The University of Manchester
Brooks World
Poverty Institute

MANCHESTER
1824

Crop returns, prices, credit and poverty in Lao-PDR

Samuel Annim[1*]

Raghav Gaiha[2]

[1] University of Cape Coast, Ghana and University of Central Lancashire, UK
*Corresponding author

skannim@gmail.com

[2] University of Delhi

raghavdasgaiha@gmail.com

May 2012

BWPI Working Paper 170

Creating and sharing knowledge to help end poverty

www.manchester.ac.uk/bwpi

Abstract

With Lao PDR's macroeconomic performance currently booming, we investigate the country's poverty situation by examining the drivers of household poverty. This paper tests four major hypotheses: (1) Whether higher returns on all crops harvested per capita reduce consumption expenditure, food expenditure and the World Bank's US$1.25/day (PPP, 2005) poverty cut-offs? (2) Whether higher returns on glutinous rice harvested per capita also reduce poverty? (3) Whether higher crop prices lower poverty? (4) Whether easier access to credit contributes to poverty reduction? Data on 5,031 households from the fourth round of the Laos Expenditure and Consumption Survey (LECS IV) are used to estimate Probit and instrumental variable Probit equations. Potential endogeneity of some of these variables (e.g. returns to crops harvested) is addressed through appropriate instrument variables. Briefly, returns on crops harvested reduce different measures of poverty (e.g. food poverty, dollar poverty), as do higher producer prices and easier access to credit. An important policy conclusion in light of Millennium Development Goal 1 is the imperative of higher returns on rice and glutinous rice, more remunerative prices for farmers and easier access to credit. These areas of policy concern assume greater importance as Laos prepares for its accession to the World Trade Organization (WTO). An accelerated market-orientation of agriculture may induce not just greater efficiency but also more equitable outcomes.

Keywords: Poverty, Returns on rice and other crops, Prices, Credit, Value chains

Samuel Annim is Senior Lecturer, University of Cape Coast, Ghana and Research Associate, University of Central Lancashire, UK.

**Raghav Gaiha** is Professor of Economics, University of Delhi, India.

1. Introduction

In less than three years, the poverty headcount in Lao PDR is expected to have reached a relatively low level of 23 percent, following the Millennium Development Goals' 25-year road map of halving poverty by 2015. Estimates based on the 1992/93 and 2007/08 Laos Expenditure and Consumption Surveys (LECS) showed that poverty had dropped by about 18 percent over the 15-year period, 1992/93 to 2007/08. In view of the complex channels through which poverty reduction is achieved, simplistic extrapolation of past experience could be misleading. Elaborating these complex channels, Gaiha and Annim (2010) assessed the prospects of Lao PDR halving poverty, based on analysis of feasible growth rates of agriculture and GDP. Briefly, our analysis suggested that GDP and agricultural growth rates of 6.16 percent and 3.96 percent, respectively, will enable Lao PDR to achieve a 23 percent reduction in the poverty headcount by 2015. These results suggest that, as average annual percentage growth rates of 6.9 and 3.3 percent, respectively, were already attained between 2000 and 2009 (World Bank, 2011a), little additional effort will be necessary for halving poverty by 2015. But a careful investigation of the drivers of household poverty is necessary to focus better on policy options.

In light of this, and building on the extant literature (Datt and Ravallion, 1998; Irz et al., 2001; and Ivanic and Martin 2010), the current study analyses the determinants of household poverty in Lao PDR, with emphasis on returns on all crops harvested, as well as glutinous rice, producer prices and access to credit. The discourse on how poor households benefit from higher returns on crops, improved agricultural practices and increased agricultural growth and productivity mostly posits a positive relationship, but with varying elasticities given the differences in the transmission mechanisms. Since the work of Datt and Ravalion (1998), most of the studies have concentrated on cross-country analysis which limits researchers' ability to control for other household- and community-level factors that affect household poverty. The current study departs from the work of Datt and Ravallion (1998), among others, on two counts. First, this study uses an external instrument to correct for endogeneity of yields instead of lagged values. The argument is that since the source of endogeneity is premised on a bi-causal relationship, use of lags reduces to a statistical artifact, rather than providing a policy tool. Second, in addition to examining the poverty-reducing effects of all crops, we explore the effect of a major crop (glutinous rice) in Lao PDR.

Although in the past few years, the service and industrial sectors have contributed more to GDP growth in Lao PDR, most of the poor households still depend on agriculture. Three measures of poverty are considered: consumption expenditure (food and non-food) poverty, food expenditure poverty, and dollar poor (based on World Bank's poverty line of $1.25 (Purchasing Power Parity [PPP], 2005). The rationale for using different measures of poverty is to examine variation (if any) in the drivers of poverty and identify correlates of poverty that cut across all three measures. In fact, the sources of these measures of poverty differ, but there are a few common correlates as well.

Lao's economy in the last few years – transitioning to a market-oriented policy regime – has performed well compared to other developing economies in the Southeast Asia region. With a GNI per capita, Atlas method (current US$) of US$1,010 (World Bank, 2011b), it is currently classified as a lower middle income country. Figure 1 below gives a snapshot of the trends of key macroeconomic indicators since 2000. The left axis of Figure 1 tracks annual percentage trends of

3

Figure 1: Recent trends of macroeconomic variables in Lao PDR
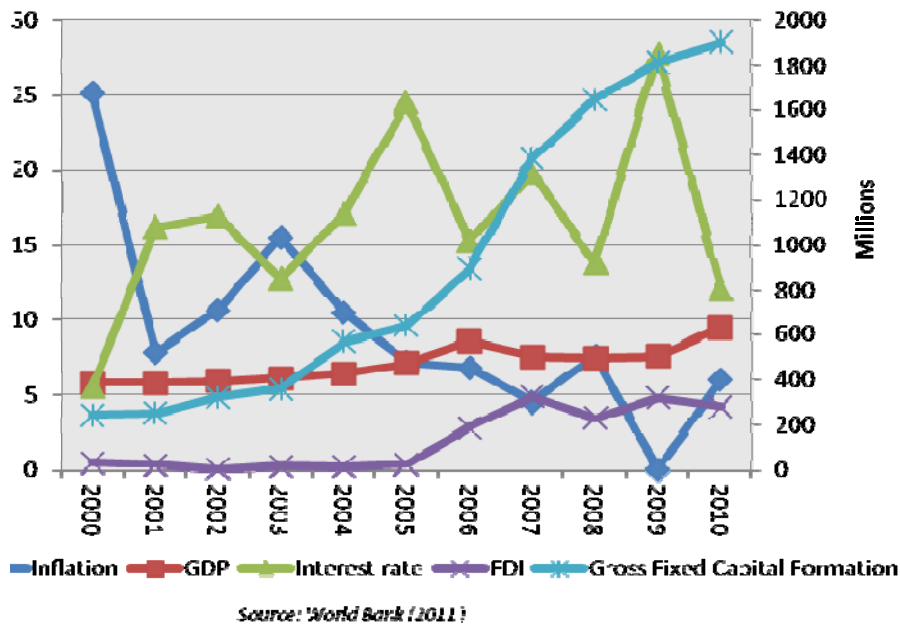
GDP growth, real interest rate, and inflation (consumer prices). The right vertical axis tracks gross fixed capital formation and foreign direct investment (both in current, US$).

