Static and Dynamic Disparities between Monetary and Multidimensional Poverty Measurement: Evidence from Thailand

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Abstract

There has been a rapid expansion in the literature on the measurement of multidimensional poverty in recent years. This paper focuses on the longitudinal aspects of multidimensional poverty and its link to dynamic income poverty measurement. Using panel household survey data in Thailand from 2007, 2008, and 2010, the paper analyses the prevalence and dynamics of both multidimensional and monetary poverty from the same dataset. The results show that the monetary poor (or non-poor) are not always multidimensionally poor (or non-poor) - indeed the overlap between the two measures is much less than 50 percent. Additionally, monetary poverty shows faster progress as well as a higher level of fluctuation than multidimensional poverty. I suggest that rapid economic growth as experienced by Thailand has a larger and more immediate impact on monetary than on multidimensional poverty.

Keywords: monetary poverty, multidimensional poverty, poverty dynamics, Alkire-Foster method.

JEL classification: I31, I32, D31

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1 Introduction

In the literature, there is an increasing discussion of the conceptual and methodological shortcomings of monetary poverty measures and the need for alternative approaches. Following the seminal work by Sen (1979, 1981) on the capability approach, there have been extensive investigations on the matter, including theoretical studies by Sen (2000), Tsui (2002), Atkinson (2003), Bourguignon and Chakravarty (2003), Duclos et al. (2006a), and Alkire and Foster (2011), and empirical studies by Klasen (2000), Baulch and Masset (2003), Duclos et al. (2006b), Asselin and Vu (2008), Günther and Klasen (2009), and Alkire and Santos (2014). They argue that "human lives are battered and diminished in all kinds of different ways" (Sen, 2000, p. 18), and that "all the issues around poverty are interconnected and demand crosscutting solutions" (UN, 2001, p. 3). In addition, markets often do not exist or function imperfectly (Tsui, 2002; Bourguignon and Chakravarty, 2003; Thorbecke, 2008) and monetary values cannot be assigned to particular aspects of well-being (Hulme and McKay, 2008; Thorbecke, 2008). Also, having sufficient income for the purchase of a basic basket of goods does not directly imply that it is also spent on this basket of goods (Thorbecke, 2008). Hulme et al. (2001) also argue that the multidimensionality and severity of poverty are likely to reinforce one another.

From the capability perspective, the improvement in outcomes, or human development, is more important than the changes in inputs, such as income or consumption. Therefore, the analysis of poverty and of poverty dynamics has focused more on assets, stocks and outcomes rather than on flows or inputs (Clark and Hulme, 2005; Hulme and Shepherd, 2003; Carter and Barrett, 2006) and uses non-monetary indicators more extensively (Baulch and Masset, 2003; McKay and Lawson, 2003, Günther and Klasen, 2009).

There is a limited but growing literature on the dynamics of poverty over several dimensions of human development. In a study from African countries, Sahn and Stifel (2000) find a declining trend in poverty as measured by a household's wealth, especially in rural areas, which is due to economic openness and the removal of distortions that discriminate against rural areas. A shortcoming of this study is that it has no comparison with the improvement in incomes because of data constraints. In another study, Harttgen, Klasen and Vollmer (2013) compare income growth and assets growth as measured by asset indices in Africa and show that the relationship between the two measures is extremely weak. Comparing income poverty with malnutrition and education deprivations in Vietnam in the 1990s, Baulch and Masset (2003) find that non-monetary indicators generally report

higher levels of poverty persistence than do monetary indicators. Additionally, there is more correlation within the same measure of poverty over time than between different measures of poverty in the same time period. Illustrating a new measure of chronic multidimensional poverty, Alkire *et al.* (2014) explore dynamics, for example finding that in Chile, 50 percent of the population are multidimensionally poor in at least one of three periods, 31 percent are poor in two periods; only 10 percent in all periods. Günther and Klasen (2009) find that nutrition and education deprivations in Vietnam show much smaller improvements than income poverty does. They also note that there is high heterogeneity in intra-household non-income poverty dynamics, which would not normally be captured by income poverty measures. Other studies include Bradshaw and Finch (2003), Stewart *et al.* (2007), and Nolan and Whelan (2011); (for a survey see Alkire *et al.* 2015, Ch 4). To contribute to the literature on the static and dynamic disparities between the monetary and multidimensional measurement of poverty, this study aims to identify which sub-groups of the population are poor in one or both measures of poverty, which measure of poverty shows faster progress in poverty reduction over time, and what drives the dynamics in both measures of poverty.

An increasing number of articles as well as official measures use single period or cross-sectional data to document the matches and mismatches between income and a Multidimensional Poverty Index (MPI), measured from the same dataset. For example, in Bhutan, 12.0 percent of people are income poor, and 12.7 percent of people are MPI poor by the official national measures, but only 3.2 percent are poor according to both measures (NSB-RGOB, 2013). In Chile's official poverty measures, 14.4 percent of people are income poor and 20.4 percent of people are MPI poor, but only 5.5 percent are poor in both (Chile 2015). Some recent studies with MPI vs income include Gallo and Roche (2012), Levine *et al.* (2014), Al Alaq and Shlash (2014), Santos *et al.* (2015), Sumarto and De Silva (2014). But few studies have examined the mismatch between income poverty and the MPI in a dynamic context, using panel data.

This study addresses the static and dynamic relation between income multidimensional poverty in the context of Thailand although I believe that the approach is applicable to other developing countries. Thailand has made remarkable socioeconomic progress, moving from a low income country to an upper-income country in less than a generation. As such, Thailand has been one of the widely cited development success stories, with sustained strong growth and impressive poverty reduction. Economic growth rate has been 8 percent during the 1980s and early 1990s and around 5 percent from 2002 to 2007. Since 2008, it has lagged because of the global financial crisis of 2008-2009, the flood in 2011 and the political tensions and uncertainty in 2010 and again in 2013-2015. Along with the economic

achievements, there have been significant improvements in human capital such as health and education. Thailand is likely to meet most of the Millennium Development Goals (MDGs) on an aggregate basis. Maternal mortality and under-five mortality rates have been greatly reduced and more than 97 percent of the population, both in the urban and rural areas, now have access to clean water and sanitation (World Bank, 2015a).

