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Short-term poverty dynamics of rural households: Evidence from Central Sulawesi, Indonesia

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Abstract

The understanding of poverty dynamics is crucial for the design of appropriate poverty reduction strategies. Taking the case of Central Sulawesi, we investigate the determinants of both chronic and transitory poverty using data from 264 randomly selected households interviewed in 2005 and 2007. Regarding the US 1$/day poverty line, the headcount index declined from 19.3 % in 2005 to 18.2 % in 2007. However, we observed an increasing number of people living on less than US 2$/day expressed in purchasing power parity (PPP). The results of the estimated multinomial logit model applied in this study indicate that a lack of non-agricultural employment opportunities and low endowment of social capital are major determinants of chronic as well as transitory poverty in this province of Indonesia. These results are used to draw policy conclusions with respect to the alleviation of transitory and chronic poverty in Central Sulawesi.

Keywords: poverty dynamics, spells approach, multinomial logit model, Indonesia

1 Introduction

Poverty reduction is a main goal of development policies, programmes and projects (e.g. United Nations, 2009). To achieve this target it is important to not only identify the poor but also determine whether the poverty is chronic or transitory, as the appropriate poverty reduction strategies will differ (Jalan & Ravaillion, 2000; Hulme & Shepherd, 2003; McKay & Lawson, 2003). This important temporal component of poverty was described as a dynamic of poverty by Baulch & Hoddinott (2000).

To characterise the situation regarding poverty development in Indonesia during the last 15 years, it has to be mentioned that in mid-1997, Indonesia – like other Asian countries – faced a severe financial crisis which led to economic distortions. Within this crisis, the national headcount poverty rate increased quickly from 15.6 % in 1996 to 27.4 % in 1999 (Suryahadi & Sumarto, 2003). However, Suryahadi & Sumarto (2003) stated that the total number of households who changed their poverty status in Indonesia during this crisis was even higher than the changes in the Indonesian poverty rate. After the crisis, poverty decreased in Indonesia when the economic situation stabilised. Therefore, many households in Indonesia only faced short-term poverty during the crisis. Thus, poverty in Indonesia appears to be a ‘fluid condition’, due to transitions into and out of poverty (Widyanti *et al.*, 2001; Dhani & Islam, 2002). The 1997 economic crisis drew attention back to the issue of poverty reduction in Indonesia (Sumarto *et al.*, 2004). However, after poverty rates in Indonesia came down to the pre-economic crisis level in 2005, the situation worsened again after 2006 due to rising food prices (World Bank, 2008). Therefore, even when the overall economic situation stabilises, poverty in Indonesia is still prone to fluctuations.

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For Indonesia, the studies of SMERU research institute on poverty dynamics (for example Suryahadi & Sumarto, 2001; Widyanti *et al.*, 2001) used SUSENAS cross-sectional household surveys for their analysis. Sumarto *et al.* (2005) used the so-called '100 Village Survey' to analyse the impact of social safety net programmes on household welfare and poverty dynamics in 1998. Alisjahbana & Yusuf (2003) used panel data of the Indonesian Family Life Survey (IFLS) from 1993 and 1997. However, the IFLS data were pre-crisis data and therefore drawing relevant policy implications from their analysis is difficult. Also, a survey by Fields *et al.* (2003) used the IFLS data sets to analyse household income dynamics in Indonesia as part of a cross-country comparison. A more recent attempt to analyse poverty dynamics in Indonesia was undertaken by Widyanti *et al.* (2009). They used the IFLS data from 1993, 1997 and 2000. These data sets were also used in the empirical analysis of 'pathways out of poverty' by McCulloch *et al.* (2007) and Weisbrod (2008). Using our own panel data from 2005 and 2007, our study adds the most recent panel to the analysis of poverty dynamics in Indonesia.

This study aims to contribute substantially to an understanding of determinates of poverty mobility in the Indonesian context, providing an in-depth analysis of a small yet exemplary 'rural-in-an-urbanising-world' region using recent panel data. Specifically, it addresses the following questions:

(1) How has the poverty situation in the vicinity of the Lore Lindu National Park changed between 2005 and 2007?

(2) How dynamic is poverty in this research area?

(3) What are the determinants of chronic and transient poverty?

The paper is organised as follows: Section 2 describes the data collection as well as the research area in Central Sulawesi. Section 3 presents the methods used for these data analyses and Section 4 summarises the results. Finally, Section 5 adds a discussion and provides conclusions.

