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Do the initial land endowments lift people out of chronic and transient poverty? Evidence from central and Northern Mozambique

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This study aims at assessing the most prevalent type of poverty in rural Mozambique, and if the causes of chronic and transitory poverty are similar to recommended policy, strategies to address each of them caused by different factors. This paper concludes that, most poverty is transient (66%) than chronic (34%), unlike in earlier studies where the determinants of chronic and transient poverty are not necessarily similar. However, it is recommended to prioritize addressing the chronic poverty given its damaging and long-lasting effects. Also, it is believed that by addressing chronic poverty some synergies can be generated, which allow tackling of the transient poverty as well. The most important set of variables for transient poverty are the household landholdings, head's age, family and hired labor, land quality, and livestock. All these covariates tend to increase the transient poverty, except the family labor which is likely to decrease it. The same variables are important to chronic poverty, in addition to education especially in men, where the number of members with self-employment and widowed household heads has a negative effect on chronic poverty. Policies aimed at reducing chronic poverty should concentrate more on improving household characteristics such as investing in education, agricultural reform that encourages landholding expansion and energy such as human power or animal traction for farming while reducing transient poverty would call for policies oriented at allowing economically active families to earn income for their livelihoods.

Key words: Chronic, transient, poverty, Mozambique, panel data.

INTRODUCTION

While poverty is well documented in Mozambique, few studies have systematically used the existent panel data to make a distinction between chronic and transitory poverty which estimate their determinants (Pitoro, 2016).

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A study of such nature is of interest to policymakers, development practitioners, and economists as it allows the decomposing poverty into two categories, which permit the developing intervention strategies to address the prevailing type of poverty.

Chronic poverty is defined as the living status in which households' incomes fall below the poverty line for extended period of time or contemporaneously, while transient poverty is when households' income move cyclically below and above the poverty line. In a sense, vulnerable households are more likely to be categorized as transient poor families.

It is important to mention that, a transient poor household has much higher ability to bounce back after a severe shock suggesting that, strategies to mitigate these shocks are likely to have great impact in preventing them to be poor in future.

MPD (2010) reported that, one of the millennium development goals (MDGs) for Mozambique is to reach an absolute consumption poverty rate of 40% by 2015, from an estimated 80% in 1990. To reach this goal, the government has been implementing development projects aiming to meet three types of needs namely: primary needs, secondary needs, and other needs.

Despite these efforts, it is still not clear what type of poverty is being targeted. Even if one has identified the pathways out of poverty, one important aspect is to identify the prevalent type of poverty, to assess whether policies will have a similar effect on addressing chronic and transitory poverty and assess whether the determinants of chronic differ from those of transitory poverty. To address these issues, one needs to decompose the total poverty into chronic and transient.

As argued by Garza-Rodriguez et al. (2010), chronic poverty is more unfair and damaging than transient poverty. Understanding the causes and consequences of these types of poverty is very important in policy-making arena. In general, mixed results are found concerning the congruency between transient and chronic poverty determinants. For instance, in Latin America and Asia, studies have found that variables explaining transient poverty are different from those explaining chronic poverty (Garza-Rodriguez et al., 2010; Jalan and Ravalion, 2000); whereas in Eastern Africa, these differences are minimal, as per example from Kenya (Muyanga et al., 2007).

One important aspect of poverty study is whether the poverty reduction interventions will have a similar effect on addressing chronic and transitory poverty or whether the determinants of chronic differ from those of transitory poverty. To answer those questions, one needs to decompose poverty into chronic and transient components. As argued by Garza-Rodriguez et al. (2010), chronic poverty is more damaging than transient poverty; a chronically poor person is perceived to be in such state for so long.

As such, understanding the causes and consequences of these types of poverty is very important in policymaking arena. However, as presented by Cunagura (2008), distinguishing transitory from chronic poverty is an important methodological challenge in poverty analysis. This becomes much more challenging when using a two-period three-year panel to make this distinction with certainty that, large panel periods would be appropriate.

In fact, the distinction between transitory and chronic poverty is of great interest to policy makers, as it provides insights in what development strategies to pursue, based on the prevalent type of poverty. For policy interventions, to distinguish between chronic and transient poverty is not sufficient. One also needs to understand whether the determinants of chronic and transient poverty are different (Pitoro, 2016) and additionally assess, whether policies that address one are different from the other or whether policies that address the transient poverty would also be effective in addressing the chronic poverty.

This study aims to investigate the extent the initial landholdings endowments can address chronic and transient poverty, and the congruence of their determinants using the two-period panel data. The study empirically estimates the relationship between landholdings, transient and chronic poverty in rural Mozambique. It addresses two main questions: i what are the determinants of chronic and transient poverty? ii What is the role of the initial landholding endowments that affect transient and chronic poverty?

The results of this study give a guidance of whether the safety net or more activist policies used to remove poverty traps which are the focus (Dang et al., 2014) are appropriate. As noted by Jalan and Ravalion (1998), to design policies which harness poverty, it is necessary to know the severity of each component of the total poverty, in order to determine whether chronic or transient poverty is determined by the same or different factors.

Given that implementation of social assistance programs in developing country suffer two main problems: leakage (targeting not eligible beneficiaries) and under-coverage (missing the eligible beneficiaries), this study could assist in improving target, by identifying households based on their type of poverty, in order to identify the specific type of program to be implemented. For instance, in Ethiopia, Nega (2010) found that Food-to-Work decreased both total and transient poverty, while the food security package increased total, chronic, and transient poverty and the better-off households benefited the most.