A natural question, given this evident success in reducing both income and non-income deprivations, is whether the pace and pattern of reduction in monetary and multidimensional poverty is similar, and whether the same persons have left income and multidimensional poverty. This study is based on the hypothesis that monetary poverty has fallen faster over time due to a more direct link between income growth and the reduction of income poverty. Additionally, it proposes that monetary poverty is more sensitive to the changes in macroeconomic conditions as well as to the changes in a household's assets.

The analyses of multidimensional poverty are based on the Alkire-Foster method and panel data from more than 2000 households in Thailand collected in 2007, 2008 and 2010 to identify which sub-groups of the population are monetary poor and/or multidimensionally poor and to analyze the dynamics of those two measures of poverty over time. An advantage of this rare data set is that it allows for the analysis of both monetary poverty and multidimensional poverty in the same time period and over time using the same survey.

This study is organized as follows: the introduction is followed by Section 2 which presents the data source and analytical strategy. Section 3 shows the multidimensional poverty profile across different sub-groups of the population and discusses the mismatch between monetary and multidimensional poverty by sub-groups of the population in a static setting. Section 4 explores the mismatch between the two measures of poverty, which proves to be sizeable, over time. Section 5 examines the changes in components and different measures of multidimensional poverty. Lastly, Section 6 concludes with the key messages of this study.

2 Data and analytical strategy

2.1 Data

This study employs panel household data from 2007, 2008 and 2010 collected from the provinces of Buriram, Nakhon Phanom, and Ubon Ratchathani in Thailand in the context of the research project “Vulnerability in Southeast Asia” run by a consortium of German universities and local research institutes in Thailand and Vietnam (see Klasen and Waibel,

2012). The household surveys cover more than 2000 households located in border areas with Lao PDR and Cambodia. They contain information on household demographics, health, education, economic activities, shocks and risks, employment, financial market access, public transfer, household consumption, assets, and housing conditions.

There have been a number of household surveys in Thailand including the Multiple Indicator Cluster Surveys (MICS) since 2000s, and the Household Socio-Economic Surveys. However, these surveys are in the form of either repeated cross-sections such as the MICSs or partially repeating panels making them less useful than panel data in analyzing the changes of households' and individuals' poverty status over time. Furthermore, there is no information on income or consumption in the MICS, and little information regarding nutrition in the Household Socio-Economic Surveys. Therefore, the surveys I use here include particularly suitable data for the analyses in this study.

2.2 Analytical strategy

I first identify the monetary poor using household consumption levels and then apply the recently proposed Alkire-Foster method (see Alkire and Foster, 2011) to identify the multidimensionally poor. I then compare the two measures of poverty across sub-groups of the population to find if the two measures identify the same households as poor. The dynamics of both measures of poverty are then compared via joint probability matrix and transition matrix to find which measure recorded that faster progress was being made over time. Subsequently, the study attempts to find which indicators play an important role in driving the changes in the Multidimensional Poverty Index.

2.2.1 Identification of the monetary poor

Although households' aggregate income and consumption are available in the data set, this study is based on consumption because it is believed to be a better measure than income (see Deaton, 1997) and poverty lines at the national and international levels are usually set on the basis of consumption. Thailand's national poverty line is approximately $1.65 a day (using PPP exchange rates). In addition, I also refer to the international poverty line of $1.25, $2.0 and $2.5 a day (all using PPP exchange rates) as references in some of analyses below.

2.2.2 Identification of the multidimensionally poor

Notation and definition of multidimensional poverty

The multidimensional poverty index, which is based on Alkire-Foster method, measures poverty in *d* indicators across a population of *n* individuals. Let $z_j > 0$ be the deprivation cutoff in indicator *j*, and w_j be the weight of indicator *j* such that the weights sum to one. I construct a matrix of deprivations $g^0 = [\, g_{ij}^0 \,]$, whose typical element g_{ij}^0 is defined by $g_{ij}^0 = w_j$ when $y_{ij} < z$, and $g_{ij}^0 = 0$ when $y_{ij} \geq z$.

We then construct a column vector *c* of deprivation counts, whose j^{th} entry $c_i = \sum_{j=1}^{d} g_{ij}^0$ represents the sum of weighted deprivations suffered by person *i*. Second, a person is considered poor if his or her weighted deprivation count is greater than or equal to *k*. Let ρ_k be the identifier that indicates a person's achievement vector. ρ_k takes value of 1 when $c_i \geq k$, and 0 when $c_i < k$.

To focus on poor people, I censor the deprivations of persons who are deprived and non-poor by constructing a matrix $g^0(k)$, obtained from g^0 by replacing its i_{th} row g_i^0 with a vector of zeros whenever $\rho_k = 0$. This matrix contains the weighted deprivations of all persons who are identified as poor and exclude deprivations of the non-poor. Base on this matrix, I construct a censored vector of deprivation counts $c(k)$ which differs from vector *c* in that it counts zero deprivations for those not identified as multidimensionally poor. Multidimensional poverty index (MPI) is the mean of the matrix $g^0(k)$ multiplied by the number of columns it contains *d* that is $MPI = d\mu(g^0(k))$, where μ denotes the arithmetic mean operator.

The multidimensional poverty index can be decomposed into two measures: the multidimensional headcount ratio (*H*) and the average deprivation share among the poor (*A*). *H* is the proportion of people that are poor and is measured by $H = q/n$ where *q* is the number of poor people. The fraction of weighted indicators that person *i* is deprived is $c_i(k)$. The average of that fraction among the poor is then expressed as $A = \sum_{i=1}^{n} c_i\,(k) \big/ q$.

