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Naoko Shinkai*

Abstract

Sub-Saharan African countries have demonstrated high economic growth in the last decade. However, it seems that economic growth has not always contributed to poverty reduction in Sub Saharan Africa, as found in previous studies at regional or country levels. Mozambique is not an exception. The average economic growth rate of real GDP between 2000 and 2013 was 6.76%, whereas the poverty headcount rates in rural areas did not decrease in the same period. However, this was found based on economic measures of poverty, such as consumption-based or income-based poverty. It is often said that poverty is multidimensional and economic measures alone cannot represent the real situations of the poor. This is true especially when most of the population is engaged in subsistence agriculture. Then, the next questions will be how non-economic measures of or multidimensional poverty have changed in the same period and what the differently estimated determinants of poverty are. In this paper, poverty incidence based on non-economic and multidimensional measures of poverty were explored after 2003 in northern Mozambique where severe poverty was detected in previous studies, and major determinants of three types of poverty were investigated. Analyses were made based on the survey which was conducted in northern Mozambique for small-scale farmers in 2010 by the JICA Research Institute. As a result, multidimensional poverty in rural areas appears to have decreased in the given period. Concerning determinants of poverty, positive effects of household size and negative effects of the share of literate household members on poverty are quite robust for any type of poverty; the feminization of poverty was not clearly detected in northern Mozambique.

Keywords: Multidimensional Poverty Measurement, Nacala Corridor, Northern Mozambique, Determinants of poverty, Feminization of poverty

JEL Classification: I32, O12, O20, O55

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1. Introduction

In Mozambique, between 2000 and 2013, the average growth rate of real GDP was 6.76% and the GNI per capita more than doubled, in line with the economic growth experienced by other countries in Sub-Saharan Africa (SSA) during the same period. On the other hand, according to IAF 2002/03 (Inquérito aos Agregados Familiares 2002/03) and IOF 2008/09 (Inquérito Nacional ao Orçamento Familiar 2008/09), the poverty headcount ratio measured by the national poverty line increased between 2002/03 and 2008/09, particularly in rural areas (Ministério da Planificação e Desenvolvimento, República de Moçambique 2010). It seems, in fact, that economic growth has been achieved without poverty reduction. The vast literature on growth and poverty based on data for countries across regions tends to show a negative relationship between growth and poverty (Dollar and Kraay 2002).

However, this relationship may vary by region and according to the period of time under consideration. In particular in SSA, this relationship does not seem to hold all the time (Shinkai 2011; Martins 2013; McKay 2013; Thorbecke 2013). Mosley (2013) examined data on 31 African countries for the period between 1990 and 2010 and concluded that there is no significant negative relationship between per capita income growth and poverty headcount ratios. In addition to regional studies, country studies in SSA have been conducted to examine the nexus of economic growth and poverty. For these country studies, household surveys are usually used with or without panel data characteristics, but the results are somewhat mixed. Côte d'Ivoire showed a negative relationship between economic growth and poverty reduction based on a household survey in 1985 (Kakwani 1993). In Ethiopia for the period between 2000 and 2009, economic growth appeared to reduce poverty (Geda, Shimeles, and Weeks 2009). On the other hand, looking at Kenya, Kabubo-Mariara, Mwabu, and Ndeng'e (2012) applied the

Ravallion-Datt and Shapley approach between 1994 and 2006 and demonstrated that economic growth did not always have a positive impact on poverty reduction. Nigeria showed positive elasticity between economic growth and poverty between 1998 and 2008 (Stephen and Simoen 2013), and Tanzania did not show a significant negative relationship between economic growth and poverty between 2000 and 2007 (Atkinson and Lugo 2010).

In Mozambique, according to the country report by the World Bank (World Bank 2005), it appears that while there was a negative relationship during the post-war period between 1996 and 2003, the relationship seemed to be unclear after 2003. A study by Arndt et al. (2012a) examined the relationship between poverty rates—which are based on consumption, economic growth, and external economic condition, such as changes in fuel and food prices between 2002/03 and 2008/09 in Mozambique. They combined household data such as IAF 2002/03 and IOF 2008/2009 with a dynamic computable general equilibrium model to connect macroeconomic variables to consumption. They concluded that the main reasons for consistently high rates of consumption-based poverty in the given period are a slow growth in agricultural productivity, weather shocks in 2008 in the central provinces, and a large increase in international food and fuel prices.

These results were mainly obtained measuring poverty levels by monetary variables such as income or consumption. It is often said that using only one economic indicator such as income does not provide an accurate picture, as poverty is multidimensional. In addition, when most of the population is engaged in subsistence agriculture, there is a possibility that income measures do not represent actual living conditions. The question then is, how do other poverty measures that consider non-monetary aspects, such as social conditions and infrastructure development, indicate changes in living conditions over time?

Non-monetary measures or multidimensional measures of poverty have been extensively developed, accelerated by Sen's capability approach (Sen 1976; Townsend 1979, 1987; Atkinson and Bourguignon 1982; Atkinson 1987; Bourguignon and Chakravarty 2003; Arndt et al. 2012b). The multidimensionality of poverty has been also analyzed by integrating the idea of deprivation (Sen 1981, 1999). Proponents of multidimensional poverty analysis have stated that poverty is multifaceted and cannot be measured in only unilateral or cardinal ways. In 2010, the Multidimensional Poverty Index (MPI) was introduced in the Human Development Report and various deprivations in three main areas—education, health, and standard of living—have been demonstrated across regions and by country (Alkire and Foster 2009; Batana 2008; UNDP 2010). At the same time, debates regarding indices of multidimensional poverty seem to be heating up as development communities have been searching for indicators for the post-Millennium Development Goals (MDGs) (Alkire and Santos 2010; Alkire and Foster 2009, 2011a; Ravallion 2010a, 2010b, 2011; Alkire and Foster 2011b).

