770.855	4961.86	4.44	5.45
26	202.530887	0	893.777611	945.511045	406.712842	1156.155	2923.095	4.44	7.12
27	263.973412	76.6949778	2983.96972	2002.98745	0	2943.885	13992.51	3.98	5.41
28	702.455687	0	805.853028	563.51551	0	754.25	5190.5	3.98	7.31
29	1746.10748	0	1853.94075	1184.18734	0	2503.546	4488.51	6.34	8.25
30	1590.94728	0	2027.54539	1981.5877	828.590217	2214.45	7488.8	6.34	10.38
31	969.723575	0	0	3079.97431	0	1502.5915	10759.5974	0.67	11.69
32	2716.46337	0	1726.83897	1525.57828	830.61733	2403.96	3404.115	4.47	18.08
33	31.6288583	0	1597.50837	553.756043	406.154704	1416.15	1852.875	4.47	11.25
34	293.640759	0	1127.2592	0	164.224619	7629.6	2238	4.47	18.85
35	985.050205	578.430643	2398.19636	1387.37449	796.058014	3778.775	7207.2	4.47	20.1
36	735.808851	174.845668	6095.31424	3591.62142	220.985497	3859.23	14245.195	4.47	18.03
37	300.156192	0	2773.81183	1607.4154	184.306434	2522.25	8635.83	4.47	15.03
38	945.332838	263.015991	1434.77129	87.671997	357.549275	2348.275	3749.45	4.47	17.4
39	236.240238	113.239122	6421.4392	1938.73187	0	6082.125	8455.125	4.47	18.7
40	1148.67981	0	3281.46895	1137.63481	525.741912	2852.685	3803.085	4.47	22.37
41	980.798606	218.478422	474.625538	357.381729	180.33887	1233.17	2135.505	2.94	13.49
42	216.891591	233.019428	1450.393	124.0175	0	1066.5	3703.5	2.94	8.12
43	0	1601.60166	1030.16462	1373.92852	0	2622	7174.4	2.94	9.21
44	0	1032.98235	585.318108	176.983539	144.594394	1703.52	11280.36	2.94	17.16
45	890.508676	877.250482	113.799496	1571.09595	519.279253	1883.36	7660.09	2.94	10.04
46	0	0	0	0	0	0	0	2.94	9.63
47	36.7714667	239.648524	330.9432	1899.43645	419.701913	1455.21	11699.82	2.94	17.36
48	31.833012	182.589352	1186.23017	345.358149	0	908.01	4836.51	2.94	9.59

ID	Social	Agriculture	Education	Health	Energy	Financial	Transportation	Inflation	P0
49	148.301943	276.434821	854.21919	555.242474	68.8121014	1044.8	4388.8	2.94	8.12
50	22.8533294	0	564.377873	624.988877	0	855.59	4210.28	2.94	15.18
51	7309.68412	2218.53774	2611.86416	2382.05547	1149.04345	8892.32	29567.56	2.94	13.93
52	47.3824707	755.487172	931.855257	742.325375	463.295269	3290.85	28243.8	2.94	13.22
53	76.8204064	0	271.615008	634.454249	0	1956.375	5967.175	2.94	8.29
54	4101.14831	579.37514	12928.3424	4999.17978	297.964358	7425.9	17354.85	5.09	16.64
55	1035.85408	0	2474.39311	1592.19514	0	22653.2904	6032.8242	5.09	16.14
56	2918.67877	0	1034.56402	4047.63731	0	29364.3963	10542.6234	5.09	16.24
57	305.227052	1623.68205	5371.36679	2048.48259	132.160167	7878.74	21606.4	5.09	17.62
58	1366.65797	277.067333	3489.80315	3527.16054	0	13464.375	16670.775	5.09	12.57
59	2952.78831	285.160242	1853.54157	2007.62009	305.857356	6852.8702	14057.3278	5.09	14.68
60	878.793528	0	1706.2486	594.922079	206.863769	8403.75	7302.15	5.09	17.1
61	1477.30222	135.339945	1751.7945	1361.02423	0	4565.7304	14660.954	5.09	18.76
62	0	0	1991.97279	912.92517	0	5427.18	10529.64	4.08	21.31
63	164.024943	0	9506.31519	782.089947	149.761905	5082.32	12340.98	4.08	17.39
64	2588.55062	364.605902	1556.7613	564.30706	231.471797	3189.375	9960.975	4.91	17.06
65	589.4322	300.560329	656.223384	470.877848	0	1761.18	17888.94	4.91	19.66
66	3388.50953	2435.49122	336.925663	4758.67389	6218.6851	4329.36	15681.045	4.91	15.04
67	381.113186	0	122.375794	376.451251	1088.56182	549.9	4615.26	4.91	7.59
68	0	54.2218902	922.02316	88.3615988	282.656705	584.976	971.712	4.91	5.77
69	3225.38864	0	3228.81626	1309.35012	0	1704.04	10658.16	2.85	30.13
70	5686.64215	0	984.397513	1239.70577	0	750.4	5567.7	2.85	27.16
71	4857.94722	0	7405.72154	1494.31258	0	7327.275	12283.85	2.85	25.15
72	0	0	1736.11891	0	0	10310.58	0	2.85	22
73	0	0	1363.66118	947.660575	0	0	9250.83	2.85	30.96

ID	Social	Agriculture	Education	Health	Energy	Financial	Transportation	Inflation	P0
74	10102.6769	0	2318.64715	0	0	0	11620	2.85	26.7
75	4393.59976	0	734.632593	495.669978	0	1864.2	6319.56	2.85	27.94
76	0	0	906.7693	1499.09441	0	8819.515	4142.475	4.52	12.93
77	1534.58373	69.2293412	1586.06196	604.425402	821.876538	1615.9614	4029.3186	4.52	22.68
78	233.695721	394.262169	639.086258	1193.91487	804.422006	855.2796	15883.764	4.52	8.11
79	1262.33492	68.9381933	2748.33598	1648.3888	677.126255	3885.42	7925.12	4.52	8.46
80	881.157045	0	901.711418	2176.97623	315.464946	1805.905	4370.8822	4.52	20.72
81	1701.60816	0	435.500605	4320.9234	1359.51928	131.4	6818.2	2.27	33.18
82	1774.16566	0	492.097527	2586.54678	200.760851	432	5761.8	2.27	20.84
83	999.827079	0	146.463773	1553.00017	1171.71019	15.75	11887.75	2.27	43.86
84	3861.35916	0	1229.42417	7073.64344	987.611966	1438.88	16346.56	2.27	47.44
85	614.131074	0	1506.08335	20668.4351	4540.1833	523.215	12816.125	2.27	33.95
86	0	0	0	0	0	0	0	2.27	22.93
87	3675.87757	0	1771.84852	3847.39755	1839.51236	241.15	6410.95	2.27	23.5

Table 6.13 Data Frame of: Economic Evaluation in Western Part of Indonesia

ID	d_Social	d_Agriculture	d_Education	d_Health	d_Energy	d_Financial	d_Transportation	d_P0
1	0.01315482	0.00755645	0.01360232	0.00444406	0	0.02517783	0.087456584	-9.61
2	0.00478299	0.00807592	0.00489139	0.0133101	0	0.02739303	0.092720065	-10.14
3	0.00102576	0.00450244	0.00467491	0.00228768	0	0.01889026	0.040485441	-4.83
4	0.00144496	0.00695279	0.00314593	0.00455578	0	0.0348607	0.069695399	-8.82
5	0.00712011	0.00305309	0.01170953	0.0012681	0	0.02185123	0.029024475	-8.33
6	0.00278685	0.00680574	0.00109804	0.00706668	0	0.03125388	0.058467643	-10.12
7	0.0013754	0.00339626	0.00160031	0.00394517	0	0.02076783	0.062199224	-8.12
8	-0.0001323	0.01954911	0.0013182	0.00150189	0	0.02328691	0.074930217	-10.27
9	0.05730619	-0.001583	0.00662961	0.006441	-0.00103	0.04020079	0.054563306	-9.14
10	-0.0014555	0.01488178	0.00581901	0.01307247	-0.00218	0.03572038	0.101729914	-8.93
11	0.00274256	-0.0004627	0.00533584	0.00037383	0	0.00746694	0.013809425	-4.7
12	0.00348563	0.00197014	0.00951712	0.00424556	0	0.02243718	0.043594505	-1.05
13	0.01230749	0	0.00695308	0.01120322	0	0.00543481	0.13546728	-12.64
14	0	-0.0003803	0	0.01153286	0	0.00110892	0.13385006	-11.51
15	0.00329814	0	0.00371996	0.00321312	0	0.01277421	0.048723219	-6.34
16	0.00223203	0	0.00653594	0.01825075	0.007508	0.00018943	0.091177107	-14.13
17	0.07637887	0.03555992	0.01112212	-0.0165013	-0.00073	0.00107038	0.383973855	-9.26
18	0.00431345	0.02999164	-6.14E-05	0.00939542	0	0.03979166	0.113832736	-12.09
19	0.00042924	0.00237782	0.00262396	-0.0006968	-0.00828	0.00046933	-0.001012487	-7.01
20	0.00192788	0	0.00277241	0.00064338	0.000762	0.00247662	0.026950236	-7.44
21	0.00270698	0.00083769	0.00025822	0.00764065	0	0.00474617	0.050146789	-10.17
22	0.00191948	-6.17E-05	0.00571994	0.00161309	0.002845	0.00320118	0.015129123	-14.68
23	0.00114412	0.00021511	0.00121568	0.00139134	0	0.00475849	0.016251302	-6.06

