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Determinants of Poverty: The Case of Cambodia

PHIM Runsinarith
PhD student at Graduate School of International Development (GSID)

Cambodian Institute for Cooperation and Peace

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Cambodian Institute for Cooperation and Peace, CICP

Pum Paung Peay, Sangkat Phnom Penh Thmey, Khan Russey Keo,

Phnom Penh, Kingdom of Cambodia

P.O.Box 1007, Phnom Penh, Cambodia

Phone: (855)12 819953

Tel: (855) 16 98 25 59

Email: cicp01@online.com.kh

Website: http://www.cicp.org.kh

Determinants of Poverty: The Case of Cambodia[1]

by
PHIM Runsinarith[2]

Abstract:

Despite much progress was made regarding poverty reduction during the past, poverty remain pervasive in Cambodia. This paper attempts to examine the determinants of poverty for a panel of 827 households surveyed in 2001, 2004 and 2008. Panel data analysis with fixed effect estimation is applied to investigate factors influencing household's consumption and food consumption. Multinomial logistic regression will be utilized to explore the factors that affect chronic and transient poverty. The primary result suggests assets, agricultural land size, irrigated land and access to microfinance institutions yield positive and significant impact on consumption while shock would exert a negative one. Further, it suggests that an increase in agricultural land size would decrease the possibility of being transient poor while an increase in irrigated land ratio would decrease the possibility of being chronic poor.

Keywords: poverty determinants, chronic poverty, transient poverty.

1. Introduction

Cambodia is one of the poorest countries in the region with poverty head count rates at around 32 percent (World Bank 2009). The country is still struggling with a legacy of conflict and destruction that has left the country weak and vulnerable on many fronts: social and physical infrastructure, health and education, governance and institutions, and knowledge and technology. Despite these critical shortcomings, the country has made tremendous progress over the last decade. The greatest achievement has been a return to political stability and a hugely improved law and order situation, enabling the country to reap rich peace dividends. In addition, the country has emerged out of the post-conflict reconstruction stage and has now entered into a new phase of economic development characterized by open economic policies, a focus on private sector led development and far-reaching macroeconomic reforms.

One of the highest priorities of the Royal Government of Cambodia has been to reduce poverty, especially in rural areas. Through the successful implementation of the action plan spelt out in the "Vision and Financial Sector Development Plan 2001-2010" which has been updated into the "Financial Sector Strategy 2006-2015" and the "Public Financial Management Reform Program", the RGC has achieved not only macroeconomic stability but also impressive growth over the last decade, averaging

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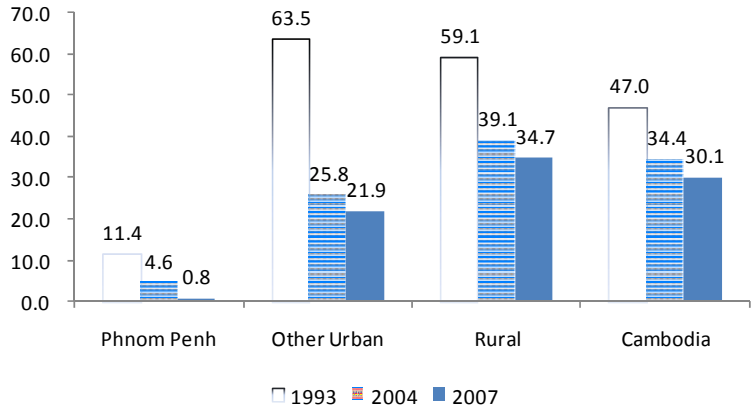
around 10 percent per year. Despite some progress in reducing poverty in Cambodia since 1993/94, the poverty issue remains pervasive reflecting in the high poverty headcount which is estimated at 30.1 percent in 2007; that is, 30.1 percent of the Cambodian population is estimated to have been living under the national poverty line and about 20 percent or one out of five Cambodians lived under the food poverty line. Poverty was considerably higher in rural areas (34.7 percent) than urban areas (0.8 percent in Phnom Penh and 21.9 percent in other urban areas). In 2007, about 92.3 percent of the poor lived in rural areas. Thus, it is safe to conclude that poverty in Cambodia is overwhelmingly a rural phenomenon.

Figure 1: Poverty Rate 1993-2007



Source: World Bank (2006, 2009)

While understanding the extent and profile of poverty is important, it is also necessary for policy makers to know the factors that pushed some people out of poverty and the factors that drag others back into it. CDRI's household surveys from 2001-2008 provides rich information on those mobility factors. Table 1 and Table 2 show how many percentages of households from a given quintile (per capita consumption expenditure quintile) are still in the same quintile over the next period and how many have moved into each other quintile. Following Haughton et all 2001 which was cited in World Bank 2008, the concept of shooting stars (top right cells in table 1 and table 2) and falling stones (bottom left cells in table 1 and table 2) are employed to refer to those households that can afford to moved up and moved down by 2 quintiles respectively. The figures in both tables show high degree of mobility; of 827 households only 269 (33 percent) in 2004 and 228 (28 percent) in 2008 remain in the same quintiles as they were in the initial periods. Households that were in one of the bottom three quintiles in the first period and also in one of the bottom two quintiles in the next period are considered to be persistently poor.

According to the CDRI's poverty study various factors explain the shooting star phenomenon. This includes new or a multiplicity of income sources, employment conditions, personal and family conditions, improved agricultural production, community security, better administration, and services from national and local government. However, the study found that the most cited primary factors are new or a multiplicity of income sources (33 percent), followed by improved employment conditions and security

(27 percent), and improved agriculture production (19 percent) (FitzGerald and So 2007:25). In general, the upward mobility is explained exclusively by economic factors.

