

Chronic Poverty in Rural Cambodia: Quality of Growth for Whom?

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Summary. – With the post-2015 era approaching, debates surrounding poverty have started seriously considering what makes for quality growth in order to eliminate extreme poverty, rather than just reduce it. Zero poverty cannot be realised without tackling chronic poverty. However, poverty reduction policies hardly consider particular situations and characteristics of the chronically poor due to lack of data and evidence. In order to fill such research gaps, this paper examines the trend and characteristics of chronic poverty in rural Cambodia between 2004 and 2010. Applying a blend of nationally representative qualitative (participatory poverty assessment) and quantitative sources (household survey), I primarily estimate chronic poverty headcount rates, based on criteria defined by the poor. Surprisingly, despite the excellent progress in economic development, the chronic poverty headcount ratio barely improved from 11 percent. The result implies that rapid economic growth has successfully raised the consumption of chronically poor households but done little to help them accumulate productive assets and human capital to break a vicious cycle of poverty. Structural constraints are identified in their demographic and socioeconomic characteristics, including: limited asset ownership, low human development, female-heads of household, high child dependency, fewer economically active members, small household size and many young members. From a policy perspective, one striking finding is that consumption measurements based on the current national poverty line cannot be used to identify a majority of the chronic poor. This is not merely a matter of different measurement applications because the chronically poor identified in this study are just as deprived as the consumption-based poor in some other attributes like human development. The evidence suggests that poverty reduction programmes should take into consideration the multidimensional criteria identified here to avoid leaving the chronically poor behind in the country's development. This policy implication is particularly important for targeting mechanisms of social protection instruments implemented under the National Social Protection Strategy, which are key measures in ending poverty in Cambodia.

Keywords – Chronic Poverty, Combining Methods, Multidimensional Poverty, Social Protection, Targeting, Cambodia

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1. Introduction

For the past decade, policy makers and researchers have paid great attention to pro-poor growth, focusing in particular on what types of growth would decrease poverty. With the post-2015 era approaching and with smaller poverty headcounts compared to the past, debates surrounding poverty have started seriously considering the quality of growth to eliminate extreme poverty in the coming decades, rather than just its decrease. Zero poverty cannot be realised without tackling structured poverty. The Chronic Poverty Report (Shepherd et al. 2014) calls for the implementation of a comprehensive set of protective and preventative measures for those living in chronic poverty, or those moving in and out of poverty over time due to limited capacities. The paradigm shift from reduction to elimination requires future growth to be aware of whose poverty counts, or quality of growth for whom. High growth and consumption increases are likely to benefit many of the poor, but what of the chronic poor who structurally remain in long-term poverty. One of the critical questions concerns the effects of past growth, particularly in terms of structured poverty, and implications for the quality of growth in the new era.

Taking the case of Cambodia, this paper aims to assess the effects of past growth on the chronic poor by estimating the remaining population in chronic poverty, and analysing the structural characteristics that keep them in poverty indefinitely. Cambodia still faces significant challenges in its poverty reduction policy. After the devastating destruction of physical, social and human capital throughout the Pol Pot regime and the following period of unstable recovery, the country is finally enjoying steady development. With a favourable macroeconomic environment, the country achieved a dramatic improvement in consumption by the poor between 2004 and 2010. With more people emerging from poverty, there are more people concentrated near or just above the poverty line. The latest poverty assessment has emphasised the need to prevent these people from falling back into poverty (World Bank 2013a). Despite experiencing an excellent pro-poor growth period, households with certain attributes still live in poverty. What is missing in the poverty discussion in Cambodia, mainly due to lack of data and analysis, is the critically important focus on chronic poverty as well as the transient poor.

This paper attempts to make two major contributions: one is to fill the research gap on chronic poverty. Recent works by the Cambodia Development Resource Institute (CDRI) are the only widely published studies that have assessed persistent poverty (Tong 2012a, 2012b, 2012c). The second is to provide an estimated chronic poverty headcount with locally meaningful multidimensional criteria. The research by Tong provides a better understanding of chronic poverty through econometric analysis using panel data but has limited data coverage. In the absence of nationwide panel data, I estimate a nationally representative figure. The findings of this study could potentially be of benefit in identifying and targeting programmes for the chronic poor.

2. Growth and poverty in Cambodia

(1) Pro-Poor Growth and Distribution

This section assesses the extent to which pro-poor growth has been achieved from the following perspectives. The definition of pro-poor growth in this study is simply “growth with poverty reduction,” as widely adopted in the development community (DFID 2004). Pro-poor growth can be achieved in several ways, such as income growth (Dollar and Kraay 2001, Kraay 2006), distribution change (White and Anderson 2001; Ravallion 2004) and the favourable sectoral pattern of growth (Eastwood and Lipton 2000).

Quantitative data for poverty analysis has been derived from a series of Cambodia Socio-Economic Surveys (CSES). Following the Socio-Economic Surveys of Cambodia (SESC) conducted in 1993 and 1996, CSES was initiated in 1997, and data is available from 1997, 1999, 2004, and every year from 2007 onwards. Since 2004, the questionnaire has been improved to provide more information. The sample size was 12,000 households in 2004 and 2009, and 3,600 households in the other years. National poverty indicators have been calculated using CSES. In April 2013, the Cambodian government modified the official calculation method of consumption aggregation and redefined national poverty lines based on CSES 2009 (Cambodia. Ministry of Planning 2013). The food poverty line is now calculated based on an equivalent food consumption of 2,200 K-calories per person per day. The total poverty line is calculated by adding an allowance for non-food items to the food poverty line. Taking price differences into consideration, separate poverty lines are defined in three geographic areas: Phnom Penh (KHR 6,347), other urban (KHR 4,352), and rural (KHR 3,503) areas.

Applying the new method and adjusting poverty lines for inflation, Table 1 shows estimated poverty indicators. All the poverty indicators present a very positive improvement between 2004 and 2010. The poverty headcount ratio dropped significantly from 62.82 percent to 20.02 percent at the poverty line and 31.67 percent to 3.38 percent at the food poverty line. In terms of depth and severity of poverty, poverty indicators show a large improvement across the nation as well. The poverty gap dropped from 22.38 points to 4.17 points, whilst the squared poverty gap followed the same trend from 10.34 points to 1.32 points.

Table 1: Poverty Estimation

Indicator	Region	Food Poverty Line		Poverty Line		Obs.	
		2004	2010	2004	2010	2004	2010
p0	Other Urban	22.89	2.70	53.50	15.90	8,685	2,938
	Rural	35.50	3.83	66.61	21.54	45,258	10,011
	Phnom Penh	6.88	0.38	39.09	11.93	5,909	3,561
	Cambodia	31.67	3.38	62.82	20.02	59,852	16,510
p1	Other Urban	5.96	0.45	19.02	3.36	8,685	2,938
	Rural	8.98	0.62	23.94	4.47	45,258	10,011
	Phnom Penh	1.79	0.05	12.05	2.63	5,909	3,561
	Cambodia	8.03	0.55	22.38	4.17	59,852	16,510
p2	Other Urban	2.30	0.10	9.03	1.12	8,685	2,938
	Rural	3.27	0.14	11.05	1.40	45,258	10,011
	Phnom Penh	0.75	0.01	5.34	0.82	5,909	3,561
	Cambodia	2.95	0.12	10.34	1.32	59,852	16,510
Updated poverty lines (riels)	Other Urban	1,774	2,694	2,962	4,498	-	-
	Rural	1,565	2,377	2,384	3,620	-	-
	Phnom Penh	2,124	3,226	4,319	6,559	-	-

Region (Rural Only)	Headcount ratio (%)		Regional Share (%)		Obs.	
	2004	2010	2004	2010	2004	2010
Mekong Plain	63.92	18.02	54.95	43.57	26,548	5,485
Tonle Sap	69.29	16.66	26.8	21	11,384	2,659
Coastal	58.22	17.99	5.64	5.58	2,840	665
North and Northeast Mountain	79.83	45.63	12.61	29.85	4,486	1,202
Cambodia	66.61	21.54	100	100	45,258	10,011

Source: Author's calculations based on CSES

Note: Poverty lines have been adjusted by consumer price index (CPI) in Phnom Penh equally across the regional poverty lines because the regional CPI breakdown is not available. Fixing the averaged CPI October/December 2009 as 100 points, CPI for the other reference years was 0.68 for 2004 and 1.03 for 2010 (Carpenter 2012, National Institute of Statistics). All presented indicators have been assigned population weights provided by each survey, calculated based on General Population Census 1998 and 2008 respectively for CSES 2004 and 2010. Poverty indicators are calculated based on the Foster-Greer-Thorbecke method (1984).