ID	d_Social	d_Agriculture	d_Education	d_Health	d_Energy	d_Financial	d_Transportation	d_PO
24	0.00494881	0	0.00585157	-0.0015404	0	-0.0011334	0.024950986	-8.12
25	0.00774711	-0.0002452	0.00661362	0.00225995	0	0.00292483	0.025416217	-8.39
26	0.00122306	0.00066645	-0.0015744	-0.0013045	0	0.00800633	0.046242764	-12.69
27	0.0006825	0.00100164	-0.0014566	-0.0038065	0	0.00160183	0.020537219	0.41
28	0.01072712	0.00376217	0.00649469	0.00402527	0.001179	0.0070816	0.045125092	-8.34
29	-0.0024013	0.00061738	0.00043446	-0.002755	0.001948	0.00859389	0.061463577	-15.55
30	-0.0017263	0	-0.0073348	-0.0007117	0	0.00241547	-0.004307645	-6.78
31	0.00090712	-0.0024778	0	-0.0080173	0	0.00512959	0.009340329	-5.65
32	0.00173106	-0.0011702	-0.0026265	-0.0074465	0.001239	-0.0033287	0.017537069	-2.53
33	0	0	0.00180154	0.0186707	0	0.00337101	-0.000965624	-8.45
34	0.01570919	0	0.01860843	0.01446893	0.004692	0.00365523	0.038873407	-4.68
35	5.24E-05	0.00071169	0.00323842	0.0025829	0	0.00514185	0.015176325	-5.7
36	7.01E-05	0.00198492	0.00266442	0.00255508	0	0.00369906	0.016812031	-5.84
37	0	0	0.00315743	0.00164447	0	0.00159618	0.009969367	-5.18
38	0.00014726	5.19E-05	0.00108255	-1.44E-06	0	0.00231186	0.01409933	-7.89
39	0.00034196	0.00166438	0.00632548	0.00829169	0	0.00887387	0.018064422	-7.57
40	0.00079473	0.00344659	0.00501589	0.00381655	0	0.00454747	0.020416088	-0.49
41	0.00136359	0.0014795	0.00149124	0.00030323	0	0.00260508	0.005321819	-6.61
42	0.0001142	0.00011039	0.0024339	0.00028541	0	0.00080789	0.029072305	-5.34
43	0.00031293	0.00031199	0.00103995	0.00019861	0	0.00206764	0.030582204	-9.21
44	0.00066679	0.00244981	0.00490174	0.00346241	0.000169	0.00518289	0.029465804	-5.84
45	0.00220981	0.00075094	0.01211395	0.00217846	-0.00011	0.00561066	0.025386229	-5.23
46	0.00079871	0.00445229	0.00149798	0.00219801	0	0.00291982	0.015382695	-7.6
47	0.00233289	0.00349334	0.00192096	0.00133689	0.000231	0.00163883	0.003661249	-3.89
48	0.00090016	-0.0028663	0.00432467	-0.0043876	0	-1.26E-05	0.013901358	-8.75

ID	d_Social	d_Agriculture	d_Education	d_Health	d_Energy	d_Financial	d_Transportation	d_PO
49	0	0	0.04680504	0.01006885	0	0.00690396	-0.002985459	-12.9
50	0.00196761	0.00266701	0.02217944	0.01331397	0.009409	0.033925	0.096252747	-11.78
51	0.00608595	-0.0001025	0.0330781	0.01448889	0.00508	0.02185594	0.082266272	-10.47
52	0.00161599	0.0033978	0.07268925	0.05772394	0	0.02016522	0.013992918	-6.41
53	0.03172036	0	0.02989182	0.03242507	0.001465	0.03088925	0.067516613	-8.52
54	0	0	0.01529956	0.03356445	0	0.03321549	0.089045282	-9.28
55	0.0020331	0.00133926	0.02485588	0.01942613	0	0.03268099	0.065738425	-6.52
56	0.00162783	0.00323815	0.03315186	0.01029036	-0.00065	0.02436957	0.087123169	0.04
57	0.00561516	-0.0020178	0.00271671	-0.0036098	0	0.00599654	0.020979362	-5.92
58	0.00384805	0.00793189	0.006439	0.00415725	0	0.01943226	0.033739588	-8.69

Table 6.14 Data Frame of Economic Evaluation in Case Study of Aceh

ID	D_POV	D_HEA	D_EDU	D_AGR	D_FIN	PTDIST06	PEASNT06	INSCHO06	FOSCHO06	DEATH06	IRRL06	COOP06
1	-37.05412	0.1351999	0.0085185	0	0.06830853	0.0046917	0.0557212	0	0	0.2857143	259.57143	0
2	-5.839877	0.1906968	0.1060438	0	0.02426807	0	0.0616717	0.0190178	0.0588235	0.0588235	40.823529	0.6
3	-6.783703	0	0	0	0	0	0.0856816	0	0	0.2222222	63.333333	0.1111111
4	7.7542711	-0.127061	-0.032818	0	0.01382834	0.0414031	0.0243696	0.0011729	0.0555556	0	138.33333	0
5	6.4587241	0	0	0	0	0	0.0535515	0.001336	0	0.1666667	29.666667	0
6	-6.39425	0	0.1762132	0	0.04979139	0	0.1148092	0.0138422	0.0588235	0.2941176	33.352941	0.2352941
7	2.5898878	0	0	0	0	0.0723404	0.0694888	0	0	0	117.83333	0.1666667
8	5.7600189	-0.109717	0	0	0.00369226	0.0979249	0.0526732	0.0014748	0	0	32.285714	0.0357143
9	-2.679588	0.3086484	0.1383115	0	0.06386516	0.1038251	0.1012973	0	0.0666667	0.2	77.8	0.1333333
10	-6.065559	0.2286762	0.2841796	0	0.16417833	0.3877999	0.1294756	0.0054928	0.1481481	0.3333333	0	0.1111111
11	17.523398	0	-0.637937	0.1318003	0.00653154	0.0945884	0.0352047	0	0.1764706	0.1764706	23.588235	0
12	4.4968069	0	0.5585153	0.4560495	0.08499053	0.3697038	0.0081083	0.0110489	0.1395349	0.1395349	37.744186	0.0232558
13	7.6650012	0	0.0840247	0	0.03864351	0.1262067	0.0627622	0.0014741	0.1153846	0.0384615	5.5769231	0
14	5.2642377	0	0	0	0.11194401	0.1729291	0	0.0123093	0	0.25	78.708333	0
15	7.5028115	0	0.1822363	0	0.0983321	0.051373	0	0	0	0.03125	5.90625	0.125
16	16.69933	0.6476662	0	0	0.09833231	0	0	0	0.0555556	5.0555556	0	0
17	-6.036015	0.3309666	0	0.3869079	0.12773757	0.1860577	0.0350061	0.0140351	0.0232558	1.627907	2.0930233	0.0232558
18	4.2221087	0	0.2984401	0	0.09399907	0.6722689	0.2777034	0	0.125	3.9583333	4.25	0.0416667
19	-17.46955	-0.355136	-0.63181	-2.0781	0.08741114	0.2554348	0	0	0	6.7692308	13.653846	0
20	20.185794	0	0.0059876	0	0.03022088	0	0	0	0	0	0	0
21	9.2936326	-0.042962	-0.074656	0	-0.0051126	0.3502304	0.0185882	0.0040434	0.15625	0.09375	1.71875	0.1875
22	11.292171	0.0716185	-0.098268	0	0.05047195	0	0.0212141	0	0	0.1428571	6.0714286	0.0714286
23	6.9808945	0	0.0097783	0	0.04301484	0	0.0510266	0.0031755	0	0	43.310345	0.137931
24	-7.121154	0.209473	0.0688657	0.2695901	0.11026909	0.6262158	0.1385747	0.0199846	0	0.5192308	46.769231	0.1153846
25	-1.045436	0	0.069419	0.1424825	0.06889402	0	0.0749699	0.0066818	0.1	0.3	47.18	0.1333333
26	15.777205	-0.22314	0.0041083	0	0.06089396	0.3364591	0.2067389	0	0	0	22.692308	2.3846154
27	12.540929	-0.243044	0	-0.408775	0.11473325	0.0192662	0.0273986	0.0022832	0.0851064	0	37.12766	0.0851064
28	17.165739	0.1669431	0.0316885	0.4703107	0.07750793	0.2080663	0.2149533	0.002932	0.03125	0	20.1875	0
29	-12.24731	-0.06518	0.0801389	-0.386881	0.02782245	0.1387721	0.2209483	0	0	0	32.066667	0