As indicated earlier, in the context of MDG1, Lao PDR is on track in terms of annual GDP growth rate pegged at a minimum of eight percent per annum and an inflation rate lower than GDP growth rate. However, given the hikes in food prices between 2007 and 2008, and between 2009 and 2010, the vulnerability of large segments of the population to poverty is high. Real interest rate volatility is worrying too, as it dampens investment. The government has failed to maintain steady real interest rates over the period 2000 and 2011. Unlike gross fixed capital formation that has steadily increased over the period, foreign direct investment increased sharply between 2005 and 2007, fell slightly the year after and since 2008 has been fairly stable. In sum, although Lao's macroeconomic outlook is promising, there are a few disturbing symptoms.

The last few decades have seen significant changes in agricultural markets on account of several factors, such as reduced state intervention and deregulation, changing food basket, growing urbanisation and emergence of supermarkets, and globalisation of agricultural trade. Increasing intensification and diversification of agriculture are dependent on integration with markets (due to the relatively small domestic market and much larger and rapidly growing regional and global markets) and ultimately on the development of value chains. But agro-ecological characteristics and cross-border trade matter a great deal.

Agricultural households operate both as producers and consumers. While many are net buyers of food and sellers of labour, some are net producers and others perform more than one activity. All of them need access to markets in order to obtain high returns on their resources of land, labour and capital, including human capital. Rural households with assets, non-farm income, and occupying

4

favourable locations (irrigated regions with good infrastructure) have better access to markets than those who do not have one or more of these characteristics. When output prices rise, the latter are not able to take advantage, either because they do not have enough surpluses to sell or because they lack easy access to the market. A major priority, therefore, is how to make agricultural activities profitable for smallholders and those located in unfavourable agro-climatic regions.

We now give a brief overview of the proposition underlying a plausible relationship between return on all crops (including glutinous rice) harvested and household poverty. Dorward et al. (2004) surmise that the expected relationship between return on all crops harvested and household poverty depends on the following: (1) linkages between different activities (production – downstream and upstream – investment and consumption); (2) source of change (price or productivity) and nature of the crop – whether tradeable or non-tradeable; (3) resource (labour and capital) and institutional constraints in the economy; and (4) number of producers and consumers of both tradeables and non-tradeables within the economy. Each of these conditions and traditional (individual, household and community variables) correlates of poverty informs the nature (positive or negative) and size of response on households, given exogenous changes in the return on crop harvested.

Complementary and substitution effects within and between the four conditions stated above yield varying multipliers for the effect of agricultural productivity on household poverty. This might have partially contributed to the fluctuating and varying trends of agricultural productivity and economic growth in Asia and sub-Saharan Africa. For instance, given an increase in returns on crops harvested, the outcome will depend on investment opportunities in the two economies. That is, in an economy where returns on savings and investment are high, an increase in returns on crops harvested will result in an injection leading to an upward spiralling of increases in real household income. On the other hand, in an economy where the returns on savings and investment are low, an increase in returns on crops harvested will lead to leakage and therefore a downward spiral effect on lower real household income. Such complexity requires a cautious interpretation of the results linking returns on crops and poverty.

The next section describes the data and discusses the rationale of econometric estimations used in the study. This is followed by a discussion of the results in the third section, and then conclusions in the final section.

2. Data and econometric estimation

This section provides an overview of the source and structure of the data set used for the analyses and estimation techniques.

2.1 Data and methodology

We use the most recent (fourth) round of the LECS (LECS IV) in estimating two separate sets of equations: (1) returns on crops harvested (per capita)[1] on different dimensions of household poverty measures; and (2) returns on glutinous rice harvested (per capita) on different dimensions

---

[1] To avoid repetition, per capita is omitted in subsequent discussion.

of household poverty measures. Among other explanatory variables, producer prices and access to credit at the village level are also used. The Lao Statistics Bureau (LSB), since 1992, has collected data on household composition, consumption expenditure, health, occupation and village-level characteristics every five years. The datasets are nationally representative and capture information from all the provinces in Lao PDR. The fourth round (conducted in 2007/08) is more comprehensive and detailed both in size (sample) and depth of issues covered, relative to earlier surveys. For instance, during the fourth round, the health component of the LECS survey explored issues on both health status and healthcare-seeking behaviour, compared to just health status in the third round. With a response rate of 99.9 percent, the fourth round survey has data on 8,296 households in 518 villages.

The current study relies on two different structures of LECS IV. The main data (disaggregated based on various components of the survey instrument) were obtained from LSB and a processed version, which has poverty-related variables, was obtained from the World Bank country office of Lao-PDR. After initial cross-validation, the datasets were merged for econometric analyses. The current study analyses the effect of returns on all crops and glutinous rice harvested, producer prices and access to credit, among other variables, on household poverty using 5,031 households.

2.2 Econometric specification and estimation

Two types of econometric estimation techniques (Probit and IV Probit) are used here. The choice of a Probit (Maximum Likelihood Estimation) technique is informed by the measurement of the dependent variable (a binary outcome), relevant explanatory variables, and key hypotheses for empirical validation. The Probit model (structural), as specified in Equations 1 and 2 below, estimates the determinants of household poverty. As indicated earlier, the two main variables of interest in Equations 1 and 2, respectively, are return on crops harvested and return on glutinous rice harvested, conditioned on various household and village characteristics.

$$
\begin{aligned}
Poverty = \beta_0 &+ \beta_1 rtns\_value\_crops + \beta_2 price\_crops + \beta_3 agehd + \beta_4 district\_gini \\
&+ \beta_5 education + \beta_6 hhsize + \beta_7 kid5 + \beta_8 adult\_nonagric\_hh \\
&+ \beta_9 creditbank + \beta_{10} altitude + \beta_{11} burglary + \beta_{12} urban + \beta_{13} ethnic \\
&+ \beta_{14} region + \beta_{15} landholding + \varepsilon_i
\end{aligned}
$$

$$(1)$$

where *Poverty* is based on consumption expenditure, food expenditure and 'dollar' poverty headcount (below a cutoff of $1.25 PPP 2005), *rtns_value_crops* is returns on crops harvested, *price_crops* is average village price of crops sold, *agehd* is age of the head of household, *district_gini* is a continuous variable capturing district-level consumption expenditure inequality, *education* is the household head's level of education, categorised into primary or below, lower secondary, upper secondary and vocational or university education. The reference category for household head's education is primary or lower level of education; *hhsize* is number of persons in a household and *kid5* denotes number of children under five years old in the household; *adult_nonagric_hh* is number of adults in non-agricultural employment, *creditbank* is availability of credit bank in the village, *altitude* is altitude of land, categorised into lowland, midland and upland, with low land as the reference group, *burglary* is a village-level variable that captures the degree to

6

which burglary is a concern. This is coded as major, minor and no, and major concern is the reference group; *urban* is residence (dummy) with urban residence coded as 1 and 0 otherwise; *ethnic* is the household head's ethnic group categorised into Lao-Tai, MonKhmer, ChineTibet and HmongluMien. The base category for ethnic group is Lao-Tai; *region* is the region in which the household is located, and region is categorised into four locations, namely, Vientiane main (national capital), North (Phongsaly, Luangnamtha, Oudumxay, Bokeo, Luangprabang, Huaphanh and Xayabury), Central (Xiengkhuang, Vientiane, Borikhamxay, Khammuane and Savannakhet) and South (Saravane, Sekong, Champasack and Attapeu). Vientiane is used as the base region for the econometric estimation. *landholding* is the landholding of the household and is categorised into small (< 2.5 hectares), medium (2.5>= landholding<5) and large (>=5 hectares). The reference category for landholding is small landholding.

$$
\begin{aligned}
Poverty = {} & \delta_0 + \delta_1 rtns\_glutinousrice + \delta_2 price\_glutinousrice + \delta_3 agehd \\
& + \delta_4 district\_gini + \delta_5 education + \delta_6 hhsize + \delta_7 kid5 \\
& + \delta_8 aldult\_nonagric\_hh + \delta_9 creditbank + \delta_{10} altitude + \delta_{11} burglary \\
& + \delta_{12} urban + \delta_{13} ethnic + \delta_{14} region + \delta_{15} landholding + \mu_t
\end{aligned}
$$

$$(2)$$

where all interpretations of the variables remain the same as in Equation 1 and *rtns_glutinousrice* is returns on glutinous rice harvested and *price_glutinousrice* is the average price of glutinous rice at the village level.