This trend is likely a result of the favourable macroeconomic environment and growth pattern. Between 2004 and 2010, even during the global financial crisis, the country enjoyed 6.17 percent annual growth in GDP per capita. Sectoral growth took place almost evenly in agriculture, which most poor people rely on, at 6.81 percent, as well as manufacturing and services, at about 8 percent (Appendix 1). The consumption growth of the poor was higher than that of growth rate in mean and at median in all regions, increasing annually by 9.11 percent in Phnom Penh, 11.66 percent in other urban and 10.34 percent in rural areas (Appendix 2). The growth incidence curve clearly indicates that growth and distribution patterns were pro-poor in the rural settings. Moreover, human development has improved substantially. The net enrolment ratio presents an upward trend at all levels, primary, lower

secondary and upper secondary whilst school attendance and adult literacy follow similar trends. Child mortality has also improved in terms of neonatal, infant and under-5 age groups. Overall, the quantitative data both on macro and micro confirm that the country has achieved pro-poor growth.

Looking closely into the socioeconomic data in 2010, geographic distribution and economic activities illustrate poverty characteristics further. All poverty indicators are noticeably higher in rural regions than urban settings. Rural poverty was 21.54 percent whilst urban poverty was even lower, 11.93 percent in Phnom Penh and 15.9 percent in other urban areas. Although the difference in poverty rates between rural and urban areas might be seen as small, it is significantly different in absolute terms. In spite of increasing urbanisation, rural areas are still home to 80 percent of the population and over 86 percent or 2.3 million of the poor. This geographic distribution correlates with the trends in economic activities: 72 percent of poor people depend on agriculture² for their livelihoods in Cambodia, and the rate increases to 78 percent in rural settings. Of the poor agrarians, crop farmers account for 80 percent. Although agricultural labourers, livestock farmers, forestry workers, fishery workers and hunters constitute a minority (12 percent), these groups contribute a higher share to poverty (18 percent) than their population share. Poverty rates are relatively higher among them too. In rural areas, 33 percent of fishery workers and 40 percent of agricultural labourers live below the poverty line. On the other hand, urban poverty shows quite different patterns in economic activities, with 95 percent of the poor in Phnom Penh and 52 percent in other urban areas working in secondary or tertiary sectors.

To sum up, Cambodia seems to have achieved pro-poor growth between 2004 and 2010. Both macroeconomic environment and human development progress were steadily positive, consumption growth of the poor increased more than that of other socio-economic groups, and poverty indicators dramatically improved.

(2) Existing Literature on Chronic Poverty

Quantitative regional studies provide fruitful insights on chronic poverty. Tong (2012a) conducted a dynamic poverty study using CDRI panel data of 793 households, collected in 2001, 2004/05, 2008 and 2011, from nine villages in seven provinces in four geographic regions, including Tonle Sap, Mekong Plain, Plateau and Coastal areas. The data include information on household demographics, consumption, asset ownership and economic activities. The study applies principal component analysis to construct a wealth index from mixed asset ownership for ranking households (Filmer and Pritchett 2001). Households always below the set poverty line (40th percentile or 60th percentile) are regarded as the chronic poor. The study finds that most poverty was transient during the period. It also finds the following characteristics of the chronic poor households. Compared to non-poor households, the chronic poor households are likely smaller and have more children under-six

² Main economic activities of households are defined by time that household members spend on particular sectors. A detailed definition is discussed later.

years, fewer adults aged 15-64, and the household heads tend to be younger, less educated, female and single. They likely lack agricultural land, non-land assets, livestock, and connection with their community than other households.

Using the same dataset, Tong (2012b, 2012c) reassesses chronic poverty with consumption measurements to compare results. It confirms all the major findings above except for household size and age of household heads. While the asset approach finds that the chronic poor tend to be in smaller households and their heads are likely young, the consumption approach finds larger households and no significant trends in head's age among them. There is no further analysis of these particular contradictions.

These findings provide a valuable foundation for understanding chronic poverty in Cambodia. In relation to the previous studies by Tong, this paper potentially makes an important contribution by confirming some of his major findings from a different approach and at the national level. There are certain differences in methodologies and scopes. For example, while Tong's studies cover households with all the occupations in the selected areas, this paper limits its scope of analysis to agrarians in rural areas across the nation. While Tong's study uses consumption poverty and a wealth index, this study defines chronic poverty by local perspectives through PPA as discussed later.

3. Methodology for identifying chronic poverty

The methods for measuring the persistence of poverty have been disputed. In contradistinction to transient poverty, chronic poverty is commonly defined by poverty over long durations and regarded as intergenerational transmission of poverty through transferred capital or assets (Hulme and Shepherd 2003). For the identification of chronic poverty in practice, one of the most common approaches is quantitative assessment using a set of panel data (McKay and Lawson 2002; Haddad and Ahmed 2003; Wadugodapitiya and Baulch 2011). Comparing income or consumption of the same households over time, it provides informative analysis with figures. On the other hand, Hulme, Moore and Shepherd . (2001, 34) argued that monetary measurements cannot fully reflect the complexity of chronic poverty; therefore such analyses need to take into account the multidimensional characteristics of chronic poverty and can benefit from qualitative or subjective assessment by poor people themselves. White (2002) also argued that productive synergy can be established between them in poverty analyses.

Building upon these ideas, Howe and McKay (2007) developed an innovative framework for identifying chronic poverty by combining both quantitative and qualitative approaches. They pointed out that panel data analysis provides a narrow understanding of chronic poverty within the capacity of data availability or questionnaires, although it provides the numeric results that policy makers prefer to have for decision making. It can also assess relatively short spans and is usually sensitive to measurement errors. They also acknowledge the pros and cons of a qualitative approach. It provides narrative information based on rich local knowledge and experience that is usually missed by purely numerical methods. Data can be

ambiguous and therefore difficult for policy makers to use the results, as there are fewer objective figures and macro perspectives. To overcome the limitations and maximise the advantages, they innovated by combining the methodologies. The major value of the resulting methodology is that it does not require panel data – instead, it uses cross-sectional socioeconomic data at a single point in time and qualitative information collected through participatory poverty assessments (PPA). They proposed undertaking several steps of analysis: firstly, selecting criteria of chronic poverty defined by the poor people themselves in the PPA, translating those qualitative criteria onto nationally representative household data, and finally checking the robustness and sensitivity of the estimation.

As Howe and McKay (2007) acknowledge, the sustainable livelihood approach (SLA) is a useful framework to understand qualitative information in a vicious poverty cycle at the stage of criteria selection (Ellis 2000, 2006). In SLA, livelihood is conceived as a cycle of three main components: assets, activities and outcomes. Assets consist of five or more types such as human capital (skills, education, health), physical capital (goods), financial capital (savings, access to loans), natural capital (land, water, forest), and social capital (kinship, friendship). Households are considered to mobilise those assets to produce outcomes through different types of economic activities, and invest the outcomes to accumulate assets again. In terms of vulnerability in SLA, households are considered to utilise assets to practise risk management and coping strategies. If they manage the sequence successfully, they are able to build up assets. If unsuccessful, they deplete assets. Institutions and policies are involved in the framework to reduce vulnerability. In relation to chronic poverty, destitute households may live in a vicious cycle of asset-activity-outcome.

In this study, I adopt the approach of Howe and McKay (2007) to identify chronic poverty. The approach is relevant for this study in two reasons. The first reason is data availability. Cambodia does not have nationwide panel data but socioeconomic survey data and the results of PPA are available. Secondly, the methodology allows estimating the chronic poverty headcount at two points in time, enabling analysis of the extent to which pro-poor growth benefits the chronic poor over the period. As Howe and McKay admit, this is not the most rigorous way to estimate chronic poverty and it has a tendency to underestimate the population but it is still considerably useful in assessing chronic poverty given the absence of panel data.

4. Qualitative insights into chronic poverty in Cambodia

This section reviews qualitative information to identify the characteristics of chronic poverty. The qualitative information is derived from the PPA conducted across the nation by the Asian Development Bank between October and December 2000 (ADB 2001). The PPA compiled local voices through focus group discussions (FGDs), formulated in geographically targeted poor regions based on quantitative surveys (National Population Census and CSES) and selection by local authorities, community or village members and nongovernmental organisations. Locally selected poor people participated in 169 FGDs in 154 villages in 70 communes in all 24 provinces and in additional 15 urban areas. The regional share of FGDs

was 47 percent in the Mekong Plain, 29 percent in Tonle Sap, 12 percent in the North and Northeast Mountain regions, and 12 percent in coastal areas. The participants included a variety of vulnerable groups: women, children, rural farmers, fisher folk, ethnic minority groups, female-headed households, demobilised soldiers, orphans, street children, sex workers, plantation workers, garment workers, garbage collectors and cyclo-drivers. Females and ethnic minorities accounted for over 50 percent and 13 percent respectively. The PPA paid particular attention to the process to have real voices from those socially weaker groups. For instance, the team members conducted separate discussions with women in situations where they could not openly explore gender issues in the FGD where men were present.