ID	D_POV	D_HEA	D_EDU	D_AGR	D_FIN	PTDIST06	PEASNT06	INSCHO06	FOSCHO06	DEATH06	IRRL06	COOP06
30	-4.954628	0	-0.115581	0	0.08096244	0	0.0970305	0	0.0833333	0.0833333	95.416667	0
31	28.177966	0	0.3064365	0	0.16999221	0.2235469	0.1744122	0	0	0	0	0
32	7.1088659	0.0212109	0.025828	0	0.04784554	0.0075827	0.2201137	0.00209	0.08	0	0	0.12
33	-0.76627	0	0.0366933	0	0.07810967	0.2298056	0.0183848	0	0.0357143	0	34.285714	0.0357143
34	-7.08785	0.0251595	0.0188212	0	0.03053803	0	0.0133264	0	0	0	0	0
35	17.126007	-0.239063	0.0181962	0.0558017	-0.0193887	0.1215935	0.0647517	0.0023937	0	0	77.435897	0.1538462
36	9.5665629	0	0.1163088	0	0.05416004	0	0	0	0	0	0	0.0384615
37	12.173203	0.1201519	0.0416468	0	0.12630047	0.1048304	0	0	0	0	0	0.0588235
38	4.0392071	-0.260702	-0.272157	-0.174867	0.12909531	0.2862912	0.0385012	0.0207465	0.1276596	0	53.787234	0.1702128
39	2.6972623	0.0249656	-0.295641	-0.386505	0.16894992	0.0919429	0.1531832	0	0	0	36.777778	0.0555556
40	10.331352	0.0313465	0.1694184	0.1903565	0.15106881	0	0.1465558	0.0054919	0.0285714	0.0285714	38.228571	0.2285714
41	-6.504037	0	0.3807776	0	0.03905411	0.3563025	0.1621184	0.0028789	0	0.0833333	9.8125	0.0208333
42	14.203911	0	0.149231	0	0.0247892	0.0239944	0.0309338	0.0039539	0.0588235	1.3529412	0	0.2941176
43	5.4419217	0	0	0	0.0868241	0.253012	0.0498339	0	0.0526316	0.2105263	18.947368	0.0526316
44	0.8436626	0	0.3378015	0	0.17524947	0.2793631	0.1021945	0	0	0.0789474	2.6315789	0
45	1.2554777	0	0	0	0.0549449	0.4385259	0.0200215	0	0	0.0769231	26.923077	0
46	10.016485	0	0	0	0.03831248	0.1932006	0.0030703	0	0.1111111	0.3611111	5.5555556	0.0555556
47	0.9633968	0.1362256	0.0274611	0	0.05777391	0	0.0465821	0	0	0	0	0.6
48	29.573518	0	0.0413528	0	0.07179304	0	0.0343553	0	0	0	0	0
49	1.5672708	0.3620475	0.0932402	0.2719568	0.04925778	0	0.0952381	0	0	0	19.117647	0.1176471
50	-10.43518	0	0.0434483	0	0.05593733	0.3826325	0.0536632	0.0015537	0	2.7692308	111.46154	0
51	-7.219072	0.1522681	0.1559278	0	0.06317773	0	0.1130918	0	0.2857143	0.2857143	117.85714	0.1428571
52	-4.781738	0	0.044914	0	0.0446037	0.0365607	0.06751	0	0.1052632	1.7368421	92.947368	0.3157895
53	-8.093653	0.206617	0.0330371	0	0.05586134	0.2011621	0.0661972	0.0086164	0.25	0	15.8125	0.5
54	-0.065535	0	0.1290432	0.1573216	0.03923042	0.2195701	0.1597079	0.0047461	0.3076923	1.9230769	31.307692	0.5384615
55	-20.77875	0.2588549	0.1356058	0	0.04610118	0.6890325	0.0672774	0.0033588	0.1818182	0.1818182	45.636364	1
56	-7.677014	0.1596985	0.1273125	0.1704637	0.04491009	0.0617778	0.1366642	0.007505	0.1363636	0.4545455	26.727273	0.6818182
57	4.2403262	0.3018923	0.1216997	0	0.08019881	0	0.0739323	0	0	0	47.7	0.6
58	-6.072119	0.3237228	0.3490783	0	0.07953422	0.1835708	0.0285318	0.0017832	0.037037	0.9259259	14.185185	0.1111111
59	-2.985747	0	0.1250943	0	0.02778677	0	0.0316569	0.0023392	0.0666667	0	30.533333	0.4

60	1.7427524	0.4635766	0.1977325	0	0.06211505	1.31569	0.1916036	0.0073224	0	2.1666667	0	0
61	-22.3679	0.3281762	0.1582577	0	0.07046683	0	0	0.0048823	0	0.25	10	0
62	-0.268998	0	0.0718314	0.2770688	0.05957657	0.2864829	0.2112296	0	0.6666667	1	4.1666667	0.5
63	23.959042	0	0.0099646	0	0.00748141	0.3353344	0.1411878	0.007456	0.12	0	31.32	0.04
64	-2.209867	0.0754776	0.0238206	0	0.04967525	0.6902256	0.0353821	0	0	0	3.4444444	0.3333333
65	20.536314	0	0.4821205	0	0.04591624	0.1016949	0.029484	0.03276	0.25	0	0	0.25
66	66.641844	0	0.0681395	0	0.02710326	0	0.1259822	0	0.3333333	0.3333333	0	0
67	5.0251558	0.1829542	0.2114307	0.5194527	0.04151613	0.4113829	0.1217981	0.0041855	0.04	0.12	67.68	0.08
68	23.03344	0	0.0842443	0	0.05221486	0.4392342	0.0543968	0.0030432	0.1875	0.125	2.25	0.25
69	-1.473335	0.0498399	0.0168793	0	0.02216684	0	0.1379359	0.0019929	0	0.1428571	0	1.1428571
70	8.4985836	0	0.0712205	0	0.04893671	0.0630063	0.1840149	0.0028914	0.1428571	0	185.42857	0
71	10.965263	0	0	0	0	0.2106904	0.1304495	0.001866	0.1818182	0.4545455	293.54545	0.3636364
72	5.7556519	0	0	0	0.0518058	0.8697406	0.0702067	0	0.0909091	0	6.8484848	0.0909091
73	1.3153689	0	0.0125307	0	0.01071964	0.3031373	0.0276062	0	0.1290323	0	0	0.2258065
74	3.4215125	-0.018423	0.0142638	0	-0.0030026	0.0092123	0.0999046	0	0.8	0.1333333	0	0.4666667
75	15.40292	0	-0.026435	0	-0.0105741	0.2299523	0.0097	0.0016919	1.6	0.2	0	2.2
76	13.458149	0	0.0078134	0	0.01528594	0.0236453	0.0478175	0	0.125	0.59375	13.125	0.375
77	7.2674283	0.017302	0	0	0.00040239	0.0671616	0.0245959	0.0005332	0.5	0	5.6875	1
78	7.4173195	0	0.0337223	-0.046987	-0.0049231	0.3216931	0.0521252	0	0.625	0.25	16.208333	0.4583333
79	0.9057174	0	-0.010694	0	0.01486717	0.2201759	0.0785219	0.0032819	0.1111111	0.1111111	0	0.7777778
80	0.2114814	0	0	0	0	0.1621262	0.0408719	0	0	0	0	0.25
81	4.2763986	-0.094167	-0.068372	0	-0.0039528	0.059871	0.0208669	0.0047195	0.1923077	0	17.115385	0.2692308
82	7.1432402	0	0	0	0	0	0.0302976	0	0	0	10	0
83	12.867021	0.4376007	0	0	0.07657055	0	0.0153758	0.0043603	0	0	64.157895	0.0526316
84	19.512239	-0.318156	0.093501	0.3890875	0.03904177	0.0591216	0.02319	0	0.2	0.3333333	74	0.0666667
85	11.538523	0	0	0	0	0	0.0648544	0	0.1666667	0	0	0.1666667
86	10.709679	0	0.0793369	0	0.00589314	0.0731456	0.0256047	0.0007091	0.4444444	0	39	0.8888889
87	11.359708	-0.298719	0	0	0.08296339	0.1956408	0.0408205	0.0148954	0	0.8235294	20.705882	0.2941176
88	10.851213	-0.303062	0	0	0.0992816	0	0.0506592	0.0082951	0.1428571	0.4285714	5.7142857	0.1428571
89	8.887632	-0.093452	0	0.6219565	0.10894229	0.1503268	0.0615404	0	0	0	72.05	0.05
90	13.92036	-0.133177	-0.127666	0	0.0177257	0	0.0407308	0	0.1363636	0	68.818182	0