METHODOLOGY

Data sources and collection techniques

The data for the analysis are drawn from a repeated regionally

representative agricultural household survey, conducted by the Mozambique Ministry of Agriculture to understand the investments needed to guarantee a robust response, to the new rural environment resulting from the spike in food prices, in the domestic and international markets.

For that purpose, data covering the period before and after the food price crises, in 2008 and 2011, respectively, were collected. With financial assistance from USAID/Mozambique and technical assistance from Michigan State University, the survey sample size was 1,186 households in the Central and Northern regions in the five high agricultural potential provinces (Manica, Tete, Sofala, Nampula, and Zambezia).

This type of data has the advantage of allowing and controlling unobserved time-invariant household characteristics, which is one of the limitations of using cross-section data in empirical studies (Garrett and Ruel, 1999). Panel data were preferred for this research, as it allows an in-depth understanding of the size of the landholdings, poverty, and dynamics in rural Mozambique thus, contributing to more effective policy intervention design.

Several things are noteworthy with respect to survey design. First, although the panel is covering only five provinces out of ten originally interviewed in 2008, it uses the weights of the household Agricultural Survey conducted in 2008 (TIA, 2008). There was no random replacement in 2011, implying that the sample is the only representative of 2008 population.

Given that two sources of attrition were identified in 2011, the TIA2008's weights are used along with an attrition correction factor (Inverse Probability Weights), to control for the attrition bias. The first is that, the 2011 survey team did not go to all the TIA2008 districts in the center/north (for financial reasons). The second is that for the TIA2008 not all the households were re-interviewed during the revisit in 2011 (due to refusal or unavailability of the respondents and households have moved or dissolved).

Tests for attrition have shown the evidence of the presence of attrition bias, and as proposed by Wooldridge (2002), the appropriate inverse probability weights (IPW) were applied to the data. Donovan and Mather (2007) provide a detailed application of this method for previous TIA2002-2005 panel data in Mozambique.

Out of seventy-two districts sampled in 2008, a total of forty-two districts were not re-visited in 2011 in Zambezia, Manica, Tete, and Sofala provinces. These not represented at the provincial level in these provinces, but are representative of the areas surveyed in 2011. Nampula Province is the only one that did not drop a district, between the two survey years. All its data are a representative at province level.

Although since these data contain information on agricultural sector, some limitations are observed such as lack of information on physical wealth found in earlier research, as associated with low poverty and important to decreasing transient and chronic poverty (Jalan and Ravalion, 2000; Muyanga et al., 2007). The distance to markets, road, schools, and health posts, commonly used as measurements of infrastructures are also lacking in the data set.

As found by Muyanga et al. (2013), distance to markets is positively associated with total poverty while Adakhari et al. (2014) found that, in Nepal distance to primary schools and health posts is significant determinant of food consumption. For instance, they found that houses that are as twice as the one far away from a hospital tend to have 9% lower consumption, as compared to another house. With these earlier findings in mind, these omitted variables would have had an effect on the ability of the models to explain exit from poverty as well as vulnerability to chronic poverty.

Method of data analysis

The distinction between chronic and transitory poverty is based on the framework developed by Jalan and Ravalion (1998), which recognizes that chronic poverty is as a result of household characteristics that prevent people from meeting their basic needs, resulting from long periods of limited income while transitory poverty is caused by income and other shocks associated with household characteristics, that prevent them from meeting their basic needs temporarily.

Yaqub (2000) identifies two methods to distinguish chronic from transient poverty: the spells and components methods. The spells method defines that, chronically the poor depend on the number of times the household has been in poverty. In essence, the emphasis is on the time that an individual experiences deprivation (Harper et al., 2003), which is suggested by Hulme and Shepherd (2003) that, this can be five or more years. The components method identifies chronically poor, if the individual's permanent income is below the poverty line.

The components method has been adopted in this study due to its advantages over the spells method. The attractiveness of the components method resides on the fact that, it considers income transmission between periods (Aaberge and Mogstad, 2007) and depth of poverty (MacKay and Lawson, 2002) while the spells method does not.

Drawing from insights of the pertinent literature (Jalan and Ravallion, 1998; Dulcos et al., 2006; Garza-Rodriguez et al., 2010; Ribas and Machado, 2007; Panganiban, 2010; Muyanga et al., 2007), to distinguish between chronic and transitory poverty we consider the following decomposition in general terms: let (y_{i1}, y_{i2},.., y_{iT}) be the household *i*'s (positive) normalized income stream over T years. At any point in time *t*, a household *i*'s poverty is expressed as P_{it}^{α}, which is based on poverty measures developed by Foster et al. (1984). Jalan and Ravalion (1998) claim that using $\overline{y_i} = t^{-1}\sum_{t=1}^{T} y_{it}$ as an estimate of household *i*'s "permanent income," the chronic poverty is estimated by replacing household's income y_{it} for all periods *t* by the estimated permanent income, which results in an assessment of chronic poverty for the household *i*, $P_{it}^{C\alpha} = t^{-1}\sum_{t=1}^{T}(1-\overline{y_i})^{\alpha}$. Then, transitory poverty is the difference between total poverty and chronic poverty, which is thus given by: $P_i^{T\alpha} = P_{it}^{\alpha} - P_{it}^{C\alpha}$. The regional-level estimates of chronic, transient, and total poverty are obtained by summing each type of poverty (excluding the non-poor), divided by all sample households irrespective of their poverty status.