As designed, the PPA provides deep insights about the livelihoods and demographic characteristics of poor households. It found that food insecurity is a primary concern for all poor households regardless of region and ethnic group. Poverty means they spend a large amount of time looking for food, potentially causing loss of other opportunities such as participation in village activities. It also found that food foraging activities are often undertaken by women and children; therefore children, particularly girls, in poor families potentially have a higher risk of missing educational opportunities. Most PPA participants generate their livelihoods through agriculture. Rice farming was listed as the most important economic activity by 83 percent, with market gardening second at 16 percent, and raising livestock third at one percent. Some households certainly mixed those activities but very few households had other supplemental activities for livelihood. Moreover, the PPA found a vicious poverty cycle in relation to asset deprivation. In rural Cambodia, the poorest families tend to sell assets to cope with major shocks like natural disasters, sickness or death of household members, resulting in low levels of asset ownership. As ownership of productive land was listed as very important for their lives, the coping strategy of selling land is certainly not an easy choice for the poor.

Table 2: Household Characteristics Identified in Participatory Poverty Assessment

Category	Household Characteristics
Poorest <i>Kror bamphot</i> : Extremely poor <i>Toal</i> : People who have no way out of their present situation	<ol style="list-style-type: none"> 1. Little or no land (0.8-1.2 ha) 2. Perhaps one draft animal but no farming implements 3. Housing made of thatch in very poor condition 4. Few household utensils 5. Live on hand-to-mouth basis (food shortages for up to eight months) 6. Much reliance on natural resources to meet subsistence needs 7. Accumulated debts and inability to repay or borrow additional amounts 8. No kinship support 9. Large young families with 5-12 children
Poor <i>Kror</i> : Literally poor <i>Kror thomada</i> : Typical poverty	<ol style="list-style-type: none"> 1. Less than 2 ha of land in unfavorable locations 2. Usually have at least a pair of draft animals and some farm implements 3. Houses made of thatch sometimes with tile roof and bamboo walls 4. Limited number of household utensils 5. Food shortages for 3-6 months 6. Able to borrow money for rice farming
Lower medium income <i>Kror imom</i> : Reasonably poor <i>Kandal</i> : Medium	<ol style="list-style-type: none"> 1. Less than 3 ha of land 2. Draft animals and farm implements 3. Houses made of wood or bamboo, thatched roof and walls and tile roof 4. Limited number of household utensils 5. Food shortages for 3-4 months 6. Able to borrow money for rice farming
Middle income <i>Mathyum</i> : Average <i>Kandal</i> : Medium	<ol style="list-style-type: none"> 1. Land holdings of up to 6 ha 2. 2-4 draft animals, some livestock and all farm implements 3. Houses made of wood with either bamboo or wooden floors and tile roof 4. Reasonable number of household utensils 5. No food shortages except when major crisis or ritual occurs 6. Limited cash savings 7. Small-scale business 8. Old motorbike or boat
Least poor (Non-Poor) <i>Throuthear</i> : Fully self-sufficient without any debts; <i>Neak leu</i> : Living above poverty	<ol style="list-style-type: none"> 1. More than one hectare of very productive agricultural land 2. At least two draft animals and many other livestock and farm implements 3. Houses made of permanent building materials, including corrugated iron and tiles 4. Full food security with limited surplus for lending, sale or labor exchange 5. Well-furnished households, often with television 6. Able and willing to lend money to other villagers

Source: Summarised by the author based on the PPA (ADB 2001)

The PPA identified five broad livelihood ranks and those characteristics (Table 2), enabling a chronic poverty threshold to be defined. The first category clearly implies chronic poverty. The literal description in local language is *Toal*, people who have no way out of their present situation, and *Kror Bamphot*, extremely poor. The identified characteristics also confirm a significant deprivation – namely, lack of food security most of the time (eight or more months per year), relying on subsistent livelihoods (living on a hand-to-mouth basis), no productive assets or kinship support. Spending most months hungry and unable to escape the situation, those households in this category can be clearly identified as being in chronic poverty. The second and third categories are too ambiguous to be regarded as chronic poverty.

Households in these two categories have land at unfavourable locations and limited farming implements with relatively long term food shortages. The PPA describes their marginalised situation but does not provide a clear definition or characteristics of poverty persistence. In order to avoid ambiguity and subjectivity for selection criteria, this study regards only the first category as chronic poverty.

Reflecting the limitations in coverage of the PPA, the above criteria potentially underestimate chronic poverty in particular groups. Firstly, the PPA provides little information about urban chronic poverty. Although there are some related descriptions such as lack of in-house toilet, mobile phone, car or motorcycle, or child's education, it does not link to those characteristics to poverty persistence. Due to this lack of clear definition, this study is unable to estimate chronic urban poverty and therefore the following analysis focuses on rural areas. Secondly, the PPA does not provide sufficient information about characteristics of chronic poverty in secondary and tertiary sectors; therefore, the study's scope is limited to chronic poverty in agriculture in terms of livelihood. Given the lack of information, it also potentially underestimates the chronic poor who rely on non-farming agricultural subsectors. For instance, as resource-based livelihoods are reported to have very different characteristics from farming (Ballard et al. 2007), households relying on fishery and forestry would not be rigorously identified in chronic poverty by the single set of criteria. Similarly, chronic poverty among ethnic minorities cannot be easily identified by the single selection criteria because each tribe has a variety of perceptions of poverty. For example, whilst the Stieng and the Tumpoun recognise loss of cultural identity as a characteristic of poverty, the dominant lowland Khmer, the Cham or the Vietnamese do not have such perceptions. Stieng participants stated that they do not even have a term to describe poverty and would not compare life with others in their culture. A tribal elder of the Tumpoun in Ratanakiri defines poverty based on situations in which they would be unable to protect and hand over their land to the next generation, and they would not be rich even if they had enough money. Such differences in values cannot be taken into account in this study.

Lastly, on a possible critique for using the PPA conducted over a decade ago, I would argue that the validity can be reasonably confirmed, because Tong's work (Tong 2012a, 2012b, 2012c), conducted throughout the decade after the PPA, also found similar demographic characteristics of chronically poor households, including lack of agricultural land, non-land assets, livestock, and networks with their community.

In summary, this study defines chronic poverty by the first category of Table 2 and focuses solely on rural areas. With limited information, this study potentially underestimates chronic poverty among households who make their livelihood through non-farming activities, the urban poor and ethnic minorities. Further studies could explore such categories. Nevertheless, this study is still of value because the proportion of the population in urban settings, forestry, fishery or ethnic minority groups is relatively small and the vast majority of rural populations are covered in the following estimation.

5. Chronic poverty estimation

I will now combine the quantitative information and the qualitative data to estimate chronic poverty. In order to identify the chronic poor, the general principle of criteria selection here is to translate as many local definitions as possible to household survey data. One critique of this combining method is that selected criteria are loosely associated with PPA results (Shaffer 2013, 49). Therefore, it is crucial for this study to test the robustness and sensitivity of the estimation result. This section reviews the descriptive statistics of each dimension that the PPA identifies, followed by an estimated chronic poverty headcount and finally, a robustness and sensitivity analysis.

(1) Descriptive Statistics and Discussion on Selection Criteria

Concerning economic activities, 77.34 percent of rural people relied on agriculture in 2004 and 72.87 percent in 2010 (Table 3). The data allows further breakdown into agricultural subsectors, but the categorisation is not fully comparable over the two datasets at the subsector level. Among agrarians in 2010, most of them lived on crop farming (87.53 percent), while others relied on agricultural labour (7.5 percent), livestock raising (2.37 percent), fishery (1.35 percent) and forestry (0.26 percent).

In terms of asset ownership among agrarians in each survey year respectively, 58.81 percent and 57.34 percent owned one hectare or less of land for any agricultural activities such as vegetable gardening, crop cultivation, livestock raising or private forestry; 42.19 percent and 46.48 percent owned one or no draft animals, which included cattle, buffaloes, horses and ponies but excluded other types of livestock like pigs, sheep, goats, chickens, ducks or quails; 82.35 percent and 75.44 percent owned no high value farming implements, such as tractors, bulldozers, threshing machines, hand tractors, rice mills, or water pumps; 58.49 percent and 57.06 percent lived in houses where the walls or roof are made from bamboo or thatch.