91	1.4515166	0	0	0	0	0	0.1052962	0	0.125	0.875	46.125	0
92	14.555355	-0.158148	0.1400941	0	0.01384683	0	0.0524292	0.0037955	0.16	0.04	28.64	0.08
93	-3.585171	0.0492452	0.2406046	0.1574565	0.04554093	0.0442356	0.0551508	0.0013318	0.6470588	0	80.882353	0.1764706
94	6.2288693	-0.021733	0.1345447	0	0.02573374	0.319732	0.0415268	0	0.0666667	0.0666667	21.333333	0
95	2.3761325	-0.243499	0	0	-0.0078197	0.0790663	0.0917915	0.0012941	0.1428571	0	25.357143	0.0714286
96	-4.512578	0.0248323	0.1328929	0.2963771	0.050237	0.0189978	0.3112644	0.0141652	0.0869565	0	108.26087	0.1363636
97	12.485115	-0.046751	0.3561364	-0.092249	0.09681052	0.4044656	0.0835466	0.0052217	0	0	32.529412	0.1764706
98	-15.08936	0.1449694	0.1777912	0.3320443	0.04998926	0.1266568	0.1598103	0.0051525	0	0.3888889	43.555556	0.6111111
99	20.527016	0.5674727	0.2359508	0.2066652	0.08190175	0	0.0619318	0	0	0	70.142857	0.3571429
100	24.490235	0.2467881	0.4469445	0	0.05747816	0.2639853	0.0864872	0	0.6	0	28.6	0.2
101	-16.18033	1.2018095	0	0	0.07906621	0	0.063655	0	0.3333333	2.6666667	0	0
102	4.9260805	0.1794526	-0.016976	0.4308057	0.02779511	0.1477149	0.0531083	0	0.2105263	2.1578947	396.94737	0.2631579
103	-4.429081	-0.031862	0.1434841	0.2102233	0.00608589	0.0784473	0.0488363	0.0263781	0.4117647	1.7647059	81.411765	0.4705882
104	5.1791	0.1405117	0.1273182	-0.046034	0.04296677	0.0448566	0.0229283	0.0089934	0.1153846	0	93.653846	0.1538462
105	-41.93052	0.2444491	0.2859475	0.3714521	0.13802108	0.1114112	0.1926164	0	0.1818182	0	88.545455	0.0909091
106	-21.69139	0.0779106	0	0.1605084	0.03855254	0.2434077	0.0845109	0	0.0666667	0.0666667	36.4	0.2
107	-0.647179	0	0.0734451	0.5822538	0.06990468	0.2126899	0.0527638	0	0.1428571	0.5714286	27	0
108	10.874489	0	0	0	0.03479463	0.1911765	0.1602434	0	0.0625	0	40.25	0.0625
109	-7.55722	0.1039186	0.0790616	0	0.04001651	0.2884946	0.1163259	0.0045532	0.1538462	0.0384615	40.192308	0.3461538
110	5.875663	0.3956398	0	0	0.09005803	0.1224125	0.1459345	0.0031679	0.0222222	0	1.5111111	0
111	-36.31286	0	0.621128	0	0.00617585	0	0.0726112	0.0037843	0	0.6875	0	0.0625
112	-12.694	0.1461036	0.1228776	0	0.03909235	0.2991122	0.0576507	0.002045	0	0.0882353	4.4411765	0
113	-76.6582	0	0	0	0.15619092	0.3758911	0.0183951	0.0133298	0	0	10.36	0.04
114	-1.974395	0	-0.050516	0	0.00631329	0.1436323	0.2411086	0.0048625	0.2	0.4	101.8	0.8
115	6.7972182	0	0	0	0.03637635	0.5419104	0.1234629	0.0172468	0	0.0857143	37.228571	0.1142857
116	3.9115078	0	0	0.2797077	0.02639606	0.0414453	0.1515332	0	0.1923077	0.4230769	92.461538	0.1153846
117	8.2752343	0	0.0273577	0	0.01219066	0.0784428	0.1289416	0.0087085	0.0322581	0	18.096774	0.1612903
118	3.7348868	0	0.0691443	-0.105454	0.00548569	0.0108184	0.2228297	0	0.0434783	0	70.695652	0.0434783
119	-12.28606	0.1452321	0.0696369	0	0.07716127	0.3884282	0.0623821	0	0	0.2352941	0	0
120	7.6035734	-0.113012	0.1660878	0.141058	0.06481896	0.4156324	0.0384466	0	0.0606061	0	15.848485	0
121	-2.113855	0.1222421	0	0.1218056	0.0416667	0.5218772	0.0684808	0	0.0909091	0	100.63636	0

122	-0.702387	0	0	0	0.07192164	0.3936677	0.0958041	0	0.0526316	0	0	0
123	-10.99888	0.0303557	0.0773789	0	0.09091986	0.1307241	0.0174058	0.0025924	0.1428571	0	5	0.1428571
124	9.9028265	0.0105506	-0.159085	-0.279278	8.04E-05	0.0475764	0.0451116	0.0102424	0.1363636	0	13.681818	0.5
125	2.9663757	0.3163212	0.3895128	0.5243041	0.05799584	0.3630732	0.083928	0	0.0555556	0.7777778	15.944444	0.1111111
126	-3.705936	-0.133558	-0.108985	0	0.11153977	0.3076923	0.1159549	0	0.125	0.125	15	0
127	27.460306	0	0.3125946	0.1920869	0.04926337	0.2377856	0.1495628	0	0	0.1818182	155.27273	0.0454545
128	-29.91773	0.1975837	0.0070699	0	-0.0321528	0.1836529	0.0673351	0	0	0	77.230769	0.4615385
129	3.3681145	0	0	-0.107388	-0.0304	0.1752584	0.085469	0	0	0.2280702	79.614035	0.0526316
130	-0.422092	0	0	0.0547006	0.06993882	0.1060828	0.0693152	0	0	0	96.038462	0
131	-1.026634	0	0.0730139	0.0474337	-0.0057814	0.1025492	0.2549636	0.0049784	0	0	29.75	0.2916667
132	28.848227	0	0.0459011	0	0.00994692	0.1684941	0.0622633	0.0031381	0.6666667	8.6	0	1.2
133	-1.103886	0	0	-0.602358	-0.0074223	0	0.0396123	0.0021976	0.0512821	0.4615385	35.512821	0.1538462
134	-3.018077	0	-0.178261	0.2659882	0.0049749	0.1019361	0.0552249	0	0.0869565	0	39.869565	0.2173913
135	1.0680139	0.0408053	0	-0.065742	0.01733023	0.3093258	0.0763519	0.0071625	0.0266667	0.2266667	43.853333	0.1066667
136	7.2923322	0.0605227	0.1450568	-0.190134	-0.0685779	0	0.0442145	0.0160929	0	0	26.244898	0.0408163
137	14.891152	0.0399129	0	0.0693806	-0.0471178	0.3561553	0.0490719	0	0.02	0	28.64	0.02
138	3.3086304	0	0	0.0526468	0.02689414	0.4350306	0.1345437	0.0104759	0.0416667	0.2916667	58.833333	0.5416667
139	0.8067573	0.0471401	0.0836845	-0.013227	0.05454856	0.0892317	0.1223351	0	0.15	0.05	45.25	0
140	34.101438	0	0	0.3880148	0.06888834	0.0458619	0.0511356	0	0.1034483	0	44.827586	0.1034483
141	21.857526	-0.073783	0.0525881	0.6603482	0.0683496	0.0871184	0.1060946	0.0134669	0.025641	0.025641	20.025641	0.1025641
142	31.804049	0.0784839	0	0.037955	0.02444302	0.0975793	0.0202011	0.0018705	0.025	0	27.875	0
143	4.9004431	0.0155142	-0.017221	-0.072561	-0.0002314	0.1081177	0.1157926	0.0025695	0.1794872	0.5384615	88	0
144	-26.13862	0	0	0.0783275	0.02969367	0	0.0888093	0.0166096	0.0625	0	80.46875	0.09375
145	-12.25	-0.054113	-0.104631	0.0703082	0.01307582	0.1391941	0.0925662	0.0025361	0.1875	0	31.875	0.5
146	8.3554526	0	0	0.2845531	0.01937028	0	0.1138391	0.0104609	0.0294118	0.0294118	34.941176	0.0882353
147	-3.85651	0	0	0.1054406	0.07215065	0.114057	0.1026141	0	0	0	31.631579	0.0526316
148	8.3115445	0	0	0	-0.008175	0.9521721	0.1161	0.0070816	0.1702128	0.3191489	68.680851	0.0851064
149	-2.853531	0	0	-0.202595	-0.0455408	0.3806964	0.0509358	0.0226381	0.0175439	0.3684211	45.122807	0.0714286
150	-2.702683	0	0	0.2847097	0.12305904	0	0.0175505	0	0	0	19.388889	0
151	-0.31179	-0.139479	0.079201	-0.117522	0.01039355	0	0.0449113	0.002467	0.3043478	0	2.3913043	0.0454545
152	7.4159762	-0.19193	0.138874	0	0.01165955	0	0.0331638	0.0168673	0.0384615	0	50.576923	0.0384615