Monetary measures to estimate poverty have so far been used extensively in Mozambique, and there has been discussion as to whether economic poverty measures are appropriate for this country (Walker et al. 2006; Hanlon 2007; Arndt and Simler 2010; Arndt et al. 2012b). Additionally, Alfani et al. (2012) pointed out that when spatial price differences across provinces are incorporated into the poverty line calculations, poverty rates are underestimated in the northern and central regions, and rural areas in southern regions, based on household surveys (IAF [1996/97, 2002/03] and IOF [2008/09]). While the existing literature using non-monetary measures of poverty is smaller than that using monetary measures, some studies on social dimensions have been made. For example, Pontara (2001) examined consumption and non-consumption poverty and the social dimensions of development focusing on gender perspectives in Mozambique; Vollmer (2012) followed Alkire and Foster's approach and estimated the

multidimensionality of poverty in Mozambique. He also emphasized the importance of multidimensional measures for capturing real situations of poverty in Mozambique, citing the fact that the percentage of children with malnutrition in Mozambique increased despite the fact that the consumption-based poverty rate decreased. He has included an additional dimension, Good Governance, to dimensions similar to those suggested by Alkire and Santos (2010), and concluded that the official poverty rate of 54.7% is far below his estimate of the poverty rate at 98.1%, based on QUIBB (Questionário de Indicadores Básicos de Bem-Estar 2008).

Salvucci, Betti, and Gagliardi (2013) estimated poverty levels using monetary and non-monetary measures of poverty based on a household budget survey (IOF 2008/09) and compared these with levels in urban/rural areas and by province. They found that the northern and central regions appeared to suffer substantially higher rates of poverty than the southern region when non-monetary measures were applied. The gap between urban and rural areas was also shown in their study to be larger when monetary measures were supplemented by non-monetary measures. Arndt et al. (2013) used the first order dominance (FOD) approach, which is a multidimensional approach developed by Arndt et al. (2012b), and the poverty mapping methodology based on consumption, then made a comparison of results obtained from these two approaches based on Census data of Mozambique in 1997 and 2007. They demonstrated that rankings from the poor to the rich based on two approaches are quite different and most central and northern districts are ranked higher in the poverty mapping than in FOD approach. They also concluded that the FOD index, which represents water, sanitation, education, electricity and radio, is less volatile than the consumption-based figures.

As the differences in results between monetary and non-monetary measures are quite large, the determinants of poverty may also be quite different among these measures.

Determinants of poverty have been investigated extensively in the past. The second main objective of this paper is to see whether the same set of determinants of consumption-based poverty would also be important for multidimensional poverty. Among determinants, the gender of household heads has been one of the primary concerns in the previous literature since it indicates the existence or non-existence of the feminization of poverty, indicated by higher rates of poverty among households with female heads.

Although feminization of poverty has been addressed many times, the results are mixed in SSA. In a study in Nigeria, gender came out with an opposite sign to consumption-based poverty incidence (Adekoya 2014) as was the case in a study in Kenya by Omonona and Okunmadewa (2009). The effect of land is also mixed, partly because the measurements are quite diverse. Distance from the main or paved road was found to be positively correlated with poverty rates in Papua New Guinea based on a household survey in 1996 (Gibson and Rozelle 2003). Iwasaki and El-Laithy (2013) examined determinants of poverty in greater Cairo, Egypt in 2005 and found that households with male heads have a significantly lower probability of being poor for consumption-based poverty and multidimensional poverty, but not for subjective poverty. Simler et al. (2004) examined determinants of poverty in Mozambique measured by a poverty line based on a household survey in 1996/1997. They found that male heads of household, education, household size, and number of children correlated positively with per capita food consumption. Bruck (2001) investigated determinants of welfare measured by food consumption, total consumption, and income, based on data collected for the Food Security project in northern Mozambique in the period between 1994 and 1996 and found similar results to those obtained by Simler et al. (2004). However, these studies are based in the period when economic growth seemed to have reduced poverty in Mozambique.

This study has two main objectives. The first is to examine the multidimensional sides of poverty and investigate the socio-economic dimensions in northern Mozambique. This investigation focuses on the period after 2003 when the negative relationship between economic growth and poverty based on monetary measures is not likely to be detected all over the country. The second objective is to identify major determinants of multidimensional poverty in northern Mozambique, an area that was selected because according to previous studies most of the poor in the country are found in this region. These objectives are investigated based on a survey conducted on small-scale farmers in northern Mozambique by the JICA Research Institute.

The remainder of the paper is organized as follows. Section 2 presents attributes of the data by the JICA Research Institute in comparison with other micro data sets, Section 3 elaborates socio-economic and social characteristics of northern Mozambique, Section 4 explores multidimensional poverty in rural areas and northern Mozambique based on different household surveys conducted after 2003, and Section 5 demonstrates the analyses of determinants of three types of poverty. This is followed by the Conclusions.