We further estimate Instrumental Variable Probit (IV Probit) equations in view of the potential endogeneity of some of our main explanatory variables. Our inclination towards endogeneity is premised on a plausible bi-causal relationship between household poverty and returns on all crops harvested, on one hand, and between household poverty and returns on glutinous rice harvested, on the other. Instruments used for the respective endogenous variables in Equations 1 and 2 are availability of a rice bank in the village (for returns on all crops harvested) and availability of a rice bank and the presence of farmers' association or a trade union in the village (for returns on glutinous rice harvested per capita).

Availability of a rice bank in the village as an instrument for both returns on crops harvested and return of glutinous rice harvested is appropriate, as it is expected that it will have a negative effect on both the yield and price of crops harvested and sold by households. On the other hand, the presence of a rice bank in the village is unlikely to have a direct effect on the poverty status of a household. In Equation 2, a second instrument (presence of either a farmers' association or a trade union in the village) is added to availability of rice bank in village. The search for another variable that correlates with returns on glutinous rice harvested but not household poverty status was unavoidable because of the non-convergence of the IV Probit estimation. We opted for the presence of either a farmers' association or a trade union in the village, because such organisations are instruments for knowledge transfer relating to production techniques and marketing. Hence, we expect a significant correlation between such organisations and returns on glutinous rice harvested.

One of the strategies used in investigating the validity of the instruments used is the inspection of the instruments in the first stage analyses, where returns of crops harvested and returns on glutinous rice harvested are the dependent variables. Equations 3 and 4 below represent the reduced form equations.

$$
\begin{aligned}
rtns\_value\_crops \\
&= \alpha_0 + \alpha_1 ricebank + \alpha_2 price\_crops + \alpha_3 agehd + \alpha_4 district\_gini \\
&\quad + \alpha_5 education + \alpha_6 hhsize + \alpha_7 kid5 + \alpha_8 aldult\_nonagric\_hh \\
&\quad + \alpha_9 creditbank + \alpha_{10} altitude + \alpha_{11} burglary + \alpha_{12} urban + \alpha_{13} ethnic \\
&\quad + \alpha_{14} region + \alpha_{15} landholding + \epsilon_t
\end{aligned}
$$

(3)

where the dependent variable *rtns_value_crops* is returns on crop harvested. The instrument used is *ricebank,* which represents the presence of a rice bank in the village. The other variables have the same interpretations as in Equation 1.

$$
\begin{aligned}
rtns\_glutinousrice \\
&= \gamma_0 + \gamma_1 ricebank + \gamma_2 farmersunion + \gamma_3 price\_glutinousrice + \gamma_4 agehd \\
&\quad + \gamma_5 district\_gini + \gamma_6 education + \gamma_7 hhsize + \gamma_8 kid5 \\
&\quad + \gamma_9 aldult\_nonagric\_hh + \gamma_{10} creditbank + \gamma_{11} altitude + \gamma_{12} burglary \\
&\quad + \gamma_{13} urban + \gamma_{14} ethnic + \gamma_{15} region + \gamma_{16} landholding + \sigma_t
\end{aligned}
$$

(4)

where the dependent variable *rtns_glutinousrice* is returns on glutinous rice. The two instruments used are *ricebank* (presence of a rice bank in the village) and *farmersunion* (presence of either a farmers' association or a trade union in the village). The other variables have the same interpretations as in Equation 1.

Although some other variables (education, land holdings and land inequality) in our model are susceptible to endogeneity, they are unlikely to be correlated with the error term. So we concentrate on potential endogeneity of returns on all crops and glutinous rice. Accordingly, we estimate a parsimonious model (using these variables and district-level fixed effects). In each of the two cases (returns on crops and on glutinous rice) statistically significant coefficients are observed.

3. Results

3.1 Descriptive analysis

First, we examine the pattern of poverty in Lao PDR. The LECIV data, sourced from the World Bank country office in Lao PDR, contains information on poverty using three different indices: based on consumption expenditure, food expenditure and 'dollar' cut-off (see Ministry of Planning and Investment, Department of Statistics (2010) for the details on these measures). Consistent with

the report, Figure 2 below shows that just under a third (27.6 percent) of the Lao PDR population are poor in terms of consumption expenditure using 159,611.9 KIP as the national poverty line. The red vertical line in each of the three diagrams represents poverty incidence in Lao PDR for each of the three measures of poverty. The diagram in the lower left panel of Figure 2, representing 'dollar' poverty, shows that more than a third of the Lao PDR population is poor. The incidence of poverty in the context of food expenditure (<2100 calories per capita per day) is slightly lower and shows that about one in four households is poor in terms of food expenditure. The kernel density curves for all three measures of poverty depart from the normal distribution curve at the peak and in the tails.

Figure 2:
Kernel density and normal curves for consumption, food and dollar poverty
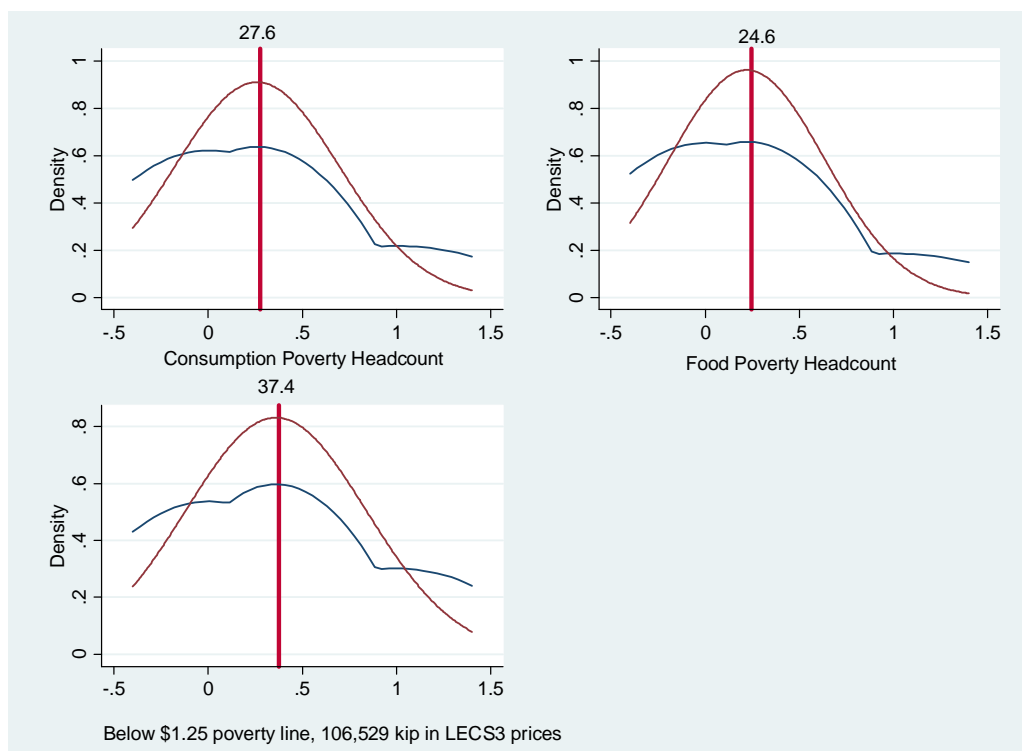
Figure 3 below examines the patterns of consumption expenditure poverty across rural-urban residence, different ethnic groups and regions. As in other developing countries, poverty in Lao PDR is mainly a rural phenomenon. The top left panel shows that the incidence of poverty in the rural areas is higher across the entire expenditure stream. In the diagram in the lower left panel, representing poverty incidence for different ethnic groups, we observe that, with the exception of Lao-Tai showing relatively low levels of poverty incidence, the ethnic groups tend to overlap at different points of the consumption expenditure stream. This implies that poverty across different ethnic groups is sensitive to the choice of the poverty line. For instance, up to a poverty line of about 221000 kip, consumption poverty incidence is higher among the HmongluMein ethnic group than the Chine Tibet ethnic group. However, for a higher poverty line (greater than 221000 kip), the Chine Tibet ethnic group tends to have a higher consumption poverty incidence than the HmongluMein ethnic group. Poverty incidence across the different regions shows that Vientiane,