Dimensions, indicators, deprivation cutoffs and weights

The multidimensional poverty index in this study is constructed following the international Multidimensional Poverty Index (MPI) that was presented in the *Human Development Report* 2010 (UNDP, 2010; Alkire and Santos, 2014), but adjusts the indicators to data available in our surveys. Since people usually live in households and share common resources and since individual deprivation is hard to observe in some indicators (particularly the living standard items which are used jointly at the household level), it is reasonable identify deprivations and poverty at the household level. If a household is

deprived in an indicator then all of its members are considered to be deprived in that indicator as well. Likewise, if a household is multidimensionally poor then all of its members are considered to be multidimensionally poor.

Table 1 Dimensions, indicators, cutoffs and weights

Dimensions Indicators	Deprived if…	Relative weight
Health		
Nutrition	Any adult (16 years old or older) has BMI of less than 17	16.7%
Health functioning	Any member suffering serious disease/injury and unable to pursue main occupation for at least four weeks	16.7%
Education		
Schooling	No household member has completed five years of schooling	16.7%
Attendance	Any school-aged child is not attending school in years 1 to 8	16.7%
Standard of living		
Cooking fuel	The household cooks with dung, wood, rice leaf or charcoal	5.6%
Sanitation	The household's sanitation facility is not improved, or it is improved but shared with other households	5.6%
Drinking water	The household does not have access to clean drinking water	5.6%
Electricity	The household has no electricity	5.6%
Housing	The walls are of metal/clay/canvas/bamboo and/or the roof is of straw/wood	5.6%
Assets	The household does not own more than one of: radio, television, telephone, bike, motorbike or refrigerator, and does not own a car or tractor	5.6%

Source: Normative choice by authors with reference to the data available, the MDGs, UNDP (2010) and Alkire and Santos (2014).

Nutrition and health functioning are chosen as the two indicators of the health dimension. Unlike the MICSs and DHSs used in the global MPI, the height and weight of household members are not measured in our surveys but are subjectively reported by a respondent. In addition, age is not measured in months for children but in years. Therefore, this study focuses on the body mass index (BMI) of adults who are 16 years old or older to identify the deprivation in nutrition instead of using the weight-for-age for children as in the MPI. A household is deprived in nutrition if any adult has a BMI of less than 17. This lower cutoff, as compared to the cutoff of 18.5 in the MPI, was proposed by James et al. (1988) and Himes (2000) and applied by Baulch and Masset (2003) and is reasonable for the case of Thailand where people have lower BMIs in general. Health functioning is used as another indicator of the health dimension because the surveys have no information on child mortality. A household is deprived in health functioning if any member had any disease or injury during the 12 month reference period and was unable to pursue his or her main occupation for more than four weeks (see Table 1).

The education indicators and their cutoffs are the same as those in the global MPI. A household is deprived in schooling if none of its member has at least five years of schooling. A household is deprived in school attendance if any 6 to 14 year old child in the household is not attending school during the age at which they should attend years one to eight (see Table 1).[1]

The six indicators of living standards and their cutoffs are similar to the ones in the global MPI. A household is deprived in cooking fuel if its main cooking fuel is dung, wood, rice leaf or charcoal. It is deprived in sanitation if it has no flushing toilet (note the higher cutoff, compared to the global MPI) or if it has a flushing toilet but must share it with another household. A household is deemed as being deprived in drinking water if it has no access to clean (defined here as tap, purified or rain) drinking water. Since no information is available regarding a household's distance from a water source, this indicator is slightly different from that in the global MPI. A household is deprived in electricity if the main source of lighting is not using electricity. This study also focuses on housing conditions instead of flooring because the surveys have better information on the former. A household is deprived in housing if the main walls of the main house[2] are made from metal, clay, canvas, or bamboo or if the roof of the main house is made from straw or wood. Lastly, a household is deprived in assets if it does not own more than one of the following: radio, television, telephone, bike, motorbike, or refrigerator, and if the household does not own a car or tractor.

The three dimensions are assigned equal weights of 33.3 percent each, and indicators of the same dimension are then assigned equal weights (see Table 1). Hence, the two health indicators have weights of 16.7 percent each, the two education indicators also have weights of 16.7 percent, and the six indicators showing the standard of living have weights of 5.6 percent each.

Association among indicators

Generally, dimensions of a household's well-being are correlated with one another. For instance, education is believed to be correlated with health (see Ross and Wu, 1995; Cutler and Lleras-Muney, 2006) and with income (see Becker, 1994; Farrell and Fuchs, 1982; Berger and Leigh, 1989), and income and consumption can sometimes be correlated with

[1] For households that do not have children in this age range, they are assumed to be non-deprived in this indicator, following the procedures used for the global MPI. For a discussion of this issue, see Alkire and Foster (2014) and Dotter and Klasen (2014).

[2] A household might have more than a house. This study focuses on the main house only.

dwelling conditions, physical assets, etc. Table A.1 in the appendix shows the correlations using Cramer's V values and indicates the correlation between every pair of indicators.

In general, correlations between the indicators turn out to be quite weak. Nutrition is found to be only weakly correlated with other indicators (see Table A.1). Apparently, whether a person in a household has a low body mass index depends not only on the household wealth and characteristics at the present moment but, also on their genes, early childhood mental and physical conditions, household health practices, and environmental conditions, i.e. climate, pollution, availability of food stores, etc. (see Powell et al., 2007; Gonzalez et al., 2012). Health functioning is also weakly correlated with other indicators of well-being since it is measured by a proxy of diseases and injuries which is correlated not only with household covariates such as wealth and characteristics but also with exogenous factors such as environment conditions and health shocks, etc. Schooling is also weakly correlated with most other indicators. Child school attendance is weakly correlated with other indicators because it has a low deprivation ratio (see raw headcount ratios in Table 6 below). Among the six indicators of living standard, cooking fuel, sanitation and drinking water all have high deprivation ratios so they are moderately correlated with one another. Three other dimensions, namely electricity, housing, and assets are loosely correlated with one another, which might be due to the fact that they have very low deprivation ratios (see raw headcount ratios in Table 6 below). Since most of the households have access to electricity yet use non-improved cooking fuel and non-improved sanitation facilities there is a negative correlation between electricity, cooking fuel and sanitation.