2 Materials and methods

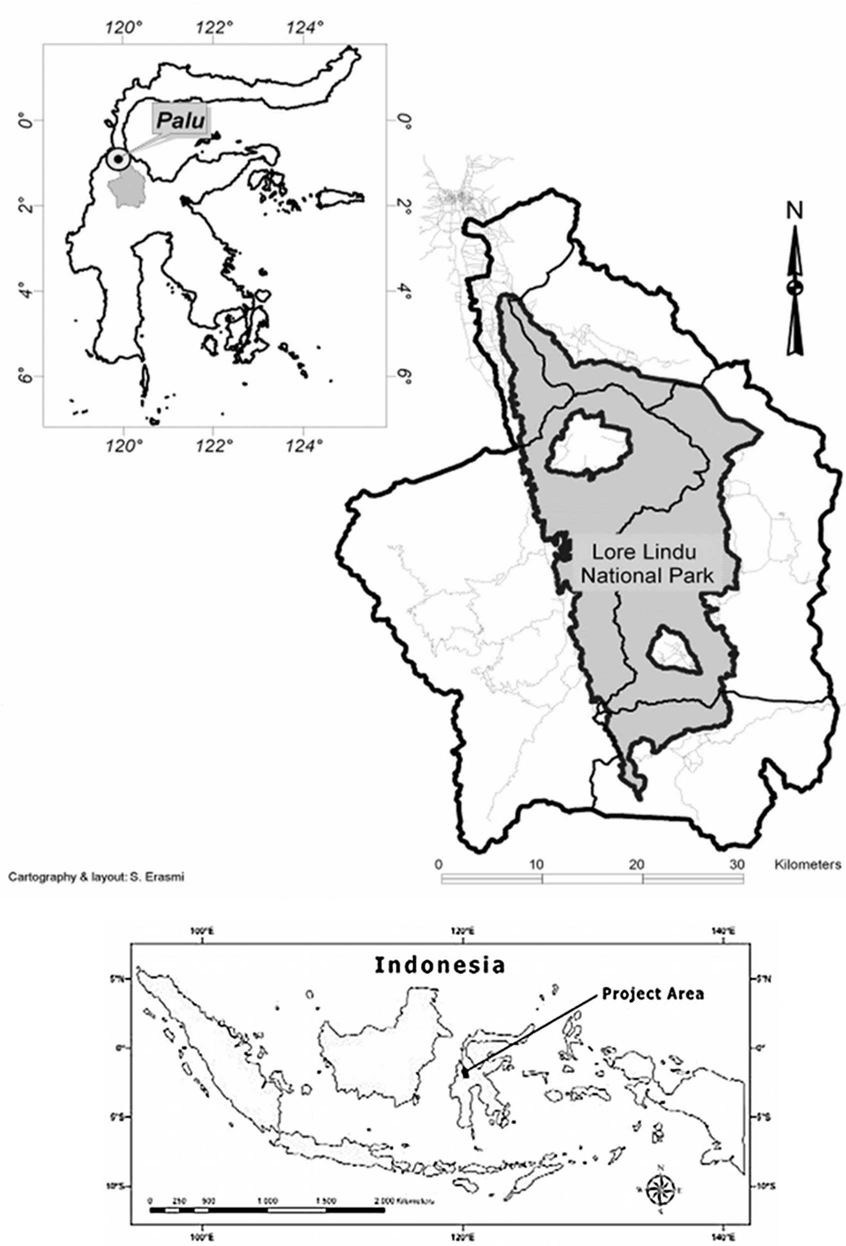
2.1 Sampling method and data collection

The data were collected in 13 villages in the vicinity of the Lore Lindu National Park in rural Central Sulawesi, Indonesia. For the selection of the villages and the households, a stratified random sampling method was chosen (for a description of the sampling procedure, see Zeller *et al.*, 2002). Because the stratified random sampling was applied, we included weights in the data analysis as far as the statistical software packages (SPSS, Stata) supporting them. Household data of the same 264 randomly selected households from two expenditure surveys (2005 and 2007) were used. Furthermore, we conducted both surveys at the same time of the year to reduce the influence of the seasonal dynamic on transient poverty.

Like other panel studies, our sample had to face dropouts of respondents, therefore, threatening the validity of the results by attrition biases. Attrition can be caused by households who move away or by households who refuse to participate in a second survey round. The rate of attrition matters for analytical purposes because the households that remain in the panel are liable to be systematically different from those that dropped out and therefore bias the results (McKay & Lawson, 2003). In our case, the attrition rate was comparatively low: from 279 households in 2005 to 264 households in 2007 (5.4 %). For the 15 households that dropped out between 2005 and 2007, we found that the differences between the expenditures of this group and of those who remained in the sample were very low, i.e. the expenditures of both groups were allocated across the entire range of the 2005 expenditures. Thus, a distortion of the results by attrition bias is negligible to nonexistent.

Two types of questionnaires were used in both surveys. On the one hand, we used a benchmark questionnaire to obtain the daily per capita consumption expenditures of each household. This part resembled the consumption module of the *Living Standard Measurement Survey* (LSMS) of the World Bank and essentially had the same purpose of collecting descriptive information about poverty and monitoring it over time (Grosh & Glewwe, 2000). With LSMS, only monetary poverty is measured, which is defined as a shortfall of consumption/income from a poverty line. The underlying assumption is that "uniform monetary metrics account for all heterogeneity across individuals and their situations" (Ruggeri Laderchi *et al.*, 2003). It is argued that welfare can be measured as total consumption enjoyed if utility maximising behaviour is assumed. However, this widely-used approach is criticised as it does not account for the multidimensionality of poverty (Sen, 1999).

To account for the multidimensionality of poverty, we also used a composite questionnaire to derive indicators of poverty in dimensions other than expenditures such as health, education, housing or assets.



Source: Erasmi *et al.* (2004) / STORMA project

Fig. 1: *Research area*

2.2 Research area

The research area is located in the vicinity of the Lore Lindu National Park in Central Sulawesi, a province of Indonesia (Figure 1).

The research area in Central Sulawesi covers about 7100 km^2 and is inhabited by 132,000 people (Maertens *et al.*, 2002). Most households are farm households and most of the household heads are self-employed in agriculture. The percentage of household heads working as agricultural wage labourers is very low and it dropped even more during our two study periods: from 7.6 percent in 2005 to 3.8 percent in 2007. Accordingly, the percentage of household heads working in the non-agricultural sector increased slightly from 8.3 percent in 2005 to 12.9 percent in 2007. The average area possessed by each household slightly increased from 2 hectares in 2005 to 2.2 hectares in 2007. The households who remain agrarian predominately grow paddy, cocoa, coconuts and vegetables, and some households also own livestock. While the percentage of households owning big animals such as bulls, cows or pigs went down from 2005 to 2007 (e.g. cow ownership from 14.8 percent to 10.2 percent), the percentage of households owning small animals such as chickens increased from 45.1 percent in 2005 to 56.4 percent in 2007. As to the demographic situation, most of the households during both study years were male-headed. The percentage of female-headed households slightly increased from 7.6 percent in 2005 to 10.6 percent in 2007. About 20 percent of the households in our sample were migrants.