the national capital, has the lowest poverty incidence among the four regions. Poverty incidence for the central and northern sectors of Lao PDR tends to overlap along the consumption expenditure distribution.

Figure 3: Consumption poverty incidence by rural-urban residence, region and ethnic group
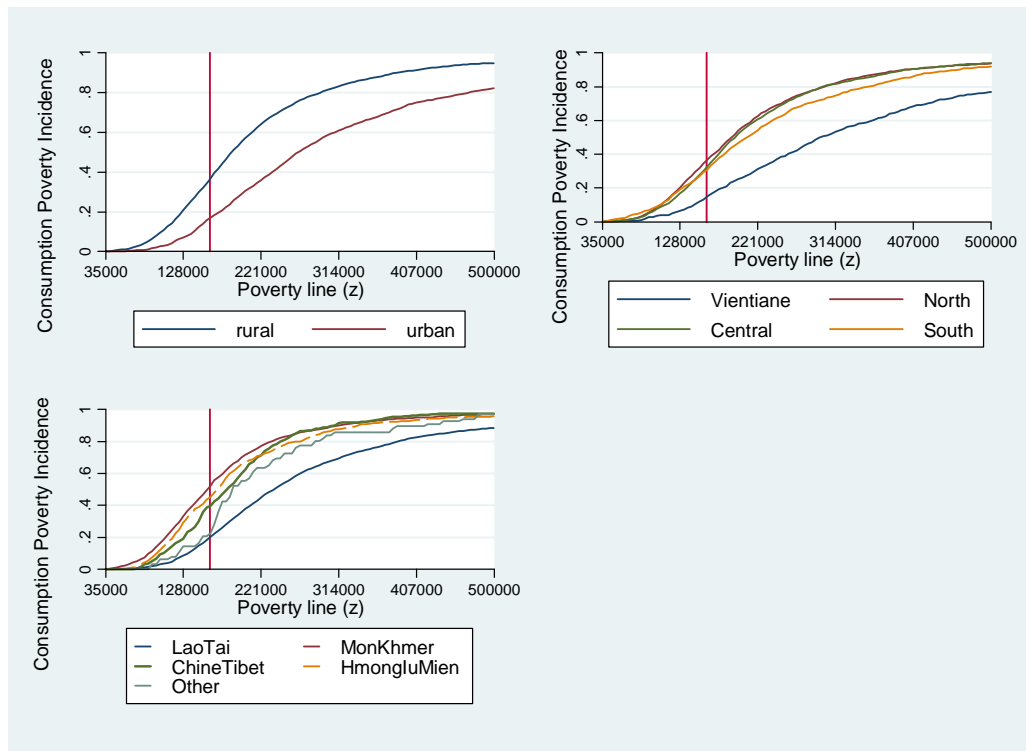
Table 1 gives the mean returns on all crops and glutinous rice harvested last season for poor and non-poor household by different measures of poverty. As expected, we find that non-poor households in each of the six cases have higher returns than poor households. The t-test for the differences suggests that the positive differences between the non-poor and poor households are statistically significant.

Table 1: Return on crops and glutinous rice harvested by poverty

Poverty		Mean of return on crops harvested per capita	Mean of return on glutinous rice harvested per capita
Consumption Expenditure	Poor	95.71	37.22
	Non-poor	420.01	144.47
T-test		10.65(0.00)	9.97(0.00)
Food	Poor	116.97	48.21
	Non-poor	400.64	136.97
T-test		8.79(0.00)	7.75(0.00)
'Dollar'	Poor	114.80	45.87
	Non-poor	461.58	157.04
T-test		12.74(0.00)	11.58(0.00)
Number of observations		**5031**	**4106**

3.2 Econometric analysis

As indicated in the preceding section, we present two sets of results. First, Table 2 gives the results on the effect of returns on crops harvested in a season on three measures of poverty (income, food and dollar). Under each poverty measure, we give results for both the Probit and IV Probit estimation. This is done as the reliability of the estimations varies for the two main hypotheses of the study. In Table 2, where returns on all crops is the main variable of interest, the results support the IV Probit estimation. One of our main hypotheses, that higher returns on crops reduces poverty, is validated. At the mean value of returns on all crops (342.34 kip/season) and of the correlates specified in Equation 1 above, we observe that for every five households, one is likely to be poor. The likelihood of not being poor, holding all other correlates of poverty at their means, will be realised at a return on all crops of about 3000 kip/season. Appendix 1 gives the mean values used in estimating Equation 1.

The IV Probit results are preferred to the ordinary Probit estimation, going by the Wald Test of exogeneity and Hausman post-estimation results (last two rows of Table 2). Based on the null hypothesis of exogeneity, we fail to accept the case that returns on crops sold per capita is exogenous in the Probit estimation. Also, in all three cases of IV estimation (Columns 2, 4 and 6), the Hausman test rejects the null hypothesis that the Probit estimation is consistent and efficient. For further examination of the suitability of the instruments used, Appendices 2 and 3 give the correlation matrix of the potential endogenous variables, poverty measures and the instruments used, and the first stage estimation results. In Appendix 3, for instance, we see that the instruments used – presence of a rice bank and of either a farmers' association or a trade union in the village – are statistically significant across all the first stage estimations.

The evidence on the relationship between district-level inequality and household-level poverty is inconsistent across the three measures and, statistically, fairly weak. However, it is worth noting that in all three cases of poverty measures, the IV Probit has positive coefficients. This implies that reduction of inequality will reduce poverty.

Other household-level variables that consistently showed a poverty-reducing effect are head of household's level of education, number of adults employed in non-agricultural activities in the household, and land holdings. On the other hand, larger households and with higher dependency (number of kids in the household) are more likely to be poor. A somewhat intriguing result is the negative association between landholdings and expenditure and dollar poverty, but not food poverty.