153	5.1238903	-0.234645	0.134958	0	0.04227169	0.1536643	0.0342596	0.0012372	0	0	0	0
154	-2.418701	0.1785988	0	0	0.08370922	0.0456714	0.0566934	0	1	5.8	13.2	0
155	5.1708404	0.1045503	0	-0.045511	0.0424686	0.0538768	0.0658979	0.0005681	0.1	0.6	55.9	0.4
156	1.5282021	-0.064188	0.0967894	0	-0.0100925	0	0.0288732	0.0052522	0.2727273	0	6.4545455	0.0909091
157	-0.960676	0	0	0.1661637	0.04405217	0.1890007	0.2365302	0.0019668	0	0	9.1315789	0.3421053
158	11.803036	0.310002	0	0.2675137	0.02701623	0.2317497	0.2200162	0.0063688	0.0444444	0	33.377778	0.0444444
159	3.3740411	0	0	0.1793313	0.022142	1.9668282	0.2422706	0.01108	0.0277778	0.1666667	34.555556	0.0277778
160	1.7266221	0.3415153	0.3175112	0.2934092	0.09168213	0.1572097	0.2773287	0.0145351	0.0263158	0	37.684211	0.0789474
161	26.226903	-0.211674	0	-0.175611	0.01167256	0.0805423	0.1737416	0.0049916	0.047619	0	15.904762	0.047619
162	-4.612981	0	0.0914442	0.0580593	0.01270919	0	0.0249553	0.0037027	0.1818182	0	26.136364	0.2727273
163	9.7193291	0.1693359	0	0	0.02804127	0	0.4545512	0.001266	0	0	31.25	0
164	-8.174352	0.1541003	0	0.160537	0.10411984	1.1723158	0.2839674	0.0161911	0.0769231	1.3076923	18.794872	0.2564103
165	4.9765122	-0.247222	0	-0.086758	0.09850176	0.1002539	0.0646729	0	0	0.0384615	10.692308	0.1153846
166	-4.000835	0.1380101	0.2127761	0	0.09213732	0.629321	0.1177265	0.0445411	0	0.8333333	39.388889	0.4444444
167	8.2829708	0.2835553	0	0.2117271	0.0743502	0.4616682	0.2339643	0.003389	0.0243902	0.1463415	36.487805	0.1463415
168	2.2396476	0	0.0724784	0	0.06245338	0	0.0408686	0.0253898	0	0.2105263	25.526316	0
169	3.6611473	0	0	0	0.06057882	0.3475913	0.3689611	0.0172399	0.1492537	0.0149254	32.343284	0.0298507
170	2.2765802	0	0	0.1489163	0.06141999	0.11803	0.1078724	0.0030687	0	0	0	0
171	-0.819109	0	0	0	0.0435565	0.4522736	0.1173131	0.067289	0.1578947	0.4210526	35.526316	0
172	3.2965401	0	0	0.1524426	0.04435271	0.4527503	0.2088499	0.0242144	0.1086957	0	40.043478	0.1111111
173	4.8350563	0.3416892	0.2506069	0.2619903	0.04985418	0.0230956	0.0428209	0.0018899	0	0.4210526	22.789474	0
174	-1.167976	0.0389326	0	-0.082265	0.01637699	0.0694554	0.0066375	0.0012951	0	2.625	122.5	0
175	0.9899223	0.1261925	0	0.1118545	0.02282212	0.0445127	0.01272	0.0084709	0.2222222	0.3333333	114.38889	0.6666667
176	0.2905229	0.0498164	0.2501462	0	0.09090327	0	0.0051187	0	0	0.6	74	0
177	3.7640775	0	0	0.4285533	0.06436526	0	0.0068966	0	0	1.6666667	93.333333	0
178	5.5363704	0	-0.249589	0.1137226	0.02215562	0.1251739	0.0055232	0.0029855	0	1.8	103.7	0.2
179	-39.6826	0.0842271	-0.276589	0.3050873	0.11219023	0	0.0325283	0	0	0	116	0
180	7.9836682	0.3003559	0	0	0.05460539	0.0200222	0.012691	0	0	1.1111111	60.444444	0
181	13.792975	0	0	0	0.06772645	0.0377207	0.0122686	0	0	2.5	84	0
182	-5.335461	0	0.113849	0	0.00110781	0	0.0978102	0	0	0	124.5	0
183	34.663635	-0.118584	0	-0.287348	0.10795329	0.0353535	0.0056711	0	0	0	22.5625	0.2