3 Methods for data analysis

3.1 Poverty measures

We calculated the Foster-Greer-Thorbecke (FGT) poverty measures – the poverty headcount, poverty gap and the poverty severity – as well as the Sen and Sen-Shorrocks-Thon Index to draw a broad picture of the poverty situation in the region in both years. More information on these measures can be found in Sen (1976), Foster *et al.* (1984), Ravallion (1992), Shorrocks (1995), Ebert & Moyes (2000); Xu & Osberg (2001), Aguirregabiria (2006), and Haughton & Khandker (2009).

The *headcount index* P_0 is the most widely-used poverty measure. However, it only accounts for the proportion of a population that is regarded as poor. It does not tell anything about the severity of poverty or the distribution of poverty among the poor. P_0 is given as

$$P_0 = \frac{N_P}{N} \tag{1}$$

where N_P is the number of poor in a population N, i.e. the proportion of poor of the total population. The *poverty gap* P_1 assesses the depth of poverty. P_1 is seen by some as the minimum cost for poverty elimination by showing how much transfer to the poor would be necessary to lift their incomes/expenditures up to the poverty line (assuming perfect targeting). For the mean proportionate poverty gap across the entire population, with zero gap for the non-poor, P_1 is given as

$$P_1 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z-y_1}{z}\right] \tag{2}$$

where z is the poverty line and y is the consumption of the poor, arranged in ascending order. The *poverty severity* is a weighted sum of poverty gaps, i.e. the mean squared proportionate poverty gap. With the poverty severity (P_2), conclusions about the distribution of poverty among the poor (whether it is equally distributed or not) can be made. P_2 is given as

$$P_2 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z-y_1}{z}\right]^2 \tag{3}$$

The *Sen Index* integrates the number of poor, the depth of their poverty and the distribution of poverty among the poor. In contrast to the FGT poverty measures, the Sen Index is not decomposable to different subgroups. P_S is given as

$$P_S = P_0\left(1-(1-G^p)\frac{\mu^p}{z}\right) \tag{4}$$

where P_0 is the headcount, μ^p is the mean income/expenditure of the poor and G^p is the Gini-coefficient among the poor (a measure of the income [in our case expenditure] distribution ranging between 0 and 1).

The *Sen-Shorrocks-Thon* Index (SST) is a modified version of the Sen Index, normalized to take values between zero and one. A value equal to zero indicates that all incomes are above the poverty line, while a unit value of one indicates the extreme case where all the individuals are poor with an income of zero. P_{SST} is given as

$$P_{SST} = P_0\, P_1^P(1+\hat{G}^P) \tag{5}$$

where P_0 is the headcount, P_1^P is the poverty gap ratio among the poor, and $\hat{G}^P$ is the Gini coefficient of the poverty gaps of all households.

It is possible to decompose the SST index into a form providing information on the sources of changes of poverty over time. This is given as

$$\Delta\ln P_{SST} = \Delta\ln P_0 + \Delta\ln P_1^P + \Delta\ln\hat{G}^P \tag{6}$$

where the differences of the natural logarithms of the single components are summed.

3.2 Does the setting of poverty lines matter?

Where the poverty line is set can matter a great deal for policy decisions (Ravallion, 1998). A poverty line set at a low income or expenditure level might lead to different findings than a poverty line set at a higher level. Therefore, varying the poverty line can be used to examine the sensitivity of the poverty rates to different poverty lines (Haughton & Khandker, 2009). Testing for stochastic dominance of any order, i.e. testing whether one distribution is dominating another over time or space is a further step in this analysis. It can be determined whether poverty is greater in one distribution or another for general classes of indices and for ranges of poverty lines (Davidson & Duclos, 2000; Chakravarty, 2009).

With these considerations in mind, we conducted first and second order stochastic dominance tests to assess the influence of different poverty lines. Formally, in testing for first order stochastic dominance an income/expenditure distribution, y_1 is compared with another income/expenditure distribution, y_2. First order stochastic dominance of y_1 is given when the cumulative distribution of y_1 lies nowhere above and somewhere below the cumulative distribution function of y_2. To do so, the headcount poverty rate on the y-axis is plotted against consumption expenditures ranging from 0 to any maximum on the x-axis. The ratio curve derived is a cumulative distribution function and is called a *poverty incidence curve*. If none of the poverty deficit curves dominates the other, one might check for second order stochastic dominance by calculating the area under the poverty incidence curve, i.e. under each point, and plotting this against the poverty line. Doing so, a *poverty deficit curve* is derived. Consequently, the poverty deficit curve can be drawn by displaying the total values of poverty gaps on the y-axis and the consumption expenditures on the x-axis. If the sum of the total poverty gaps – the poverty deficit – is nowhere above and somewhere below the other, we find second order stochastic dominance (Haughton & Khandker, 2009). With this analysis, one is able to say whether poverty has risen or fallen over time no matter which poverty line is applied.

3.3 Poverty mobility: the chronically, the transient and the never poor

To display the movement into and out of poverty, we created a transition matrix including both international poverty lines (US 1 and 2 $/day). The more consistent over time the income/expenditure estimates given by a household just above and just below the poverty line in the first panel year, the more robust the conclusions can be interpreted regarding poverty mobility drawn from a poverty mobility or transition matrix (Scott, 2000).

Furthermore, we identified how many households are chronically poor, transitory poor, or never poor. The most important issue about chronic poverty is its extended duration, as the extent of duration tends to correlate with the difficulty to eradicate (McKay & Lawson, 2003).

Using the spells approach, which regards the number of years of poverty experienced, the poor are characterised as either chronically poor, i.e. those who remained (very) poor in both years of the panel or transitory poor, i.e. those who were poor in either one of the survey years (McKay & Lawson, 2003). Dercon & Shapiro (2007) describe the same idea as poverty persistence, i.e. the proportion of the households that is always, sometimes, or never poor across the survey waves. Thus, the spells approach focuses on the transition into and out of poverty. With this approach, it is likely to overestimate the transient poor due to a measurement error (Hulme & Shepherd, 2003).