In the context of rural/urban, ethnic group and regional fixed effects, the results vary across the different econometric estimations and are mostly in contrast to the evidence observed from the descriptive statistics.[2] For instance, we found that, after controlling for the correlates of poverty, households in the Southern region (that is, the following provinces – Saravane, Sekong, Champasack and Attapeu) are less likely to be poor than those in Vientiane. Another contrast was

---

[2] This is not surprising, since multiple regression analysis isolates marginal effects keeping all other variables constant. The cross-tabulations, by contrast, show averages in a bivariate comparison.

observed for the likelihood of being poor among ethnic groups. That is, based on the IV probit estimations, we observed that across the three poverty measures, the HmongIuMien ethnic group was less likely to be poor compared to the Lao-Tai ethnic group. The fixed effect of altitude, by contrast, was consistent across poverty measures, on the one hand, and econometric estimation, on the other. We observed that both midland and the upland areas were more likely to be poor than the lowland area. Further computations using ordinary Logit estimation (results not given here for brevity) showed that households in the midland and upland areas were, respectively, 45 percent and 44 percent more likely to be poor than their counterparts in the lowland areas.

Table 2: Regression results of household poverty in Lao-PDR

Dependent variables: consumption expenditure, food expenditure and 'dollar' poverty headcount

Explanatory variables	Consumption Exp. poverty		Food poverty		'Dollar' poverty	
	Probit estimation	IV Probit estimation	Probit estimation	IV Probit estimation	Probit estimation	IV Probit estimation
	(1)	(2)	(3)	(4)	(5)	(6)
Return on crops harvested per capita	-0.001	-0.001	-0.000	-0.001	-0.000	-0.001
	[-6.87]**	[-19.29]**	[-3.81]**	[-3.01]**	[-7.57]**	[-16.11]**
Average village price of crops sold	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	[-0.41]	[-2.73]**	[-0.51]	[-1.78]+	[-1.01]	[-3.30]**
Age head of HH	-0.008	-0.005	-0.008	-0.007	-0.009	-0.006
	[-3.79]**	[-2.16]*	[-3.84]**	[-2.55]*	[-4.49]**	[-2.35]*
District income Gini	-1.160	1.015	-0.233	1.074	-1.690	0.698
	[-3.55]**	[1.82]+	[-0.71]	[1.50]	[-5.42]**	[1.09]
Head of household has completed at least lower secondary education[1]	-0.250	-0.114	-0.128	-0.079	-0.209	-0.092
	[-4.39]**	[-1.66]+	[-2.22]*	[-1.23]	[-4.02]**	[-1.51]
Head of household has completed at least upper secondary	-0.538	-0.284	-0.371	-0.276	-0.391	-0.201
	[-4.90]**	[-2.12]*	[-3.52]**	[-2.11]*	[-4.27]**	[-1.90]+
Head of household has completed at least vocational or university education	-0.506	-0.273	-0.359	-0.271	-0.514	-0.280
	[-4.17]**	[-2.05]*	[-3.09]**	[-2.03]*	[-4.84]**	[-2.17]*
Household size	0.185	0.060	0.180	0.108	0.206	0.073
	[15.45]**	[1.37]	[14.99]**	[1.85]+	[17.61]**	[1.56]
Number of children under five in the household	0.123	0.016	0.120	0.053	0.104	0.005
	[4.60]**	[0.40]	[4.42]**	[1.01]	[3.97]**	[0.14]
Number of adults in non-agricultural employment	-0.169	-0.126	-0.089	-0.093	-0.179	-0.132
	[-5.10]**	[-3.40]**	[-2.83]**	[-3.18]**	[-5.99]**	[-3.57]**
Availability of credit bank in the village	-0.156	-0.130	-0.182	-0.174	-0.122	-0.107
	[-2.19]*	[-2.16]*	[-2.49]*	[-2.51]*	[-1.88]+	[-1.96]*
Midland[2]	0.206	0.223	0.293	0.311	0.115	0.172
	[3.30]**	[4.15]**	[4.59]**	[4.91]**	[1.94]+	[3.59]**
Upland	0.201	0.284	0.431	0.467	0.195	0.281
	[3.34]**	[5.82]**	[7.05]**	[7.06]**	[3.45]**	[5.96]**
Burglary is a minor problem in the village[3]	-0.177	-0.034	-0.205	-0.112	-0.082	0.019
	[-2.10]*	[-0.43]	[-2.44]*	[-1.10]	[-1.04]	[0.28]

14

Burglary is not a problem in the village	-0.061	-0.071	-0.155	-0.150	0.012	-0.027
	[-0.72]	[-1.07]	[-1.81]+	[-1.91]+	[0.15]	[-0.42]
Urban	0.008	-0.052	0.092	0.030	-0.070	-0.097
	[0.12]	[-0.97]	[1.33]	[0.41]	[-1.11]	[-1.94]+
MonKhmer [4]	0.420	-0.070	0.407	0.089	0.450	-0.050
	[7.54]**	[-0.50]	[7.14]**	[0.42]	[8.46]**	[-0.35]
ChineTibet	-0.116	-0.340	0.041	-0.173	-0.080	-0.320
	[-0.79]	[-2.87]**	[0.28]	[-1.02]	[-0.58]	[-2.73]**
HmongIuMien	0.018	-0.363	-0.005	-0.284	0.083	-0.325
	[0.19]	[-3.63]**	[-0.05]	[-1.80]+	[0.91]	[-3.03]**
Other	-0.286	-0.171	0.182	0.137	0.120	0.058
	[-1.05]	[-0.79]	[0.74]	[0.61]	[0.52]	[0.30]
North[5]	-0.368	0.045	-0.664	-0.333	-0.391	0.029
	[-2.89]**	[0.30]	[-5.39]**	[-1.25]	[-3.44]**	[0.20]
Central	-0.196	-0.272	-0.198	-0.277	-0.121	-0.229
	[-1.59]	[-2.96]**	[-1.70]+	[-2.69]**	[-1.10]	[-2.68]**
South	-0.555	-0.391	-0.544	-0.484	-0.530	-0.377
	[-4.28]**	[-2.88]**	[-4.37]**	[-3.30]**	[-4.56]**	[-2.98]**
Medium land hold holdings (2 hectares < land <5 hectares)[6]	-0.183	0.257	-0.227	0.091	-0.211	0.238
	[-3.48]**	[2.50]*	[-4.28]**	[0.49]	[-4.34]**	[2.26]*
Large land holdings (> 5 hectares)	-0.455	0.521	-0.651	0.071	-0.527	0.475
	[-4.85]**	[2.30]*	[-6.59]**	[0.16]	[-6.27]**	[2.02]*
Constant	-0.667	-0.347	-1.048	-0.802	-0.288	-0.132
	[-3.26]**	[-1.69]+	[-5.18]**	[-2.60]**	[-1.51]	[-0.82]
N	5031	5031	5031	5031	5031	5031
Pseudo R2	0.215	-	0.190	-	0.219	-
Likelihood ratio test	1192.245	1000.707	971.527	830.043	1418.079	1441.607
P-Value (LR test)	0.000	0.000	0.000	0.000	0.000	0.000
Hosmer-Lemeshow	10.39(0.24)	-	25.83(0.00)	-	23.10(0.00)	-
Wald test of exogeneity	-	7.93(0.00)	-	2.30(0.13)	-	8.23(0.00)
Hausman	96.54(0.00)		40.62(0.01)		115.38(0.00)	

t statistics in brackets ----- + p<.10, * p<.05, ** p<.01; 1 Reference group for head of household's education is primary and lower; 2 Reference category for altitude is low land; 3 Reference group for burglary is major burglary; 4 Base group for ethnic group is Lao-Tai; 5 Base group for region is Vientiane; 6 Reference group for land holdings is small land holdings.

Among the drivers of household poverty are additional village-level variables. We examined the effect of average village-level producer prices of crops, presence of a credit bank in the village, and the extent to which burglary is a concern in the village. On the effect of average village-level prices, the IV Probit estimates consistently showed a poverty-reducing effect for all three poverty measures. Or, in other words, the higher the crops' prices, the higher will be the revenue and the lower the risk of poverty. The relationship between burglary as a concern in the village and household poverty is weak. By contrast, presence of a credit bank in a village consistently reduced poverty, regardless of the measure used. This evidence reinforces the case for financial inclusion.