184	13.803089	-0.086273	0.1902829	0.1517291	0.01859348	0.0532646	0.0053681	0	0.1666667	0	57.5	0
185	29.118355	0	0.2165558	0.4403314	0.05556409	0.3588564	0.0147392	0	0.1666667	0	59.708333	0.0416667
186	-2.039877	0	0.1097583	0.2093191	0.03529024	0.0830355	0.0801244	0.0050002	0.0731707	0.1219512	16.463415	0.0487805
187	-3.662018	0	0.1524598	0.1348017	0.02487866	0.0266249	0.0233438	0	0.1764706	0	37.529412	0.1176471
188	1.6623024	0	0	0	0.03095956	0.050923	0.0720611	0.0125022	0	0	0	0
189	-5.395932	0	0.3921852	0.2044809	0.10179633	0.0975015	0.0302244	0.0142472	0.0857143	0.0857143	43.885714	0.1428571
190	-2.968898	0	0.2787985	-0.809934	0.09450883	0.1757976	0.0486658	0.0030755	0	0.2647059	58.705882	0
191	-26.26374	0.3390081	0.2997155	0.3804035	0.0937493	0.0208791	0.0214908	0	0	0.8421053	59.157895	0
192	1.4747116	0	0.1914419	0	0.0375372	0	0.0688974	0	0	0	12.090909	0
193	8.6979335	0	0	0.2395548	0.03584879	0.3501781	0.0573243	0.0206474	0.0666667	0.1555556	34.911111	0.1777778
194	-2.043902	0	0	0.4776942	0.14686497	0.0979325	0.1388707	0	0	0.1666667	25.055556	0
195	7.4855515	0	0.0991402	0.1233772	0	0.3073871	0.0636183	0.0039761	0.0526316	0.2631579	36.578947	0
196	3.5261801	0	0	0.1606051	0.0852547	0.0521638	0.1334502	0	0.037037	1.1111111	29	0.037037
197	-4.328897	0	0.0044896	0	0	0.4130723	0.3958585	0	0	0	31.033333	0.0333333
198	-3.464881	0	0	0	0.05639246	0.4514471	0.1673109	0	0.0357143	0	1.6071429	0.0357143
199	13.596386	0.0901909	-0.182805	-0.171095	0.1407441	0	0.0488768	0.0039936	0.0227273	0	40.454545	0
200	1.5080764	0.1639045	0.1382532	0	0.09972949	0.2094811	0.0835529	0	0.1111111	0	135.55556	0.2222222
201	2.0757265	0.1001632	-0.01442	0.2975549	0.0910294	0	0.0907922	0	0	0	102.04762	0
202	-5.020049	0.1831836	0.0182723	-0.334009	0.00056777	0	0.1057079	0	0	0	72.529412	0.1
203	29.176747	-0.166138	0.2300679	-0.634024	0.08819714	0.0820232	0.0513002	0	0	0	30.666667	0
204	5.5044854	0.1988178	0.2464879	0	0.11133442	0.0617795	0.1220388	0.0316583	0	0.5102041	27.408163	0.1632653
205	-19.84903	0.2734673	0.2992136	0.3057243	0.11965282	0.3958944	0.0750529	0.0046456	0.0222222	0	32.466667	0.1333333
206	-11.4952	0.1346321	-0.053742	0.0671302	0.06476108	0.2420999	0.072015	0	0	3.25	320.75	0.25
207	-0.113047	0.146645	0.0431539	0.3580203	0.15302682	0	0.1684975	0	0	0	57.3	0
208	4.5672989	0.1089148	0	0	0.03304527	0.1069512	0.1544141	0	0	0	50.111111	0
209	-15.41059	-0.31517	0	-0.153113	0.03706062	0.4740072	0.2779456	0.0081123	0.1034483	0.1034483	40.793103	0.0689655
210	9.6044666	0.2279889	0	0	0.03997281	0.1982886	0.272214	0	0	0	50.395833	0.1041667
211	10.819998	0.1537727	0	-0.59827	0.16126013	0.0412548	0.2521513	0.0033996	0	0	85.453125	0
212	6.697519	-0.214642	0	0.0024239	0.05025755	0	0.0992154	0	0.0416667	0.0833333	20.333333	0.0208333
213	7.923626	0	0	0	0.05290139	0.0712836	0.0655645	0	0.015625	0	18.046875	0.015625
214	-3.738343	0	0	0.0006653	0.11025836	0.2746096	0.0647566	0.0129513	0	0.0204082	47.081633	0.0612245

215	-2.392225	0.6468966	0	0.5269442	0.07867861	0.086246	0.1692907	0	0.0192308	0	8.4615385	0.08
216	13.211337	0.0638495	0.1517265	0	0.03808396	0.1756768	0.0959841	0	0.1071429	0	54.285714	0.0714286
217	11.175899	-0.133196	-1.000602	-0.087323	0.07792044	0.2328431	0.2095998	0	0.0526316	0.1052632	49.947368	0
218	-25.31936	0	0.0494459	0	0.10742671	0.179129	0.0010563	0	0.75	0.5	0	0.25
219	-3.282883	0	0.2692219	0	0.10925915	0.0089037	0.0059355	0	0.4375	0.1875	0	0.125
220	13.136875	0	0	0	0.05402698	0.0532749	0	0.0027074	0.6428571	0	1.4285714	0
221	-29.55675	0.5568925	0	0	0.12193731	0.1175958	0.1219848	0	0.0833333	0	2.0833333	0
222	3.8798418	0.0901384	0	0	0.05425424	0.2173205	0.0095967	0.0058423	0.137931	0.2068966	7.2413793	0
223	13.770497	0.3375232	0	0	0.07941172	0.1539987	0.0025284	0.0042141	0.2	0.7	50.4	0.4
224	-0.12774	0.3548581	0.1210932	0	0.11551298	0	0.0275941	0.0077609	0.2777778	2.1666667	11.666667	0.0555556
225	2.12676	0	0	0.4066309	0.09638311	0.2069957	0	0	0.3125	0.0625	114.75	0

## R Syntax for PODES Data Transformation

```
getwd()
setwd("C:/Users/Sachnaz/Documents/R")
#install.packages("foreign")
library(foreign)

#citation
foreign:#####
# R Core Team (2016). foreign: Read Data Stored by Minitab, S,
SAS,#
# SPSS, Stata, Systat, Weka, dBase, .... R package version 0.8-67.
#
# https://CRAN.R-project.org/package=foreign
#
#####
podes05a = read.dbf("podes2005a-1100.dbf")
podes05b = read.dbf("podes2005b-1100.dbf")
podes05c = read.dbf("podes2005c-1100.dbf")
podes11d1 = read.dbf("podes2011-d1-1100.dbf")
podes11d2 = read.dbf("podes2011-d2-1100.dbf")
podes11d3 = read.dbf("podes2011-d3-1100.dbf")
mfd05 = read.dbf("mfd aceh 2005.dbf")
mfd11 = read.dbf("mfd aceh 2011.dbf")

##subset variable of interests from every data frame##

#####
#####PODES2005#####
#####

#from data frame podes05a:
#EXP, 101, 102,103,104,105,401a-e, 402, 403a, 404, 405, 501b1-2,
#507b1, 508b1, 509c3, 601ak-ik(2 dan 3), 602ak-ik(3), 603ak-kk(2),
604a1-d2, 605, 606

sub05a<-
podes05a[,c(1:11,22:28,30:31,37:38,56,62,95:96,99:100,103:104,107:10
8,
          111:112, 115:120,122,124,126,128, 130, 132,134,
136, 138:139, 143, 147,151, 155,
          159, 163, 167, 171, 175, 179, 183:188, 189:190)]

#from data frame podes05b:
#EXP, 101, 102,103,104,703a-f, 705a-e(3 dan 4), 707, 710, 901b1

sub05b<-podes05b[,c(1:5,8:13, 33:34, 36:37, 39:40, 42:43, 45:46, 54,
57, 84)]
```

```

#from data frame podes05c:
#EXP, 101, 102,103,104,10011,10021,10031, 1108a-h, 1112, 1119,
1120a, 1121

sub05c<-podes05c[,c(1:6,8,16, 39:46, 54, 61:62, 64)]

#Merge podes05 with all variable of interest:

datPODES05<- merge(sub05a, sub05b, by = c("EXP","R101B","R102B",
"R103B", "R104B"))
datPODES05<- merge(datPODES05, sub05c, by = c("EXP","R101B","R102B",
"R103B", "R104B"))

#simplified the number of variable (omit 101a,102a,103a, 104a, 105a)
#exclude variables R101A, R102A,R103A, R104A, R105A
variables <- names(datPODES05) %in% c("R101A", "R102A", "R103A",
"R104A", "R105A")
datPODES05 <- datPODES05[!variables]

#revise primary key of EXP to its corresponding District, Sub-
district, and Village name

#rename variable name of mfd05 (prop, kabu, keca, desa into
corresponding questionnaire variable)

for (i in 1:4) {
colnames(mfd05)[i] <- names((datPODES05)[i+1])
print(colnames(mfd05)[i])
}

#drop unnecessary variables in mfd05
variables <- names(mfd05) %in% c("KLAS", "PROP_OLD", "KABU_OLD",
"KECA_OLD", "DESA_OLD", "KLAS_OLD", "NAMA_OLD")
mfd05 <- mfd05[!variables]

#vlookup/ left outer join with mfd05 data frame
PODES05<-merge(x = datPODES05, y = mfd05, by = c("R101B","R102B",
"R103B", "R104B"), all.x = TRUE)

#re-order variable column
PODES05<-PODES05[,c(5, 1:4, 98, 6:97)]

#####
#####PODES2011#####
#####