2. Some features of the data by the JICA Research Institute

There are various micro surveys existing in Mozambique, such as Census (Censo) 1997, 2007, DHS (Demographic and Health Survey), IAF, IOF, QUIBB, and TIA (Trabalho de Inquérito Agrícola). These are all meant to be representatives at national/provincial levels, however, there are some differences among them. Regarding the agriculture sector and farming households, TIA is often used. There is Census for Agriculture and Livestock (Censo Agro-Pecuário, CAP) but the most recent one available was taken in 1999/2000. The next one to be released will be in 2009/2010. For TIA, sample districts

are selected based on provinces and agro-ecological zones out of 138 districts. The number of districts differ by survey year. Then, within each district, a sub-sample of the primary sampling units of CAP is selected. Since 2006, 90 districts are selected for TIA (Kiregyera et al. 2008). TIA is a set of integrated questionnaires of agriculture modules including home consumption with income modules. However, in northern Mozambique, most districts along the Nacala corridor were not selected for TIA samples. In order to complement their samples, the JICA Research Institute conducted a household survey in northern Mozambique along the Nacala corridor. For the JICA survey, first, districts whose centers are fewer than 200km from the Nacala corridor were selected. Those districts reside in four provinces: Cabo Delgado, Nampula, Niassa, and Zambezia. After districts were selected, administrative posts whose centers are within the 200km from the Nacala corridor were sampled. Then, within each administrative post, small- and medium-scale farming households were randomly selected from a list, their numbers varying in each administrative post depending on the total number of farming households. In total, 633 small-scale farmers were sampled, 94% of which are in rural areas. Demographic and Health Surveys (DHS) are often used for obtaining health information at the provincial level. Their household module details the characteristics of houses and education levels, which is why DHS are used for computing multidimensional poverty index. However, DHS contains no information on the agricultural sector, land, income, or consumption.

This paper utilizes variables related to agricultural activities and the distance from the corridor as well as socio-economic information to compute the multidimensional poverty index in order to examine determinants of multidimensional poverty. Therefore, the JICA survey in 2010 was used for analysis. Prior to investigating the determinants of poverty, the section below compares various indicators based on

JICA samples with those based on other micro surveys in order to examine the legitimacy of samples.

3. Examination of socio-economic and social aspects of Northern Mozambique

As mentioned in the previous literature, Mozambique has significant gaps in social and economic status across provinces within the country. The disparity in poverty or living conditions between rural and urban areas within the same province is quite large as well. The poverty headcount ratio based on the national poverty line was 54.7% for the total population in 2008/09 (Ministério da Planificação e Desenvolvimento [MPD] 2010). The poverty headcount rates in 2008/2009 based on poverty lines adjusted for differences in prices and basic costs across regions were 57.2%, 71.2%, and 44.7% for northern rural, central rural, and southern rural areas respectively. In urban areas, the rates were 44.2%, 33.8%, and 15.9% for northern, central, and southern areas respectively in the same year, as estimated and presented in Alfani et al. (2012). Social conditions also differ across regions. The percentage of the population having electric lights in the urban areas of the Maputo province was 57.2% compared to 22.8% in rural areas of the province, based on IOF 2008/09. In northern Mozambique, electric coverage in the same year in rural Niassa-Cabo Delgado is 0.7%, in rural Nampula, 1.5%, and in rural Sofala-Zambezia, which is considered part of the central region, though with its northern areas categorized as the northern region, is 0.3%. Regarding toilet/latrine facilities, the coverage is 40% in rural areas of Maputo province, 6.9% in rural Niassa-Cabo Delgado, 1.6% in rural Nampula, and 3.5% in rural Sofala-Zambezia. The net enrollment rate in primary school is 67.5% in northern rural areas, 74.2% in central rural areas, and 85.9% in southern rural areas. The net enrollment in secondary school is 6.4% in northern rural areas, 11.1% in central rural areas, and 17.2% in southern rural areas in 2008/2009, according to the third

national poverty assessment by MPD (MPD 2010). Perceived conditions may differ depending on which socioeconomic dimensions are observed, but overall, rural populations have more severe living conditions than those in urban areas.

In addition, there are notable variations between northern and southern regions arising from differences in cultural and historical development that cannot be ignored. The northern part of the country is mainly populated by the Macua, the largest ethnic group in Mozambique, and the Nacala corridor runs through the heart of the Macua community. Macua societies are structured based on a matrilineal kinship system in which the wife's family is the base for building ancestry relationships. Among Macua communities, there are some variations: "Macua-nyanja" and "Macua-interior/xirima" in the inner regions, "Macua-interior" and "Macua-meto" between inner and coastal regions, "Macua-lomwe" close to central Mozambique, and the Islamized north coast ("islamizados litoral norte") in coastal regions, etc., according to Martínez (2009, 69). There are strong influences from Muslim communities in northern areas with some influences from Christianity. Southern Mozambique is mainly populated by the Shangana ("Changane"), a different ethnic group, which resides also in South Africa. The communities in these areas are built on a patrilineal kinship system.

Polygamy seems to be found more frequently in northern areas than in southern areas. According to Tvedten, Paulo, and Tuominen (2009), 14% of households sampled and interviewed in their research sites in Mossuril, where all samples were Muslims, were in polygamous relationships, and 3% of households in Nampula city. However, in their research sites in Gaza, a southern province, they found almost no polygamous households. According to MISAU (2005), 14% of men from 15 to 64 years old had more than two wives and 33.9% of women between 15 and 49 years old were in polygamous relationships in Nampula. In Niassa and Maputo provinces respectively, 26.8% and 22.5% of women in the same age group were in polygamous relationships in 2003. In

2011, 10.5% of women between 15 to 49 years old were in polygamous relationships in Nampula, while 23.1% and 12.6% of women in the same age range in Niassa and in Maputo provinces respectively were in polygamous relationships. However, in 2011, 4.4% of women in Niassa, 7.2% in Nampula, and 19.5% in Maputo province reported "do not know ("não sabe")" for the question "Do you know whether your husband/partner has other wife (wives) besides you? ("Sabe se o seu marido/parceiro tem outra[s] esposa[s] além da senhora?")" (INE, MISAU 2013). The percentage of engagement in polygamous systems may also vary by district and by sample, which may be affected by mixed social systems and varied historical development. It may therefore be hard to capture real situations using average figures.