For empirical estimation of determinants of transitory and chronic poverty, the squared poverty gap is used, and two models are estimated by a regression of each poverty measure on a set of explanatory variables. The initial characteristics are used as explanatory variables. The choice of squared poverty gap is because of the measure of poverty that meets several conditions for empirical work, including the convexity of the poverty function and the transfer of axiom as defined by Jalan and Ravalion (1998).

Models are the regressions of measures of the chronic and transient poverty on the same set of explanatory variables, as before. For the chronic poverty, the econometric model is expressed as:

$$P_i^{C\alpha} = C_i = \begin{cases} C^{*} if\, C^{*} > 0, where\, C^{*} = x_i'\beta^{C} + +\varepsilon_i^{C} \\ 0 otherwise \end{cases} \quad (1)$$

Where C^* is latent variable, C_i is the observed chronic poverty, β^C a vector of estimable parameters, x_i a set of explanatory variables and ε_i are the model error terms. Similarly, transient poverty model is estimated as:

$$P_i^{T\alpha} = Tr_i = \begin{cases} Tr^* if\ Tr^* > 0, where\ Tr^* = x_i'\beta^{Tr} + +\varepsilon_i^{Tr} \\ 0 otherwise \end{cases} \quad (2)$$

Finally, a Censored Qunatile regression is used to deal with censored data issue, resulting from the fact that several observation on the dependent variables are non-poor (taking a value of zero). This strategy has been used by researchers such as Jalan and Ravalion (1998) to address the limitation of the usual Tobit model which is not robust to misspecification and the estimates are inconsistent and inefficiency in the presence of heteroscedasticity and non-normality in the distribution of error terms.

According to Panganiban (2010), Quantile regression has the advantage of being robust to distributional misspecification in the error terms and large outliers in the income data as the one used in this study. Following Garza-Rodriguez et al. (2010), to focus on the poorest, the 70th quantile is used for chronic poverty and 90th quantile for transient. The bootstrapping techniques were used to obtain the standard errors of the parameter estimates.

Description of variables and expected signs

To implement the conceptual framework adopted for this study, it is hypothesized that the ability of a household to move out or into poverty and to move out of transitory and chronic poverty is a function of its demographic characteristics (including education, age of the head and family labor), access to rural services, agricultural production, agricultural technologies, and the assets that the households have access to and are able to control as described below.

Household demography

The variation in household characteristics is believed to be highly correlated with poverty transition. For instance, the human capital theories argue that household earnings potential is a function of education attainments and age (Muller, 2002). Therefore, the initial household head's education and age are added in the model as continuous variables.

In fact, several studies have found that higher level of education of the household members decreases the likelihood of falling into poverty. Muyanga et al. (2007) found that household headed by educated heads experience more chronic than transient poverty. Garza-Rodriguez et al. (2010) found that illiteracy is inversely associated with transient poverty in Mexico, perhaps because illiterate people are more likely to earn lower income and can hardly aspire to earn high income in the course of their lifetime.

To concur with earlier findings that the success of education in poverty reduction hinges on students exceeding beyond secondary school education (Muyanga et al., 2007) and that a change of household head's education from no education to post-secondary education increases income by 34% in Kenya (Muyanga et al., 2013), the number of male household members with secondary school was included in the model. Male household members are used because they are most likely to influence the decision-making within the household compared to female members.

Jalan and Ravalion (1998) found some evidence of life cycle events being determinants of transient poverty but falling up to 45 years of age. In their study, they found that household characteristics such as household size, education levels of the head and the labor force are more important for chronic poverty than transient poverty. On the other hand, Muyanga et al. (2013) found that asset holding is an increasing function of household size and age of family head. As per this evidence, the age of the household head was included.

Furthermore, Gender of the household head is an important determinant of poverty. Garza-Rodriguez et al. (2010) found that male family head decreases both total and chronic poverty in Mexico while Muyanga et al. (2007) found that female-headed households tend to experience more chronic than transient poverty in Kenya. Therefore, the gender of the household head was hypothesized to influence poverty. The household gender dummy is also included to capture gender differences.

Household size has been found to be both a burden and a blessing in household livelihoods in the earlier studies. To test these relationships in this study, we added into the estimation model, the number of adult and active members to capture the potential of income generation, which is hypothesized to be more linked to transient poverty than chronic poverty as well as with the potential to move out of poverty. Muyanga et al. (2007) found that households with large dependence ratios (large familiy size) experienced chronic poverty as opposed to transient poverty, but Garza-Rodriguez et al. (2010) found an inverse relationship between the family size and transient poverty, that large households which have lower dependency ratio have greater number of people. This contributes to family income, making the household to cope with external issues to reduce income variability which is the leading cause of transient poverty.

Rural services

Rural services such as infrastructure, access to credit and self-employment were added to the models to capture their ability to reduce poverty in rural settings. For instance, Muyanga et al. (2007) found that Kenyan households that accessed credit either in cash or kind were less likely to be poor than those that did not.

On infrastructure, Muyanga et al. (2013) found that a one Kilometer decrease from homestead to the nearest motorable road increases ascenders' asset wealth by 15%. A lower effect is found on the distance to the health post, where a kilometer decrease leads to an income increase for poverty ascenders, descenders, and consistently non-poor by 2 and 3%, respectively. Given the lack of measures of distance in our data, we assessed the infrastructural effect through a dummy variable measuring remoteness of the village, defined as a village with public transport and roads travelable throughout the year assigned a value of zero and one otherwise.