```

```

#Variable of interest:
#kode dan nama prov, kab, kec, desa, 401a-e, 711, 712

#from data frame podes11d1:kode dan nama prov, kab, kec, desa, 401a-
e
sub11d1<-podes11d1[,c(1:8,31:35)]

#from data frame podes11d2:kode dan nama prov, kab, kec, desa, 711,
712
sub11d2<-podes11d2[,c(1:8,130:131)]

#Merge podes11 with all variable of interest:

datPODES11<- merge(sub11d1, sub11d2, by = c("KODE_PROV",
"NAMA_PROV", "KODE_KAB", "NAMA_KAB", "KODE_KEC", "NAMA_KEC",
"KODE_DESA", "NAMA_DESA" ))

##convert primary key in PODES05 to that associated id in 2011
#this is due to in 2011 there was dynamics in number of villages
available from profileration or
#changes in villages name
#furthermore, the conversion process is excercised using excel file

#retrived matched id;

id11<-read.csv("ID2011.csv")

#combine id in id11 to that in PODES05

POD05<-cbind(PODES05[,1:6], id11[,6:7],PODES05[,7:98])

#incorporate variables in podes11 into final podes data
#rename the variable names

)
colnames(datPODES11)[1] <- "R101B"
colnames(datPODES11)[3] <- "R102B"
colnames(datPODES11)[5] <- "R103B"
colnames(datPODES11)[7] <- "R104B"

#change class of the above-mentioned variables

POD11<-transform(datPODES11,
                 R101B = as.factor(R101B),
                 R102B = as.factor(R102B),
                 R103B = as.factor(R103B),
                 R104B = as.factor(R104B))

```

```

#add leading zero on R102B, R103B, and R104B
library(stringr)
POD11$R102B<- str_pad(POD11$R102B, width=2, side="left", pad="0")
POD11$R103B<- str_pad(POD11$R103B, width=3, side="left", pad="0")
POD11$R104B<- str_pad(POD11$R104B, width=3, side="left", pad="0")

#citation stringr:#####
# Hadley Wickham (2016). stringr: Simple, Consistent Wrappers for #
# Common String Operations. R package version 1.1.0. #
# https://CRAN.R-project.org/package=stringr #
#####

#concatenate strings of variable name R101B, R102B, R103B, R104B
into single id

POD11$ID2011<-apply(POD11,1 ,function(x) paste0(x[1], x[3], x[5],
x[7]))

# left outer join of POD05 with POD11
PODES0611<-merge(x = POD05, y = POD11, by = c("ID2011"), all.x =
TRUE)

#DF whose rows contained NA, dont forget to check the dimension
using function dim()
NA_PODES <- PODES0611[is.na(PODES0611$NAMA_DESA),]

#unavailable data PODES11 is only data for village; KEBUN SERE,
#DF whose rows contained no NA, dont forget to check the dimension
using function dim()
noNA_PODES<- subset(PODES0611, (!is.na(PODES0611[,108])) &
(!is.na(PODES0611[,109])))

#verify the NA data with village history data
#change name of .y column in noNA_PODESm
#x<- c(100, 101, 103, 105, 107, 109, 110, 111, 112, 113)

#for (i in x) {
#colnames(noNA_PODESm)[i] <- gsub(".y$", "", names((noNA_PODESm)[i]),
perl=T)
#print(colnames(noNA_PODESm)[i])
#}
#row-bind veriefied NA data with non-NA data
#PODESf<-rbind(noNA_PODESm, NA_PODESm)

write.csv(noNA_PODES, "PODESf.csv")

```

## R Syntax for PNPMP and PODES data merge

```
#suppose noNA_PODES data frame already available at R environment
```

```
names(noNA_PODES)
```

```
#extract the variables of interest
```

```
PODESf<-noNA_PODES[c(1, 101:108, 7:8, 9:100, 109:115)]
```

```
#Check number of villages belong to rural villages and urban villages
```

```
DESA05<-subset(PODESf, R105B == "2") #dim: 5521 desa
```

```
KOTA05<-subset(PODESf, R105B == "1") #dim: 445 desa
```

```
M05<-subset(PODESf, R105B == "M") #dim: 1 desa
```

```
#trim any unnecessary leading, between words, and trailing whitespaces in variables NAMA_KAB,
```

```
#NAMA_KEC, NAMA_DESA
```

```
PODESf$NAMA_KAB <- gsub("\\s+", " ",PODESf$NAMA_KAB)
```

```
PODESf$NAMA_KEC <- gsub("\\s+", " ",PODESf$NAMA_KEC)
```

```
PODESf$NAMA_DESA <- gsub("\\s+", " ",PODESf$NAMA_DESA)
```

```
#concatenate Kab, Kec, and Desa Name
```

```
PODESf$ID_DESA<- paste(PODESf$NAMA_KAB, PODESf$NAMA_KEC, PODESf$NAMA_DESA, sep = "_")
```

```
#import PNPMP Activity data
```

```
PNPMP<-read.csv("PNPMPactivity.csv")
```

```
#rename PNPMP primary key to ID_DESA
```

```
colnames(PNPMP)[1] <- "ID_DESA"
```

```
# left outer join of POD05 with POD11
```

```
PODPNPMP<-merge(x = PODESf, y = PNPMP, by = "ID_DESA", all.x = TRUE)
```

```
# left outer join of POD05 with POD11
```

```
PNPMPPOD<-merge(x = PNPMP, y = PODESf, by = "ID_DESA", all.x = TRUE)
```

```
NA_PNPMPPOD <- PNPMPPOD[is.na(PNPMPPOD["ID2011"]),]
```

```
dim(NA_PNPMPPOD)
```

```
new_DF <- DF[is.na(DF$Var),]
```

```
write.csv(PNPMPPOD, "PNPMPPOD.csv")
```

## R Syntax for Sub-District Aggregation

```
##### Data transformation for sub-district aggregation
#import data final podes
setwd("C:/Users/Sachnaz/Documents/R/AGG")
podes<-read.csv("PODESf2.csv")

#trim any unnecessary leading, between words, and trailing
whitespaces in variables NAMA_KAB,
#NAMA_KEC, NAMA_DESA
podes$NAMA_KAB <- gsub("\\s+"," ",podes$NAMA_KAB)
podes$NAMA_KEC <- gsub("\\s+"," ",podes$NAMA_KEC)
podes$NAMA_DESA <- gsub("\\s+"," ",podes$NAMA_DESA)

#concatenate Kab, and kec name

podes$ID_KEC<- paste(podes$NAMA_KAB, podes$NAMA_KEC, sep = "_")

#aggregate podes data by sub-district (ID_KEC) both with the
function SUM and MEAN
# re-arrange and isolate non numeric variables
# extract variables that classed as factor
is.fac<-sapply(podes, is.factor)
factor.podes<-podes[,is.fac]

# extract variables that classed as character
is.char<-sapply(podes, is.character)
char.podes<-podes[,is.char]

#re-arrange podes variable order

podes2<-
cbind(podes[,c(1:3,8:10,18,104,106,108,110,118)],podes[,c(4:7,11:17,
19:103,105,107,109,111:117)])

#aggregate the data frame
magg_podes<-aggregate(podes2[13:118], by=list(podes2$ID_KEC),
FUN=mean, na.rm=TRUE)
sagg_podes<-aggregate(podes2[13:118], by=list(podes2$ID_KEC),
FUN=sum, na.rm=TRUE)

#save file into working directory
write.csv(magg_podes, "magg_podes2.csv")
```

```

write.csv(sagg_podes, "sagg_podes2.csv")

#import data PNPM

pnpm<-read.csv("Data PNPM Perdesaan ACEH.csv")
list_keg<-read.csv("list kegiatan PNPM.csv")

#matched indicator_name in pnpm to category variables in list_keg
data frame
pnpm2<-merge(pnpm, list_keg, by="indicator_name", all.x = TRUE)

#trim any unnecessary leading, between words, and trailing
whitespaces in variables kab_name,
#kec_name, kel_name
pnpm2$kab_name <- gsub("\\s+", " ", pnpm2$kab_name)
pnpm2$kec_name <- gsub("\\s+", " ", pnpm2$kec_name)
pnpm2$kel_name <- gsub("\\s+", " ", pnpm2$kel_name)

#concatenate Kab, and kec name

pnpm2$ID_KEC<- paste(pnpm2$kab_name, pnpm2$kec_name, sep = "_")

#isolate NA rows data

NA_pnpm2 <- pnpm2[is.na(pnpm2$category),]

#extract full cases data
pnpm3<-subset(pnpm2, (!is.na(pnpm2[,12])))

#extract necessary column of pnpm2
pnpm4<-pnpm3[,c(2,14,9:10,12)]

#reshape from long format to wide format

library(reshape2)

pnpm4$value<-as.numeric(pnpm4$value)
pnpm5s<-dcast(pnpm4, ID_KEC ~ category + years, value.var='value',
fun.aggregate=sum, na.rm=TRUE)
pnpm5m<-dcast(pnpm4, ID_KEC ~ category + years, value.var='value',
fun.aggregate=mean, na.rm=TRUE)

write.csv(pnpm2, "pnpm2.csv")
write.csv(NA_pnpm2, "NA_pnpm2.csv")
write.csv(pnpm5s, "pnpm5s.csv")
write.csv(pnpm5m, "pnpm5m.csv")