In Table 3, we give results on the effects of returns on glutinous rice on the three measures of poverty. Based on a comparison between observed and expected number of cases for groups of 10 (Hosmer-Lemeshow Goodness-of-fit test) of the probit estimations, we fail to reject the null hypothesis that there is no difference between the observed and predicted values for the consumption and 'dollar' poverty estimations. That is, these models (consumption and 'dollar' poverty) in Table 3 fit the data. In all three cases of the Probit estimation, returns on glutinous rice show a strong poverty-reducing effect. Thus, the econometric analyses support the hypothesis that higher return of glutinous rice harvested reduces poverty. At the mean value of returns on glutinous rice (119.16 kip/season) and means of other correlates specified in Equation 2, the probability of being poor for the respective measures of poverty are: (1) 17 percent for consumption expenditure poverty; (2) 14 percent for food expenditure poverty; and (3) 29 percent for 'dollar' poverty. To achieve zero likelihood of being poor at the means of the other correlates of household poverty specified in Equation 2, returns on glutinous rice should be about 1600kip/season in the consumption expenditure poverty model, 3700kip/season in the food expenditure poverty model, and 2300kip/season in the 'dollar' poverty model.

Higher village price of glutinous rice sold and easier access to credit in the village reduce poverty regardless of the measure of poverty. In the case of the latter and for the consumption expenditure poverty model, households resident in villages that had easier access to credit were 26[3] percent less likely to be poor than those resident in villages without access to a credit bank. This finding is important in the current wave of financial (including microfinance) sector reforms in Lao PDR.

Similar to the results from Table 2, we observe that households with more persons working in non-agricultural sectors are less likely to be poor. This result is consistent across different measures of poverty and estimation techniques. In Table 3, households with larger land holdings are less likely to be poor than those with smaller land holdings. This result is observed for all three measures of poverty. Specifically, in the food expenditure poverty model, households with medium land holdings (2 hectares < =land <=5 hectares) are 35 percent less likely to be poor, while those with larger land holdings (land > 5 hectares) are 65 percent less likely to be poor than those with smaller land holdings.

In both Tables 2 and 3, age and education of household head and other household characteristics (size and dependency ratio) showed expected results in terms of statistical significance and sign.

---

[3] The value is ascertained using the STATA routine for computing percentages post logit estimation. We use logit estimation instead of probit, as such routines are not available for probit estimation.

Table 3: Regression results of household poverty in Lao-PDR
Dependent variables: consumption expenditure, food expenditure and 'dollar' poverty headcount

Explanatory variables	Consumption exp. poverty		Food exp. poverty		'Dollar' poverty	
	Probit estimation	IV Probit estimation	Probit estimation	IV Probit estimation	Probit estimation	IV Probit estimation
	(1)	(2)	(3)	(4)	(5)	(6)
Returns on glutinous rice per capita	-0.001	-0.001	-0.000	-0.001	-0.001	-0.001
	[-5.27]**	[-1.90]+	[-2.66]**	[-1.28]	[-6.01]**	[-0.94]
Village price of glutinous rice	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	[-2.17]*	[-2.24]*	[-4.66]**	[-4.78]**	[-2.79]**	[-2.67]**
Age head of HH	-0.007	-0.007	-0.009	-0.008	-0.009	-0.009
	[-3.01]**	[-2.62]**	[-3.57]**	[-2.82]**	[-3.80]**	[-3.90]**
District income Gini	-1.323	-1.333	-0.271	-0.299	-1.963	-1.932
	[-3.50]**	[-3.54]**	[-0.70]	[-0.79]	[-5.40]**	[-5.27]**
Head of household has completed at least lower secondary education[1]	-0.273	-0.266	-0.131	-0.118	-0.235	-0.239
	[-4.28]**	[-4.06]**	[-2.01]*	[-1.77]+	[-4.05]**	[-4.12]**
Head of household has completed at least upper secondary	-0.607	-0.582	-0.333	-0.288	-0.350	-0.368
	[-4.91]**	[-4.36]**	[-2.87]**	[-2.22]*	[-3.54]**	[-3.65]**
Head of household has completed at least vocational or university educ.	-0.560	-0.545	-0.347	-0.320	-0.572	-0.579
	[-4.11]**	[-3.90]**	[-2.67]**	[-2.36]*	[-4.83]**	[-4.90]**
Household size	0.196	0.187	0.192	0.172	0.214	0.221
	[14.36]**	[7.74]**	[13.85]**	[5.52]**	[16.10]**	[14.62]**
Number of kids under five in the household	0.151	0.146	0.147	0.138	0.129	0.131
	[4.96]**	[4.63]**	[4.73]**	[4.04]**	[4.39]**	[4.46]**
Number of adults in non-agricultural employment	-0.164	-0.170	-0.105	-0.114	-0.163	-0.156
	[-4.41]**	[-4.48]**	[-2.86]**	[-3.08]**	[-4.93]**	[-4.46]**
Availability of credit bank in the village	-0.172	-0.171	-0.156	-0.152	-0.152	-0.151
	[-2.13]*	[-2.13]*	[-1.88]+	[-1.84]+	[-2.09]*	[-2.07]*
Midland[2]	0.192	0.156	0.299	0.231	0.077	0.110
	[2.61]**	[1.58]	[3.94]**	[2.00]*	[1.10]	[1.33]
Upland	0.183	0.162	0.426	0.382	0.159	0.176
	[2.76]**	[2.12]*	[6.31]**	[4.18]**	[2.55]*	[2.66]**
Burglary is a minor problem in the village3	-0.207	-0.195	-0.205	-0.184	-0.043	-0.052
	[-2.21]*	[-2.04]*	[-2.17]*	[-1.87]+	[-0.49]	[-0.59]
Burglary is not a problem in the village	-0.060	-0.051	-0.105	-0.088	0.067	0.057
	[-0.65]	[-0.54]	[-1.11]	[-0.91]	[0.76]	[0.65]
Urban	0.030	0.008	0.103	0.059	-0.070	-0.051