Agricultural production and technologies

Higher agricultural output and use of improved agricultural production technologies are associated with the ability to exiting poverty and transient poverty than chronic poverty, thus, added to the models. Muyanga et al. (2007) found that households that adopted modern productivity-enhancing technologies such as fertilizer were less likely to face chronic poverty.

Household asset endowments

As indicated by Jayne et al. (2003), the initial asset endowments are essential for pro-poor growth. Jalan and Ravalion (1998) found that households with large cultivated areas in China are less

Table 1. Incidence, depth, and severity of income poverty, 2008-2011.

Poverty	2008	2011	Total	% change	Significance
Local poverty lines					
Head count index	0.32	0.40	0.36	3.0	**
Poverty gap ratio	0.23	0.29	0.26	1.0	**
Squared poverty gap	0.43	0.41	0.42	-1.0	+
Poverty line =US$ 1.25/day based on Purchasing Power Parity (PPP)					
Head count index	0.78	0.80	0.79	2.0	
Poverty gap ratio	0.56	0.58	0.57	1.0	
Squared poverty gap	0.48	0.49	0.48	1.0	
Number of observations	1,172	1,172	2,344		

Singificance level: + at 10%; * at 5%; ** at 1% Source: Author's computation from TIA 2008 and Partial Panel 2011.

vulnerable to chronic poverty. Large cultivated areas were found to be positively associated with high income in Nepal (Adhikari and Bjorndal, 2014). To account for these relationships, the cultivated land size and livestock possession measure as total household tropical livestock units were added into the models.

RESULTS AND DISCUSSION

Table 1 presents poverty measure estimates. Results show that headcount ratio increased from 32% in 2008 to 40% in 2011. In only three years, the headcount ratio increased by 8% corresponding to 2.7 points decrease on average per year between 2008 and 2011.

The upsurge of poverty was further strengthened by an increase in poverty gap by an average of 2% points per year although, the squared poverty gap ratio decreased by 2% points in three years. Using the international poverty line of US$1.25 per capita per day based on parity purchase price (PPP), the poverty rate was much higher with similar trend although at a slower pace, with the exception that the difference between the two survey periods is not significant.

These poverty estimates are below those stated by MPD (2010) using consumption indicator and local poverty lines which in 2008/09 estimated 54.7% of people living in poverty in the entire country with the estimates at 49.6 and 56.9% in the Northern and Central Mozambique; respectively.

Characteristics of sampled households

The 2008 to 2011 panel permits an understanding of the short-term poverty dynamics over the three-year spell since 2008. The other features of the sample households are presented in Table 2. The average size of cultivated land per household did not increase over time estimated at 2.59 ha in 2008 and 2.37 ha in 2011 mainly due to limited access to manpower and alternative power sources for land expansion (Bolardo et al., 2014).

However, the aggregated agricultural production and access doubled over time from an average of about 1.6 tons of wheat equivalent units in 2008 and 2.7%, respectively. The size of inherited land represents about 52% of the cultivated land and follows the same pattern as the cultivated land size with no statistical change over time. Access to quality land observed 2.7 percentage points increase from 34 % of sampled households in 2008. The use of improved inputs is persistently low with the percentage of households, using chemical fertilizer and pesticides estimated at 6 and 2.5%, respectively. Similar results are reported by Mabiso et al., (2014) using earlier panel data (2002 to 2005).

During the study period, a gradual shift of the rural occupational structure was observed. The number of households residing in non-remote areas noted about 0.7 percentage points increase and the number of migrant workers increased over this period.

Results in Table 2a show that the adoption of improved agricultural technologies is low in rural Mozambique and did not vary over time. For instance, the use of chemical fertilizer is estimated at 6%, while the adoption of pesticides is estimated at not more than 2.5%. The structure of family labor occupation observed significant changes over time. Results in Table 2a and b show that an increase in agricultural workers more than doubled in 2011 from an average of 2 in every 10 household members reported in 2008. The local and international migration increased from 2008 to 2011, with domestic migration increasing from 0.32 members per household to 0.64 members in 2011.

Determinants of total poverty (squared poverty gap)

As argued by Walker et al. (2004) and Jalan and

Table 2a. Characteristics of sample households, 2008-2011 (continuous variables).