3.4 Measurement error

As Baulch & Hoddinott (2000) point out, it is crucial that studies on poverty dynamics account for possibilities of measurement error. This is particularly important as the results for poverty categories can be biased, especially in a short-term analysis. It might seem that households move into and out of poverty even if their poverty status actually remains the same. This is especially true for those households with expenditures close to the poverty line. Thus, it is clear that the measurement error in the income (expenditure) variable might affect the extent of mobility. How either side of the equation actually affects mobility is less clear: on the one hand, the measurement error will depend on the accuracy with which a household reports its income/expenditures over time. On the other hand, its accuracy also depends on how the measurement error varies among households with different income/consumption levels at any point in time (Scott, 2000). Nevertheless, due to measurement error in the income/expenditure welfare measure, it is likely that the degree of poverty mobility is overstated (Dercon & Shapiro, 2007).

In our analysis, we refer to the approach of Alderman & Garcia (1993) to treat the measurement error. They conducted a theoretical analysis on the extent of measurement error and regressed the changes in assets (which can be assumed to be well measured) on the changes in expenditures. With their method they tried to quantify the amount of the variance due to measurement error. From this, Baulch & Hoddinott (2000) concluded that “if the measured changes in incomes were nothing more than the measurement error, then there should be no relation between asset changes and income changes” (p. 8). Keeping this interpretation in mind, our results suggest that there was true variance between our observations in 2005 and 2007, as the change in household size, the change in the value of transportation assets owned, and the change in the size of irrigated rice fields owned were significant in a first difference regression on the change in the daily per capita expenditures. Based on this analysis, we conclude that the observed changes in the daily per capita expenditures are related to true changes and not due to measurement error.

3.5 Regression analysis

Poverty dynamics are often modelled by assessing the risk of a household or an individual to remain poor for a given period of time (Justino & Lichtfield, 2003). However, given that we only have two time periods available, we believe our data are best suited to answering the question of which factors determine chronic and transient poverty. The categories 'chronic' and 'transitory' indicate a certain status of poverty, but not the expenditures themselves. As the literature attests, poverty outcome can take three distinct values: chronic poor, transient poor, and never poor (McKay & Lawson, 2003; Baulch & Hoddinott, 2000) Therefore, it is advisable to use a discrete choice model. The main criticism of using qualitative discrete variables (as the poverty status) instead of quantitative continuous variables (as expenditures) is that information gets lost (Deaton, 1997).

Notwithstanding the possibility of using ordered logit or probit models, we choose a multinomial logit model (MNL). In general, MNLs are used to model processes that involve a single 'decision' among several alternatives that cannot be ordered (Justino & Lichtfield, 2003). Although there is, strictly speaking, no choice between the movements into and out of poverty, several alternatives can be differentiated regarding the poverty status. Thus, we applied MNL because "although poverty status is based on an underlying welfare measure (per capita expenditure) defined on an interval scale, it is not always appropriate to assume that chronic poverty represents a higher level of deprivation than transient poverty, as would be implied by treating it as an ordinal variable" (Bhatta & Sharma, 2006). It is hence reasonable to treat the poverty status as a nominal variable and to use a multinomial logit model to trace factors influencing the movement into and out of poverty.

Since we are interested in which initial household characteristics affect the evolution of the poverty status over time, the values of the independent variables are those from the initial year 2005.

In the model, P_{ij} is the probability that a household i is in poverty status j. It is modelled as a function of the independent variables x_i :

$$P_{ij} = \frac{e^{x_i' \beta_j}}{1 + \sum_{k=1}^{2} e^{x_i' \beta_k}} \quad \text{for } j = 0, 1, 2\,, \tag{7}$$

where β_j is a vector of the coefficients, β_0 is set to zero, and j can take the values 0 (non-poor), 1 (transient poor) and 2 (chronically poor). The non-poor category ($j = 0$) serves as base category for the regression.

We conducted this analysis regarding both international poverty lines of US 1 \$/day (Model 1) and US 2 \$/day (Model 2). We chose the category never (very) poor as the base outcome because we are interested in the factors which influence a deviation from this status (into chronic or transitory poverty). The estimated sets of coefficients represent the effect of the explanatory variables on chronic and transitory poverty relative to the base outcome.

Instead of displaying the regression coefficients, the relative risk ratio (RRR), i.e. the exponentiated coefficients, is denoted.
Suppose

$$P(y_i = j) = p_{ij} \tag{8}$$

where P is the probability that a household i is in a poverty status j.

As everything in a multinomial logit is stated relative to a base category (here 0),

$$\frac{p_{ij}}{p_{i0}} = \exp\left(x_{ij}\,\beta_j\right) \tag{9}$$

where p_{i0} is the probability of $j = 0$ (in our case never poor), which is the 'relative risk' to the base category. The exponentiated coefficient in multinomial logit is the ratio of two relative risks (the one given $x_{ij} + 1$ to the one given x_{ij}).

$$\frac{p'_{ij}}{p'_{i0}} = \exp\left((x_{ij} + 1)\beta_j\right)\text{, such that} \tag{10}$$

$$\exp\left(\beta_j\right) = \frac{p'_{ij}\,/\,p'_{i0}}{p_{ij}\,/\,p_{i0}} \tag{11}$$

is the relative risk ration (RRR).

This relative risk ratio tells us how the probability of choosing j relative to 0 changes if we increase x by one unit (Gutierrez, 2005; Boockmann, 2009).

In our context, RRR shows how the probability of being transient or chronic (very) poor relative to being never poor changes if the explanatory variable increases by one unit. If the RRR is greater than 1, the probability of becoming transient or chronic poor increases. If RRR is less than 1, it decreases.

Applying MNL, the assumption of the independence of irrelevant alternatives (IIA), i.e. that the inclusion or exclusion of categories does not affect the probabilities associated with the regressors in the remaining categories, has to be satisfied. To test whether this assumption is valid for our data, we applied the *suest* (seemingly unrelated estimations) command of the Stata 10 statistical software package. Doing so, the IIA was found to be satisfied, i.e. no significant differences in the coefficients were observed.