	[0.39]	[0.09]	[1.32]	[0.62]	[-1.01]	[-0.68]
MonKhmer [4]	0.432	0.409	0.358	0.313	0.444	0.461
	[7.03]**	[5.29]**	[5.59]**	[3.54]**	[7.51]**	[7.41]**
ChineTibet	-0.253	-0.275	-0.056	-0.097	-0.447	-0.421
	[-1.21]	[-1.30]	[-0.27]	[-0.46]	[-2.21]*	[-2.05]*
HmongIuMien	0.225	0.199	0.134	0.087	0.261	0.283
	[1.61]	[1.34]	[0.93]	[0.56]	[1.90]+	[2.02]*
Other	0.021	0.062	0.386	0.452	0.494	0.453
	[0.06]	[0.19]	[1.26]	[1.45]	[1.66]+	[1.50]
North [5]	-0.569	-0.635	-0.841	-0.950	-0.526	-0.459
	[-4.16]**	[-3.58]**	[-6.23]**	[-5.50]**	[-4.25]**	[-2.95]**
Central	-0.336	-0.409	-0.302	-0.432	-0.177	-0.106
	[-2.58]**	[-2.23]*	[-2.41]*	[-2.24]*	[-1.51]	[-0.69]
South	-0.787	-0.865	-0.769	-0.904	-0.654	-0.573
	[-5.57]**	[-4.47]**	[-5.59]**	[-4.62]**	[-5.16]**	[-3.32]**
Medium land hold holdings (2 hectares < land <5 hectares) [6]	-0.218	-0.181	-0.263	-0.192	-0.221	-0.253
	[-3.74]**	[-1.96]*	[-4.37]**	[-1.75]+	[-4.11]**	[-3.69]**
Large land holdings (> 5 hectares)	-0.452	-0.378	-0.575	-0.432	-0.508	-0.573
	[-4.18]**	[-2.13]*	[-5.00]**	[-1.99]*	[-5.27]**	[-4.49]**
Constant	-0.317	-0.154	-0.361	-0.058	0.071	-0.079
	[-1.24]	[-0.39]	[-1.38]	[-0.13]	[0.30]	[-0.25]
N	4106	4106	4106	4106	4106	4106
Pseudo R2	0.228	-	0.212	-	0.226	-
Likelihood ratio test	1021.889	748.524	872.285	684.146	1190.795	905.574
P-Value (LR test)	0.000	0.000	0.000	0.000	0.000	0.000
Hosmer-Lemeshow	11.63(0.17)	-	18.29(0.02)	-	14.07(0.08)	-
Wald test of exogeneity	-	0.30(0.59)	-	0.67(0.41)	-	0.52(0.47)
Hausman		1.19(1.00)		2.94(1.00)		2.51(1.00)

t statistics in brackets ----- + p<.10, * p<.05, ** p<.01; 1 Reference group for head of household's education is primary and lower; 2 Reference category for altitude is low land; 3 Reference group for burglary is major burglary; 4 Base group for ethnic group is Lao-Tai; 5 Base group for region is Vientiane; 6 Reference group for land holdings is Small land holdings.

4. Conclusion

The study examines the effects of returns on all crops and glutinous rice on three measures of poverty, namely: consumption expenditure; food expenditure; and 'dollar' cut-offs. The main finding is that both returns on all crops and glutinous rice have a robust poverty-reducing effect. This finding supports the general view that increased agricultural productivity and growth have a poverty-reducing effect. Our simulations at the mean values show that the likelihood of being poor in terms of consumption expenditure is one out of every five households. Further, our estimated conditional probabilities show that, to eradicate consumption expenditure and food expenditure poverty, the latter will require higher returns on glutinous rice.

We also observed that larger land holdings, higher levels of education of the household head and having more persons employed in non-agricultural activities all have poverty-reducing effects. Some village-level characteristics also have poverty-reducing effects; in particular, higher than average village price of crops and glutinous rice, and easier access to credit in the village have considerable potential for reducing poverty.

Based on the IV estimations, a specific policy recommendation for Lao PDR is that making available a rice bank in the village and promoting the creation of either a farmers' association or a trade union in the village are important for ensuring that higher returns on crops lead to poverty reduction. From a broader policy perspective of accomplishing the goal of halving poverty by 2015, a few areas of policy concern are delineated. Of considerable importance is better integration of Lao PDR agriculture with sources of demand outside the country. While there is substantial cross-border trade of paddy with Thailand, and re-importation of milled rice, and of glutinous rice with Vietnam, the export potential is far from fully utilised. From this perspective, the Greater Mekong Sub-region (GMS) alone represents a huge market, with rapidly growing incomes and effective demand for products in which Lao PDR has actual or potential comparative advantage (e.g. temperate and off-season fruits and vegetables). So the potential for a demand pull stimulus to diversification and increase in aggregate production needs careful assessment. However, an overoptimistic assessment of such trade prospects must not overlook the emerging concerns for biosecurity, food safety and measures of sanitary and phytosanitary (SPS) and Lao PDR's limited capacity in addressing them, as these could come in the way of its accession to the World Trade Organization (WTO). Public-private partnerships must be forged for better enforcement and compliance.

To conclude, an accelerated transition to a more market-oriented policy regime may promote not just a more efficient agriculture, but also a more equitable outcome.

References

Datt G. and Ravallion M. (1998). 'Farm productivity and rural poverty in India'. *Journal of Development Studies* 34(4): 62-85.

Dorward, A., Kydd, J., Morrison, J. and Urey I. (2004). 'A policy agenda for pro-poor agricultural growth'. *World Development* 32(1): 73-89.

Gaiha, R. and Annim. S. K. (2010). 'Agriculture, GDP and prospects of MDG 1 in Lao PDR', *Economics Discussion Papers – EDP-1012*, University of Manchester, UK.

Irz X., Lin L., Thirtle C. and Wiggins S. (2001). 'Agricultural productivity growth and poverty alleviation'. *Development Policy Review* 19(4): 449-466.

Ivanic M. and Martin W. (2010). 'Poverty impacts of improved agricultural productivity: opportunities for genetically modified crops'. *AgbioForum.* 13(4): 308-313.

Ministry of Planning and Investment, Department of Statistics (2010). *Poverty in Lao PDR 2008* Lao PDR: Department of Statistics).

World Bank (2011a). *2011 World Development Indicators* (Washington, DC: World Bank).

World Bank (2011b). *Sustaining Growth Coping with Rising Uncertainty – LAO PDR Economic Monitor Dec 2011 – Update* (Vientiane, Lao PDR: The World Bank).

Appendices

Appendix 1: Descriptive statistics

Variable	Obs.	Mean	Std. dev.	Min	Max
Consumption expenditure poverty	5031	0.240	0.427	0	1
Food expenditure poverty	5031	0.206	0.404	0	1
'Dollar' poverty	5031	0.344	0.475	0	1
Return of crops harvested per capita	5031	342.34	931.99	0	15250
Return of glutinous rice harvested per capita	4106*	119.16	296.15	0	6000
Average village price of crops sold	5031	2743.65	3400.95	400	40035.71
Village price of glutinous rice	4106*	1924.50	390.41	750	4000
Age head of HH	5031	44.38	11.246	18	90
District income Gini	5031	0.291	0.071	0.13	0.60
Education of HH	5031	1.527	0.850	1	4
Household size	5031	5.831	2.208	1	26
Number of children under five in the HH	5031	0.756	0.929	0	8
Number of adults in non-agric. employment	5031	0.370	0.834	0	8
Availability of credit bank in the village	5031	0.131	0.338	0	1
Altitude	5031	1.753	0.872	1	3
Burglary	5031	2.354	0.636	1	3
Urban	5031	0.175	0.380	0	1
Ethnic group	5031	1.522	0.874	1	5
Region	5031	2.726	0.865	1	4
Land holdings (ha?)	5031	0.479	0.660	0	2
Rice bank in village	5031	0.158	0.364	0	1
Farmers' association/ union in village	5031	0.138	0.344	0	1

*In deriving the returns for glutinous rice harvested per capita, the sample reduced given that it is not all households that planted, harvested and sold glutinous rice in the last season.