Characteristics	Total		Year				Operated land size/AE 08 quintiles		Meandifferences(t-test)	
			2008 (1)		2011 (2)					
	Mean	SD	Mean	SD	Mean	SD	Q1 (3)	Q5 (4)	(1-2)	(3-4)
Total land owned (ha)	2.94	3.74	3.09	4.06	2.79	3.35	1.58	5.83	-	**
Cultivated land size (ha)	2.48	3.41	2.59	3.79	2.37	2.95	1.16	5.10	-	**
Inherited land size (ha)	1.28	4.68	1.33	5.02	1.22	4.29	0.83	2.22	-	**
Head's education (years completed)	3.1	2.96	3.1	2.97	3.1	2.95	3.7	2.6	-	**
Males in secondary school (number)	0.22	0.55	0.21	0.54	0.22	0.55	0.40	0.13	-	**
Head's age (years)	42.1	13.28	42.3	13.32	41.9	13.24	43.5	41.5	-	-
HH size (number of members)	6.0	2.79	6.0	2.84	6.0	2.75	8.1	4.5	-	**
HH size (Adult equivalent)	4.5	2.0	4.45	2.0	4.4	2.1	6.0	3.5	-	**
Number of months with food reserves	7.3	4.27	7.3	4.20	7.2	4.34	6.8	7.9	-	-
Total Net HH income (in '000 2011 MZM)	40,17	252,9	47,08	339,7	32,95	101,24	65,05	27,19	-	*
HH's Maize production (Kgs)	792.8	1724.04	784.4	1811.21	801.7	1628.89	972.5	715.3	-	-
Average Maize yield (Kg/ha)	925.6	1010.11	939.0	103,2	911.2	986.49	1259.8	687.1	-	-
Mean Maize price (MZM/Kg)	5.30	2.94	5.09	2.96	5.52	2.92	5.09	5.73	-	-
Aggregated production (in Wheat equivalent units)	2,577.2	48089.59	1,587.9	4377.77	3,610.6	68619.97	1,697.8	1,668.4	-	-
People aged 15-59 years (number	2.6	1.36	2.7	1.35	2.6	1.37	3.4	2.2	-	**
People with self-employment (number)	0.69	0.92	0.74	1.01	0.65	0.80	0.80	0.58	-	**
Total Tropical Livestock units per HH	0.94	2.72	0.98	2.93	0.91	2.47	1.11	1.01	-	-
HH used improved seeds for cereals	55.0	0.50	55.8	0.50	54.2	0.50	58.6	55.0	-	-
Agricultural technologies used (number)	3.2	1.50	3.1	1.48	3.2	1.53	3.1	3.3	-	-
Number of agricultural workers	0.33	0.69	0.21	0.54	0.49	0.80	0.32	0.36	**	-
Number of non-agricultural workers	0.13	0.34	0.11	0.33	0.14	0.35	0.10	0.11	-	-
Number of domestic migrants per HH	0.46	0.75	0.32	0.60	0.64	0.87	0.42	0.47	**	-
Number of overseas migrants per HH	0.02	0.14	0.00	0.03	0.04	0.19	0.02	0.02	**	-
Number of observations	3,244	1,172	1,172	-	-	-	-	-	-	-

Singificance level: + at 10%; * at 5%; ** at 1%; SD is standard deviation; HH: household. Source: Author's computation from TIA 2008 and Partial Panel 2011.

Ravalion (1998), squared poverty gap is preferred as it provides information on how far people are from the poverty line and satisfies two essential conditions: the convexity poverty function and the income transfer axiom. I then aim to understand the determinants of the total poverty (severity of income poverty) in rural Mozambique by estimating the predictors of the Squared Poverty Gap with varying the poverty lines.

The first two columns of Table 3 pertain to income poverty severity, the poverty gap and squared poverty gap estimated in Tobit models

Table 2b. Characteristics of sample households, 2008-2011 (discrete variables).

Characteristics	Percentage reporting			Operated land size/AE 08 quintiles		Group difference (chi^2 test)	
	Total	2008 (1)	2011 (2)	Q1 (3)	Q5 (4)	(1-2)	(3-4)
HH lives in non-remote village (1=Yes)	41.0	40.7	41.4	44.6	34.1	-	**
Female-headed HH (1=Yes)	18.2	18.1	18.3	15.3	20.4	+	-
Widowed HH head (1=Yes)	7.4	7.6	7.2	5.2	7.2	-	-
HH is food insecure (1=Yes)	24.3	25.6	23.0	25.7	15.4	-	**
HH have access to credit (1=Yes)	4.1	2.7	5.5	4.2	3.7	-	-
HH has good land quality (1=Yes)	35.3	34.0	36.7	51.4	19.5	-	**
HH used fertilizer (1=Yes)	6.0	6.1	6.0	2.6	8.6	-	**
HH used pesticide (1=Yes)	2.5	2.6	2.4	0.0	4.9	+	**
HH used manure (1=Yes)	4.3	4.3	4.3	3.6	3.3	-	+
HH used irrigation (1=Yes)	3.9	3.0	4.8	3.2	4.9	-	*
HH used improved seeds for cereals (1=Yes)	55.0	55.8	54.2	58.6	55.0	-	-
HH used improved seeds for beans (1=Yes)	28.5	28.1	28.9	26.3	31.3	-	-
HH used improved seeds for vegetables (1=Yes)	12.5	12.3	12.8	13.6	11.0	-	-
HH does crop rotation (1=Yes)	29.1	29.4	28.9	27.5	26.6	-	-
HH does intercropping (1=Yes)	76.6	75.1	78.2	73.9	81.3	-	-
HH does line sowing (1=Yes)	52.2	51.8	52.6	58.8	59.6	-	-
HH used permanent labor (1=Yes)	4.9	4.7	5.1	5.7	4.7	-	-
HH used seasonal labor (1=Yes)	28.3	27.0	29.7	30.1	25.3	-	-
HH used animal traction (1=Yes)	11.6	12.7	10.5	9.1	15.8	-	**
HH used at least one improved agricultural technology (1=Yes)	97.5	97.9	97.0	97.0	98.6	-	+
HH hired seasonal labor (1=Yes)	28.3	27.0	29.7	30.1	23.8	-	-
Number of observations	3,244	1,172	1,172	-	-	-	-

Singificance level: $^+$ at 10%; * at 5%; ** at 1%; SD is standard deviation. Source: Author's computation from TIA 2008 and Partial Panel 2011.

using the local poverty lines and $1.25/day PPP, respectively. An important estimation concern is an endogeneity of the explanatory variables. For this particular study, the endogeneity of landholdings is a major concern, as cultivated land size may result from income accumulation implying that households make decisions on their cultivated land sizes depending on the income they have or generate.