Table 1: Transition Matrix 2001-2004

		2004					
		1	2	3	4	5	Total
2001	1	65	44	30	13	14	166
	2	43	36	41	30	15	165
	3	25	32	45	38	26	166
	4	18	34	26	50	37	165
	5	15	19	24	34	73	165
	Total	166	165	166	165	165	827

Source: Author's calculation based on CDRI's 2001-2008 surveys

Table 2: Transition Matrix 2004-2008

		2008					
		1	2	3	4	5	Total
2004	1	69	41	27	18	11	166
	2	40	38	29	32	26	165
	3	23	30	36	43	34	166
	4	19	33	40	32	41	165
	5	15	23	34	40	53	165
	Total	166	165	166	165	165	827

Source: Author's calculation based on CDRI's 2001-2008 surveys

Determinant factors for downward mobility are also spelled out in the same study. These include personal and family conditions, health problems and crises, worsening employment security and opportunities, and bad agriculture production. The most raised factors is, personal and family conditions account for 25 percent, followed by health problem and crises for 25 percent, worsening employment security and opportunities for 17 percent, and bad agriculture production for 10 percent (FitzGerald and So 2007:25). It notes importantly that the negative movement is explained primarily by personal and family conditions and crises, followed by economic factors.

The downward mobility may have something to do with the decline in Common Pulled Resource (CPR). CPR which includes forests and fisheries, have been a mainstay of rural livelihoods in Cambodia, enabling better-off households to accumulate additional capital, and buffering poor and vulnerable households against shocks and insufficient rice productivity. FitzGerald and So (2007) also found that the amount and quality of CPR has been declining in all communities over the past decade with a significant acceleration in this decline since 1998. In some villages, people no longer collect CPR as access has been restricted.

As can be seen from the review early poverty literatures in Cambodia are only based on qualitative studies or poverty profile which describes the pattern of poverty but is not principally concerned with explaining its causes. While there may be certain contexts where unconditional poverty profiles are relevant to a policy decision, they are usually limited by the bivariate nature of their informational content and which can sometimes be misleading because of their unconditional nature (Datt and Jolliffe 1999:3). This indicates there is a need to fill the gap by studying the determinants of poverty which goes beyond the poverty profile of assessing mere correlation of the characteristics of a household.

While there is evidence that poverty headcount has been reduced and while poverty reduction has been widely recognized as top priority on the government development agenda, little quantitative work has been done to explain determinants of poverty due to the lack of reliable data. Recent development in collecting repeated data set from nine rural villages by Cambodia Development Resource Institute (CDRI) provides rich information to allow empirical analysis on the subject.

This paper attempts to answer the question of how a particular variable affects poverty conditional on the level of other potential determinants of poverty. It is worth noting that early literatures on poverty

determinants in Cambodia are based on either qualitative research or poverty profiles which are limited by the bivariate nature of their informational content and which can sometimes be misleading because of their unconditional nature. This paper attempts to examine poverty profile and provide a quantitative analysis of the determinants of poverty which goes beyond assessing mere correlation of the characteristics of a household. The results of this analytical exercise should be of particular interest to policy makers since it provides a means to assess the likely impact on welfare in rural Cambodia of a range of specific government policies.

The rest of the paper is structured as follows. Section 2 reviews early literatures on determinants of poverty. Section 3 discusses how data are collected and how poverty is measured. Section 4 analyzes how certain factors including household characteristics, asset and livestock, agricultural land size, access to common pooled resources, and shocks affect consumption, food consumption, chronic and transient poverty. The last section will provide some policy recommendation to reduce poverty in Cambodia.

2. Literature Review

Poverty modeling has been more preoccupied in searching for criteria to determine individuals' poverty status. Apart from their obsession with monetary approach for the measurement of poverty, more literatures are now trying to come up with an index of multidimensional poverty facet, but so far there has been little conclusion. Kanbur and Squire (1999) argues that the employment of different approaches has not yield different results on the material differences in the number of poor who are identified as poor, which is convincing given that the very poor are poor in every dimension. In addition, after comparing different definition of poverty and their implications to poverty modeling, Rouband and Razafindrakoto (2003) conclude that the traditional approach which is monetary approach to measuring poverty seems justified since is the most correlated with other subjective measures. The problem does not rest on the usage of money metric unit for the determination of absolute poverty line per se but it is rather on the mechanism employed for the derivation of such a line (Ravallion 1996). Until now there are still debates on the definition and measurement of poverty (Ravallion 1996).

There are basically two approaches in modeling determinants of poverty. In the first approach, consumption expenditure per capita is used in the regression against potential explanatory variables (Haughton and Khanker 2008:137). However the weakness in this approach is that it exclusively uses consumption as the indicator of welfare and that it assumes that consumption of the poor and non poor are determined by the same process (Haughton and Khanker 2008:137). In the second approach, poverty is directly modeled using a discrete choice model, which has been a popular approach. Analysis is resulted from the employment of binary logit or probit model to estimate the probability of a household being poor upon some characteristics. In some cases households are divided into three categories: absolute poor, poor and non poor. Then, ordered logit or ordered logit model are employed in order to identify the factors which affect the probability of a household being poor conditional on a set of characteristics.

The discrete choice model provides a number of superior features as compared to the expenditure approach. The expenditure approach does not offer probabilistic estimates to help classify our samples

into different poverty categories, so it does not allow us to make probability statements about the effect of the variables in the poverty status of our economic agents. This approach assumes that consumption expenditures are negatively correlated with absolute poverty at all expenditure levels and by logic, suggests that whichever factors which increase expenditures reduce poverty, which is not always the case. Increasing in consumption expenditure for individuals above the poverty line will not affect the poverty level. As for the discrete choice model, the effects of independent variables may be allowed to vary across poverty categories. The use of this approach could also help capture any heterogeneity between the moderate poor, non poor and absolute poor with a possibility of weak test for any captivity or "poverty trap" in static sense in each group, which is not possible in the former approach.

There are significant increases in study of poverty dynamics. Kedir and McKay (2003) contributed a significant literature on poverty dynamics in other developing countries. In their study, they examined chronic poverty in urban Ethiopia with panel data collected on 1500 households during 1994-1997. They defined the chronically poor as households with real total expenditure per adult per month below the poverty line in all three years and the transient poor as those with real total expenditure per adult per month below the poverty line in one or two of the years. From these definitions they found that the proportion of transiently poor households was higher than chronically poor. Using multinomial logit regression, they argue that chronic poverty is associated with household composition, unemployment, lack of asset ownership, casual employment, lack of education, ethnicity, household head's age and female head.