Some particular dimensions need further discussion in order to determine selection criteria. Firstly, the PPA found that the chronic poor tend to have 0.8 hectare to 1.2 hectares of agricultural land, as shown in Table 4, while also indicating that owning productive cropland is one criterion for non-poverty. The major difference between these two descriptions is quality of land. Unfortunately, there is no translatable quantitative data available to distinguish the quality of land. Therefore, defining chronic poverty by taking land ownership of between one hectare and 1.2 hectares potentially includes households with productive land who are not poor according to the PPA. To avoid the inclusion error, this study takes one hectare as a threshold.

Secondly, the farming implement criterion is disputable. Selecting households who have ‘no farming implements’, as the PPA indicates, identifies only 4.61 percent and 0.51 percent in respective years. It may cause significant underestimation of chronic poverty. On the other hand, selecting households with ‘a few farming implements’ potentially identifies those with productive agricultural machines. As the PPA implies that the poor rely on low productive activities, they are unlikely to own such modern farming tools. In order to minimise both

inclusion and exclusion errors, this study adopts ownership of low productive farming implements including an animal cart, plough, harrow, rake, hoe, spade, axe or none as a criterion. In other words, households with high productive farming implements are excluded from this category. The number of owned implements is not considered here because the PPA does not specify the extent of ownership.

Thirdly, the PPA identifies that housing in chronically poor households is likely made of thatch in very poor condition. Although it does not specify what types of housing materials are indicated, roofs and walls are repeatedly mentioned in the other categories. As the household survey data do not allow division of bamboo and thatch and those qualities, those two materials, in any conditions, are treated as a criterion in this study. Finally, the other listed characteristics in the first category are not precisely translatable due to either limitation of the survey data or the PPA description. They mostly provide rich understanding of chronic poverty but are insufficient as identification criteria. A wide range of utensil variables is actually available in the survey data but the PPA provides little indication of what types of durables the participants meant. Although utensil ranking and assigned weights can probably be inferred through statistical techniques like principal component analysis (Filmer and Pritchett 2001), the result would not reflect the self-rated characteristics of the poor people in this study.

Similarly, the narrative description of “live on hand-to-mouth basis” or “food shortages” is not directly translatable into the survey data, but alternatively, consumption data are available. Variables for debt accumulation and kinship support are not available in the household survey data. Lastly, the dimension of “large young families with 5-12 children” is too ambiguous to be taken as a criterion and partially conflicts with the survey data. The survey data show no families with more than nine children and very few of them, 1.44 percent in 2010, have five children or more. This contradiction is probably because children in the PPA period have grown up and the household size norms have changed. However, this assumption cannot be verified with the available information. Some of these indicators will be used to test estimation robustness later.

Table 3: Main Economic Activities and Asset Ownership in Rural Cambodia

	2004	2010
Main Household Economic Activities (%)		
Crop farmers	77.34	63.50
Livestock farmers		1.73
Forestry workers		0.19
Fishery workers or hunters		0.99
Agricultural labourer		5.47
Mixed agriculture		0.99
Non-agricultural activities	22.05	26.73
None	0.60	0.40
Obs.	45,258	10,011
Land (among agrarian) (%)		
0.8 ha or less	44.91	45.09
0.8 < & <=1 ha	13.90	12.25
1 ha <	41.19	42.66
Obs.	34,786	7,317
Draft Animal (among agrarian) (%)		
None	32.56	37.2
One	9.63	9.28
Two or above	57.81	53.52
Obs.	34,786	7,317
Farming Implement (among agrarian) (%)		
High farm implements only	1.55	0.78
Both high and low value farm implements	16.10	23.77
Low value farm implements only	77.74	74.93
None	4.61	0.51
Obs.	34,786	7,317
Housing Material (among agrarian) (%)		
Wall and Roof made of Bamboo or Thatch	16.50	13.84
Wall or Roof made of Bamboo or Thatch	41.99	43.22
Others (Tiles, Fibrous cement, Concrete etc.)	41.50	42.94
Obs.	34,772	7,317

Source: Author's calculations based on CSES

Note: Main economic activity is defined by share of time that household members spend on each activity. The sum of months that household members spend in agriculture is divided by the total sum of months in all occupations to obtain the share of agricultural activity for each household. Then, main economic activity is identified in agriculture if the share is 50 percent or above. All the presented data are population-weighted.

(2) Selection Criteria and Estimation Result

As discussed above, this study adopts the following criteria for identifying chronic poverty, and regards households that meet all of these criteria as clearly chronically poor according to the local definition. The identified households would not have sizable-enough land to harvest sufficient food for household subsistence needs. They have very limited farming assets to increase the productivity and efficiency of farming activities, although they invest most time and labour in agriculture throughout the year. The vicious poverty cycle can be observed in

the SLA framework as well. The criteria take into consideration physical capital (draft animals and farming implements), natural capital (agricultural land) and human capital (labourers). This provides a convincing enough picture of the negative spiral of poverty in the household:

- Main household economic activity is agriculture,
- Household owns agricultural land of one hectare or less,
- Household owns one draft animal or none,
- Household owns no high value farming implement, and
- Household walls or roof is bamboo or thatch.

Of the total rural population, these criteria identify chronic poverty rates of 11.53 percent and 11.34 percent in the reference years (Table 4). Although there are a few variations across different regions, it is notable that the chronic poverty headcount almost levelled off over the favourable period for economic growth and reduction in consumption poverty.

Table 4: Estimated Chronic Poverty Headcount in Rural Cambodia

Region (Rural Only)	Headcount ratio (%)		Regional Share (%)		Obs.	
	2004	2010	2004	2010	2004	2010
Mekong Plain	11.04	12.24	54.8	56.19	26,548	5,485
Tonle Sap	13.63	10.25	30.45	24.53	11,384	2,659
Coastal	7.39	9.56	4.13	5.63	2,840	665
North and Northeast Mountain	11.64	10.98	10.62	13.64	4,486	1,202
Cambodia	11.53	11.34	100	100	45,258	10,011

Source: Author's calculation based on CSES

(3) Robustness Analysis

In order to see the robustness of estimation, I compared the other indicators of poverty and human development, specified by PPA participants, between two groups: the chronic poor and non-chronic poor in the same economic activity at the 95 percent confidence level. The PPA claims that ill health and education access are major determinants of poverty and food shortages are important factors in defining chronic poverty. In relation to these descriptions, there are rich quantitative data available to create indicators of human development and consumption.

In general, the result shows that the estimation is robust across different indicators (Table 5). The education indicators of the chronic poor, including school enrolment, attendance and adult literacy, are significantly lower than those of the others in the same economic activity, except for primary net enrolment ratio in 2010 (for which the difference is statistically not significant). Looking over time, although the primary net enrolment ratio has improved equally and is even slightly higher among the chronic poor, the gap becomes much more evident in secondary education. Whilst both lower and upper secondary net enrolment ratio

improved remarkably among the non-chronic poor, the results were different for the chronic poor. Only 8.93 percent of chronic poor children in the relevant ages go to lower secondary school, compared to 27.19 percent in non-chronic poverty in the same activity, and 35.53 percent for the non-agrarians. Moreover, the share of household members who ever attended school and the proportion of adult members who are able to read and write show considerable deprivation among the chronic poor.

Similarly, prevalence of illness or injury tends to be slightly higher among the chronic poor. The share of people who seek advice or care from health practitioners is not very different between the groups. That is probably because access to health care services improved equally and most people now seek health care services when they become ill. In terms of consumption, the estimation is also robust. The result presents a large proportion of chronic poor identified in the bottom consumption quintile, 34.32 percent and 32.83 percent, and few in the highest quintile, 5.99 percent and 3.16 percent, respectively; and most of the other chronic poor are concentrated in second and third lowest quintiles. The comparison of food consumption also follows the same distribution pattern. Overall, almost all indicators demonstrate a significant difference between the chronic poor and the others both in 2004 and 2010. It may provide an indication of the robustness for the estimation.