The inherited land size is used as an instrument for land size, assuming that the decision of transferring land from the predecessors is not made by the heirs who are being investigated, so it is an exogenous decision, which therefore, meets the required conditions for an instrumental variable. Given that the reliability of Instrumental variables estimates depends on the validity of an instrument, caution must be exercised while interpreting these results because of lack of other good instruments resulting in the estimation of just-identified IV-models with no further IV tests

Table 3. Determinants of Squared Poverty Gap at local and $1.25/day PPP poverty lines

Variables	RE-estimation models		IV-estimation models	
	Local poverty lines	$1.25/day PPP	Local poverty lines	$1.25/day PPP
Year=2011	0.876+ (1.68)	-0.009 (-0.22)	0.094** (2.68)	0.017 (0.58)
HH lives in non-remote village (1=Yes)	-1.602** (-2.68)	-0.094+ (-1.91)	-0.130** (-3.27)	-0.088** (-2.96)
Log of cultivated land per AE	-0.765* (-2.29)	-0.132** (-4.74)	0.066 (0.96)	-0.344** (-6.56)
Male-headed HH (1=Yes)	-0.224 (-0.26)	0.028 (0.36)	-0.144* (-2.54)	-0.013 (-0.21)
Head's education (years completed)	-0.087 (-0.78)	-0.011 (-1.19)	-0.004 (-0.48)	-0.005 (-0.86)
Males in secondary school (number)	-0.436 (-0.71)	-0.013 (-0.26)	0.016 (0.42)	-0.007 (-0.27)
Head’s age (years)	0.080** (3.85)	0.006** (3.47)	0.003* (2.39)	0.001 (0.86)
Widowed head (1=Yes)	-1.249 (-1.03)	-0.077 (-0.73)	-0.155* (-1.99)	-0.068 (-1.01)
People aged 15-59 years (number)	-0.660** (-2.85)	0.015 (0.80)	-0.017 (-0.80)	-0.031* (-2.06)
People with self-employment (number)	-1.308** (-3.65)	-0.090** (-3.46)	-0.082** (-3.43)	-0.072** (-3.96)
HH have access to credit (1=Yes)	-0.279 (-0.20)	-0.095 (-0.84)	0.076 (0.76)	-0.114 (-1.62)
HH has good land quality (1=Yes)	-1.333* (-2.30)	-0.109* (-2.32)	-0.049 (-1.11)	-0.155** (-4.18)
HH used fertilizer (1=Yes)	-1.172 (-0.90)	-0.072 (-0.68)	-0.135+ (-1.82)	-0.001 (-0.01)
HH used improved seeds (1=Yes)	-0.868 (-1.54)	-0.024 (-0.51)	-0.083* (-2.11)	-0.016 (-0.54)
HH used permanent labor (1=Yes)	-1.416 (-0.98)	-0.006 (-0.06)	-0.056 (-0.69)	0.028 (0.43)
HH hired seasonal labor (1=Yes)	-2.052** (-3.06)	-0.155** (-2.96)	0.000 (.)	0.000 (.)
HH used animal traction (1=Yes)	0.254 (0.26)	-0.012 (-0.15)	-0.019 (-0.32)	0.041 (0.89)

Table 3. Contd.

Total Tropical Livestock units per HH	-0.136 (-1.15)	-0.010 (-1.15)	-0.009 (-1.22)	-0.010 (-1.60)
Constant	2.325 (1.30)	1.099** (6.57)	0.125 (1.09)	0.508** (5.41)
Observations	2,334	2,334	2,334	2,334
Exogeneity test (p-value)	-	-	0.443	0.000

Marginal effects; *t* statistics in parentheses; + at 10%; * at 5%; ** at 1%; District FE included, Source: Author's computation from TIA 2008 and Partial Panel 2011.

implemented.

In columns three and four, we estimate consistent parameters addressing the potential endogeneity of the initially cultivated land size/AE. Given that a value of one in the head count index is assigned to poor households, higher value in the severity measures indexes high severity, the negative signs of coefficients imply a reduction of poverty and positive signs of coefficients reveal an increase in poverty. As expected, many of the variables explaining variation in household income also explain the variation in poverty, although with an opposite sign.

Results in Table 3 indicate that keeping other factors constant, the Squared Poverty Gap in 2011 were both significantly higher than in 2008 (a year of high food prices) by 11. In fact, results show a poverty increase between the two survey years and they are consistent with the descriptive statistics in Table 1, highlighting the worsening of poverty in rural Mozambique between the two study years.

The determinants of poverty in Mozambique have been well documented using a variety of available nationally representative data (Boughton et al., 2005; Boughton et al., 2006; Cunguara, 2008; Datt et al., 2000; Jayne et al., 2003; MPD, 2010; Walker et al., 2004). A common finding in those studies is the positive effect of the size of cultivated land/AE in reducing poverty. To some extent, results in Table 3 confirm the welfare effect of cultivated land size in poverty reduction.

Although this relationship is true, the average farm size in rural Mozambique is very low, suggesting that creating conditions that encourage land expansion and utilization plays a major role in agricultural growth and poverty reduction. The cultivated land size increases significantly the total net household income and reduces the severity of poverty. Results show that, an additional percent of cultivated land/AE results in increased household income sufficient to shrinking the distance between income and poverty line (squared poverty gap index) by about 4%. It is noteworthy that the results are sensitive to the poverty line used. This effect vanishes when the size of cultivated land/AE is considered endogenous.

