



The Role of Human Capital on Economic Development and Poverty Reduction in Lao PDR

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**THE ROLE OF HUMAN CAPITAL ON
ECONOMIC DEVELOPMENT AND POVERTY REDUCTION
IN LAO PDR**

by

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Ph.D Dissertation

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TABLE OF CONTENTS

Acknowledgement	i
Table of Contents	ii
List of Figures and Tables	vi
Executive Summary	x
Chapter 1: Introduction	1
1.1: Background of the Study	1
1.2: Objectives of the Study	3
1.3: Organizational Structure	4
Chapter 2: Overview of Economic Development in Lao PDR	6
2.1. Recent Macroeconomic Developments of Lao PDR	8
2.1.1. Structures of Economy and Labor Market	8
2.1.2. The Influences of Asian Financial Crisis on Lao Economy	11
2.2. Poverty and Inequality in Lao PDR	12
2.3. The Supply of Education in Lao PDR	17
2.3.1. The levels of Educational Attainment in Lao PDR	17
2.3.2. Government Expenditure on Education in Lao PDR	20
Chapter 3: Human Capital and the Distribution of Earnings in Lao PDR	24
3.1. Human Capital and Wage Differentials in Transition Economies	25
3.1.1. Returns to Human Capital in Transition Economies	26
3.1.2. Wage Differentials in Public and Private Sectors in Transition Economies	29
3.2. The Distribution of the Public-Private Earnings in Lao PDR	31

3.3. Theoretical Framework and Empirical models	34
3.3.1. Theoretical Framework	34
3.3.2 Empirical model	36
3.4. Data Descriptions	39
3.5. Estimation Results	45
3.5.1. Returns to Human Capital in 1997/98	45
3.5.2. Returns to Human Capital in Public and Private Sectors in 2002/03	49
3.5.3. Returns to Education in the Private Sector in 2002/03	56
3.6. Concluding Remarks	59
Chapter 4: Entrepreneurial Human Capital and Micro/Small Business in Lao PDR ..	62
4.1. Human capital, entrepreneurship and micro/small business	64
4.2. Micro and Small Business in Lao PDR	67
4.3. Theoretical Framework and Empirical Models	71
4.3.1 Theoretical Framework	71
4.3.2 Empirical Models	72
4.4. Data Description	74
4.5. Estimation Results	78
4.6. Concluding Remarks.....	85
Chapter 5: Human Capital and Farm Productivity in Lao PDR	88
5.1. Farmer Education and Farm Efficiency	89
5.2. Key Features of the Agriculture Sector in Lao PDR	91
5.3. Theoretical Framework and Empirical models	95
5.3.1 Theoretical Framework	95

5.3.2 Empirical models	96
5.4. Data Description	97
5.5. Estimation Results	101
5.5.1 Education of Household Heads and Farm Productivity in 1997/98	102
5.5.2 Education of Household Heads and Farm Productivity in 2002/03	105
5.5.3 Education of Household Spouses and Farm Productivity	109
5.5.4 Farmer Education and Farm Productivity – Rates of Return per Year	112
5.6. Concluding Remarks.....	113
Chapter 6: Human Capital Accumulation of Young Generations in Lao PDR.....	115
6.1. Literature on School Enrollment Choice, Expenditure, and Achievement	117
6.2. Key Features of the Educational Attainments in Rural Lao PDR	119
6.3. Theoretical Framework and Empirical Models	121
6.3.1 Theoretical Framework	121
6.3.2 Empirical models	122
6.4. Data Description	124
6.5. Estimation Results	127
6.5.1. Household Demand for Schooling (probability of ever attending school)	127
6.5.2. Household Expenditures on Children’s Schooling	130
6.5.3. Children School Achievement (delay enrollment and grade repetition)	133
6.5.4 The Role of Public Policy	137
6.6. Concluding remarks	138
Chapter 7: Conclusion	141
7.1: Research Findings and Policy Implication	142

7.2: Remarks for Further Development	145
Bibliography	147
Appendix 2A	157
Appendix 3A	165
Appendix 4A	170
Appendix 5A	176
Appendix 6A	191

LIST OF FIGURES AND TABLES

Figures

Figure 2-1: Distribution of GDP and Employment in Lao PDR, 2003.	10
Figure 2-2: Poverty Map of Lao PDR	15
Figure 2-3: The Chart of Education System in Lao PDR	19
Figure 3-1: Distribution of Wage Earners by Type of Businesses in 2002/03	33
Figure 4-1: Distribution of Micro/Small Enterprises by Sub-sector	69
Figure 4-2: Employment in Micro/Small Enterprises by Region and Gender	70
Figure 4-3: Micro/Small Entrepreneurs and Education by Region and Gender	70
Figure 5-1: Household Agriculture Outputs in 2002/03	94
Figure 5-2: Household Agriculture Outputs for Market in 2002/03	94
Figure 5-3: Household Agriculture Outputs for Own Final Use in 2002/03	94
Figure 5-4: Percent of Households Using Chemical Inputs in 2002/03	95
Figure 6-1: Reasons why a child had never attended to school in 2002/03	120
Figure 6-2: Household expenditures on education per child in 2002/03	121
Figure 2A-1: Map of Male Literacy Rate	161
Figure 2A-2: Map of Female Literacy Rate	162
Figure 2A-3: Distribution of Primary School by District.	163
Figure 2A-4: Distribution of Secondary School by District.	164
Figure 4A-1: Distribution of Household Businesses in Lao PDR	170
Figure 6A-1: Boys at Risk to Delay Enrollment in Primary Education	191
Figure 6A-2: Girls at Risk to Delay Enrollment in Primary Education	192
Figure 6A-3: Internal Efficiency Indicators (Average Dropout Rate)	193
Figure 6A-4: Internal Efficiency Indicators (Average Repetition Rate)	194
Figure 6A-5: Internal Efficiency Indicators (Average Survival Rate)	195