Based on studies in SSA including Mozambique revealing mixed results, these differences may affect the feminization of poverty in various ways. For instance, land, or more precisely, the right of use of land, is transferred to wives and wives' families in northern Mozambique. Therefore, after divorce, separation, or widowhood, land will be used by these women. The number of household members also tends to be smaller for households with female heads.

This paper also compares education components of the household survey conducted in northern Mozambique by the JICA Research Institute with the existing results (Table 1). Percentages of households with female heads are lower than the figures reported in INE (2010), which in 2008/2009 reported 29.4% of the total sample in Mozambique. However, these percentages are still comparable with the results from other household data collected in districts in northern regions. Literacy or illiteracy rates of household heads are quite similar to those found in 2008/2009 by INE (2010), where 44.3% of household heads were reported as illiterate. Literacy rates among female heads of households across all four provinces are much lower than among those of male heads. Among the provinces surveyed, the highest literacy rate of female heads, 40.63%, is

detected in Nampula province. Net enrollment rates in primary schools in the four provinces are slightly higher than the enrollment rates found in northern rural areas, based on IOF 2008/2009, but the figures are quite similar. Net enrollment rates in secondary schools in these provinces are also similar to the rates obtained in northern rural areas from IOF 2008/09. Comparisons of net enrollment rates in primary schools by gender of household heads do not reveal the same stark differences that were observed in literacy rates of household heads. On the contrary, in Niassa, Cabo Delgado, and Nampula provinces, households headed by females show higher net enrollment rates in primary schools than households headed by males. When net enrollment rates in secondary schools are considered, higher net enrollment rates of households with male household heads seem to emerge. The exception is Zambezia, where households headed by females show much higher net enrollment rates in secondary school than households headed by males.

In conclusion, although the literacy rates of household heads substantially differ by gender, it seems that net enrollment rates of children are not significantly worse for households headed by females in the provinces surveyed.

Table 1. Literacy rates and net enrollment rates in primary and secondary schools by region and type of household head, rural only[1] (%)

		Literacy rates			Net enrollment rates, Primary			Net enrollment rates, Secondary		
Provinces	Female head	Total	Male head	Female head	Total	Male head	Female head	Total	Male head	Female head
Niassa	15.25	51.69	57	22.22	75.88	75.55	80	9.09	9.52	0
Cabo Delgado	16.67	33.33	35.38	23.08	58.67	58.48	60	4.41	5.77	0
Nampula	16.33	54.59	57.32	40.63	69.18	68.84	70.83	4.24	4.81	0
Zambezia	19.46	41.62	49.66	8.33	76.8	78.1	69.61	16.67	14.16	30

Source: Author's calculations based on the Household Survey by the JICA Research Institute, 2010

[1] The enrollment status in the academic year in 2009/2010 was used in the calculation of net enrollment rates.

So far, socioeconomic characteristics and important factors that may affect living conditions in northern Mozambique have been investigated. In the next section, multidimensional poverty is examined in order to explore changes in and further aspects of poverty in northern Mozambique.

4. Non-monetary measures of poverty over time in Mozambique

Conforming with Sen's capability approach to poverty in emphasizing the multidimensional issues of poverty and deprivation (Sen 1983, 2000), the Human Development Index (HDI) was constructed to be in line with basic human needs so that situations in different regions and countries could be compared. The Multidimensional Poverty Index (MPI) contains the same three dimensions as the HDI as well as multiple deprivations that assess attainment of the Millennium Development Goals (MDGs) (Alkire and Foster 2007; Alkire and Santos 2010, 2013). It is hard to deny that an increase in income may be a necessary condition for poverty reduction, but it may not be sufficient alone. Poverty indices with non-monetary components along with economic indicators may capture more reliably genuine living conditions. Next, MPIs are investigated in Mozambique in order to understand different deprivations that may have occurred in the country over time. This investigation also uses the survey by the JICA Research Institute in 2010 in northern Mozambique for comparison. This survey was conducted on 633 small scale farmers selected based on multistage random sampling from four provinces: Cabo Delgado, Nampula, Niassa, and Zambezia. Five hundred and ninety-five of these samples were from rural areas; sample districts were selected so that their capitals were located inside or within 200km of the Nacala corridor. Of the samples, 16.75% were households with female heads. The average age of the head of the household was 41.186 years.

The MPIs of Mozambique were calculated over time and by urban and rural areas and compared with the published figures obtained from DHS (Demographic and Health Survey) (Table 2). Unlike the poverty estimates based on income, which increased between 2003 and 2008, the MPI headcount ratios seem to have declined between 2003 and 2011 from 79.8% to 69.6% for the total population. On the other hand, this 2011 MPI headcount ratio for Mozambique is above the regional MPI headcount ratio for SSA, which is 59.47% between 2002 and 2013 (Alkire, Conconi, and Seth 2014). Also in rural areas, the MPI headcount rate of 83.9% in Mozambique remains high compared with the regional MPI headcount ratio, which is 73.8% for rural areas of SSA in the same period.

Unidimensional measures based on monetary variables can indicate the degree of integration to the monetary society and market-based economy. When the poverty measures based on income in rural areas worsened, it is probable that the degree of market integration either did not change much or deteriorated. In addition, even if the poverty line increased, the income or consumption levels in rural areas did not rise enough to reflect the rate of inflation.

Nevertheless, these measures do not provide information on the welfare of the poor when there is not much market integration. On the other hand, multidimensional measures, which are based on living conditions rather than unidimensional monetary measures, can tell more about the welfare of the poor despite the degree of market integration. However, these dimensions cannot be definite and requirements of variables are more, although those tend to be free from subjective sample errors.