Another significant literature on poverty dynamics is from Haddad and Ahmed (2003) who applied quintile regression to two-period panel data of 347 households in Egypt to identify the causes of chronic and transient poverty. They categorised households that had real consumption per capita below the poverty line in both periods as chronic poor, and households in which real consumption per capita fell below the poverty line in one of the two years as transient poor. Their study found that household size, number of members aged less than 15 years, age of household head, livestock assets, agricultural land, education of household members and employment status affect chronic poverty. Only members aged over 60 and agricultural land increased the likelihood of transient poverty.

Jalan and Ravallion (2000) studied poverty dynamics in south-west rural China. They used data on 5,854 households in south-west rural China over 1985–90 to test whether transient poverty is determined similarly to chronic poverty. They defined chronic poverty as having time-mean consumption below the poverty line. Households experienced transient poverty if they had been observed to be poor at least once in the available data and had time-mean consumption above the poverty line. Using quintile regression, they found that a household's stage of life cycle, physical wealth and cultivated land are the most important variables for transient poverty. Demographic characteristics, education, household members' employment status, physical wealth and cultivated land seemed to be more important for chronic poverty.

Although the key determinants of chronic and transient poverty differ slightly among countries, however, it is commonly noted that health and education services, asset redistribution and infrastructure development are variables likely to reduce chronic poverty. When poverty is transient, security areas and

measures such as unemployment and health insurance, income stabilisation programmes, micro-credit and temporary social safety nets are important. The availability of these social security assets would be crucial. Finally, to achieve policies for alleviating poverty, there is also a need to know the whereabouts of the two types of poverty.

In Cambodia a study done by Fitzgerald and So (2007), examined poverty dynamics in Cambodia and ultimately categorized households into (a) very poor, (b) moderately poor (between 20 percent above and below the poverty line) and (c) well-off. It found that 52 percent of households did not change their status between 2001 and 2004. About 14 percent of the very poor in 2001 managed to move to being moderately poor or well-off. Approximately 7 percent of the moderately poor become very poor, while 12 percent became well-off. And 15 percent of the well-off fell to being moderately or very poor. Information from this study is rich but its analysis is more descriptive which might have ignored other useful economic information concerning simultaneous effects on the key determinants of the defined poverty measure. Therefore, the analysis led to inconclusive results.

As noted earlier due to scarcity of panel data a rigorous analysis of poverty dynamics in Cambodia, especially in quantitative form, has never been done, mainly due to a lack of panel data. This paper aims to address this limitation by exploring the key determinants of chronic and transient poverty in the hopes of contributing evidence based results to policy makers to develop effective poverty reduction strategies in appropriate areas.

3. Data and Poverty Measurement

3.1. Data

Data analysis will be based on the household survey on 827 households conducted by CDRI for 2001, 2004 and 2008 in nine rural villages as shown in Table 3. The panel data set is constructed within 827 households over the 3 rounds of surveys 2001, 2004 and 2008. Table 4 describes the size of the panel sample in each study village. It also describes the characteristics of each selected village. The nine villages were purposively selected to represent the four agro-climatic zones in Cambodia: the Tonle Sap region, the Mekong Plain, the Plateau and the Coastal region since 2001.

Table 3: Sample size and villages characteristics

Village	Total households	Sample housholds	Characteristics
Tonle Sap			
Tuol Krasaing	196	86	wet season rice and migration work
Andong Trach	234	61	wet season rice
Khsach Chiros	339	87	dry season rice and fishing
Mekong Plain			
Prek Khmeng	343	110	dry season rice and fishing
Babaong	543	110	dry season rice
Plateau			
Kanhchor	267	106	dry season rice and forestry resources
Dang Kdar	420	107	wet season rice and forestry resources
Trapeng Prey	75	51	wet season rice and labour sale
Coastal			
Kompong Thnoat	363	109	wet season rice and fishing
Total	2780	827	

Source: Chan and Acharya (2002)

3.2 Poverty Measurement

Village poverty lines were constructed using adult equivalent per capita expenditure on food and non-food consumption. Food consumption data are based on recall of the amount consumed (both purchased and domestically produced and handed out, including an imputed value) for one week. Non-food consumption was also based on six months' recall, but a few items were based on one week's recall. Consumption per capita was calculated by total expenditure on or the value of each consumption item, divided by household adult equivalent members. All nominal values are converted to constant 2001 prices using village price indexes. Poverty headcount is constructed following the formula proposed by Foster, Greener and Thorbecke (1984).

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^\alpha \qquad (1)$$

where

N = total population

y_i = welfare indicator, e.g., consumption per cap

z = poverty line

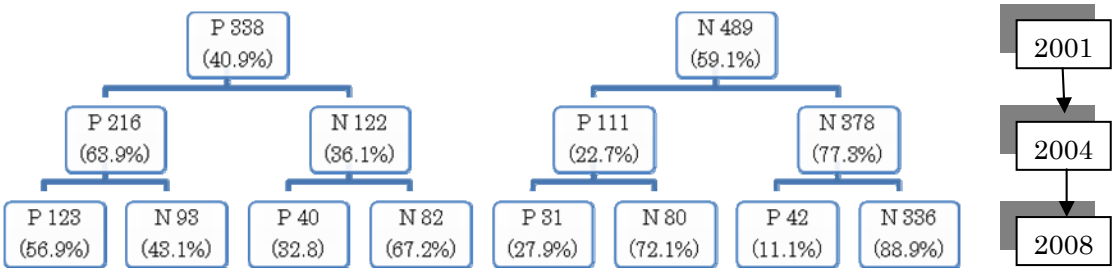
q= number of poor in the population

$y_i , \ldots, y_q < z < y_{q+1} \ldots y_n$

3.3 Longitude Poverty Profiles

Figure 2 graphically summarize individuals'poverty experices over the period in question. The left (right) chart looks at those who are poor (not poor) in 2001, the first year of our data.

Figure2: Povery Flow from 2001-2008



Source: Author's calculation based on CDRI's 2001-2008 surveys

Each box indicates the count and the fraction of those in the box immediately above. The left chart showed that 63.9 percent of those who were poor in 2001 remained poor in 2004 and 56.9 percent of the poor in 2004 continued to be poor in 2008. On the contrary, the right chart showed that of 59.1 percent of non-poor in 2001, 77.3 percent of them stayed non-poor in 2004, and 88.9 percent of the non-poor in 2004 went on to be non-poor in 2008. Besides those two groups, there were those who exited poverty and those who entered poverty from 2001-2004 and 2004-2008. Because the poverty rate declined over time the percentage of those who stayed poor or entered into poverty decreased from year to year.