By and large, most indicators are not strongly associated with one another - which means that each brings into view a different dimension of poverty (Alkire *et al.,* 2015, Chapter 7). In addition, they are vital indicators of human development. Most are also mentioned in the Millennium Development Goals (MDGs), such as MDG2 - education, MDG4 and MDG5 - health, and MDG7 - environment, and the dimensions are also included in the Human Development Index, i.e. education and health. Therefore, it is reasonable to include all ten indicators in the MPI used for our analysis.

Setting a multidimensional poverty cutoff

The global MPI defines a person as being vulnerable to poverty if he or she is deprived of between 20 and 33 percent of the dimensions. I believe that if a household is deprived in one or two indicators, i.e. being deprived in 10 or 20 percent of the dimensions, overall deprivation is still quite low; if deprivation rises above 20 percent, the risk of being multidimensionally poor rises. This study defines a person as being multidimensionally

poor if he or she is deprived in at least 34 percent of the dimensions. The poverty rate at this cutoff is approximately equal to the poverty rate measured by consumption at $1.65 in 2008. Hence, this study will use this pairs of cutoffs for some of the comparisons.

Table 2 Poverty rates at different cutoffs by measure of poverty and year, percent

Monetary poverty					Multidimensional poverty				
cutoff ($)	2007	2008	2010	2007-10	2007	2008	2010	2007-10	*k* cutoff (%)
2.50	36.1	27.1	8.4	-27.7	37.4	38.0	43.9	6.5	25
2.00	21.4	14.5	4.0	-17.4	16.8	15.5	15.1	-1.7	30
1.65	12.3	8.0	1.4	-10.9	7.7	7.7	7.7	0	34
1.25	4.4	2.6	0.4	-4	2.5	2.2	2.5	0	45

Source: Author's calculations based on Vulnerability Surveys in Thailand.

3 Disparities between monetary and multidimensional poverty across groups

In order to find out if the two poverty measures identify the same poor group, this section will compare the monetary with the multidimensional poverty across sub-groups of the population. The comparison will be supported by statistical evidence at the individual level. For simplicity, monetary poverty is set at the cutoff of $1.65 a day and multidimensional poverty is set at the cutoff of 34 percent, where both measures show poverty headcount ratios of approximately 8 percent in 2008 (see Table 2). Sub-groups of the population are classified by household size, ethnicity, head's education attainment, consumption quintiles, and provincial location.

Household size has a negative relationship with monetary poverty but an unspecified relationship with multidimensional poverty. Particularly, people from households with more than five members have a higher risk of being monetary poor than their peers. People from households of less than three members have a higher risk of being multidimensionally poor than their counterparts. Contrarily, people from middle-sized households, having from three to five members, have a lower risk of being poor in both measures (see Table 3). Interestingly, there is no significant difference in the intensity of multidimensional poverty across population groups as classified by household size. This evidence tells us that monetary poor families usually have more members because they have many children and they tend to live together to share their limited resources. Another fact is that monetary poverty in this study is identified on the basis of per capita consumption, which is more likely to identify people from large families as being income poor. By omitting equivalence scales, it ignores economies of scale in household consumption and the fact that children

might need fewer resources than adults (see Deaton and Paxson, 1998). Conversely, small families in Thailand are usually home to single old men or women or old couples who are often deprived in health, education, and some other living standards that generates a higher risk of being multidimensionally poor.[3]

Table 3 The incidence of monetary and multidimensional poverty in 2008, percent

	MN poor	MD non, MN poor	Both	MD poor, MN non	MD poor	Average dep. share	Population share
Average	8.0	7.4	0.6	7.1	7.8	46.9	100.0
Household size							
1	3.7	1.9	1.9	16.6	18.4	44.5	0.8
2	2.4	1.8	0.5	12.1	12.7	45.6	8.2
3	3.3	2.5	0.8	9.0	9.8	46.5	16.8
4	5.0	4.5	0.5	5.7	6.3	46.2	24.6
5	8.3	7.7	0.6	8.4	9.0	48.3	21.9
6	14.2	14.2	0.0	3.8	3.8	46.4	15.1
7 +	16.2	14.7	1.5	5.0	6.5	47.6	12.6
Head's education							
None	15.8	13.9	1.9	10.8	12.7	47.3	9.4
Primary	9.0	8.3	0.7	8.8	9.5	46.8	65.3
Middle	4.1	4.1	0.0	1.3	1.3	48.7	14.7
Secondary	0.0	0.0	0.0	0.6	0.6	38.9	4.9
Tertiary	0.0	0.0	0.0	0.8	0.8	38.9	5.6
Head's ethnicity							
Minority groups	15.4	15.6	0.0	7.4	7.4	51.3	6.2
Thai (majority)	7.4	6.8	0.7	7.0	7.7	46.6	93.8
Consumption quintile							
First (poorest)	40.6	37.3	3.3	5.1	8.4	48.0	19.8
Second	0.0	0.0	0.0	8.8	8.8	48.5	20.0
Third	0.0	0.0	0.0	8.9	8.9	45.5	19.9
Fourth	0.0	0.0	0.0	6.4	6.4	47.7	20.2
Fifth (richest)	0.0	0.0	0.0	6.3	6.3	44.3	20.1
Province							
Buriram	6.5	5.9	0.6	8.7	9.3	45.5	37.3
Ubon Ratchathani	7.2	6.5	0.6	6.2	6.9	47.8	45.5
Nakhon Phanom	13.3	12.6	0.8	5.6	6.3	48.5	17.2

Notes: MN poor refers to monetary poor and is based on the threshold of $1.65 a day, MD poor refers to multidimensionally poor and is based on the threshold of 34 percent, non refers to non-poor, Average dep. share refers to average deprivation share or intensity, and is related to MPI only. Population shares in the right-most column sum to 100 percent for each category.