The fact that the percentage of the MPI is higher means that there are more people who are deprived in at least one third of all the indicators used, one sector equivalent of three dimensions of poverty indicators. In the case of Mozambique, there are more people who are deprived than in SSA overall on average as of 2011. However, the percentage of people, who are deprived in more than one third of all the indicators,

decreased between 2003 and 2011. This decrease seemed to be produced from two things. One is from more access to primary school and another is from the improvement in sanitation facility (Alkire et al. 2014).

These MPIs are constructed based on three dimensions:, health, education, and living standard, with equal weights of 1/6 assigned for each component of education and health, and 1/18 for each component of living standard. Following the method described in Alkire and Santos (2010), the same sets of indicators and weights were used to construct MPI estimates based on the JICA survey. However, two adjustments were made due to the unavailability of data. One indicator on Health in their MPI is “Any adult or child for whom there is nutritional information is malnourished.” Since there is no nutrition information in the JICA survey, an alternate indicator to represent health status of household members was used: “Any of the household members had malaria or HIV/AIDS in the last 12 months (between September 2009 and August 2010).” One more difference lies in living standard. In Alkire and Santos (2010), there are 6 indicators: electricity, sanitation, water, floor, cooking fuel, and assets. There was, however, no question about cooking fuel and floor materials on the JICA survey, so we assumed that all the households have dirt floors and charcoals or wood as cooking fuels. In rural areas, this is a safe assumption, confirmed by other micro surveys in Mozambique. All the MPIs are calculated at the household level. The multidimensionally poor households are those whose “deprivation scores” are more than 33.33%. Those households, which are severely multidimensionally poor have “deprivation scores” greater than 50%. Those households which are “near-MPI” have “deprivation scores” greater than 20% but less than 33.33%. “MPI Intensity” is the average of “deprivation scores” of the poor. “Revised, MPI” was calculated based on some changes in the specifications of the categories of education and health. For instance, for education, if no member of a household completed 6 years of education instead of 5 years of education (*Ensino*

Primario do Primeiro Grau, EP1 in Mozambique), this household is classified as "deprived" in "Years of schooling." Also those children who enrolled in primary school one year later than the designated age are considered as "attending" for "Child attendance to school." In the health section, households with a child who died in the past are classified as deprived in terms of "child mortality." In the "Revised, MPI," households that have a child who died within 5 years of the survey time are considered "deprived" (UNDP 2014). "MPI, Alternative" here was calculated based on a change made for a category of "Child attendance to school" by allowing the entrance to primary school two years later than the designated age to see the robustness.

The samples of the household survey conducted by the JICA Research Institute in 2010 are mostly found in rural areas. For this reason, the MPI estimates drawn from the JICA samples may be closer to the DHS results in rural areas. Despite the differences in sample areas and survey years, the headcount ratios of the MPI near poor within the JICA samples are similar to the comparable estimates of the total population based on DHS in 2011. The differences in the headcount ratios of severe poor may have emerged because the JICA samples include only the four northern provinces of Cabo Delgado, Nampula, Niassa, and Zambezia. There seem to be more people considered as MPI poor but fewer categorized as severely affected MPI poor in the JICA samples than in the DHS samples. When the relationship between geographical location and multidimensional poverty is investigated, the MPI poor and the severely affected MPI poor exhibit the lowest values for the population along the Nacala corridor (Table 3). This means that those households that are closer to the Nacala corridor are less likely to be multidimensionally poor compared to those households that live far from the Nacala corridor. Those households who reside 200km south of the Nacala corridor show somewhat lower MPI headcount ratios than those who live 100km south. This situation could be derived from the effect from Quelimane, the capital city of Zambezia province, which is located around 400km

south of Nampula and is connected to Nampula by a fairly good road network. This finding somewhat resembles the connection derived by Gibson and Rozelle (2003) for Papua New Guinea between access (travelling time) to the nearest road and poverty (measured by consumption) and for the relationship between income and the distance to the road.

Next, given these results, determinants of poverty, being important factors that may cause people to fall into poverty, are examined for three types of poverty measures including multidimensional poverty.

Table 2. Comparisons of multidimensional poverty in Mozambique

	Year	Survey	MPI	MPI Headcount ratio (%)	MPI Intensity (%)	Pop. Near MPI(%)	Pop. Severe pov. %	MPI Revised Headcount ratio (%)	MPI Alternative	Rural Sample(%)
Mozambique, total	2003	DHS	0.483	79.80	60.50					
Mozambique, rural	2003	DHS	0.586	93.21	62.90					66.61
Mozambique, urban	2003	DHS	0.277	53.10	52.09					
Mozambique, total	2011	DHS	0.389	69.60	55.60	14.8	44.10	70.2		
Mozambique, rural	2011	DHS	0.480	83.90	57.16	11.88	57.53			
Mozambique (Northern region)	2010	JICA	0.412	84.83	48.62	13.74	35.55	86.57	80.88	
Mozambique, rural (Northern region)	2010	JICA	0.423	86.66	48.84	12.16	36.82	88.34	82.6	93.52

Source: Human Development Report (2014) and author's calculations based on the Household Survey by the JICA Research Institute, 2010

Table 3. Comparisons of multidimensional poverty by distance from the Nacala corridor

	Year	Survey	MPI	MPI Headcount ratio (%)	MPI Intensity (%)	Pop. Near MPI(%)	Pop. Severe pov. %	MPI Revised Headcount ratio (%)	MPI Alternative
Mozambique, rural (Northern region)									
Along the Nacala corridor	2010	JICA	0.382	81.29	46.95	15.83	28.78	82.73	75.54
100 km North	2010	JICA	0.403	84.38	47.71	14.58	35.42	88.54	79.17
200 km North	2010	JICA	0.455	91.58	49.67	8.42	42.11	92.63	91.58
100 km South	2010	JICA	0.456	90.56	50.40	8.33	43.33	91.67	86.67
200 km South	2010	JICA	0.409	84.15	48.56	15.85	31.71	85.37	79.27

Source: Author's calculations based on the Household Survey by the JICA Research Institute, 2010

5. Determinants of poverty

In the earlier sections, it has been demonstrated that the monetary based and non-monetary based poverty measures reveal different trends. In Mozambique, the poverty rates based on monetary measures in rural areas somewhat increased after 2003, whereas those based on non-monetary poverty measures derived from DHS and the definition by the author seem to have decreased. In this section, the determinants of poverty for monetary and non-monetary based measures are investigated in order to observe more deeply the differences, which may lie in these two measures.