3.6 Selection of explanatory variables

The explanatory variables were selected according to the ‘sustainable livelihoods’ framework. The sustainable livelihoods framework shows linkages, interactions and feedbacks between transforming institutional structures and processes to household vulnerability, as well as the influence of these transformations on livelihood strategies, and thus livelihood outcomes. These livelihood outcomes impact the asset endowment of a household (Carney, 2003).

For a comprehensive analysis of poverty dynamics, it is important to understand the asset endowment of the households or, as Ashley & Carney (1999) put it, one needs to know how poor people construct their lives.

These assets can be categorised respective the livelihood pentagons described in Adato & Meinzen-Dick (2002):

Natural Capital: land water, forests/marine resources, air quality, erosion, protection, biodiversity

Physical Capital: transportation, roads, buildings, shelter, water supply, sanitation, technologies, communications

Financial Capital: savings, credits, inflows

Human Capital: education, skills, knowledge, health, nutrition, labour power

Social Capital: trust-increasing networks, ability to work together, access to opportunities, informal safety nets, membership in organisations.

Commonly, the sustainable livelihoods framework is used by several organisations to analyse the causes of poverty (Adato & Meinzen-Dick, 2002). In our work, we want to use its core – the livelihood assets – to analyse the determinants of poverty mobility.

Our conceptual framework is constructed as follows: All households analysed live around the Lore Lindu National Park, they face similar environmental and political conditions. However, their endowment with livelihood assets, i.e. human, social, physical, and financial capital, might be very different. This asset endowment is the basis for the income a household earns and can further influence its vulnerability to shocks. Both low incomes/expenditures and the vulnerability to shocks influence poverty mobility (Figure 2).

From the composite questionnaire, we included those variables in the analysis which fit into the framework. These variables served as independent variables which might help to explain the determinants of poverty mobility. It is, however, sometimes difficult to differentiate between the causes of poverty and its outcomes. To avoid endogeneity which might occur when the actual outcome of variables is highly influenced by the household’s decision-making in the past, we use lagged variables to assess the causes of poverty dynamics. With lagged variables, one ensures that the right hand side variables are prior time to the left hand side variable (Deaton, 1997). In our estimation strategy we therefore avoid the problem of reverse causality by including only independent variables that were measured in 2005.

To control for the influence of covariate shocks as well as for the influence of agro-ecological differences, we included regional dummies in our analysis (see Alderman & Garcia, 1993).

4 Results

4.1 Changes in poverty between 2005 and 2007

The choice of poverty measures and poverty lines is always somewhat arbitrary (Haughton & Khandker, 2009). Therefore, we present five different poverty measures for both survey years. These measures and indices are displayed for the national poverty line and for the international poverty lines of US 1 and 2 $/day PPP (Table 1). Any differences in the means of the FGT poverty measures between both years were tested using a paired t-test.

The headcount poverty rate using the US 1$/day poverty line slightly decreased from 2005 to 2007 (Table 1). The depth of poverty and the inequality among the very poor increased slightly in 2007. The values of the integrated indexes also increased. To summarise, severe poverty hardly declined within these two years, but the situation of the very poor worsened slightly.

Regarding the national poverty line for rural areas, the situation is different: The headcount index increased by 2.7 percentage points, and the poverty gap and the poverty severity also slightly increased (Table 1). However, these changes are statistically insignificant. In addition, both of the integrated indexes, the Sen and SST index, increased. With regard to the Indonesian national poverty line, the Human Development Report of 2010 lists a poverty headcount of 16.7 percent for the period between 2000 and 2008 (UNDP, 2010).

We observe the most tremendous change when looking at the households below the US 2$/day poverty line

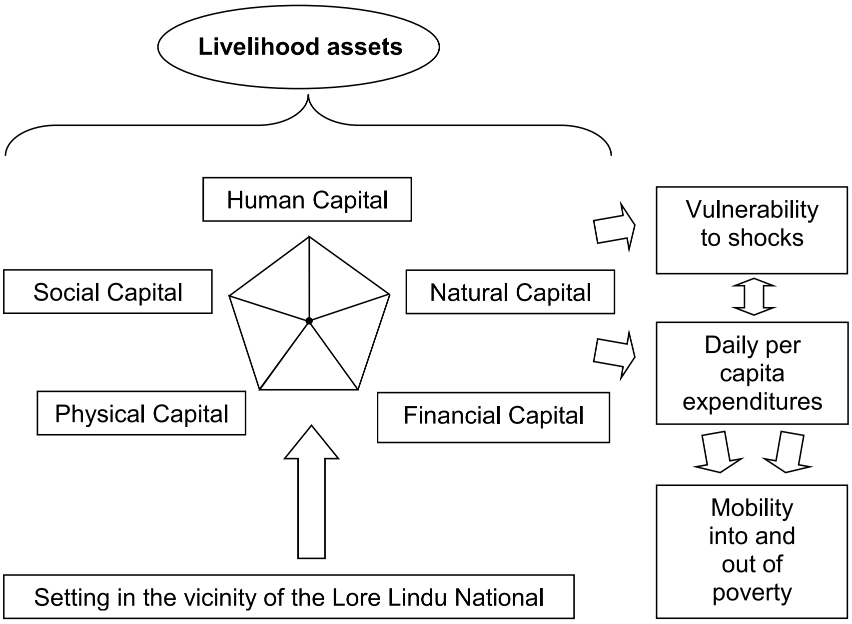


Fig. 2: *Conceptual framework for the selection of independent variables*

Table 1: *Different poverty measures for three poverty lines from 2005 and 2007, N = 264, SST = Sen-Shorocks-Thon*

Poverty measure/indices	*International poverty line of US 1 $/day in PPP*		*Indonesian national poverty line for rural areas*		*International poverty line of US 2 $/day in PPP*	
	2005	*2007*	*2005*	*2007*	*2005*	*2007*
Headcount Index (P0) in %	19.3	18.2	34.9	37.5	47	59.1
Poverty Gap (P1) in %	4.1	4.3	11.1	11.9	19.6	22.4
Poverty Severity (P2)*100	1.3	1.5	4.7	4.9	10	11
Sen Index *100	5.6	5.9	14.7	15.6	24.9	29.4
SST[I] Index *100	7.7	8.1	19.6	20.7	32.5	35.7

in both years. The increase in the headcount poverty rate was quite large. Between 2005 and 2007, the poverty incidence grew significantly by 12.1 percentage points (Table 1). Furthermore, the depth of poverty became larger; the poverty gap increased by 2.5 percentage points ($p < 0.05$). Additionally, income became less equally-distributed within the group of the poor; the poverty severity grew by 1 percentage points. This observed increase in poverty follows the earlier mentioned findings from the World Bank (2008). It could be that the increase in prices of certain commodities affected the poor more than the very poor due to the type of commodity.