[3] The cut-offs for being deprived in a particular dimension, shown in Table 1, are sensitive to household size. In a household with many members (adults in case of nutrition), the chance that one of them experienced a health problem (low BMI) rises if these deprivations were randomly distributed among members; conversely, households with more members are mathematically more likely to contain a member with more than 5 years of schooling. Despite this mathematical probability, it is not the case in our data that large households are more deprived in the nutrition and health dimension so that the convex relationship I observe between household size and the MPI is not driven by this. For related discussions, see Alkire and Santos (2014) and Dotter and Klasen (2014)

The literature argues that the education of household members, especially of the head, has positive spillover effects on other members and hence on overall household's well-being (see Becker, 1967). This study also finds that people from a less educated background, i.e. the head of the household has no schooling or attains primary education only, are more likely to be poor in both measures of poverty. They also have a higher intensity of poverty (see Table 3). The poverty rates in both measures and the intensity of multidimensional poverty decrease substantially when the head has higher education levels. Only four percent of individuals from households where the head attained tertiary education is multidimensionally poor. Similarly, almost no one from households where the head attained secondary education and beyond is monetary poor (see Table 3).

There are gaps between the risks of being poor in each measure of poverty across ethnic groups. Ethnic minority groups account for more than 6 percent of the three provinces' population and usually live in mountainous and remote areas where the infrastructure is in poor condition. They also have less access to education, health care services, and markets, thus they are more likely to be poor in each measure of poverty as well as have a higher intensity of multidimensional poverty (see Table 3). Additionally, there are gaps in the risks of being poor in the two measures of poverty in each group. A person from the majority Thai background is slightly more likely to be multidimensionally poor than monetary poor. In contrast, a person from one of the ethnic minority groups has a lower risk of being multidimensionally poor than monetary poor. This suggests that ethnic minorities suffer particularly from income shortfalls, presumable related to their remote location and disadvantages they suffer while non-income dimensions appear to partly make up for these shortfalls.

In addition, the risk of being poor varies substantially across measures of poverty for the same income quintile as well as across income quintiles. Nearly 41 percent of the individuals from the poorest income quintile are monetary poor while only 8.4 percent of them are multidimensionally poor. People from the second poorest quintile have no risk of being monetary poor (as the poverty line is set at level below the cut-off between the first and second quintile) but more than 8 percent of them are multidimensionally poor. This pattern is similar to those in the third and fourth quintiles. Even the richest quintile still has a noticeable of multidimensional poverty, at slightly higher than 6 percent (see Table 3). One possible explanation is that the Thai are still generally living on low income levels, nearly a fifth of the population live on less than $2 a day and the whole population lives on an average of $7 a day (World Bank, 2015b). Hence, they have a high risk of being deprived in one or several dimensions of human development. Another option is that the

consumption poverty data are measured with error or suffer from strong seasonal effects. The disparity in the poverty profiles requires further research, but suggests that being poor in the monetary measure is not necessary attributed to being poor in the multidimensional measure, and vice versa.

People from different provinces have different risks of being poor in each measure. People in Nakhon Phanom are the most likely to be poor in monetary measure; the province generally has less advantages than its two peers in terms of economic activities and land fertility. They are however less likely to be multidimensionally poor than their counterparts because this province benefit from national programs on infrastructure investment. Contrarily, people in Buriram are the least likely to be monetary poor since economic activities are more dynamic in the province. They however have a higher risk of being multidimensionally poor than their counterparts because people in this area tend to undervalue the importance of education which results in high deprivation ratios in schooling and attendance.

In summary, the headcount ratios in both measures of poverty vary significantly across sub-groups of the population. There is also a high level of mismatch between the two measures of poverty in general as well as across sub-groups. Among those who are monetary poor (8.0 percent of the population), only a small group is also multidimensionally poor (0.6 percent of the population). The remaining (higher than 7 percent of the population) are non-poor in the multidimensional measure (see Table 3). This match (about 7.5 percent) is much smaller than that noted by a review of the literature on poverty by Perry (2002), which finds the match to be between 40 and 50 percent. Nevertheless, it is bigger than the matching between income poverty and nutrition deprivation found in Vietnam by Günther and Klasen (2009), at 30 percent and 14.5 percent in 1992 and 1997 respectively; their numbers between income poverty and educational poverty are 31 percent and 17 percent, respectively. The low match between the two measures of poverty suggests that being poor in one measure is not necessary attributed to being poor in another.[4] This is in line with the argument that having sufficient income for the purchase of a basic basket of goods does not imply that it is also spent on this basket of goods (Thorbecke, 2008) and that the measurement of households' income or consumption might not be accurate (Deaton, 1997; Dercon and Krishnan, 2000). Of course, other reasons might also explain the mismatch, including the role of sectoral policies which might affect non-income dimensions of poverty

[4] Note that the overlap also depends on the overall poverty incidence, as shown by Klasen (2000). So these comparisons with other studies have to be treated with caution.

more directly, while the effect of such policies (such as education or health policies, or policies to improve water and sanitation access) might only affect income poverty after some time.