In this section, three separate measures of poverty including multidimensional poverty are examined in order to determine the elements that will be more likely to increase the probability of being poor. These three measures are the bottom quartile by food expenditure per capita, the bottom quartile by total land size of cultivation, and the MPI extreme poor or so-called severely affected poor based on the MPI. The first two categories are selected for comparison since these are often used as monetary or wealth-based poverty measures. Being poor is set equal to 1 and 0 is otherwise as a dependent variable. Here, the main concern is the probability of being poor based on three categories and the ris the main concern and its relationship of those probabilities with the determinants of poverty identified previously. Therefore, as in the previous literature, the logit regression model was applied in order to distinguish important determinants for the probability of being poor in association with being non-poor.

There are three sectors, education, health, and living standard, with equal weights assigned to each according to the counting approach described in Alkire and Foster (2009). The MPI poor are those deprived by at least a one sector equivalent in the above three. The MPI extreme poor are those who are deprived by 50% or more and are considered to be under “severe poverty” as defined in the OPHI Country briefings and

HDR issued after 2011. They are deprived by at least a one and a half sector equivalent in the above three.

Explanatory variables examined here are gender of the household head with female designated as 1, age of the household head, age squared, total land size, total land size squared, household size (which is represented by the number of total household members), household size squared, literacy of household head with being able to write Portuguese designated as 1, the share of literate household members, whether household heads have non-agricultural jobs, whether household heads are self-employed, distance from the Nacala corridor, and whether or not any cash crops[2] were planted. The multicollinearity across explanatory variables was examined but none of the results show significant multicollinearity.

In order to estimate determinants of poverty, the logit model is used since the dependent variable is binary and the probability distribution may not be necessarily normal.

The logit model is described below following the conventional form.

$$y^* = \beta' x + \delta \tag{1}$$

$$\text{y=1 if } y^* > 0$$

$$\text{y=0 if } y^* \leq 0$$

$$\Pr ob(y^* > 0) = \frac{e^{\beta' x}}{1 + e^{\beta' x}} \tag{2}$$

[2] Those crops that are categorized as cash crops here are cotton, tobacco, sisal, tea, sugarcane, soybeans, sesame, cashew nuts, coconuts, bananas, pineapples, mangoes, and other fruits.

y is 1 whether households are considered to be poor based on three criteria and 0 otherwise. x represents all the explanatory variables mentioned above.

In order to observe the effects of one-unit changes of the explanatory variable, odds ratios are presented here.

The following analyses were made at the household level and used only rural samples in northern Mozambique from the survey by the JICA Research Institute.

Table 4. Results of the logit model

	The MPI extreme poor		The MPI extreme poor with provincial dummies		The bottom quartile Land size with provincial dummies		The bottom quartile food expenditure with provincial dummies	
Variables	Odds ratio	z-value	Odds ratio	z-value	Odds ratio	z-value	Odds ratio	z-value
Female	0.937	−0.24	0.895	−0.41	2.565	3.39 **	1.441	1.25
Age	0.998	−0.05	0.994	−0.17	0.922	−2.13 **	0.978	−0.58
Age squared	1.000	−0.25	1.000	−0.07	1.001	1.94 *	1.000	0.64
Land size	0.955	−1.32	0.947	−1.51			1.007	0.15
Land size squared	1.002	1.42	1.002	1.52			0.999	−0.48
HH size	1.608	2.21 **	1.631	2.25 **	1.247	0.92	1.859	2.56 **
HH size squared	0.974	−1.23	0.972	−1.29	0.974	−1.01	0.959	−1.76 *
Non agri. Emp.	0.655	−0.81	0.649	−0.82	1.559	0.79	0.662	−0.63
Self emp.	0.879	−0.5	0.921	−0.32	1.413	1.12	0.745	−0.95
cash crops	1.419	1.46	1.404	1.36	0.458	−2.15 **	0.938	−0.23
100km from the corr.	1.855	2.53 **	1.644	1.87 *	0.962	−0.12	1.608	1.57
200km from the corr.	1.742	2.09 **	1.035	0.09	1.218	0.47	1.271	0.57
Literate					0.996	−0.01	0.862	−0.5
Share of literate HH M.					0.343	−1.87 *	0.224	−2.41 **
Log likelihood	−356.82585		−354.23817		−285.80731		−302.84982	
No. obs	576		576		577		576	

Source: Author's calculations based on the Household Survey by the JICA Research Institute (2010)
Note: Wald test is used for testing the statistical significance of coefficients with the normal distribution. Z-values are calculated based on the Wald test to test the null hypothesis of each coefficient to be zero, which are the estimated coefficient divided by the standard error. ** and * denote significance at the 5% and 10% levels.

The maximum likelihood estimation results of the logit model with and without provincial dummies are demonstrated in Table 4. The aforementioned three different categories of poverty are examined.