Table 4: Poverty Rate by Household Characteristics 2001-2008

Characteristics	poverty share			poverty headcount			years in poverty			
	2001	2004	2008	2001	2004	2008	0	1	2	3
All	100	100	100	47.0	34.4	30.1	40.1	25.3	19.2	15.4
Sex of Household Head										
male	81.4	79.2	77.6	40.3	39.8	29.8	42.8	24.8	18.9	13.5
female	18.6	20.8	22.4	46.8	48.3	38.9	31.2	24.0	24.0	20.8
Household Member										
one	0.4	0.6	1.3	0.0	20.0	45.5	0.0	33.3	66.7	0.0
two	3.9	3.3	3.6	21.9	48.1	40.0	34.4	28.1	18.8	18.8
three	9.6	9.6	8.0	25.3	35.4	40.9	43.0	34.2	11.4	11.4
four	16.7	13.4	13.7	39.1	30.6	28.3	49.3	20.3	16.7	13.8
five	14.9	21.2	19.1	37.4	31.4	25.9	42.3	26.8	21.1	9.8
six	17.7	17.2	20.6	43.8	42.3	30.6	41.8	24.7	17.1	16.4
seven	14.5	12.5	15.0	45.8	46.6	34.7	35.0	26.7	27.5	10.8
eight	10.4	9.7	8.5	57.0	53.8	31.4	32.6	19.8	25.6	22.1
nine or more	12.1	12.7	10.3	48.0	59.0	34.1	40.0	21.0	18.0	21.0
Income Source										
work inside the village	9.5	19.6	18.0	54.0	43.1	42.6	23.8	28.6	22.2	25.4
fishing	41.2	35.6	30.2	36.0	34.8	30.9	48.2	19.5	20.2	12.1
forestry	12.1	5.2	8.3	58.8	45.5	28.6	17.5	38.8	17.5	26.3
other CPR	1.1	5.7	2.5	57.1	47.2	23.5	28.6	28.6	0.0	42.9
petit trade	11.8	12.7	24.4	39.7	51.3	21.8	43.6	26.9	15.4	14.1
work outside the village	23.4	17.8	14.5	39.4	44.6	44.9	41.3	26.5	20.7	11.6
migration work	0.9	3.3	2.1	66.7	38.1	21.4	83.3	16.7	0.0	0.0
Education Level										
no education	28.8	28.5	25.5	49.2	51.7	34.6	26.5	30.3	22.3	21.0
primary	55.0	57.3	58.4	41.1	41.8	34.8	43.3	22.4	21.1	13.2
lower secondary	13.8	12.2	13.1	29.8	19.8	16.7	57.0	21.1	11.4	10.5
upper secondary	2.4	1.7	2.8	25.0	28.6	17.4	55.0	30.0	10.0	5.0
university	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Agriculture land size										
landless	16.7	14.9	20.2	47.1	40.7	38.3	40.6	21.0	25.4	13.0
less than 0.5ha	25.8	23.2	15.8	45.5	51.0	32.8	30.5	30.5	17.4	21.6
0.5ha-1ha	21.8	19.0	16.3	40.0	35.0	36.3	42.2	25.0	20.0	12.8
1ha-2ha	17.9	24.3	18.5	40.5	40.3	29.4	45.3	24.3	16.9	13.5
2ha-3ha	8.9	10.0	13.2	39.2	37.3	26.6	50.0	16.2	24.3	9.5
more than 3ha	8.9	8.6	16.0	27.0	40.8	25.0	47.3	23.0	17.6	12.2
Have outstanding loan										
no	49.6	48.0	49.9	39.8	43.8	34.9	42.4	25.1	17.6	14.9
yes	50.4	52.0	50.1	43.2	39.5	28.7	38.9	24.2	22.1	14.9
Accessed to MFI										
no	94.4	86.8	81.5	39.1	41.4	32.2	42.6	25.0	18.6	13.8
yes	5.6	13.2	18.5	82.6	43.1	30.1	6.5	19.6	41.3	32.6
Access to CPR										
no	6.0	3.3	5.6	36.0	18.5	10.9	50.0	14.0	18.0	18.0
yes	94.0	96.7	94.4	41.8	42.4	33.0	40.0	25.4	20.0	14.7
Shock in 2001										
no	15.2	44.7	55.7	51.6	48.6	34.9	31.0	31.8	23.8	13.5
yes	84.8	55.3	44.3	39.7	35.9	27.9	42.4	23.4	19.1	15.1

Source: Author's calculation based on CDRI's 2001-2008 surveys

Table 4 indicates that the poverty rate among the female headed households group decreased but slower than those of the male headed households. By family size the poverty rate of households with larger size seem to be higher in 2001 and in 2004 but lower in 2008. This may reflect increasing employment opportunity for the young children, especially agricultural related work from planting to

cutting cassava into small pieces in those rural villages in 2008. By primary source of income, those who depend on fishing for livelihood takes a large part of the households in the sample but its share declined over 2001-2008 while the poverty rate of this group declined markedly over the same period. Those who engaged in migration work in Thailand or Thai border are found to experience faster declines in poverty rate than any other groups. Poverty rates are found to decline to the lower level among those who have higher education, possess larger agricultural land size, use microfinance institute (MFI), not depend on common pooled resources (CPR), and experience shocks.

Table 4 above indicates that 40.1 percent of the households in the studied sample were never in poverty over 2001-2008 and 15.4 percent were poor every year. By sex of household head, more women experienced more years of poverty, especially the difference being greatest for those in poverty in all years. By household membership size, more of those in larger household seem to experience more years of poverty and by primary source of income those who depend on CPR seem to stay longer years under the poverty lines. By educational level, higher percentage of those households with a head who has no education, are found to be always poor across the three periods. The always-poor rates are likely to be also high for those household possessing agricultural land less than 0.5 hectares, for those who used MFI service, for those who have less access to CPR and for those who experienced shock or crisis. The question is that while some people were never poor, why some others were continuously poor (chronic poor), and why the rest moved across the poverty lines (transient poor). The subsequent section will scrutinize the factors which affect the well-being and contribute to those two kinds of poverty.