Under high poverty rates, especially when the international poverty line is used, the effect of the size of cultivated land/AE in reducing poverty is even higher, suggesting that increasing the size of cultivated land/AE is an important poverty reduction strategy under high poverty rates.

Determinants of transient and chronic poverty

For policy intervention targeting on poverty reduction, the distinction between chronic and transient poverty is made, the next step is to assess their determinants. Therefore, this study focuses on decomposing the total income poverty into chronic and transient poverty using the program “Distributive Analysis Stata Package” (DASP version 2.3), developed by Araar and Dulcos (2013), and estimates their determinants.

Poverty decomposition

Table 4 presents the decomposition of squared poverty gap index into transient and chronic poverty; both comprise total poverty. Without correcting for bias, the total poverty stands at 0.420, with transient poverty constituting 65% (0.273) of the total poverty. Correcting for biases brought about by using panel data of a small number of time periods, which is -0.027, the transient poverty now accounts for as much as 66% (0.198) of total poverty. In fact, the high share of transient poverty implies prevalent high cyclical income fluctuations in Northern and Central Mozambique, suggesting that much of the poor population can rise above the poverty line temporarily.

Results from censored quantile regression

The research question addressed in this section is whether the determinants of chronic and transient poverty are congruent. Table 4 reports the parameter estimates

Table 4. Squared poverty gap index chronic and transient poverty decomposition.

Item	Estimates without bias correction	% sample	Estimates with bias correction	% sample	Standard errors
Bias	-0.027	---	---	---	
Chronic	0.147	35	0.102	34	1.60
Transient	0.273	65	0.198	66	0.20
Total	0.420	100	0.420	100	0.43

Source: Author's computation from TIA 2008 and Partial Panel 2011.

for the two poverty measures to answer this question. The estimated parameters investigate the effect of the initial condition (using the initial landholdings as explanatory variables) on chronic and transient poverty.

Essentially, this estimation procedure aims to identify whether the determinants of poverty measures are persistent or not over time. The models predict chronic poverty fairly well than transient poverty as can be seen from the pseudo-R^2 (0.11 or 0.12). This echoes earlier studies by Jalan and Ravalion (1998) in China; Panganiban (2010) in the Philippines; and Garza-Rodriguez (2010) in Brazil.

As argued by Jalan and Ravallion, this could be due to lack of variation in the survey reflecting idiosyncratic shock to income. This argument appears to reflect the survey data of the present study where the standard deviation of transient poverty (0.20) is smaller than that of chronic poverty (1.60). The most interesting finding is that variables explaining chronic poverty are not the same that define transient poverty, suggesting that the determinants of chronic and transient poverty are not congruent; however, synergies are expected from policy interventions expected to tackle chronic poverty.

The estimates in Table 4 suggest that the determinants of chronic and transient poverty are not totally congruent; however, policies to address chronic poverty may as well tackle transient poverty, but the inverse does not hold. The most important variables for transient poverty are remoteness, head's age, family, fertilizer use, and livestock. All these variables are important even when the cultivated land is considered exogenous, except the remoteness and livestock that become insignificant. All these covariates tend to decrease the transient poverty, except the remoteness, which is likely to decrease it. The most important variables for the chronic poverty are the cultivated land size, access to self-employment, use of fertilizer, improved seeds and hiring seasonal labor.

Nevertheless, when the cultivated land size is considered endogenous, only male headship, head's education and civil status of the head (widowed head) are important for chronic poverty (Table 5). All these variables tend to decrease chronic poverty except the widowed heads who tend to increase it. It is noteworthy that the important variables have opposite effect for each type of poverty. Results in Table 4 show that 1% increase in the initial cultivated land size is likely to decrease chronic poverty in about 0.4% under the current poverty lines.

Household's demographic characteristics

As one would expect, demographic characteristics (education, male heads, and widowed head) seem to be less important for transient than chronic poverty. Results in Table 4 indicate that only family labor and head's age are important for transient poverty. Education is an important factor for avoiding chronic poverty, perhaps because an educated person can easily aspire to have higher income over the course of their lifetime. The effect of the size of family labor seems to suggest that households with a greater number of people that can contribute to household income can help households to cope with external shocks leading to transient poverty.

Rural services

The improvement of infrastructures for transport is important for transient poverty. Results show that promoting self-employment opportunities in rural Northern and central Mozambique is likely to decrease significantly the likelihood of being chronically poor. Results show that an additional household member with accessing or engaging in self-employment is likely to reduce the likelihood of the household being chronically poor by a sizable amount, about 19%.

Productive assets

Increasing cultivated land sizes decrease the chance of being chronically poor. This result is consistent with findings by Jalan and Ravallion in China; households with higher cultivated land are less vulnerable to chronic poverty. An additional percentage of cultivated land decreases the likelihood of being chronically poor by

Table 5. The effect of initial endowments on transitory and chronic poverty.