In the previous literature on the determinants of poverty, education was shown to decrease poverty whereas household size increased it. The effect of gender of household head on poverty has not been clear overall in Africa. For Mozambique, household size decreases whereas adult literacy and male headed households increases consumption per capita, which is consumption based poverty measure based on IAF 1996/1997 (Simler et al. 2004). The effect of land size was not significant in their study. According to Bruck (2001), female headed households, the number of dependent household members, and the number of non-dependent household members decrease food consumption per capita significantly, whereas diversification of crops increases food consumption per capita in northern Mozambique in the post-war period between 1994 and 1996.

In terms of the MPI poverty measure, recent studies by Adeoti (2014), female headed household, household size, and agriculture sector as a main production sector had significantly positive effects on the probability of being poor in rural Nigeria between 2004 and 2010 (Adeoti 2014). Iwasaki and El-Laithy (2013) found that male headed households are more likely to be less poor; the age of the household head and household size have negative effects on the MPI poverty in unplanned areas in Cairo in 2005.

Based on these findings, six key variables have been identified: gender of the household head, land size, household size, age of household head, the level of education of household head, and distance from the main road.

Among those variables, household size seems to have the strongest correlation with poverty, which may be striking but should not be surprising. Household size contributes significantly and positively to the probability of being classified as poor

under the MPI and food expenditures. When household size increases, the odds of being poor in terms of the MPI or food expenditures increases by 60% without provincial dummies or 80% with provincial dummies. This strong, positive effect of household size matches previous findings. Household size may have two effects on food expenditures: an additional household member will increase food expenditures and increase the probability of being poor; or, an additional household member will increase food expenditures but not as much as the existing member due to economies of scale. If the latter effect is bigger, food expenditure per capita will be smaller when an additional household member is added. Based on the result, household size squared has a negative and significant coefficient. Therefore, an additional household member will increase food expenditures per person and increase the probability of being poor, but to a lesser extent. If economies of scale pertain, an additional household member will not increase food expenditures per person at all in the extreme case. Investigating the possibility of economies of scale at the household level, Simler et al. (2004) estimated the economies of household size in Mozambique for consumption to be conceivably 0.8. This estimate is close to 1, meaning economies of scale at the household level may not occur. Therefore, in Mozambique, when a household member is added, food expenditure increases and the probability of this household being poor increases.

Another significant variable is the share of literate household members, an increase in which significantly reduces the probability of being poor by land size and food expenditure, whereas literacy of the household head does not seem to create any significant effects on poverty. This result somewhat contradicts previous findings. However, this fact may be probable when the mean age of household head, which is around 40, and the education environment of Mozambique in the 1970s are considered. The positive effects of household size and the negative effects of the share of literate

household members are quite robust and remain significant when different types of poverty are considered.

Another factor that may be important is the distance from the Nacala corridor. If a household is located more than 100km or 200km away from the Nacala corridor, the probability of this household being poor based on the MPI rises significantly. When a household is located within 100km from Nacala corridor, the odds of being poor in terms of the MPI would be 1.8 times without provincial dummies or 1.6 times with provincial dummies, more than otherwise. This means that the distance from the principal road may compromise the integrated conditions of the MDGs. It should be noted that the coefficients of 100km and 200km away from the Nacala corridor are somewhat similar since there may be a possibility that households are also affected by another major corridor in central Mozambique, the Beira corridor, when they are located 200km south of the Nacala corridor. On the other hand, distance variables do not show any significant effects in other monetary-based poverty measures. It is possible that farmers near the corridor could be less poor in terms of food consumption if households have more chances than those far away to receive more cash to buy food by some means through markets. However, the result shows that this is not the case. Distance from the corridor in the Northern Mozambique does not have a significant relationship with food consumption. This estimation outcome can be interpreted as weak market integration of small and medium scale farmers around the corridor. There might be various reasons for that but ordinary conditions of feeder roads can be one of those.

The cultivation of any cash crop appears to reduce poverty significantly as measured by the bottom quartile of cultivated land. Whether or not household heads have non-agricultural jobs and self-employment does not have any significant effects on these three types of poverty. Among explanatory variables, in some cases, “non-agricultural employment” and “cash crops” are considered to be endogenous variables, for example,

when decisions to have “non-agricultural employment” are made when land size is determined. Also when there are distinctive variables related to food consumption and also correlated to non-agricultural employment significantly, endogeneity exists. For the JICA research institute data, samples are small and medium farmers whose main jobs are farming. The percentage of non-agricultural employment is low, roughly 3% of the whole sample. Therefore, the above two possibilities of endogeneity are not likely to be the main issues. Likewise, when the decision to have “cash crops” is made when the land size is considered, there might be a chance of endogeneity. If large and commercial farmers, who are likely to determine the size of cultivated land for cash crops, are included in the sample, possible endogeneity has to be treated carefully. In the JICA research institute data, samples do not include these large farmers. Due to the characteristics of samples, it is considered that cash crops are planted on an experimental basis with other main crops, such as maize and cassava.

Nevertheless, both “non-agricultural employment” and “cash crops” are not significant in affecting the probability of any of the three categories of poverty measurements, except for “cash crops” to “land size.” Considering the characteristics of samples, it is hard to think that this significantly positive effect is influenced by the endogeneity.

Gender, age of the household head, and age squared come out with significant coefficients with expected signs only for the bottom quartile by land size.

Following polygamous culture, each wife is entitled to have her own plot of land and a house rather than cultivating a big plot for the entire household. After divorced or separated, a plot of land and a house will continue to belong to that wife. Female headed households tend to be smaller in size and to cultivate the smaller portion of land which they are able to deal with. As land in northern Mozambique is mainly cultivated by manual labor, one person or two people can only cultivate a limited land area. Following

the matrilineal kinship system, households headed by females also have land for cultivation. If they wish to enlarge their lands, a relative of the female head (usually "Tio," a matrilineal uncle) can negotiate. In Mozambique, land belongs to the state and the head of the community knows which families use which land, etc. Nevertheless, land can involve more complicated issues.