```

```

#merge pnpm5 data frame and podes data frame

##sagg_podes with pnpm5s data frame
#> dim(pnpm5s)
#[1] 226 56
#> dim(sagg_podes)
#[1] 284 106

p_pod_s<-merge(pnpm5s, sagg_podes, by.x="ID_KEC" , by.y="Group.1",
all.x = TRUE)

NA_p_pod_s <- p_pod_s[is.na(p_pod_s$R101B.x),]

#rename misspelled sub-district
sagg_podes[36,1]<-"ACEH BESAR_LHONGA"
sagg_podes[79,1]<-"ACEH SINGKIL_SURO MAKMUR"
sagg_podes[211,1]<-"GAYO LUES_BLANG KEJEREN"
sagg_podes[215,1]<-"GAYO LUES_PINDING"
sagg_podes[218,1]<-"GAYO LUES_TERANGON"

p_pod_s<-merge(pnpm5s, sagg_podes, by.x="ID_KEC" , by.y="Group.1",
all.x = TRUE)

##magg_podes with pnpm5m data frame
#rename misspelled sub-district
magg_podes[36,1]<-"ACEH BESAR_LHONGA"
magg_podes[79,1]<-"ACEH SINGKIL_SURO MAKMUR"
magg_podes[211,1]<-"GAYO LUES_BLANG KEJEREN"
magg_podes[215,1]<-"GAYO LUES_PINDING"
magg_podes[218,1]<-"GAYO LUES_TERANGON"

p_pod_m<-merge(pnpm5m, magg_podes, by.x="ID_KEC" , by.y="Group.1",
all.x = TRUE)

#subset variable of interests

ppod<-
p_pod_m[,c(1,2,6,10,14,18,22,26,30,33,37,41,45,49,53,61:65,68:133,13
7:162)]

#replace NaN data to 0
is.nan.data.frame <- function(x)
do.call(cbind, lapply(x, is.nan))

ppod[is.nan(ppod)] <- 0

#rename title of variables

```

```

oldnames=c("AGRICULTURE_2007","AGRICULTURE_2011","ECONOMY_2007","ECO
NOMY_2011","EDUCATION_2007","EDUCATION_2011","ENERGY_2007","ENERGY_2
011","ENVIRONMENT_2007","ENVIRONMENT_2011","HEALTH_2007","HEALTH_201
1","TRANSPORTATION_2007","TRANSPORTATION_2011","R401A.x","R401B.x","
R401C.x","R401D.x","R401E.x","R405","R501B1","R501B2","R507B1","R508
B1","R509C3","R601AK2","R601AK3","R601BK2","R601BK3","R601CK2","R601
CK3","R601DK2","R601DK3","R601EK2","R601EK3","R601FK2","R601FK3","R6
01GK2","R601GK3","R601HK3","R601IK3","R602AK3","R602BK3","R602CK3","
R602DK3","R602EK3","R602FK3","R602GK3","R602HK3","R602IK3","R603AK2"
,"R603BK2","R603CK2","R603DK2","R603EK2","R603FK2","R603GK2","R603HK
2","R603IK2","R603JK2","R603KK2","R604A1","R604A2","R604B","R604C","
R604D1","R604D2","R605","R606","R703A","R703B","R703C","R703D","R703
E","R703F","R705AK3","R705AK4","R705BK3","R705BK4","R705CK3","R705CK
4","R705DK3","R705DK4","R705EK3","R705EK4","R10011","R10021","R10031
","R1108A","R1108B","R1108C","R1108D","R1108E","R1108F","R1108G","R1
108H","R1112","R1119","R1120A","R1121","R401A.y","R401B.y","R401C.y"
,"R401D.y","R401E.y","R711","R712")
newnames=c("AGR07","AGR11","FIN07","FIN11","EDU07","EDU11","ENE07","
ENE11","ENV07","ENV11","HEA07","HEA11","TRS07","TRS11","TOM06","TOW0
6","TOHH06","PCHHAgr06","TOHHpPR06","TOPea06","TOHHELCTs06","TOHHEL
CTns06","TOHHRiv06","TOHHPInt06","TOHHSlu06","KG_s06","KG_p06","ES_s
06","ES_p06","JH_s06","JH_p06","SH_s06","SH_p06","VS_s06","VS_p06","
AC_s06","AC_p06","SD_s06","SD_p06","IBS_p06","SS_p06","IN_LING06","I
N_ACC06","IN_COM06","IN_CUL06","IN_FAS06","IN_BEA06","IN_MEC06","IN_
ELE06","IN_OTH06","HOS06","MATHOS06","POLI06","HEACEN06","SHEACEN06"
,"PPRAC06","MIDWP06","HEAPO06","VMATCL06","PHAR06","TRDSTOR06","MDR0
6","FMDR06","MAST06","MDW06","TTM06","NTTM06","TOHHI06","TOP06","MO0
6","SM06","CC06","CTC06","TM06","VI06","DCB06","DFB06","DCM06","DFM0
6","DCR06","DCF06","DCP06","DFP06","DCD06","DFD06","VLARE06","RFA06"
,"NRFA06","LH06","WH06","MTH06","WEAH06","POT06","CLOH06","FOH06","O
TH06","MNOB06","CBANK06","RBANK06","COOP06","TOM11","TOW11","TOHH11"
,"TOHHAgr11","TOHHPea11","TOHHI11","TOP11")
for(i in 1:107)names(ppod)[names(ppod)==oldnames[i]]=newnames[i]

```

## R Syntax for Basic Summary, Matrix Correlation, and Factor Analysis

```
setwd("C:/Users/Sachnaz/Documents/R/AGG")
dataf<-read.csv("datafin.csv")
attach(dataf)

#BASIC SUMMARY
library(psych)
describe(dataf2)

#CORRELATION MATRIX
lcorr<-lowerCor(dataf2)

#SUBSET VARIABLE OF INTEREST ACCORDING TO HYPOTHESES AND CORRELATION
MATRIX

dataf3<-cbind(dataf2[1:7], dataf2[9:14], dataf2[18:20])

#UNROTATED PCA
fit <- princomp(dataf3, cor=TRUE)
summary(fit) # print variance accounted for
loadings(fit) # pc loadings
plot(fit,type="lines") # scree plot
fit$scores # the principal components
biplot(fit)

# VARIMAX ROTATED PRINCIPAL COMPONENT
library(psych)
fitp <- principal(dataf3, nfactors=4, rotate="varimax") #retaining 4
component
fitp # print results

# DETERMINE NUMBER OF FACTORS TO EXTRACT
#install.packages("nFactors")
library(nFactors)
ev <- eigen(cor(dataf3)) # get eigenvalues
ap <- parallel(subject=nrow(dataf3),var=ncol(dataf3),
  rep=100,cent=.05)
nS <- nScree(x=ev$values, aparallel=ap$eigen$evpea)
plotnScree(nS)
```

## R Syntax for Boxplot and Histogram

```
sd<-stack(dataf3)
```

```
#BOXPLOT
```

```
library(ggplot2)
bxpltdat<- ggplot(sd, aes(x = ind, y = values, fill=ind)) +
  geom_boxplot()+ facet_wrap(~ind, scale="free")
bxpltdat
```

```
#HISTOGRAM
```

```
library(reshape2)
```

```
library(ggplot2)
ggplot(data = melt(dataf3), mapping = aes(x = value)) +
  geom_histogram(bins = 10) + facet_wrap(~variable, scales =
'free_x').
```

## R Syntax for Structure Equation Model

```
getwd()
setwd("C:/Users/Sachnaz/Documents/R/REV")
dataf2<-read.csv("datafin2.csv")
```

```
library(lavaan)
```

```
model5 <- 'F1 =~ D_HEAPC_M + D_EDUPC_M + D_AGRPC_M + D_FINPC_M
          F2 =~ PCPTD06 + PCPea06 + IN_SCHPC06
          D_PCPO ~ F1 + F2
          D_EDUPC_M ~ FORMSp06
          D_HEAPC_M ~ DEATH06
          D_AGRPC_M ~ RFA106
          D_FINPC_M ~ COOP06
          F1 ~~ F2
          '
```

```
fit15 <- sem(model5, data=dataf2, std.lv=TRUE)
summary(fit15, fit.measures = TRUE)
parameterEstimates(fit15)
fitMeasures(fit15)
varTable(fit15)
```

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