4. Model Specification and Regression Results

4.1. Model Specification

A model used for regression analysis is a multiple regression equation adopted from a typical poverty model which is suggested in World Bank's Handbook of Poverty Analysis by Haughton and Khandker, which has been widely used in previous poverty studies in other countries (Engvall and Kokko 2007; Finnie and Sweetman 2003; Shinkai 2006). Haughton and Khandker (2008) provides a detailed explanation on causes or correlates of poverty according to regional-level characteristics, community level characteristics and household and individual level characteristics. The regional-level characteristics include vulnerability to flooding or typhoons, remoteness, quality of governance, property rights and their enforcement. The community level characteristics include the availability of infrastructure (roads, water, and electricity) and services (health, education), proximity to markets, and social relationships. For household and individual characteristics it further disaggregates into demographic (gender of head, dependency ratio, age structure), economic (employment status, property owned) and social (health and nutritional status, education, shelter).

By far the most widespread technique used to identify the contributions of those different variables to poverty is regression analysis which is divided into two main types of analysis (Haughton and Khandker 2008:137). The first type attempts to explain the level of per capita expenditure or income as a function of variables which are considered as causes or correlated of poverty discussed above. The

second type attempts to explain whether a household is poor or not, using a logit or probit regression. In the later case the independent variables are the same variables used in the first type but the dependent variable is binary, usually taking on a value of 1 if the family is poor and zero otherwise. The main problem is that when logit or probit regression is used only the information of whether a household is poor or not is known but the more informative information such as how poor the household given by per capita consumption or income is thrown away (Haughton and Khandker 2008:142).

In this paper both types of regression techniques are applied. The first type will be used to scrutinize factors which contribute to poverty and food poverty proxied by logarithm of per capita consumption expenditure and logarithm of per capita food consumption expenditure respectively. Panel data regression analysis with fixed effect estimation method will be employed to explore the effect of a set of independent variables includes dependency ratio, log of per capita asset and livestock, size of total agricultural land and the ratio of irrigated agricultural land on the total agricultural land, use of loan from MFI in 2001, shock and access to CPR. The regression model to detect determinants of poverty can be summarized as in the following equation:

$$y_{it} = x_{it}(+\mu_i + (_{it} \qquad (2)$$

Where y a dependent variable,

x a matrix of independent or explanatory variables,

μ is an unobserved fixed effect, and

ε is a white noise error term.

Repeated surveys of the same sample of households by CDRI have enabled to set up a panel data for regression analysis. Panel data is argued to provide a lot of advantages compared to cross sectional data. A more significant reason of using panel data is it may control for unobserved characteristics (heterogeneity) which is an important issue in econometrics (Haughton and Khandker 2008:183). The use of current panel data set is expected to help drop out the effects of unobserved factors.

When should fixed effects estimation be used rather than random effects estimation or vice versa? In principle, random effects is more attractive because observed characteristics that remain constant for each household are retained in the regression model while in fixed effects estimation, they have to be dropped. Statistically, fixed effects are always a reasonable thing to do with panel data as they always give consistent results but they may not be the most efficient model to run. Random effects will give better p-values as they are a more efficient estimator, so random effects should be run if it is statistically justifiable to do so.

The generally accepted way of choosing between fixed and random effects is running a Hausman test. The Hausman test checks a more efficient model against a less efficient but consistent model to make sure that the more efficient model also gives consistent results. The Hausman test tests the null hypothesis that the coefficients estimated by the efficient random effects estimator are the same as the ones estimated

by the consistent fixed effects estimator. If the p-value is large then use random effects is preferred and if the p-value is significant then fixed effects should be used.

Hausman test is performed to see if the unobserved fixed effect is best treated as a fixed or random effect. It test a null hypothesis that random effects estimation gives consistent and efficient coefficients versus alternative hypothesis that random effects coefficients would be inconsistent. The result of the test given in Table 6 show that the p-value is less than 1 percent critical level suggesting that the random effect model is strongly rejected. Hence fixed effects estimation will be applied in the panel data regression analysis.

The first type of regression analysis can identify factors which affect household consumption and food consumption expenditure, yet it cannot explain while some households are always never poor, why some others are chronically poor and why the rest are transient poor. It is important to distinguish chronic poverty form transient poverty in the sense that moving into and out of poverty looks less serious than remaining stuck in poverty. Someone who is poor now, but can reasonably expect to be out of poverty next year, is in a better position that someone who is equivalently poor now, but likely to remain stuck there in the future.

The second type of regression analysis attempts to investigate the factors affecting the likelihood of a household being in either of the poverty groups by taking advantage of multinomial logit model. The dependent variable takes the value of 0, 1 or 2 for the never poor, the chronically poor, and the transient poor households, respectively. The independent variables include a dummy variable whether the household head changed from male to female over 2001-2008, the difference of household age between the two periods, the difference in dependency ratio, the log of the difference in per capita capital, the difference in agricultural land size, the difference of the ratio of irrigated land on total agricultural land size, and dummy variables such as whether a household took loan from MFI in 2001, whether a household experienced shock or crisis in 2001, and whether a household accessed to CPR in 2001. The village dummies are also included to account for the location affects. The regression model to detect determinants of transient and chronic poverty can be summarized as in the following equation:

$$Prob(poor_i = j) = \frac{e^{\beta' \mathbb{X}}}{1 + e^{\beta' \mathbb{X}}} \qquad (3)$$

where $poor_i$ a dependent variable taking 0, 1 and 2

β a set of parameters reflecting the impact of changes in $\mathbb{X}$

$\mathbb{X}$ a matrix of independent or explanatory variables

Relationship between Dependent Variables and Independent Variables

As noted earlier, a number of variables will be used to explain poverty. These include dependency ratio, log of per capita asset and livestock, size of wet season and dry season rice field, MFI loan users in

2001, shock and access to CPR. The basic concepts of these variables and their relationships to the welfare are briefly explained below.