Variables dependent variables: Log of chronic/transient poverty	Quantile regression		IV-quantile regression	
	Chronic (70th quantile)	Transient (90th quantile)	Chronic (70th quantile)	Transient (90th quantile)
HH lives in non-remote village (1=Yes)	0.105 (0.59)	0.294+ (1.73)	-0.000 (-0.55)	0.145 (1.27)
Log of cultivated land per AE	-0.388+ (-1.80)	0.222 (1.23)	-0.000 (-1.32)	0.023 (0.05)
Male-headed HH (1=Yes)	-0.181 (-0.85)	-0.028 (-0.19)	-0.000** (-2.74)	0.213 (1.12)
Head's education (years completed)	-0.003 (-0.10)	0.019 (0.80)	-0.000+ (-1.82)	0.004 (0.19)
Males in secondary school (number)	-0.094 (-0.93)	0.074 (0.53)	0.000 (0.99)	0.160 (1.35)
Head's age (years)	0.014* (2.38)	-0.007* (-2.11)	0.000 (0.57)	-0.009* (-2.33)
Widowed head (1=Yes)	-0.067 (-0.16)	0.032 (0.23)	0.188** (1.69e+15)	0.088 (0.36)
People aged 15-59 years (number)	0.115 (1.56)	-0.119* (-2.12)	-0.000 (-1.30)	-0.306** (-5.20)
People with self-employment (number)	-0.188** (-2.97)	-0.034 (-0.64)	-0.000 (-0.69)	0.021 (0.40)
HH have access to credit (1=Yes)	-0.196 (-0.77)	-0.037 (-0.09)	0.000 (0.01)	0.051 (0.23)
HH has good land quality (1=Yes)	-0.227 (-1.58)	0.060 (0.66)	-0.000 (-1.20)	-0.024 (-0.17)

Table 5. Contd.

HH used fertilizer (1=Yes)	-0.591*	-0.385*	-0.000	-0.489*
	(-2.16)	(-2.11)	(-0.57)	(-2.25)
HH used improved seeds (1=Yes)	-0.330*	0.031	-0.000	0.193
	(-2.17)	(0.28)	(-0.59)	(1.62)
HH used permanent labor (1=Yes)	-0.358	0.392	-0.000	0.362
	(-1.31)	(0.79)	(-0.53)	(1.62)
HH hired seasonal labor (1=Yes)	-0.328+	0.295	-0.000	0.109
	(-1.86)	(1.01)	(-0.15)	(0.88)
HH used animal traction (1=Yes)	0.021	0.347	0.000	-0.086
	(0.09)	(1.25)	(0.91)	(-0.50)
Total Tropical Livestock units per HH	-0.028	-0.036*	0.000	-0.014
	(-1.18)	(-2.07)	(0.80)	(-0.74)
Constant	3.176**	0.328	0.000*	-0.483
	(7.67)	(1.24)	(2.27)	(-1.21)
Observations	2,344	1,768	2,344	1,768
R-square	0.114	0.047		
Pseudo R-square	-	-	0.121	0.080

Marginal effects; *t* statistics in parentheses; Significance level: + at 10%; * at 5%; ** at 1%. Source: Author's computation from TIA 2008 and Partial Panel 2011.

about 0.4%. However, when the cultivated land size is considered endogenous, only male headship, head's education and civil status of the head (widowed head) are important for chronic poverty. This suggests that policies aimed at reducing chronic poverty should focus on agricultural reform that encourages landholding expansion given as it as a positive effect on income. However, it is noteworthy that land expansion will not be effective if complementary services are unavailable. It is acknowledged that small-scale agriculture is the main livelihood strategy for most rural households which accounts for a majority of the nation's agricultural production (85%) (Shapito et al., 2009) and that 80% of the area under cultivation in Mozambique is used for rain-fed production with limited use of improved inputs; efforts to increased production and productivity should be top priority in the government's development agenda when considering land reform.

Agricultural production and technologies

Similar to productive assets, the agricultural production and technologies are important for

both types of poverty. It appears that hiring seasonal labor for agricultural productionand adopting of chemical fertilizers and improved seeds are more important for chronic than transient poverty as they reduce the chances of households being chronically poor by 60% and being transient poor by 39%.

Those adopting improved seeds and hiring seasonal labor are less likely to being chronically by 33% compared to those not using these inputs. The possession of livestock is more important for transient than for chronic poverty.

CONCLUSION AND RECOMMENDATIONS

Poverty decomposition shows that 66 percent of poverty is transient and 34 percent is chronic. Unlike most earlier studies, this study concludes that the determinants of chronic and transient poverty are not congruent, suggesting that the chronic and transient have different causes. However, multiple effects are expected from interventions aiming to promote agricultural growth and labor market.

Although the majority of poverty is transient, fighting chronic should be a priority given the fact that chronic poverty is more unfair and damaging than transient poverty. So, long-term interventions such as education and self-employment are recommended to tackle chronic poverty because an educated person can easily aspire to have higher income over the course of their lifetime. On the other hand, with the promotion of rural non-farm economy, households with a large size of family labor are likely to have higher income to cope with external shocks. The cultivated land size is more important for the poorest households under high poverty rates while education, labor market and infrastructure are important for the less poor under lower poverty rates.

The most important set of variables for transient poverty are the household landholdings, head's age, family and hired labor, land quality, and livestock. All these covariates tend to increase transient poverty, except the family labor which is likely to decrease it. The same variables are important for the chronic poverty in addition to education especially in men, the number of members with self-employment, and widowed household heads, which all tend to decrease chronic poverty. It is noteworthy that the important variables have opposite effect on each type of poverty.

Policies aimed at reducing chronic poverty should concentrate more on improving household characteristics such as investing in education, agricultural reform that encourages landholding expansion and alternative power sources for agricultural production while reducing transient poverty would call for policies oriented at allowing economically active families to earn income for their livelihoods.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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