Table 5: Comparison of Socio-Economic Indicators

2004 Indicators (%)	(1) Chronic Poor (CP)	(2) Non-CP in same activity	All other	Total	(2) - (1) Diff.	t-value
Net enrolment ratio (ages 6-11)	65.60	74.84	79.72	74.70	9.24	5.34
Net enrolment ratio (ages 12-14)	4.84	10.26	21.34	12.17	5.42	4.54
Net enrolment ratio (ages 15-17)	2.55	3.64	8.75	4.67	1.10	1.12
Ever attended school (ages 5+)	61.52	72.59	81.39	73.39	11.08	13.92
Adult literacy (ages 15+)	50.55	64.50	77.39	66.07	13.95	13.91
Prevalence of illness or injury	20.51	18.20	16.99	18.19	-2.31	-3.75
Seek care during the survey period	13.64	11.70	10.97	11.76	-1.94	-3.68
Seek care when ill or injured	66.87	64.36	64.70	64.76	-2.51	-1.56
1st quintile, Food consumption	27.37	24.63	14.85	22.73	-2.74	-3.98
5th quintile, Food consumption	8.86	11.21	24.07	13.86	2.35	5.38
1st quintile, Total consumption	34.32	24.58	13.61	23.22	-9.74	-13.43
5th quintile, Total consumption	5.99	9.41	25.40	12.64	3.42	9.22
Food consumption	1,351	1,459	1,903	1,547	108	9.88
Total consumption	1,920	2,270	3,761	2,568	350	12.84

2010 Indicators (%)	(1) Chronic Poor (CP)	(2) Non-CP in same activity	All other	Total	(2) - (1) Diff.	t-value
Net enrolment ratio (ages 6-11)	87.51	81.95	90.48	84.77	-5.57	-1.95
Net enrolment ratio (ages 12-14)	8.93	27.19	35.53	27.43	18.26	4.67
Net enrolment ratio (ages 15-17)	2.74	11.72	23.20	13.94	8.98	3.69
Ever attended school (ages 5+)	68.30	78.05	85.94	79.14	9.75	6.06
Adult literacy (ages 15+)	56.50	71.43	81.31	72.65	14.93	7.37
Prevalence of illness or injury	23.36	18.60	21.46	19.91	-4.76	-3.47
Seek care during the survey period	19.97	16.21	18.96	17.38	-3.76	-2.92
Seek care when ill or injured	85.51	87.18	88.36	87.30	1.68	0.65
1st quintile, Food consumption	32.83	23.51	21.19	23.94	-9.31	-6.17
5th quintile, Food consumption	5.54	9.12	16.64	10.75	3.58	4.63
1st quintile, Total consumption	38.46	23.20	19.44	23.91	-15.26	-9.77
5th quintile, Total consumption	3.16	8.78	18.81	10.86	5.62	9.04
Food consumption (constant 2004)	1,937	2,132	2,398	2,182	195	7.39
Total consumption (constant 2004)	2,978	3,780	4,570	3,904	802	13.15

Source: Author's calculation based on CSES

(4) Characteristics of Chronic Poverty, Regional Distribution and Key Factors

The previous sections have shown some key characteristics of the chronic poor – they have limited assets and relatively lower human development. Table 6 shows additional demographic characteristics. Chronically poor households are more likely to be headed by

females with 31.96 percent, compared to 17.72 percent for the non-chronic poor in the same economic activities. The proportion of either elderly- or ethnic-minority-headed households is not statistically significant. Notably, households in chronic poverty tend to have higher dependency, in particular child dependency, mainly due to fewer working aged members, and household size is significantly smaller compared to other groups. The chronic poor also tend to be younger. The average age of household heads and members is about two years younger than the national average.

These results support some of the key findings of the previous studies. As Howe and McKay (2007) in Rwanda and Tong (2012a, 2012b, 2012c) in Cambodia found, chronically poor households are likely female-headed and smaller in rural Cambodia. As Tong also found, the chronic poor are liable to have fewer adults, younger members and less educated household heads. From a different approach, this paper confirms that chronically poor households seem to have structural challenges to accumulate human capital and make a living with fewer economically active members and high child dependency.

Table 6: Demographic Characteristics of Chronic Poor in 2010

Indicators	(1) Chronic Poor (CP)	(2) Non-CP in same activity	All other	Total	(2) - (1) Diff.	t-value
HH head: female (%)	32.01	17.53	24.79	21.35	-14.48	-4.82
HH head: elderly 65+ (%)	10.27	11.13	11.29	11.06	0.86	0.43
HH head: ethnic minority (%)	4.19	4.95	2.65	4.24	0.76	0.59
HH head: age	43.66	45.81	46.67	45.76	2.15	2.28
HH member: age	24.55	26.82	26.98	26.60	2.26	3.60
HH head: school attainment (year)	3.03	3.99	5.29	4.22	0.96	4.79
Average HH size	3.98	4.65	4.62	4.55	0.67	5.65
Average number of working age	2.27	2.92	2.99	2.85	0.64	8.15
Average number of children 0-14	1.54	1.51	1.41	1.49	-0.03	-0.31
Average number of elderly 65+	0.17	0.22	0.22	0.21	0.05	1.86
Dependency ratio (%)	85.13	73.45	67.18	73.30	-11.68	-2.24
Child dependency ratio 0-14 (%)	75.91	62.21	59.02	63.12	-13.70	-2.83
Aged dependency ratio 65+ (%)	9.22	11.24	8.16	10.17	2.02	1.02

Source: Own calculations based on CSES

Looking at regional distribution, the criteria seem to capture the chronic poor better in some regions than in others. Most notably, the criteria possibly underestimate chronic poverty in the North and Northeast Mountain region. The consumption poverty headcount ratio was 45.63 percent in the region in 2010, compared to 16.66 percent to 18.02 percent in the other regions. This regional disparity does not appear on the estimated distribution of chronic poverty, which is almost at the same level across the four regions. This estimation gap between the two measurements was also observed in 2004. One possible reason for the underestimation is diversity within the region. As discussed later, estimation in the region is relatively more sensitive to housing and land ownership criteria than the other regions. It

possibly reflects the diversity of ethnicity, livelihood and concept of value, which standardised criteria cannot capture. To overcome this potential underestimation, more information both from quantitative and qualitative sides is necessary.

Regarding key factors, ownership of high value farming implements is the most influential variable among the four criteria (Appendix 5). With the highest contribution rate, lack of a high value farming implement explains chronic poverty most, followed by non-ownership of land, lack of draft animals and type of housing materials. In other words, owning high value farming implements has the largest impact on decreasing chronic poverty among the four variables; and worsening housing materials to thatch, and loss of draft animals to zero potentially increase chronic poverty most. Moreover, in the North and Northeast Mountain region, the ranking is clearly different from the others: farming implements, housing, land and draft animals in order. This implies again that particular attention needs to be paid to the unique and diverse characteristics of the Mountainous region in identifying chronic poverty.

(5) Chronic Poverty and Consumption Poverty

In practice, poverty targeting commonly focuses on consumption poverty; it is useful to know whether consumption poverty can provide a good proxy for chronic poverty. Comparison between consumption poverty and chronic poverty shows that measurement based on the national poverty line cannot capture a large proportion of the chronic poor identified in this study (Table 7). The total poverty line identifies only 36.32 percent of the chronically poor. Nevertheless, in terms of human development, the rest of the chronic poor (chronic poor but not consumption poor) are also greatly deprived. Their education indicators are as low as the consumption poor in lower and upper secondary enrolment, school attendance and adult literacy, except for the primary enrolment ratio. Health indicators show that the chronically poor become ill slightly more frequently than the consumption poor but access health care services almost equally. One interesting question for further studies at this point is how much the chronic poor spend on health services. They might be trapped in a vicious cycle of long-term poverty because of high prevalence of illness and health expenditure. In addition, some counterintuitive differences in demographic characteristics are worth noting. Unlike in other low-income countries, female-headed households are not a particular phenomena among the consumption poor in Cambodia but more evident amongst the chronic poor. The chronic poor tend to have smaller families while the consumption poor have larger ones, although both groups face higher dependency in common compared to the average.

Inconsistencies between the two measurements likely become greater when the population below the poverty line is smaller. In fact, the consumption poor overlapped 79.44 percent of the chronic poor in 2004, compared to only 36.32 percent in 2010. It works even better to look at consumption poverty in relative terms – by adjusting consumption quintiles, chronic poverty can be identified more successfully. Looking cumulatively from the bottom, there are 38.46 percent in the lowest quintile, 65.41 percent in the second and 87.41 percent in the third bottom quintile in 2010. The result was almost identical in 2004, with 80.35 percent in the

third bottom quintile. The national poverty line fails to identify the majority of the chronic poor but most of them are identified in the third cumulative consumption quintile.