Dependency ratio is a household variable indicating the ratio between the dependent part usually includes all household's members under the age of 15 and over the age of 64 and the productive part makes up all household's members in between, ages 15 – 64. In general, when the dependency ratio increases, it is expected that the per capita food consumption expenditure will decrease. Thus the sign of the household size coefficient is expected to be negative on per capita consumption and food consumption and positive on transient and chronic poor.

Logarithm of per capita asset which consists of both durable goods and livestock is a good indicator showing the potential claims of a household and is highly and positively correlated with income level. Therefore it will also be positively related with per capita consumption expenditure and per capita food consumption expenditure and negatively related with chronic and transient poverty.

The total agricultural land size is considered to be the most valuable asset for farmers and the size of land owned by households is often used as household welfare indicator. The better off households generally possess larger agricultural land and hence they are able to produce and consume more than the worse off ones. Here the ratio of irrigated land on the total agricultural land also included in the regression model to check the effect of irrigation on welfare indicators. They are expected to be positively related with per capita consumption and food consumption and negatively related with chronic and transient poverty. However, it is worth noting that agricultural landless households are not necessarily poor as among them there are better-off households who depend on non-farm work. For this reason, in the regression analysis two samples are used, the full sample and the sample excluding agricultural landless.

MFI loan users is a dummy variable taking on value 1 if a household borrowed loans from MFIs in 2001 and 0 otherwise. Many existing literatures found that MFIs play an important role in rural poverty reduction through providing loans to households with low interest rate to conduct economic activities that would generate income. If this hypothesis is true, it is expected that this variable would exert a positive relationship with per capita consumption and food consumption expenditure and negative relationship with chronic and transient poverty.

Shock is also a binary variable taking value 1 if a household reported facing shock during the past 6 months and 0 otherwise. As can be seen from section 4.7 there are various kinds of shock defined by those rural households. These include "death of family member", "illness of family member", "natural disaster such as flood and drought", "thievery", and "job loss of family member". Households facing those shocks would experience a decrease in per capita food consumption expenditure. It is therefore expected that shock will have a negative coefficient sign on per capita consumption and food consumption and positive sign on chronic and transient poverty.

Access to CPR is a binary variable indicating whether a household has access to common pooled resources or not. It takes value 1 if they do and 0 otherwise. The Moving Out of Poverty Study of CDRI found that collection and gathering of a wide range of forestry and aquatic products from the forests and

common pool resources are particularly important for livelihood and coping strategies. In this regards, access to CPR would have a positive relationship with per capita consumption food consumption expenditure and a negative relationship with chronic and transient poor.

4.2 Regression Results

Fixed Effect Estimation

Table 5 presents the results of regression analysis based on fixed effect estimation on per capita consumption and per capita food consumption expenditure which corresponds to equation (2) above. There are two samples: the total sample and the sample excluding agricultural landless households. Hausman test indicated that fixed effect method is more plausible in econometric sense (see appendix). In this regard, only the results with fixed effect estimation are presented here.

The results obtained from fixed effect method conformed well to expectation. For log of per capita asset and livestock variable, it is found that its coefficient have positive sign and statistically significant at 1 percent level. The value of coefficient indicates that a 1 percent increase in the value of per capita asset and livestock would increase per capita food consumption by 17 percent and per capita consumption by 21.1-21.8 percent. This could imply that policies to encourage investment in capital asset and policies to encourage raising livestock such as cow buffalo and chicken would also lead to higher welfare.

The size of agricultural land is found to be statistically significant and have positive signs as expected. Its coefficients suggest that one hectare of additional land would increase per capita food consumption by 5-7 percent. The finding is further supported by that of Engvall and Kokko (2007) which studied on land and human development in Cambodia and found the positive effects of land regarding poverty reduction.

The share of irrigated land on total agricultural is found to have no significant effect when all households are included in the analysis. However the effect is strong when the agricultural landless households are excluded from the sample. It is worth noting that this finding is really encouraging as irrigation only would help enable farmers to perform double cropping per year. From literature review, the extreme poor, the poor and the lower middle are those who have little land and heavily rely on rice cultivation for livelihood (ADB 2001: 14-17). Therefore policies to distribute land to the poor and to invest in irrigation system could significantly improve rural livelihood and could dramatically reduce poverty in the rural area.

The effect of MFI can be seen from Table 5. The sign of variable MFI users in 2001 is positive and significant at 1 percent level. The coefficient suggests that those households that used microfinance service in 2001 tend to have higher per capita consumption and per capita food consumption at least 11 percent. This finding is further enhanced by similar studies which analyzed the effect of microfinance on welfare in other countries (Khandker 1998; Pitt and Khandker 1998; Chen and Snodgrass 2001; Khandker 2003 as cited in Weiss et al 2003:10-13). This is pretty an encouraging result and implies the need to expand MFI in Cambodia for poverty alleviation purpose. However, while MFI is claimed to

improve welfare of average people little is known whether its impacts reach the poorest of the poor. ADB (2001) showed that the chronic poor who were already heavily in debt could not borrow more.

Shock is found to have a significant and negative effect on both per capita consumption and per capita food consumption expenditure as expected. The coefficient implies that households facing shock during the past 6 months would reduce per capita consumption by 5.4 percent to 6.8 percent and reduce per capita food consumption expenditure by 13.7 percent to 14.9 percent. Shocks sometimes have more profound effect on poverty. Illness is one of the common serious shocks among the poor. Previous studies often pointed out that the poor are often vulnerable to illness which the cause of distress land sale and landlessness (Fitzgerald and So 2007:102). That being said, improved access to better public healthcare would result in significant poverty reduction.

Lastly the variable access to CPR is positive and statistically significant on per capita food consumption only with the full sample. Households that have access to common pooled resources could increase their per capita food consumption by around 10.9 percent. This suggests that common pooled resources which include especially forestry and aquatic resources play very crucial role for food security and poverty reduction. Early literatures showed that the poor are dependent on CPR as a source of income and livelihood in Cambodia (Fitzgerald and So 2007:90). At the same time population increase, however, could put on natural resources. The relationship between CPR and poverty reduction deserves a careful study and analysis.