Appendix 2: Correlation matrix of potential endogenous variables, dependent variables and instruments

Variable	Consumption expenditure poverty	Food expenditure poverty	'Dollar' poverty	Return of crops harvested per capita	Return of glutinous rice harvested per capita	Rice bank in village	Farmer's/trade union in village
Consumption expenditure poverty	1	0.67	0.775	-0.149	-0.145	0.072	-0.063
Level of significance		0.000	0.000	0.000	0.000	0.000	0.000
Food expenditure poverty		1	0.579	-0.123	-0.113	0.041	-0.065
Level of significance			0.000	0.000	0.000	-0.004	0.000
Dollar poverty			1	-0.177	-0.168	0.084	-0.067
Level of significance				0.000	0.000	0.000	0.000
Return of all crops harvested per capita				1	0.353	-0.062	0.054
Level of significance					0.000	0.000	0.000
Return of glut. rice harvested per capita					1	-0.066	0.033
Level of significance						0.000	-0.024
Rice bank in village						1	0.169
Level of significance							0.000
Farmers' association/ union in village							1

Appendix 3: First stage regression of household poverty estimations in Lao-PDR
Dependent variables: return of crops harvested per capita and return of glutinous rice harvested per capita

Explanatory variables	Return of crops harvested per capita			Return of glutinous rice harvested per capita		
	Consump-tion exp. poverty	Food exp. poverty	'Dollar' poverty	Consump-tion exp. poverty	Food exp. poverty	'Dollar' poverty
	(1)	(2)	(3)	(4)	(5)	(6)
Rice bank in village	-98.466	-98.469	-98.477	-26.112	-26.912	-21.754
	[-2.84]**	[-2.84]**	[-2.84]**	[-2.09]*	[-2.19]*	[-1.73]+
Farmers'association/ union in village	-	-	-	595.869	595.070	599.486
	-	-	-	[11.22]**	[11.19]**	[11.36]**
Village price of glutinous rice	-	-	-	-0.016	-0.016	-0.016
	-	-	-	[-1.29]	[-1.28]	[-1.30]
Average village price of crops sold	-0.016	-0.016	-0.016	-	-	-
	[-3.86]**	[-3.86]**	[-3.86]**	-	-	-
Age head of HH	-0.169	-0.169	-0.169	1.012	1.013	1.008
	[-0.14]	[-0.14]	[-0.14]	[2.36]*	[2.37]*	[2.35]*
District income Gini	1660.937	1660.936	1660.930	-60.682	-61.244	-57.645
	[9.50]**	[9.50]**	[9.50]**	[-0.92]	[-0.93]	[-0.87]
Head of household has completed at least lower secondary education1	32.605	32.605	32.605	12.635	12.658	12.514
	[1.07]	[1.07]	[1.07]	[1.16]	[1.16]	[1.15]
Head of household has completed at least upper secondary	27.108	27.108	27.108	50.215	50.228	50.143
	[0.54]	[0.54]	[0.54]	[2.86]**	[2.86]**	[2.86]**
Head of household has completed at least vocational or university education	22.301	22.301	22.301	30.341	30.365	30.205
	[0.41]	[0.41]	[0.41]	[1.56]	[1.56]	[1.56]
Household size	-46.319	-46.319	-46.318	-20.019	-20.013	-20.052
	[-7.09]**	[-7.09]**	[-7.09]**	[-8.49]**	[-8.48]**	[-8.50]**
Number of children under five in the household	-56.981	-56.981	-56.981	-7.546	-7.552	-7.517
	[-3.56]**	[-3.56]**	[-3.56]**	[-1.29]	[-1.29]	[-1.28]
Number of adults in non-agricultural employment	-33.263	-33.263	-33.263	-16.941	-16.961	-16.835
	[-2.08]*	[-2.08]*	[-2.08]*	[-2.90]**	[-2.90]**	[-2.88]**
Availability of credit bank in the village	-10.381	-10.380	-10.378	-584.213	-583.244	-588.764
	[-0.27]	[-0.27]	[-0.27]	[-10.77]**	[-10.74]**	[-10.94]**
Midland	117.115	117.115	117.116	-74.853	-74.785	-75.244

	[3.39]**	[3.39]**	[3.39]**	[-5.66]**	[-5.66]**	[-5.69]**
Upland	182.009	182.009	182.009	-39.456	-39.409	-39.721
	[5.39]**	[5.39]**	[5.39]**	[-3.24]**	[-3.24]**	[-3.26]**
Burglary is a minor problem in the village3	62.640	62.640	62.639	17.285	17.223	17.633
	[1.39]	[1.39]	[1.39]	[1.08]	[1.08]	[1.10]
Burglary is not a problem in the village	-37.055	-37.055	-37.056	18.461	18.435	18.606
	[-0.81]	[-0.81]	[-0.81]	[1.15]	[1.15]	[1.16]
Urban	-65.686	-65.686	-65.687	-62.711	-62.780	-62.322
	[-1.87]+	[-1.87]+	[-1.87]+	[-5.01]**	[-5.01]**	[-4.97]**
MonKhmer 4	-318.351	-318.351	-318.351	-46.202	-46.192	-46.264
	[-9.97]**	[-9.97]**	[-9.97]**	[-3.93]**	[-3.93]**	[-3.94]**
ChineTibet	-301.382	-301.382	-301.383	-58.920	-59.113	-57.883
	[-3.62]**	[-3.62]**	[-3.62]**	[-1.59]	[-1.59]	[-1.56]
HmongIuMien	-397.308	-397.309	-397.310	-60.692	-60.791	-60.155
	[-7.04]**	[-7.04]**	[-7.04]**	[-2.17]*	[-2.17]*	[-2.15]*
Other	-26.927	-26.927	-26.929	93.455	93.340	94.085
	[-0.19]	[-0.19]	[-0.19]	[1.55]	[1.54]	[1.56]
North5	272.599	272.600	272.600	-174.681	-174.569	-175.270
	[4.44]**	[4.44]**	[4.44]**	[-8.15]**	[-8.15]**	[-8.18]**
Central	-153.650	-153.650	-153.649	-180.450	-180.357	-180.958
	[-2.57]*	[-2.57]*	[-2.57]*	[-8.88]**	[-8.87]**	[-8.90]**
South	-62.783	-62.783	-62.782	-199.101	-198.989	-199.711
	[-0.99]	[-0.99]	[-0.99]	[-9.09]**	[-9.09]**	[-9.12]**
Medium land hold holdings (2 hectares < land <5 hectares)6	371.455	371.455	371.455	87.234	87.228	87.262
	[13.54]**	[13.54]**	[13.54]**	[8.81]**	[8.81]**	[8.81]**
Large land Holdings (> 5 hectares)	800.248	800.248	800.248	170.195	170.132	170.546
	[18.62]**	[18.62]**	[18.62]**	[10.56]**	[10.55]**	[10.58]**
Constant	53.520	53.520	53.522	401.033	401.115	400.565
	[0.50]	[0.50]	[0.50]	[9.26]**	[9.26]**	[9.25]**
N	5031	5031	5031	4106	4106	4106

t statistics in brackets   -----   + p<.10, * p<.05, ** p<.01; 1 Reference group for head of household's education is primary and lower; 2 Reference category for altitude is low land; 3 Reference group for burglary is major burglary; 4 Base group for ethnic group is Lao-Tai; 5 Base group for region is Vientiane; 6 Reference group for land holdings is Small land holdings.

The University of Manchester
Brooks World
Poverty Institute

MANCHESTER
1824

Executive Director
Professor David Hulme

Research Directors
Professor Armando Barrientos
Professor Rorden Wilkinson

Contact:

Brooks World Poverty Institute
The University of Manchester
Humanities Bridgeford Street Building
Oxford Road
Manchester
M13 9PL
United Kingdom

Email: **bwpi@manchester.ac.uk**

www.manchester.ac.uk/bwpi

The Brooks World Poverty Institute (BWPI) creates and shares knowledge to help end global poverty.

BWPI is multidisciplinary, researching poverty in both the rich and poor worlds.

Our aim is to better understand why people are poor, what keeps them trapped in poverty and how they can be helped - drawing upon the very best international practice in research and policy making.

The Brooks World Poverty Institute is chaired by Nobel Laureate, Professor Joseph E. Stiglitz.