The challenge of consumption poverty measurement is that it potentially underestimates the chronic poverty identified in this study, and that the applied criteria here overestimate it by including better-off people in consumption term. There is no doubt that consumption poverty measurement is useful for chronic poverty identification because households with the most vulnerable demographic characteristics appear in a group identified both in consumption poverty and chronic poverty. This study therefore suggests that consumption based targeting programmes should apply the criteria to identify chronic poverty in a mutually complementary manner. For example, this method can be used to identify potentially chronically poor households above the consumption poverty line, and to divide the consumption poor into the persistent poor and the others.

Table 7: Comparison between Consumption Poverty and Chronic Poverty among Rural Agrarians in 2010

Indicators (%)	(A) Consumption Poverty and CP	(B) Consumption Poverty but Non-CP	(C) Non- Consumption Poverty but CP	(D) Non- Consumption Poverty and Non-CP	(A) + (B) Consumption Poverty	(A) + (C) Chronic Poverty	Total
Net enrolment ratio (ages 6-11)	86.28	71.32	88.64	86.45	75.04	87.51	82.90
Net enrolment ratio (ages 12-14)	2.33	14.75	14.90	30.65	11.47	8.93	24.62
Net enrolment ratio (ages 15-17)	2.99	3.95	2.57	13.62	3.74	2.74	10.63
Ever attended school (ages 5+)	69.31	68.87	67.73	80.33	68.97	68.30	76.59
Adult literacy (ages 15+)	54.63	60.29	57.37	73.77	58.96	56.50	69.28
Prevalence of illness or injury	21.09	13.59	24.65	19.91	15.42	23.36	19.34
Seek care when ill or injured	88.17	80.81	84.21	88.32	83.26	85.51	86.87
HH head: female (%)	20.67	16.76	36.18	17.68	17.78	32.01	20.10
HH head: elderly 65+ (%)	2.30	8.79	13.20	11.59	7.10	10.27	10.98
HH head: ethnic minority (%)	2.19	8.77	4.93	4.21	7.05	4.19	4.82
HH head: age	40.50	43.51	44.82	46.25	42.72	43.66	45.42
HH member: age	21.33	22.47	26.40	27.95	22.19	24.55	26.46
HH head: school attainment (year)	3.06	3.00	3.02	4.19	3.02	3.03	3.82
Average HH size	5.37	5.89	3.46	4.40	5.76	3.98	4.53
Average number of working age	2.77	3.13	2.09	2.88	3.03	2.27	2.80
Average number of children 0-14	2.49	2.56	1.19	1.31	2.54	1.54	1.52
Average number of elderly 65+	0.12	0.21	0.19	0.22	0.18	0.17	0.21
Dependency ratio (%)	122.75	109.10	70.64	66.42	112.68	85.13	75.48
Child dependency ratio 0-14 (%)	115.22	99.96	60.77	54.76	103.96	75.91	64.59
Aged dependency ratio 65+ (%)	7.53	9.14	9.88	11.66	8.72	9.22	10.89
Food consumption (constant 2004)	1,308	1,297	2,295	2,351	1,299	1,937	2,102
Total consumption (constant 2004)	1,858	1,879	3,617	4,278	1,874	2,978	3,655
Obs. (individual)	412	1,230	740	4,935	1,642	1,152	7,317

Source: Author's calculation based on CSES

Note: (C) is a group categorised as not being in consumption poverty at the national poverty line but identified as being in chronic poverty by the definition of this study.

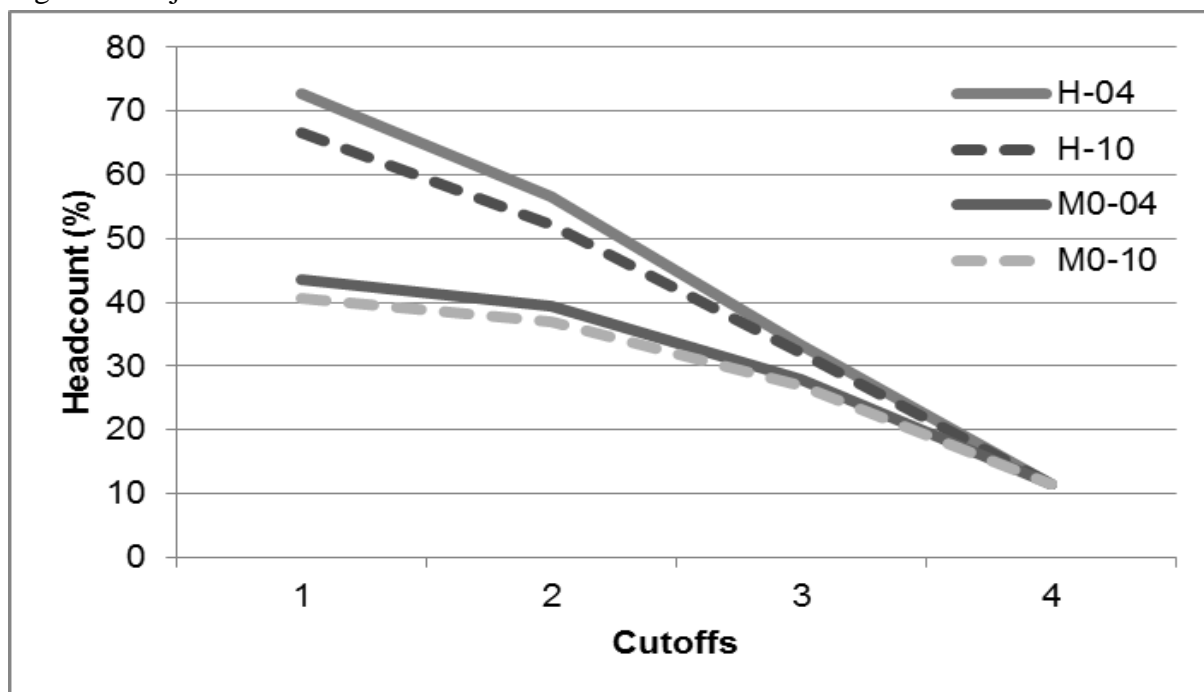
(6) Sensitivity Analysis

There are three types of sensitivity analysis to be considered, including sensitivity to selection of different criteria, level of identified criteria, and combination of identified criteria. Testing sensitivity to criteria selection is irrelevant here because chronic poverty is defined by satisfying all the criteria that the PPA specifies, so there are no unused criteria left. The other two sensitivity analyses are tested below.

Firstly, sensitivity to level of identified criteria can be tested through the comparison of the chronic poverty headcount ratio when changing the level of dimensions. There are 16 possible combinations generated by the abovementioned four variables, which have two alternative levels for each (Appendix 4). The alternative levels are associated with ambiguity that the PPA leaves as it defines the dimensions with ranges. The result shows that the hovering trend changes little at the national level no matter which levels of dimensions are adopted: the chronic poverty headcount almost stagnates between 2004 and 2010. It also indicates that the estimation is most sensitive to the ownership of farming implements followed by housing materials. Applying a criterion of no farming implements, the estimation comes up closer to zero for any combinations. Although the PPA recognises that the chronic poor tend not to have any farming implements, the household survey result shows that there are very few farmers who meet this criterion. Adopting farming implement ownership as a criterion, future research or targeting policy would need to be careful about the level, which may have strong effects on project outcomes. Excluding the farming implement variable, which hides the effects of other criteria, looking by regions reveals interesting tendencies. In the Mekong Plain, the estimation is sensitive to housing criteria. The Coastal and the Tonle Sap are not sensitive to the level of any of these selection criteria. In the North and Northeast Mountain region, the estimation is sensitive to both housing materials and land size.

Secondly, sensitivity to combining method can be tested using the counting method to examine whether the combination of identified criteria affect the trend (Appendix 5). In this method, cutoffs are defined for each dimension, and one point is assigned for each person below the cutoff. The process is repeated for other variables. It is then aggregated to obtain the total value of deprivation points (A). Then, the headcount ratio (H), which is the share of people below a set cutoff (k), is calculated. The adjusted headcount ratio (M0) is then calculated by the formula $H \times A$ divided by the number of deprivation criteria. In general, choice of different methods has little effect on the trend over the period. At almost all cutoff levels from 1 to 4 in every region, particularly at the higher or stricter cutoffs, little improvement in headcount ratio is observed (Figure 1).