For both international poverty lines, we analysed the different sources of poverty changes over time using the decomposed SST index. The decomposed form of the SST index can provide evidence on which factor – poverty incidence, poverty severity or inequality among the poor – was most influential for the changes in poverty (Haughton & Khandker, 2009). In the decomposition matrix, the values of the components included in the SST index as well as the difference of the natural logarithm of these components are displayed.

Regarding the US 1$/day poverty line, the natural logarithm of the poverty gap among the poor (ΔP_1^p) increased (Table 2). Therefore, more money would have to be transferred to the very poor to lift them up to a consumption level equal to this poverty line. The inequality among the very poor, here measured by the Gini coefficient among the poverty gaps ($\hat{G}^p$), increased only a little.

Table 2: *Decomposition of SST Index, US 1$/day poverty line as reference.*

	SST	P_0	P_1^P	$1+\hat{G}^p$	$\Delta \ln SST$	$\Delta \ln P_0$	$\Delta \ln P_1^P$	$\Delta \ln(1+\hat{G}^p)$
2005	0.077	0.193	0.211	1.881				
2007	0.081	0.182	0.236	1.888	0.05	–0.06	0.11	0.004

N = 264, SST: Sen-Shorocks-Thon Index, P_0: Headcount Index, P_1^P: Poverty gap ratio among the poor, $\hat{G}^p$: Gini coefficient among the poor, Δ ln: difference of natural logarithm of the respective parameter (2005/2007)

Table 3: *Decomposition of SST Index, US 2$/day poverty line as reference.*

	SST	P_0	P_1^P	$1+\hat{G}^p$	$\Delta \ln SST$	$\Delta \ln P_0$	$\Delta \ln P_1^P$	$\Delta \ln(1+\hat{G}^p)$
2005	0.325	0.47	0.418	1.656				
2007	0.357	0.591	0.38	1.593	0.09	0.23	–0.10	–0.04

N = 264, SST: Sen-Shorocks-Thon Index, P_0: Headcount Index, P_1^P: Poverty gap ratio among the poor, $\hat{G}^p$: Gini coefficient among the poor, Δ ln: difference of natural logarithm of the respective parameter (2005/2007)

Regarding the second threshold presented in this manner, mainly an increasing poverty incidence led to a change in the SST index, here visible from $\Delta \ln P_0$ (Table 3). The poverty gap among the poor as well as the Gini coefficient among the poverty gaps even declined slightly, as we can see from the decrease in $\Delta \ln P_1^P$ and $\Delta \ln(1+\hat{G}^p)$.

4.2 *Influence of poverty lines*

In Table 4, the development of the poverty lines in the research area between both survey years is displayed. The poverty lines were calculated by using the Consumer Price Index (CPI).

Table 4: *The development of three different poverty lines for Central Sulawesi between 2005 and 2007.*

	US 1 $/day	*National (rural)*	*US 2 $/day*
2005	2723	3920	5446
2007	3436	4935	6872

As described in Section 3.2, we assessed first and second order stochastic dominance to test for the influence of the poverty line choice. We find no first order stochastic dominance in the poverty incidence curve. Thus from the poverty incidence curve, no conclusion whether poverty had fallen or risen between 2005 and 2007 was possible (Figure 3).

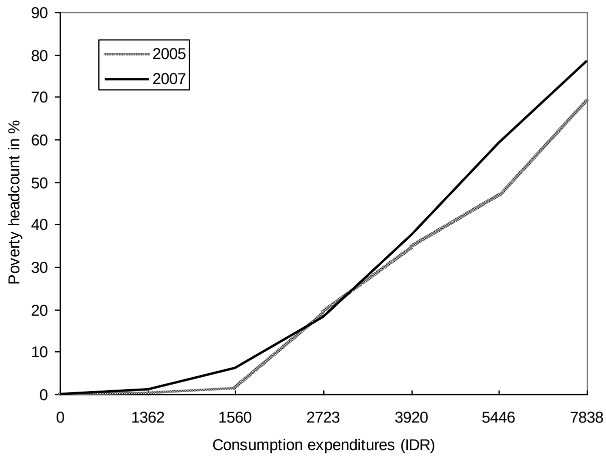


Fig. 3: *Poverty incidence curves – testing for first order stochastic dominance, N = 264*

Therefore, we tested for second order stochastic dominance by drawing poverty deficit curves for both years (Figure 4). As this graph illustrates the poverty deficit curve for 2007 is entirely to the left of the 2005 curve, indicating that the poverty deficit was always greater in 2007 no matter which poverty line was used. Thus we can state that poverty in the region increased.