4 Disparities between monetary and multidimensional poverty over time

4.1 Disparities in the trends of poverty

As shown in Table 2, the poverty headcount ratio measured by the monetary method have greatly decreased over time, regardless of the cutoff used. This reduction is in line with the reduction in poverty at the national level where poverty fell from nearly 21 percent in to close to 17 percent by 2010 (World Bank, 2015b). However, poverty rates in the three provinces were lower than that of the entire country because the three provinces are located in the economically dynamic area. Conversely, the multidimensional measure does not show a significant progress over the three-year period. At the cutoff of 34 percent for instance, the multidimensional poverty rate stayed at almost the same level of 7.7 percent. Surprisingly, the poverty headcount ratio at the cutoff of 25 percent increased from slightly higher than 37 percent in 2007 to nearly 44 percent by 2010 (see Table 2). The increase in the incidence of multidimensional poverty was the result of the increase in the deprivation share of nutrition, school attendance, and in access to electricity (see Table 6).

The disparity in the progress in the two measures of poverty found in this case study of Thailand is in line with existing literature. In studies from Vietnam from the 1990s, Baulch and Masset (2003) and Günther and Klasen (2009) also find faster progress in income poverty reduction than in non-income poverty reduction. These are also consistent with the argument of Clark and Hulme (2005) that flows, such as income, are more time variant than stocks, such as housing conditions or educational attainment.

4.2 Differences in the mobility in monetary and multidimensional poverty

The differences in the mobility using the two measures of poverty are compared using a joint probability matrix over the period from 2007 to 2010. The left panel of Table 4 shows the transitions of from extreme, moderate, and no poverty between 2007 and 2010. The rows show what share of the population was extremely poor, moderately poor, and non-poor in 2007. The columns also show the share of the population belonging to those three ranges in 2010. The extremely poor classified in this matrix refers to those who lived on less than $1.35 a day, the moderately poor are those who lived on between $1.35 and $2.55

a day, and the non-poor are those who lived on more than $2.55 a day. Note that these cutoffs have been slightly adjusted to match the multidimensional poverty rate in 2007 for ease of comparison of mobility trends. The values in the diagonal of this matrix show the shares of the population that stayed in the same poverty status over the first period. Similarly, the right panel of Table 4 shows the transitions of multidimensional poverty at different cutoffs between 2007 and 2010. For the sake of comparison, poverty cutoffs in this panel were chosen so that the shares of people that are extremely, moderately, and not poor in each row (i.e. in 2007) are the same.

The two measures of poverty show different levels of mobility across sub-groups of the population as well as over time. The mobility in monetary poverty was higher among the poor but lower among the wealthy, or the non-poor. Particularly, among those who were extremely poor in 2007 (6.1 percent of the population), only one thirtieth (or 0.2 percent of the population) remained extremely poor by 2010. Among those who were moderately poor in 2007 (31.2 percent of the population), only around a tenth (or 3.9 percent of the population) stayed in the same status while the majority (27 percent of the population) moved out of poverty by 2010.

Moreover, the mobility in monetary measure was higher than that of the multidimensional measure. Among those who were (monetary or multidimensional) extremely poor (slightly higher than 6 percent of the population), only a thirtieth (or 0.2 percent of the population) stayed the same in monetary measure but a fourth (or 1.4 percent of the population) stayed the same in multidimensional measure. This pattern happens similarly with wealthier groups (see Table 4). The literature also argues that income is more sensitive to changes than other dimensions of human development such as education and health (Clark and Hulme, 2005). Günther and Klasen (2009) also find that there was much improvement in income than in health and education in Vietnam during the 1990s.

Table 4 Joint probabilities between monetary and multidimensional poverty 2007-2010, percent

MN poor	Monetary poor 2010				Multidimensionally poor 2010				MD poor
2007	Ext.	Mod.	Non.	Total	Ext.	Mod.	Non.	Total	2007
Ext.	0.2	1.5	4.4	6.1	1.4	2.6	2.0	6.1	Ext.
Mod.	0.2	3.9	27.0	31.2	3.1	14.2	14.0	31.3	Mod.
Non.	0.1	3.1	59.5	62.7	1.7	11.8	49.1	62.6	Non.
Total	0.5	8.5	91.0	100.0	6.2	28.7	65.1	100.0	Total

Notes: MN poor refers to monetary poor, MD poor refers to multidimensionally poor. Ext. refers to extremely poor, which refers to the thresholds of $1.35 a day in monetary dimension and 40 percent in multidimensional measure. Mod. refers to moderately poor, which refers to the range of $1.35-$2.55 in monetary measure and 25-40 percent in multidimensional measure. Non. refers to non-poor, which refers to $2.55 in monetary measure and 25 percent in multidimensional measure.

4.3 Disparities between the measures of poverty over time

As discussed in Section 3, there are disparities between the two measures of poverty at the same time-period. This section will discuss the disparities between them over time using a transition matrix.

Reverse transitions between the two measures of poverty

The matrix in Table 5 (which includes columns 3 to 6) shows whether the transitions in monetary poverty are accompanied by the same transitions in multidimensional poverty in the period 2007-2010. The first row of the matrix reveals that there was close to 87 percent of the population that stayed non-poor in the monetary dimension over the three years. Among them, nearly 88 percent stayed non-poor in the multidimensional measure as well, while another slightly above 5 percent moved out of it. However, nearly 5 percent fell into multidimensional poverty and nearly 2 percent stayed poor in multidimensional measure in 2007-2010. The remaining rows in the table can be interpreted in a similar fashion.

Table 5 The dynamics of monetary and multidimensional poverty, percent

Monetary poverty trajectory	Population share	Multidimensional poverty trajectory				MPI in 2007	ΔMPI (2007-10)
		Non-poor	Rising	Falling	Staying		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-poor	86.8	87.8	5.5	4.9	1.9	0.034	-0.009***
Rising	11.8	80.5	6.2	9.4	3.9	0.029	0.018***
Falling	0.9	62.4	13.0	24.6	0.0	0.067	-0.003***
Staying poor	0.6	81.4	0.0	18.6	0.0	0.083	-0.016*
Average		86.7	5.6	5.7	2.1	0.036	-0.000

Notes: Monetary poverty refers to the threshold of $1.65, multidimensional poverty refers to the threshold of 34 percent. Population shares of the same period sum to 100. Values showing four multidimensional poverty trajectories of the same raw sum to 100.