Figure 1: Adjusted Headcount Ratio with Different Cutoffs in Rural Cambodia



Source: Author's calculation based on CSES

Furthermore, over the different combining methods, the relevance of the intersection selection may be justified for two reasons: the comparison with consumption poverty and conceptual framework. Firstly, only cutoff 4 shows a lower chronic poverty headcount ratio than consumption poverty. The headcount rates between cutoff 1 and 3 are even higher than the consumption poverty headcount both in 2004 and 2010. The estimation at cutoff 4 is also close to the estimation of Tong (2012a), 6 to 10 percent. From this point, the intersection method is likely to be a more suitable option among four alternative cutoffs. Secondly, in relation to the SLA framework of a vicious poverty cycle, the intersection method may be more appropriate than applying other cutoff levels. The main question mark for applying the other cutoff levels is on the determination of selected criteria and assigned weight. In this study, I attempt to draw locally meaningful definitions and criteria as strictly as possible, so chosen dimensions must be drawn from the PPA and be able to delineate a vicious cycle of poverty with the chosen criteria. From this point, with the PPA information, there are no reasons to justify the application of other cutoffs and weightings. Hence, the intersection method may be the most relevant combining method with given information availability.

6. Conclusions and Policy Implications

Despite the achievement of pro-poor consumption growth, this study concludes that chronic poverty in rural Cambodia, based on criteria defined by the poor, barely improved between 2004 and 2010. The result implies that rapid economic growth has certainly raised the consumption of chronically poor households by 43 percent in food and 55 percent in total, but done little to help them accumulate productive assets and human capital to break structural constraints of persistent poverty.

Regarding policy implications, one of the major findings is that consumption measurement based on the national poverty line cannot identify a majority of the chronic poor. In other words, targeting programmes or poverty analysis based on the poverty line would potentially ignore the chronic poor, which may result in them being left behind in the country's development process. More concretely, when the government attempts to implement social assistance, social insurance and public works to reduce poverty and vulnerability under the umbrella of the National Social Protection Strategy (Cambodia. Royal Government of Cambodia. 2011), its targeting mechanisms largely rely on consumption measurement. The application of defined criteria in this study may help the programmes related to the strategy to identify the chronic poor. Furthermore, the findings show that the consumption poor and the chronic poor have a lot of similar characteristics but some differences, such as household size and the sex of the household head. As the social protection strategy is expected to play a key role in ending poverty in Cambodia, these features of chronic poverty should be understood in order to implement programmes more effectively.

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Appendix 1: Macroeconomic and human development indicators

Macroeconomic Indicators	2004-2010
Agriculture, ave. annual growth (%)	6.81
Manufacturing, ave. annual growth (%)	7.96
Industry, ave. annual growth (%)	7.52
Services, ave. annual growth (%)	7.93
GDP, ave. annual growth (%)	7.74
GDP per capita, ave. annual growth (%)	6.17
Inflation, ave. annual change (%)	7.80

Human Development Indicators	2004	2010
Net enrollment ratio (ages 6-11) (%)*	75.98	85.60
Net enrollment ratio (ages 12-14) (%)*	16.37	30.80
Net enrollment ratio (ages 15-17) (%)*	8.53	17.50
Ever attended school (ages 5+) (%)*	75.92	81.70
Adult literacy (ages 15+) (%)*	69.78	76.28
Mortality rate, neonatal (per 1,000 live births)	27.2	19.7
Mortality rate, infant (per 1,000 live births)	56.6	37.3
Mortality rate, under-5 (per 1,000 live births)	70.3	43.8

Source: Author's calculation based on WDI (World Bank 2013b) and CSES

Note: Education indicators (*) are calculated based on CSES.

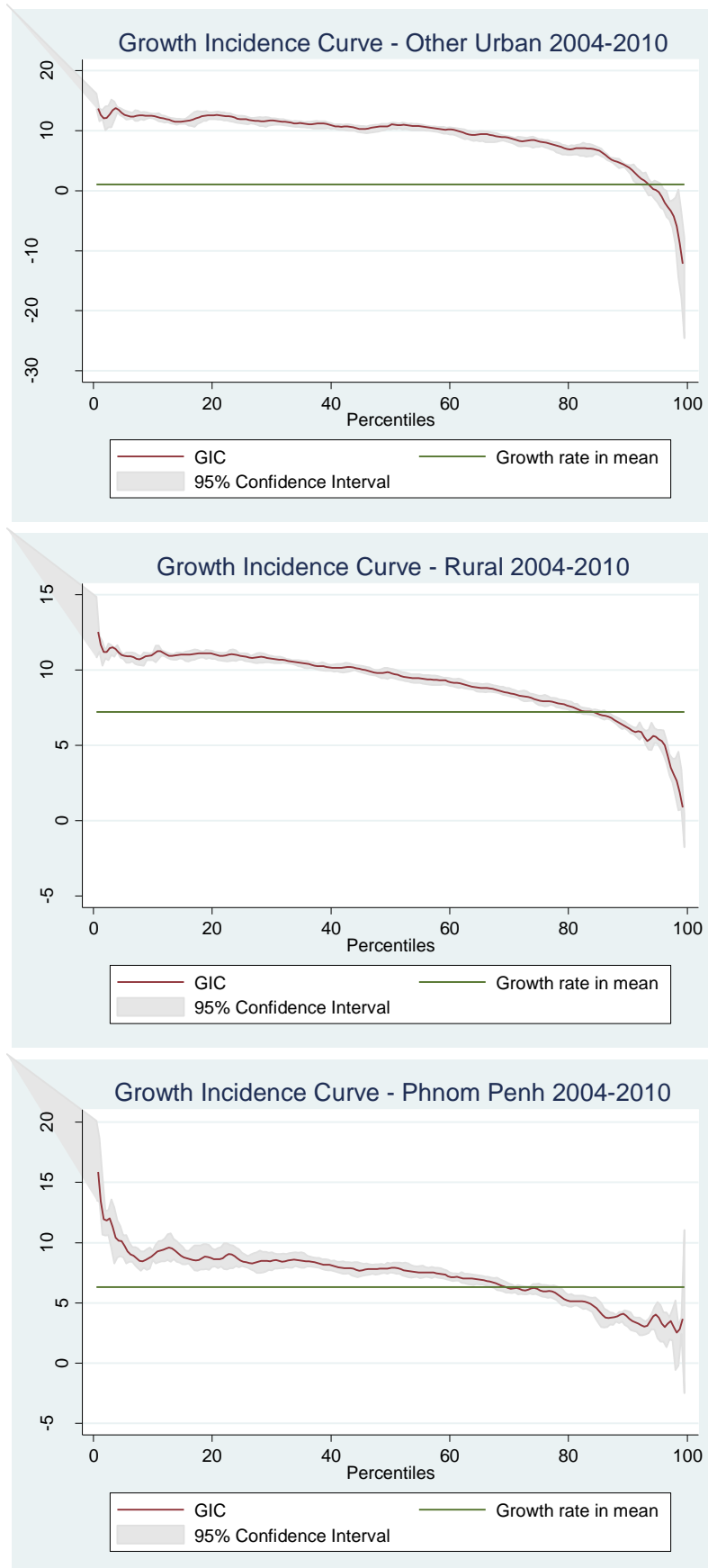
Appendix 2: Consumption growth between 2004 and 2010

Indicators	Other Urban	Rural	Phnom Penh
Growth rate in mean (%)	1.05	7.23	6.31
Growth rate at median (%)	11.05	9.81	7.86
Mean percentile growth rate (%)	9.52	9.27	7.37
Consumption growth of the poor (%)	11.66	10.34	9.11
Corresponding poverty rate (%)	53.50	66.61	39.09

Source: Author's calculation based on CSES

Note: The calculation is based on the method of Ravallion and Chen (2003). The growth rate is calculated in real terms. Aggregate consumption has been adjusted by Phnom Penh consumer price index. Growth incidence curves elaborate how much the actual consumption by the poor grew over time (Appendix 3).