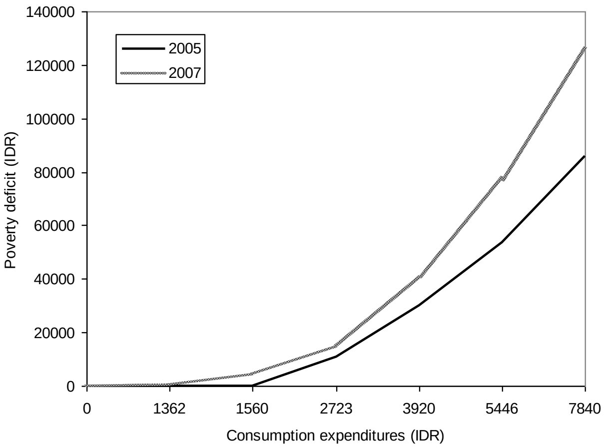


Fig. 4: *Poverty deficit curves – testing for second order stochastic dominance, N = 264*

4.3 Transition matrix

In Table 5, the movement of Central Sulawesi sample households into and out of poverty is summarised in a transition matrix. In the transition matrix, the absolute numbers of households in the different poverty groups in both years are displayed. Furthermore, the percentages for the corresponding years are displayed (row percentages relate to the year 2005 and column percentages relate to the year 2007).

Table 5: *Transition matrix on US 1 and 2 $/day PPP poverty line from 2005–2007, N = 264 households.*

2005 \ 2007	*Very poor* * {Row %}	*Poor* ** {Row %}	*Non poor* {Row} %}	*Total* {Row %}
Very poor *	25	17	9	51
	{52.1}	{15.7}	{8.3}	{19.3}
[Column %]	[49]	[33.3]	[17.7]	[100]
Poor **	17	36	20	73
	{35.4}	{33.3}	{18.5}	{27.7}
[Column %]	[23.3]	[49.3]	[27.4]	[100]
Non poor	6	55	79	140
	{12.5}	{50.9}	{56.4}	{53}
[Column %]	[4.3]	[39.3]	[29.9]	[100]
Total	48	108	108	264
	{100}	{100}	{100}	{100}
[Column %]	[18.2]	[40.9]	[40.9]	[100]

* refers to the 1$ poverty line, ** refers here to those living between 1 and US 2 $/day

A total of 49 percent of the households who lived on less than US 1$/day in PPP in 2005 remained very poor in 2007. In 2007, 33.3 percent of the households who were very poor in 2005 were able to shift from being very poor to being poor (< US 2$/day). Together with the 17.7 percent of the very poor who raised their expenditures to more than US 2$/day purchasing power parities (PPP), they can be described as escapee households.

Contrary to this movement out of extreme poverty, about 23 percent of the households who were classified as poor in 2005 were classified as very poor in 2007. Together with the 4.3 % of the households considered non-poor in 2005 who had to face extreme poverty in 2007, they can be described as descending households.

Almost half of the households remained poor (live on less than US 2$/day PPP, but on more than US 1$/day PPP). Almost two thirds of the non-poor households maintained daily per capita consumption of more than US 2$/day in both years.

4.4 Chronic, transitory and never poor

For the research area, the absolute numbers of households as well as the percentages for the different categories are listed in Table 6.

Table 6: *Chronic, transitory and never poor against the two international poverty lines, N = 264 households.*

Poverty status	*US 1$/day poverty line*	*US 2$/day poverty line*
Chronic poor	25 (9.5 %)	90 (34 %)
Transitory poor	49 (18.5 %)	95 (36 %)
Never poor	190 (72 %)	79 (30 %)
Total	264 (100 %)	264 (100 %)

Regarding the US 1$/day poverty line: only 9.5 percent of the sample households were in chronic poverty, but 18.5 percent were transitorily poor. Regarding those who fell short of the US 2$/day poverty line, the trend is the same, but less pronounced. Here, 34 percent of the households were regarded as chronic poor and only 36 percent of the sample was transitorily poor.

4.5 Determinants of chronic and transitory poverty

Table 7 presents the multi-nominal logit regression results for the determinant of chronic and transitory poverty.

The probability of female-headed households to become chronically poor increases significantly. However, this is only the case for the chronic poor, but not for the chronic very poor. We found household size to be a major determinant for all types of poverty, except the transient poor. Also the presence of dependents (older than 64 and younger than 15) increased the likelihood of chronic poverty. Furthermore, the availability of electricity reduces the likelihood of severe transient

Table 7: *Determinates of chronic and transitory poverty regarding two poverty lines, N = 264 households.*

Explanatory variables (from 2005)	Reference US 1$/day poverty line				Reference US 2$/day poverty line			
	Transient very poor		Chronic very poor		Transient very poor		Chronic very poor	
	RRR^I	z-value	RRR^I	z-value	RRR^I	z-value	RRR^I	z-value
Demographics								
Age of household head	1.15	1.26	1.03	0.19	1.14	1.26	1.08	0.77
Age of household head squared	0.99	–1.30	0.99	–0.03	0.99	–1.10	0.99	–0.62
Household is female headed (1 = yes)	1.21	0.27	2.17	0.54	0.45	–1.03	0.20	–2.11**
Household size	1.61	3.25***	2.10	3.85***	1.02	0.16	1.75	3.43***
Dependency ratio of members < 15 years and > 64 years and in relation to household size	1.02	1.89*	1.06	2.76***	1.02	1.94*	1.04	3.08***
Total land area owned by the household in are	0.99	–0.91	0.99	–0.16	0.99	–0.24	0.99	–0.59
Social capital								
Number of organisations the household is member of	0.93	–0.76	0.74	–1.95*	0.89	–1.38	0.92	–0.88
Financial Capital								
Household borrowed money from informal market in past three years (1 = yes)	0.51	–0.98	2.32e-19	–29.01***	0.29	–2.05**	0.08	–3.25***
Relative is working elsewhere and sends remittances	0.21	–1.44	7.70e-19	–30.47***	0.26	–1.65*	0.01	–3.09***
Human Capital								
Household head has less than completed primary education (1 = yes)†	1.30	0.43	2.23	1.33	1.52	0.79	1.04	0.07
Household head has higher (secondary or superior)education (1 = yes)†	1.13	0.20	0.92	–0.06	3.44	2.33**	0.65	–0.63
Household head works outside of agriculture (1 = yes)‡	0.05	–2.10**	1.72e-19	–37.25***	0.31	–1.34	0.40	–0.91
Household head is wage labourer in agriculture (1 = yes)‡	2.89	1.38	2.62e-18	–38.24***	1.70	0.59	1.33	0.28
Household head is domestic worker or unemployed (1 = yes)‡	2.05	0.70	3.14	0.76	1.53	0.45	0.63	–0.45
District Dummies								
Lore Utara§	1.28	0.37	4.27	1.66*	0.99	–0.00	0.26	–1.73*
Palolo§	0.36	–1.25	0.87	–0.08	0.58	–0.90	0.56	–0.92
Kulawi (including village Lawe)§	2.87	1.60	5.76	1.81*	2.92	1.43	1.98	0.83
Number of observation	264				264			
Wald χ^2 (38)	15691				1132			
Prob > χ^2	0.0000				0.0000			
Pseudo $R2$	0.38				0.39			
Correctly predicted (%)	74				60			