The high values of nearly 88 percent in the first cell of the first row in the matrix suggest that there was a strong correlation between the transitions of the two measures of poverty over time among the wealthy or the non-poor. Conversely, among those who rose in the monetary dimension, only slightly above 6 percent also rose in multidimensional measure while more than over 9 percent fell into poverty, more than 80 percent stayed non-poor while nearly 4 percent stayed poor in multidimensional measure. The mismatch in the transitions of the two measures of poverty became even greater among those who stayed poor in monetary dimension; almost none of them stayed poor in multidimensional measure.

Overall, there is a high level of disparity between the dynamics of the two measures of poverty, which also varies across sub-groups of the population. The transitions out of and into monetary poverty are not usually accompanied by the same transitions in the multidimensional poverty, suggesting also a serious dynamic mismatch. The correlation between the two dynamics is highest for the wealthy group, followed by the *falling into poverty* group, after which the correlation was rather low for those who escaped from monetary poverty (see Table 5). This suggests that the transitions in monetary poverty do not necessary result in simultaneous transitions in multidimensional poverty and vice versa.

This finding adds an important qualification to the seemingly small differences in the transition matrices shown in Table 4. While the share of households transiting between different poverty statuses between 2007 and 2010 is not so different, the actual households who make this transition are very different as demonstrated in Table 5. This finding is also not in line with the argument by Hulme et al. (2001) that the multidimensionality and the severity of poverty are likely to reinforce one another. The disparities in the transitions of the two measures could be the result of the high level of fluctuation in consumption over the period. This is in line with the argument made by Clark and Hulme (2005) that money might not be a good measure of poverty dynamics since it is highly variable over short periods of time. It might be related to the possibly high fluctuations in the health status variable that might be unrelated to income poverty trends (see below). It might also reflect the fact that money cannot buy some services; or there may be lagged effects.

The correlation between the dynamics of the two measures of poverty for the poor groups was even lower than the correlation between the two measures of poverty in the same time-period. This correlation is lower than that found by Whelan et al. (2004) using panel data in European countries, which is more than 40 percent. It is even smaller than the correlations between the dynamics of income and non-income indicators, i.e. nutrition and education, found by Günther and Klasen (2009), being rather high for the chronically poor and non-poor groups, which are above 65 percent, and fairly low for the transient poor group, which are in the range of 15 to 39 percent. Also, the correlations found in this study are lower than those between the monetary chronic poverty and chronic malnutrition found by Baulch and Masset (2003), which is less than 14 percent. This suggests that the similarity between the two measures of poverty over time is even lower than the (already low) similarity in the same time-period.

Reverse improvements between monetary poverty and multidimensional poverty

The aim of this sub-section is to investigate whether multidimensional well-being is still improved when an individual's monetary poverty fluctuates up, down or horizontally. To simplify the comparison, I focus on those who stayed in multidimensional poverty in the three-year period only (column 6 in the table). The last two columns of Table 5 show the MPI in the base year and the change in the MPI over the period for those who stayed multidimensionally poor in different monetary poverty trajectories. Note that since there is no change in the incidence of poverty, any change in the MPI is attributed to the change in the intensity of poverty.

There is also a disparity in the improvement in non-monetary measure of poverty. Interestingly, those who stayed poor in multidimensional measure and falling into monetary poverty made the greatest progress in multidimensional measure of all, showing a reduction of 0.016 in the MPI. The wealthiest group of all, those who never poor in consumption and stayed poor in the MPI, made only a reduction of 0.009 in the MPI. Those who fell into consumption poverty and stayed poor in non-monetary measure also made a surprisingly improvement of 0.003 in the MPI. This evidence suggests that changes in income in the short-term do not necessary positively affect other dimensions.

5 Drivers of the transitions in multidimensional poverty

The dynamics of multidimensional poverty can be attributed to the changes in deprivations of the individual indicators. Table 6 displays raw headcount ratios[5] for the entire population by indicator and year in the first three columns, the contribution of each indicator to the overall MPI in 2010 for the entire population in the fourth column. Raw headcount ratios show in general that schooling and the three living standards of cooking fuel, sanitation, and drinking water had the highest deprivation ratios while health, nutrition, school attendance, and the three other living standards showed moderately low rates of deprivation. There were also improvements in most indicators, especially in schooling and sanitation. However, fluctuations were found particularly in health, cooking fuel, and drinking water the deprivation ratio of which increased slightly and then decreased over the two sub-periods. On the contrary, some indicators showed no progress or even got worse over time, examples are nutrition, school attendance, and electricity (see Table 6).

The differences in raw headcount ratios for those who entered and those who exited poverty are shown in the last four columns of Table 6. Among the ten indicators, nutrition and

[5] The raw headcount ratio refers to the share of the population being deprived in an indicator.

health functioning were the two key drivers of multidimensional poverty transitions. Among those who entered poverty, more than 40 percent fell into nutritional deprivation and more than 41 percent fell into deprivation of health functioning. For those who exited poverty, 28 percent escaped deprivation of nutrition and almost 47 percent escaped deprivation of health functioning. These high fluctuations in nutrition and health, which was largely unrelated to changing economic conditions of the households as discusses above, might therefore be the result of climate, agriculture and health shocks that affected human development indicators. An example of the shocks is the great flood in 2011.