Overall, with only this observation of a positive coefficient of gender for land poverty observed here, we cannot conclude that the feminization of poverty, signifying that female-headed households are more likely to be poor, is occurring. Female headed households are more likely to be poor in terms of cultivated land size. However, for the MPI poor or food consumption, there is no difference between male and female heads. Since the feminization of poverty is not detected in all types of poverty, it can be concluded that the feminization of poverty, in terms of multidimensional poverty and food consumption, does not seem to occur in northern Mozambique.

6. Conclusions

In previous studies, monetary measures and non-monetary measures of poverty have both been extensively investigated. Sen's capability approach sets "capability" as the basis for development, as denoted, implying that people who have the same sets of commodities do not necessarily have the same capability (Sen 1985; Esho 2002). Sen has also stated that, "If poverty is seen, instead, as the deprivation of basic capabilities, then a more illuminating picture can be obtained from information on aspects of life…" (Sen 1999).

Monetary and non-monetary multidimensional measures of poverty do not always provide the same picture. In SSA, economic growth does not always seem to bring poverty reduction, and in Mozambique, using monetary measures of poverty seems

to increase estimates of poverty levels in some rural areas. In this study, poverty rates using both monetary and multidimensional measures are first compared for Mozambique during the period when economic growth does not seem to have decreased poverty. Social dimensions of northern Mozambique are reviewed in relation to discussions of multidimensional poverty in order to capture differences between monetary and multidimensional poverty. Then, determinants of poverty as the second objective are investigated for three types of poverty: the extreme multidimensional poverty measured by the MPI following Alkire and Foster (2009), the bottom quartile of cultivated land size, and the bottom quartile of food expenditures, for the purpose of deepening the analyses of differences or similarities between monetary and non-monetary measures of poverty.

Unlike monetary measures, multidimensional poverty measured by the MPI headcount ratios seems to have decreased over time between 2003 and 2011 from 93.21% to 83.9% in rural areas of Mozambique, although these ratios are still quite high and are certainly higher than the regional average in SSA. Regarding the social characteristics of households in northern Mozambique, female headed households with female heads show higher net enrollment rates in primary schools than households with male heads except for Zambezia. Net enrollment rates in secondary schools are higher for households with male heads than households with female heads, again except for Zambezia.

Among the determinants of poverty examined, household size and the share of literate household members demonstrate quite robust positive and negative effects respectively on poverty. Household size predominantly shows strong positive and significant effects on the probability of being poor measured by both the MPI and food expenditure. This means that when the number of household members increases, the probability of being poor significantly increases. If poverty reduction is a goal, policies to decrease the number of household members would be called for. As the share of

literate household member increases, poverty measured by land size and food expenditures will decrease significantly. Continuous efforts on reproductive health programs, which may reduce early childbearing and unintended pregnancy, and better literacy rates, which can be achieved by enhancement of primary education and non-formal education, will be favorable for further poverty reduction in these areas. The feminization of poverty does not seem to be clearly detected here. This can be because households with female heads are supported by a matrilineal kinship system of the society in this region. One difference in determinants of monetary and non-monetary poverty is found in the effect of the distance from the Nacala corridor. Distance from the main road exhibits a significant and positive effect on extreme multidimensional poverty, but has no significant effects on other types of poverty. Based on the findings in the previous literature, it can be also said that more access to primary school and the improvement in sanitation facility, which are found as major factors to contribute to the reduction of the MPI poor in Mozambique, are likely to occur when households are located closer to the corridor. This makes sense since market integration, which could decrease poverty measured by food consumption, does not happen automatically even though households are located near the corridor. Rather, development of social infrastructure happens around the corridor. These different outcomes should be taken into further consideration jointly with market integration. The relationship between the distance from the main/paved road and poverty and the process of reducing multidimensional poverty may require further investigation.

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Abstract (in Japanese)

要約

過去 10 年間において、サブサハラ諸国は高い経済成長を示してきた。しかし、同地域の地域レベルもしくは国レベルの貧困研究に関する既存文献によると、これらの経済成長が、同地域の貧困削減に貢献しているとは言いがたい。モザンビークも、その例外ではない。2000 年から 2013 年にかけての実質 GDP の平均成長率は、6.76 %であった。しかし、その一方で、農村部の貧困率は、同時期に減少していない。

ただし、これらの現象は、消費や所得ベースの貧困の経済的計測によるものである。貧困は多次元的であり、これらの経済的計測のみでは貧困者の真の状況を把握できない可能性がある。多くの住民が自給自足農業に携わっている場合は、特にその可能性が高い。その際に注目すべきは、「非経済的計測による貧困、もしくは多次元的貧困が、同時期にどのように変化したか」ということと、「これらの異なる計測による貧困の決定要因は何か」ということである。

本論文では、既存文献で、著しい貧困が見出された 2003 年以降の北部モザンビークを対象に、非経済的側面や多次元的計測に基づく貧困について検証。多次元的、また経済的計測に基づく 3 種類の貧困について、各々の主な決定要因を分析した。分析には、JICA 研究所が、2010 年に実施した北部モザンビークにおける小規模農家家計調査を用いた。

その結果、①農村の多次元貧困は、同時期に減少していること、②また決定要因としては、家族の規模のもたらす正の効果、および読み書きのできる家族構成員がもたらす負の効果は、どの種類の貧困にとっても変わらない重要な要因であること、③貧困の女性化については北部モザンビークでは顕著には見出されないこと、が導かれた。