Notes: IRRR: Relative Risk Ratio; * significant at the 10 per cent level, ** significant at the 5 percent level; *** significant at the 1 percent level; † Base category is completed primary education/ uncompleted secondary education; ‡ Base category is self-employed in agriculture; § Base category is sub district Sigi Biromaru and chronic poverty. However, for the transient poor this does not play a role. In the research area of this study, over 70 percent of the households have electricity available. The lack of transportation assets (we used motorcycle ownership as proxy) is common for all kinds of poverty. The lack of social capital (number of organisations to which a household belongs) appears to be an especially influencing factor regarding the chronically very poor. The probability of becoming poor increases if the household is not a member in any organisation such as in church or women group. Participation in informal credit markets between 2002 and 2005 reduces the likelihood of being poor. Only the transient very poor are not significantly affected at all. A very distinct determinant of chronic (severe) poverty is a lack of remittances sent from relatives working elsewhere. Remittances are a crucial income source. On average they account for 16 percent of the daily per capita expenditures.

Our model gives significantly nonsensical results regarding the economic effects of higher education, statistically suggesting that higher education increases transitory poverty. A possible explanation might be that households who invest in higher education temporarily lose part of their labour force. Furthermore, the logical correlation of remittances from family members who had sought higher education was not statistically explored. Far less confounding are our results suggesting that non-agricultural employment reduces the probability for households to fall into, and to be trapped in, poverty. Additionally, agricultural wage labour reduces the likelihood of severe chronic poverty. Finally, our model is relatively successful in predicting poverty status. As to the US 1$/day poverty line, it predicts 74 percent of the households correctly. Regarding the US 2$/day poverty line the prediction accuracy is a bit weaker (60 percent).

5 Discussion

5.1 Poverty incidence and poverty transition

We can state that more people faced poverty in 2007 compared to 2005. This finding is supported in two ways. First, the headcount poverty rate increased in terms of the US 2$/day poverty line. Second, through testing for second order stochastic dominance using poverty deficit curves, it was proved that poverty increased no matter which poverty line was used.

However, poverty in the study region in Central Sulawesi is prone to fluctuation. As one can see from the transition matrix, there is reasonable movement into and out of poverty.

5.2 Determinants of chronic and transitory poverty

That female-headed households are more likely to face chronic poverty concurs with what often is stated in theory. However, Suryahadi & Sumarto (2003) found in their study on chronic and transient poverty in Indonesia before and after the economic crisis of 1997 that there was no significant impact of gender on poverty status. However, Widyanti *et al.* (2009) reported in their study on the relationship between chronic poverty and household dynamics in Indonesia that households with a single female without children have the lowest probability of becoming chronic poor, whereas single males with children suffer the highest probability.

The finding that the household size is a major determinant of poverty is supported by the work of Widyanti *et al.* (2009). They also found that a larger household increases the probability of being chronically poor. The findings of Alisjahbana & Yusuf (2003) regarding the presence of dependents in a household concur with our finding; higher numbers of small children and elderly people increase the likelihood of poverty, especially chronic poverty.

Our result that lacking social capital fosters chronic poverty, concurs with the finding from Gertler *et al.* (2006) who estimated the effect of social capital on the ability of households to ensure consumption after unexpected negative shocks (also in Indonesia, using the IFLS panel from 1993 and 1997). They found that higher civic participation (measured in households' group memberships) lowers the decline in consumption when a negative health shock occurs. Also The Chronic Poverty Report 2008–2009 (CPRC, 2010) points out that social protection and social assistance in particular plays a crucial role in reducing chronic poverty.

Regarding the positive effect of informal credits on chronic poverty, it hast to be stated that in general, there are hardly any formal institutions providing credit in this study's research area, with the households depending mainly on non-institutionalised money lenders (Nuryartono, 2005). We cannot compare our results, as none of the Indonesian studies cited included an analysis on credit participation.

When we compare the prediction accuracy of our model – 74 % for the US 1$/day poverty line – to other studies, it is almost as high as in the model of Alisjahbana & Yusuf (2003), which correctly predicted 78 percent of households. Even though the performance regarding the US 2$/day poverty line is weaker (60 %) it still performs better than the model of Lawson *et al.* (2006), with this model achieving a relatively low 51 % correct prediction.

5.3 Policy implications

From our findings, we can draw conclusions and policy implications for poverty reduction. Poorer households have fewer opportunities to participate and derive income from non-agricultural activities because of their lower resource endowment. Therefore, potential non-agricultural activities have to be carefully evaluated as to whether they suit the assets owned by poor households. As access to credit is likely to improve people's livelihoods because it allows investments in non-farm businesses, micro-finance schemes are an opportunity for development in the region. In addition, it is clear that social capital plays a crucial role in preventing households from poverty. Therefore, it is necessary to make organisations available for the poor, e.g. integrating the poor into these organisations or through subsidised membership fees. As low education in terms of less than primary education tends to increase the probability of becoming chronically poor, and other studies found strong positive effects of education in general, it would be worth to invest in education schemes to strengthen people's human capital.

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