Table 6 Indicator deprivations and their changes, percent

Indicator	Raw headcount ratio (%)			Contribution to MPI	Change in raw head count ratio 2007-2010	
	2007	2008	2010	(in 2010)	Entry	Exit
Nutrition	11.5	12.9	14.5	21.1	-40.1	28.0
Health	8.4	8.6	8.4	16.4	-41.4	47.0
Schooling	26.4	25.7	22.4	23.0	-19.5	35.5
Attendance	4.8	5.0	5.4	12.4	-31.6	19.0
Cooking fuel	74.2	78.5	71.6	9.9	8.6	2.3
Sanitation	97.2	97.1	95.5	11.6	2.3	5.2
Drinking water	28.5	23.5	26.8	3.8	-5.7	13.9
Electricity	0.7	1.1	1.4	0.3	-2.6	1.3
Housing	2.7	2.9	1.6	0.5	-0.8	5.0
Assets	2.3	2.0	1.4	0.9	-1.1	3.9
Population share					5.7	5.6

Notes: Values in the same column "Contribution to MPI" sum to 100

Table 7 Changes in multidimensional measures of poverty

k cutoff (%)	Level in 2007	Change 2007-2008	Level in 2008	Change 2008-2010
Multidimensional Poverty Index				
25	0.123	0.002	0.125	-0.009***
34	0.035	0.001	0.036	0.000
40	0.029	0.003***	0.032	-0.003*
Headcount ratio				
25	0.374	0.006	0.380	-0.031***
34	0.077	0.000	0.077	0.001
40	0.061	0.007**	0.068	-0.006*
Average deprivation share				
25	0.329	-0.001	0.328	0.003
34	0.460	0.009	0.469	-0.005
40	0.479	0.001	0.480	0.002

Notes: The changes are tested using Wald test. *** refers to significant at 99 percent, ** refers to significant at 95 percent, and * refers to significant at 90 percent.

The improvement in multidimensional measures of poverty during the three-year period were mainly attributed to the changes in the second sub-period, while the changes in the first sub-period were either statistically insignificant or showed no improvement. Over the three years, the poor, those who were deprived in 40 percent of indicators, made slightly more progress in the MPI, the headcount ratio, than the vulnerable group, those who were deprived in 34 percent or less of indicators. Moreover, the changes in multidimensional poverty during this period was driven largely by the changes in the headcount ratio, or the incidence of poverty, while the changes in the intensity of poverty, or the average deprivation share, were insignificant (see Table 7).

6 Conclusion

This study uses panel household data from three provinces in Thailand and applies the Alkire-Foster method to investigate achievements in human development in the monetary as well as multidimensional poverty. The two measures of poverty are compared in the same time-period to find if they identify the same poor groups. They are also analyzed over time to find which measure shows faster progress, and the drivers of poverty transitions are examined.

The results show that a large disparity between the monetary and multidimensional measures of poverty. The disparity varies across sub-groups of the population depending on households' characteristics and their access to markets. Those who have better access to markets and public services benefit more from economic growth and perform better in the monetary dimension. However, their performance in the multidimensional measure tends to be less impressive. These facts imply that the results of economic growth are transferred more directly to the reduction in consumption poverty during the early years of development. The increase in consumption is necessary but not sufficient for the improvements in non-income indicators, which usually require a longer amount of time and additional efforts. These findings confirm the arguments made by Tsui (2002), Thorbecke (2008), Deaton (1997), and Dercon and Krishnan (2000) that money only is not a good measure of poverty.

We also find that there is not only a low static correlation between monetary and multidimensional poverty but there is also a substantial dynamic mismatch which suggests that improvements in one measure for households do not imply improvements in other measures as well.

Although both the monetary and multidimensional poverty have made good progress over time, the former has made faster progress than the latter. These disparities tell us that incomes of the poor are highly variable with changes in macroeconomic conditions while non-income indicators of the wealthy have a tendency to become worse in the context of poor economic performance. These results have some agreement with Clark and Hulme (2005) that income is highly variable over short periods of time.

The transitions in the MPI are driven more by the changes in deprivation of the two health indicators nutrition and health functioning. These facts suggest that there has been little improvement in the non-income indicators among the poor community and that these items can fluctuate substantially even in an environment of improving economic conditions.

The findings from this study suggest that poverty alleviation policies should pay explicit attention to the improvement in the non-income indicators which have shown slower progress during the last years. Of particular concern are the health indicators of income poor households, whose multidimensional index has changed little during the last years. Furthermore, I find that the monetary non-poor must not be ignored in anti-poverty policies, since in all income quintiles they have a substantial risk of being multidimensionally poor.

This study probed the disparities between the two measures of poverty over a three short time periods, in a small sample of three provinces. Given the surprising and significant findings of this study on mismatches between monetary and multidimensional measures of poverty, further studies on this issue might use a longer time- period, explore datasets with a larger sample size, and might consider alternative specifications of the MPI. A conclusive statement on the dynamic transitions of monetary and multidimensional poverty requires a significant body of empirical studies using consonant measurement comparisons to consider the dynamic transitions. This paper, as one contribution to that goal, reveals a surprising divergence of transition patterns in Thailand.

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Appendix

Table A.1 Cramers V's between indicators, 2010

	Nutrition	Functioning	Schooling	Child enrollment	Cooking fuel	Sanitation	Drink water	Electricity	Housing	Asset
Nutrition	1									
Functioning	0.01	1								
Schooling	-0.07	0.03	1							
Enrollment	0.10	0.00	-0.02	1						
Cooking fuel	0.01	0.01	0.09	0.00	1					
Sanitation	0.03	0.01	0.01	0.03	0.14	1				
Drink water	0.07	0.02	-0.05	-0.01	0.02	0.00	1			
Electricity	-0.01	-0.01	-0.02	0.04	-0.01	-0.01	0.05	1		
Housing	-0.03	0.05	0.00	0.08	0.05	0.03	-0.01	0.05	1	
Asset	0.03	0.03	0.13	0.04	0.06	0.03	0.01	0.11	-0.01	1
MN poor	0.04	0.05	0.01	0.01	0.00	-0.01	0.02	0.06	-0.02	0.10

Notes: Functioning refers to health functioning, attendance refers to child school attendance. MN poor refers to monetary poor and is set at the threshold of $1.67 a day. Values in this table are Cramer's Vs, and are significant at 99 percent of confidence.