Table 5: Determinant of Per Capita Consumption and Per Capita Food Consumption

Independent variables	Total sample		Excl. Agricultural landless	
	log of per capita consumption	log of per capita food consumption	log of per capita consumption	log of per capita food consumption
dependency ratio	-0.008	-0.003	0.005	0.007
log of per capita asset	0.211 ***	0.174 ***	0.218 ***	0.173 ***
agricultural land	0.063 ***	0.054 ***	0.072 ***	0.063 ***
ratio of irrigated land on agricultural land	0.015	0.082	0.153 **	0.149 **
MFI user	0.153 ***	0.125 ***	0.157 ***	0.110 ***
shock	-0.054 **	-0.137 ***	-0.068 **	-0.149 ***
access to CPR	0.063	0.109 *	0.019	0.101
constant	8.452 ***	8.146 ***	8.351 ***	8.059 ***
number of observation	2481	2481	2053	2053
Pseudo R-square	0.180	0.132	0.183	0.146
Hausman Test:				
Chi-square (7)	46.390	191.670	86.120	126.510
Prob > chi-square (7)	0.000	0.000	0.000	0.000

Source: Author's estimation based on CDRI's 2001-2008 household survey

Multinomial Logistic Regression Results

Table 6 shows the results of multinomial logistic regression analysis corresponding to equation (3) above. Again two samples are used in the analysis. One includes all households surveyed in 2001-2008 and another includes only those who possess agricultural land. In this analysis, the never poor group is set as the referent group and so it estimates a model for chronic poor relative to non-poor and for transient poor relative to non-poor.

Regression results suggest that the change of the gender of a household head from male to female between 2001 and 2004 increases the probability of being transient poor and decreases the probability of never being poor. An increase of age of household head from 2001-2008 is significantly negatively associated with the likelihood that households are chronic poor and transient poor. Surprisingly, the results suggest the increase in dependency ratio would decrease the probability of being in chronic and transient poor. This may partly reflect an increasing involvement of young children in income generating activities in agricultural work beside rice cultivation as those works became more available in the villages in 2008. Households with more children earned relatively higher.

An increase of per capita asset and livestock over the same period has a significant effect to decrease the probability of households being chronic or transient poor in both samples. An increase in agricultural land size is found to have significant effect to reducing the possibility of being a transient poor. An increase in the percentage of irrigated land is found to have significant impact to reduce the probability of being a chronic poor.

However, access to MFI, to CPR and shock are found to have no significant effect on chronic and transient poor which are different from the results found in the fixed effect estimation that those variables have some significant impact on consumption expenditure. This may suggest that the benefit from using MFI service and from accessing to CPR is not equitable between the poor and non-poor households. The impact of MFI is positive only when the loan is used for productive purpose which seems to be something the poor cannot afford. For CPR, it seems only the poor who lose benefit the most when access to it is restricted.

Table 6: Determinants of Chronic and Transient Poverty

Independent variables		Total sample				Excl. agricultural landless			
		Chronic		Transient		Chronic		Transient	
change of sex of household head to female in 2008		0.565		0.624	**	-0.163		0.323	
increase in age of head 2001-2008		-0.037	***	-0.015	*	-0.035	***	-0.015	*
increase in dependency ratio 2001-2008		-0.184	***	-0.091	*	-0.179	**	-0.078	
increase in per capita asset 2001-2008		-0.007	***	-0.002	***	-0.006	***	-0.002	**
increase in agricultural land size 2001-2008		-0.074		-0.095	*	-0.073		-0.091	
increase in irrigated land ratio 2001-2008		-0.880	**	-0.439		-0.829	*	-0.367	
access to CPR in 2001		0.452		1.016	**	0.495		1.341	**
shock in 2001		0.046		-0.223		-0.109		-0.274	
MFI users in 2001		0.277		0.238		-0.072		-0.176	
constant		-4.506	***	-1.888	***	-16.336		-2.178	***
village code									
	2080505	5.893	***	3.333	***	17.419		2.936	***
	5050408	6.560	***	4.565	***	18.713		4.659	***
	6020303	6.683	***	3.429	***	19.027		3.896	***
	6070504	5.030	***	2.969	***	16.883		2.980	***
	7070804	1.562		0.903	***	12.886		1.005	**
	8060901	-0.232		-0.310		11.381		-0.255	
	10010503	4.153	***	1.710	***	16.075		1.577	***
	14070104	1.876	*	0.833	**	13.401		0.803	**
Number of observation		827				698			
Pseudo R-square		0.232				0.240			

Source: Author's estimation based on CDRI's 2001-2008 household survey

5. Conclusion and Policy Recommendation

Poverty in Cambodia is overwhelmingly a rural phenomenon. Existing literatures on poverty in Cambodia are purely qualitative or use poverty profile which is limited by bivariate nature of their informational content and which can be misleading. Therefore there is a need to fill the gap to carefully identify the determinants of poverty beyond the poverty profile of assessing mere correlation of household characteristics. Table 7 summarizes a set of policy implication to reduce poverty. It is based on the results of fixed estimation analysis and multinomial logit regression analysis with the assumption that any policy which is good for welfare improvement will also good for poverty reduction provided that facts that many of non-poor households are above the poverty line and very sensitive to the change and can fall into poverty.

Enhance asset and livestock accumulation: Those policies to promote accumulation of productive durable assets especially agricultural equipment would accelerate poverty reduction. World Bank (2006) indicated that the poorest quintile households owned more assets compared to 10 years ago but unfortunately productive assets such as water pump were still scare. Similarly, the result of regression analysis suggest that livestock plays an important part in improving villagers' livelihood. Some kinds of livestock such as poultry and fish could be a source of daily nutrition for household consumption and some others such as cattle can also be used as draught animal in agricultural production in addition to revenue generation. The challenge, however, is how to change such traditional ways of raising livestock of household consumption & draft animal to a strategy to increase income and reduce poverty. Choosing

a better variety of livestock to raise and providing better animal health extension services better the livelihood of rural villagers.