Appendix 3: Growth incidence curve in Cambodia



Source: Author's calculation based on CSES

Appendix 4: Sensitivity to level of selected criteria

Possible combination				Region (Rural Only)	CP Headcount		Regional Share	
Land	Draft Animal	Farm Tool	House		2004	2010	2004	2010
1 ha	One	Low	OR	Cambodia	11.53	11.34	100.00	100.00
				Mekong Plain	11.04	12.24	54.80	56.19
				Tonle Sap	13.63	10.25	30.45	24.53
				Coastal	7.39	9.56	4.13	5.63
				N. & NE. Mountain	11.64	10.98	10.62	13.64
1 ha	One	Low	AND	Cambodia	5.66	4.38	100.00	100.00
				Mekong Plain	5.15	4.36	52.09	51.85
				Tonle Sap	6.74	4.53	30.65	28.07
				Coastal	2.71	6.05	3.09	9.23
				N. & NE. Mountain	7.63	3.37	14.18	10.85
1 ha	One	None	OR	Cambodia	1.31	0.15	100.00	100.00
				Mekong Plain	1.39	0.12	60.45	43.00
				Tonle Sap	1.19	0.32	23.28	57.00
				Coastal	1.04	0	5.12	0.00
				N. & NE. Mountain	1.39	0	11.16	0.00
1 ha	One	None	AND	Cambodia	0.76	0.08	100.00	100.00
				Mekong Plain	0.76	0.02	56.99	14.09
				Tonle Sap	0.75	0.24	25.40	85.91
				Coastal	0.41	0	3.49	0.00
				N. & NE. Mountain	1.02	0	14.12	0.00
1 ha	None	Low	OR	Cambodia	9.32	8.95	100.00	100.00
				Mekong Plain	8.57	9.29	52.65	54.06
				Tonle Sap	11.7	8.74	32.34	26.49
				Coastal	5.37	7.65	3.72	5.71
				N. & NE. Mountain	10	8.73	11.30	13.74
1 ha	None	Low	AND	Cambodia	4.67	3.61	100.00	100.00
				Mekong Plain	4.1	3.55	50.27	51.24
				Tonle Sap	5.83	4.01	32.11	30.17
				Coastal	1.88	4.5	2.59	8.34
				N. & NE. Mountain	6.67	2.62	15.03	10.24
1 ha	None	None	OR	Cambodia	1.13	0.15	100.00	100.00
				Mekong Plain	1.2	0.12	60.69	43.00
				Tonle Sap	1.02	0.32	23.16	57.00
				Coastal	0.75	0	4.28	0.00
				N. & NE. Mountain	1.28	0	11.88	0.00
1 ha	None	None	AND	Cambodia	0.66	0.08	100.00	100.00
				Mekong Plain	0.68	0.02	58.86	14.09
				Tonle Sap	0.63	0.24	24.39	85.91
				Coastal	0.24	0	2.33	0.00
				N. & NE. Mountain	0.91	0	14.42	0.00
0.8 ha	One	Low	OR	Cambodia	9.53	10.39	100.00	100.00
				Mekong Plain	9.81	11.23	58.93	56.29
				Tonle Sap	10.51	9.43	28.40	24.64
				Coastal	6.17	8.65	4.18	5.56
				N. & NE. Mountain	7.69	9.96	8.49	13.51

0.8 ha	One	Low	AND	Cambodia	4.61	4.01	100.00	100.00
				Mekong Plain	4.56	4.1	56.63	53.26
				Tonle Sap	5.17	4.11	28.93	27.80
				Coastal	2.06	5.14	2.88	8.56
				N. & NE. Mountain	5.06	2.95	11.55	10.38
0.8 ha	One	None	OR	Cambodia	1.11	0.15	100.00	100.00
				Mekong Plain	1.24	0.12	63.89	43.00
				Tonle Sap	0.81	0.32	18.74	57.00
				Coastal	1.04	0	6.05	0.00
				N. & NE. Mountain	1.2	0	11.32	0.00
0.8 ha	One	None	AND	Cambodia	0.61	0.08	100.00	100.00
				Mekong Plain	0.64	0.02	60.10	14.09
				Tonle Sap	0.47	0.24	19.96	85.91
				Coastal	0.41	0	4.34	0.00
				N. & NE. Mountain	0.91	0	15.61	0.00
0.8 ha	None	Low	OR	Cambodia	7.75	8.4	100.00	100.00
				Mekong Plain	7.74	8.66	57.14	53.69
				Tonle Sap	8.98	8.13	29.83	26.28
				Coastal	4.82	7.65	4.02	6.08
				N. & NE. Mountain	6.64	8.31	9.01	13.95
0.8 ha	None	Low	AND	Cambodia	3.84	3.39	100.00	100.00
				Mekong Plain	3.72	3.35	55.42	51.48
				Tonle Sap	4.45	3.8	29.84	30.46
				Coastal	1.59	4.5	2.67	8.89
				N. & NE. Mountain	4.4	2.2	12.07	9.17
0.8 ha	None	None	OR	Cambodia	1	0.15	100.00	100.00
				Mekong Plain	1.1	0.12	63.36	43.00
				Tonle Sap	0.74	0.32	19.14	57.00
				Coastal	0.75	0	4.87	0.00
				N. & NE. Mountain	1.2	0	12.63	0.00
0.8 ha	None	None	AND	Cambodia	0.57	0.08	100.00	100.00
				Mekong Plain	0.6	0.02	60.30	14.09
				Tonle Sap	0.45	0.24	20.30	85.91
				Coastal	0.24	0	2.70	0.00
				N. & NE. Mountain	0.91	0	16.70	0.00

Source: Author's calculation based on CSES

Note: The land ownership criterion varies between 0.8 hectares and one hectare; the draft animal criterion is one or none; the farming implements criterion is low productive implements or none; and the housing material criterion is walls or roof, or walls and roof.

Appendix 5: Sensitivity to selection method

2004	Headcount (H)	Adjusted Headcount (M0)	Deprivation (A)	Contribution (%)			
cutoff (k)				Land	Draft Animal	Housing	Farm Tool
Cambodia (Rural Only)							
1	72.85	43.57	2.39	26.10	18.72	18.63	36.55
2	56.62	39.51	2.79	27.14	19.73	19.71	33.42
3	33.26	27.83	3.35	27.09	23.46	20.29	29.16
4	11.53	11.53	4.00	25.00	25.00	25.00	25.00
Mekong Plain							
1	71.18	43.02	2.42	29.07	18.94	17.39	34.59
2	56.79	39.42	2.78	29.36	19.80	17.94	32.90
3	33.08	27.57	3.33	28.09	23.77	19.06	29.09
4	11.04	11.04	4.00	25.00	25.00	25.00	25.00
Tonle Sap							
1	71.73	43.14	2.41	21.57	20.85	20.03	37.55
2	53.15	38.50	2.90	23.53	21.84	21.69	32.95
3	34.06	28.95	3.40	25.37	24.32	21.43	28.88
4	13.63	13.63	4.00	25.00	25.00	25.00	25.00
Coastal							
1	80.07	44.43	2.22	28.37	17.68	11.36	42.59
2	58.95	39.15	2.66	30.99	19.80	12.89	36.31
3	31.30	25.32	3.24	27.18	25.36	16.87	30.60
4	7.39	7.39	4.00	25.00	25.00	25.00	25.00
North and Northeast Mountain							
1	80.20	47.04	2.35	20.16	13.47	25.84	40.53
2	62.80	42.68	2.72	21.76	14.66	28.13	35.46
3	33.50	28.04	3.35	26.03	18.61	25.90	29.47
4	11.64	11.64	4.00	25.00	25.00	25.00	25.00

2010 cutoff (k)	Headcount (H)	Adjusted Headcount (M0)	Deprivation (A)	Contribution (%)			
				Land	Draft Animal	Housing	Farm Tool
Cambodia (Rural Only)							
1	66.68	40.53	2.43	25.77	20.89	19.43	33.91
2	52.06	36.87	2.83	26.38	21.43	20.38	31.81
3	32.02	26.85	3.35	26.72	22.71	21.88	28.70
4	11.34	11.34	4.00	25.00	25.00	25.00	25.00
Mekong Plain							
1	65.22	40.05	2.46	28.40	19.72	19.80	33.11
2	50.69	36.42	2.87	28.87	20.80	20.55	31.22
3	32.05	27.10	3.38	28.43	22.00	21.82	28.57
4	12.24	12.24	4.00	25.00	25.00	25.00	25.00
Tonle Sap							
1	66.20	39.02	2.36	22.89	24.27	16.94	32.89
2	50.22	35.03	2.79	24.59	23.93	18.52	31.45
3	29.43	24.63	3.35	26.38	23.85	21.33	28.27
4	10.25	10.25	4.00	25.00	25.00	25.00	25.00
Coastal							
1	70.24	42.10	2.40	27.53	19.40	13.76	37.93
2	56.86	38.76	2.73	27.53	19.80	14.59	34.32
3	31.75	26.20	3.30	25.00	24.12	19.83	29.47
4	9.56	9.56	4.00	25.00	25.00	25.00	25.00
North and Northeast Mountain							
1	71.32	44.43	2.49	21.21	19.50	25.26	36.56
2	58.37	41.20	2.82	20.84	20.09	25.63	33.10
3	37.07	30.55	3.30	22.47	22.63	23.72	29.45
4	10.98	10.98	4.00	25.00	25.00	25.00	25.00

Source: Author's calculation based on CSES