Table 7: Effects of Poverty Determinant and Policy Implication

Variable	Effect on Food Cons. Or Cons.	Effect on Chronic (C) or Transient (T)	Policy Implication
Asset and Livestock	Positive	Reduce possibility of being C & T	Promote ownership of capital asset and raising livestock through less tax on agricultural capital goods and agricultural extension services
Agricultural Land and Irrigation	Positive	Reduce possibility of being C & T	Distribute idle social concession land to the poor and construct or rehabilitate irrigation system and improve management of water use for cultivation
Shock/Crisis	Negative		Reduce vulnerability of the poor through building social safety net especially improve healthcare system
Access to Micro Finance Institution	Positive		Facilitate access to credit for the poor through establishing formal rural credit and encourage MFI setup in the rural area
Access to Common Pooled Resources	Positive	Increase possibility of being T	Facilitate access to CPR for the poor through open access to the aquatic and forestry resources and creation of village association for CPR management.

Make agriculture land concession to the landless and improve irrigation system: From the current study both non-irrigated agricultural land and irrigated agricultural land are found to have significant and positive effect on per capita food consumption. This is also enhanced by early study which found the positive effects of land on poverty reduction (Engvall and Kokko 2007:19). As the extreme poor, the poor and the lower middle are those who have little land and heavily rely on rice cultivation for livelihood (ADB 2001:13-16), policies to distribute land to the poor could produce significantly positive effect on poverty reduction. Equally important, irrigation investment which allows farmers to perform two or three cropping per year could dramatically improve livelihood of rural farmers. From policy standpoint, however, it might be more convenient to build infrastructure rather than distribute the land.

Improve access to MFI: The effect of MFI on per capita food consumption is found to be positive and significantly significant, suggesting that access to MFI would improve livelihood. This is in very well in line with a number of studies, which also found positive effect of MFI on poverty reduction in other countries (Khandker 1998; Pitt and Khandker 1998; Chen and Snodgrass 2001; Khandker (2003) as cited in Weiss et al 2003: 10-13). The result from the current study supports the expansion of MFI to the rural areas, where the mass population of the poor live, in order to speed up poverty reduction. Despite this optimistic view regarding the role of MFI in reducing poverty however some evidence showed that the chronic poor who were already heavily in debt are constrained to access to new loans leading to a question whether MFI really reaches the poor.

Reduce vulnerability to shock: In the current study shock is narrowly defined as having unpleasant experiences such as "serious illness", "crop failure", "animal death/stolen", "family loss", "land conflict" or natural disaster. The result of regression analysis indicates that shock is negative associated with per

capita food consumption expenditure. Shock, however, sometimes have more profound effect as it can be the main cause of falling into poverty. Illness seems to be the most unpleasant shock suffered by many poor as it is the cause of distress land sale and landlessness (ADB 2001; Fitzgerald and So 2007:102). Reducing vulnerability to shock can rather be challenging. Even though providing high quality health services is recognized as one priority action to reducing poverty in the PRSP, many people remained suffer from illness and end up being landless. Moreover disaster management, especially in the face of floods, has been another priority action of the government to reduce vulnerability of the poor but is said to be limited by budget and capacity constraints.

Increase access for the poor to CPR: The result of regression analysis showed that households that have access to common pooled resources could increase their per capita food consumption by around 11 percent. This suggests that common pooled resources which include especially forestry and aquatic resources play very crucial role for food security and poverty reduction. The poor are dependent on CPR as a source of income and livelihood in Cambodia. At the same time there is evidence in many villages access to forestry resources has been reportedly more restricted to local villagers, after the forestry law and went into effect in 1998 (Fitzgerald and So 2007:121). As a priority action against poverty increasing environmental sustainability and improving natural resource management is recognized to be a key dimension in reducing vulnerability. Since the relationship between access to CPR and poverty reduction seems to be enhancing each other, policies to restrict the access to CPR may deserve a more careful study and sound analysis.

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Annex: Hausman Test

A1: Determinant of Per Capital Consumption (Total Sample)

log of per capita consumption (total sample)	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
dependency ratio	-0.0084	0.0200	-0.0284	0.0077
log of per capita asset	0.2111	0.1709	0.0402	0.0081
ratio of irrigated land on agricultural land	0.0152	-0.0380	0.0532	0.0474
agricultural land	0.0633	0.0462	0.0172	0.0073
MFI user	0.1534	0.1542	-0.0007	0.0242
shock	-0.0535	0.0104	-0.0639	0.0125
access to CPR	0.0635	-0.0817	0.1452	0.0412

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 146.39

Prob>chi2 = 0.0000

A2: Determinant of Per Capital Food Consumption (Total Sample)

log of per capita food consumption (total sample)	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
dependency ratio	-0.0026	0.0316	-0.0342	0.0069
log of per capita asset	0.1736	0.1309	0.0427	0.0073
ratio of irrigated land on agricultural land	0.0820	-0.0447	0.1267	0.0427
agricultural land	0.0544	0.0357	0.0188	0.0066
MFI user	0.1251	0.1441	-0.0191	0.0217
shock	-0.1375	-0.0759	-0.0615	0.0111
access to CPR	0.1087	0.0163	0.0923	0.0371

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 191.670

Prob>chi2 = 0.0000

A3: Determinant of Per Capital Consumption (excl. agricultural landless households)

log of per capita consumption (excl. agricultural landless)	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
dependency ratio	0.0047	0.0235	-0.0188	0.0091
log of per capita asset	0.2176	0.1741	0.0434	0.0097
ratio of irrigated land on agricultural land	0.1528	0.0349	0.1178	0.0561
agricultural land	0.0718	0.0614	0.0103	0.0075
MFI user	0.1565	0.1741	-0.0176	0.0270
shock	-0.0678	-0.0139	-0.0540	0.0150
access to CPR	0.0189	-0.0920	0.1109	0.0472

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 86.120

Prob>chi2 = 0.0000

A4: Determinant of Per Capital Food Consumption (excl. agricultural landless households)

log of per capita consumption (exl. Agricultural landless)	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
dependency ratio	0.0073	0.0336	-0.0263	0.0078
log of per capita asset	0.1731	0.1317	0.0414	0.0083
ratio of irrigated land on agricultural land	0.1493	0.0089	0.1404	0.0483
agricultural land	0.0632	0.0497	0.0135	0.0064
MFI user	0.1103	0.1447	-0.0344	0.0231
shock	-0.1490	-0.0938	-0.0552	0.0127
access to CPR	0.1010	0.0149	0.0861	0.0404

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 126.510

Prob>chi2 = 0.0000