Tables

Table 2-1 : Basic Indicators of ASEAN in 2006, (unit: U.S. Dollar)	7
Table 2-2: Basic Social Indicators of Lao PDR and the Neighboring Countries	7
Table 2-3: Macroeconomic Indicators of Lao PDR	10
Table 2-4: Percentage of the Population Living in Poverty.....	16
Table 2-5: Inequality of Per Capita Real Consumption, 1992/93-2002/03	16
Table 2-6: Structure of Literacy Rate (%) by Sex	17
Table 2-7: Structure of School Enrollment Ratio (%) by Sex	18
Table 2-8: Educational Services and Quality by Regions and Provinces in 2002/03 .	18
Table 2-9: Government Expenditure on Education by Levels	21
Table 2-10: Comparative data on selected macro variables across Asia countries ..	21
Table 3-1: Range of Monthly Earnings in Selected Occupations, Vientiane, 1993 .	32
Table 3-2: Average Monthly Earnings in Kip by Type of Businesses, 2002/03	33
Table 3-3: Means of Selected Variables by Region and Gender in 1997/98	42
Table 3-4: Means of Selected Variables by Region, Gender and Sector in 2002/03 .	42
Table 3-5: Earnings Functions by Region, Gender, and Pre/Post Transition	47
Table 3-6: Earnings Functions of the Public Sector by Region, Gender, and Pre/Post Transition in 2002/03	54
Table 3-7: Earnings Functions of the Private Sector by Region, Gender and Pre/Post Transition in 2002/03	55
Table 3-8: Earnings Functions with Education Levels in the Private sector in 2002/03 – Rates of Return per Year	58
Table 3-9: Summary of the rates of return to schooling in Lao PDR (%).	60
Table 4-1: Mean of Selected Variables	76
Table 4-2: Use of Schooling Years and Potential Work Experience	80
Table 4-3: Use of Educational Levels and Potential Work Experience	81
Table 4-4: Returns to Education per Year and Potential Work Experience	82
Table 5-1: Mean of Selected Variables in Lao Farming in 1997/98 and 2002/03	99
Table 5-2-1: Results of the Estimated Output Production Model in 1997/98 – Use of Schooling Years	103
Table 5-2-2: Results of the Estimated Output Production Model in 1997/98 – Use of Educational Levels	104

Table 5-3-1: Results of the Estimated Output Production Model in 2002/03 – Use of Schooling Years	107
Table 5-3-2: Results of the Estimated Output Production Model in 2002/03 – Use of Educational Levels	108
Table 5-4: Results of the Estimated Output Production Model – Farm Household Spouses.....	110
Table 5-5: Results of the Estimated Output Production Model – Rates of Return per Year	111
Table 6-1: Means of Key Variables in Education Determinants Analysis	125
Table 6-2: Determinants on Probability of Ever Attending Primary School	129
Table 6-3: Determinants of Household Expenditures on Child’s Education	132
Table 6-4-1: Determinants of Child School Achievement – Estimation Method: Probit Model	135
Table 6-4-2: Determinants of Child School Achievement – Estimation Method: Tobit Model.....	136
Table 6-5: Results of the estimated macro-level schooling model.....	137
Table 2A-1: Main Economic Activities for Population 10+, by Provinces and Regions 2002/03	157
Table 2A-2: Net School Enrolment (%) among Children 6-15 years old by Gender in 2002/03	158
Table 2A-3: Average Schooling Years and Literacy Rate by Regions and Provinces in 1997/98	159
Table 2A-4: Average Schooling Years and Literacy Rate by Regions and Provinces in 2002/03	160
Table 3A-1: Earnings Functions by Region, Gender, and Pre/Post Transition in 1997/98 – Use of Schooling Years	165
Table 3A-2: Earnings Functions of the Public Sector by Region, Gender, and Pre/Post Transition in 2002/03 – Use of Schooling Years.	166
Table 3A-3: Earnings Functions of the Private Sector by Region, Gender and Pre/Post Transition in 2002/03 – Use of Schooling Years	167
Table 3A-4: Earnings Functions with Education Levels in the Private Sector in the Pre-Transition 2002/03.....	168

Table 3A-5: Earnings Functions with Education Levels in the Private sector in Post-Transition 2002/03	169
Table 4A-1: Proportion of Households operating a business by Province	171
Table 4A-2: Selected Infrastructure Indicators by Provinces and Regions	172
Table 4A-3: Use of Schooling Years and Current Work Experience	173
Table 4A-4: Use of Educational Levels and Current Work Experience	174
Table 4A-5: Returns to Education per Year and Current Work Experience	175
Table 5A-1: Share of Household Agriculture Outputs for Market by Province and Region in 2002/03	176
Table 5A-2: Households with Access to Land and Productive Assets by Provinces and Regions (%).....	177
Table 5A-3: Access to Land and Productive Assets by Provinces and Regions in 2002/03	178
Table 5A-4: Agricultural Operated Land in 2002/03	179
Table 5A-5: Harvested areas and production of paddy rice in 2002/03.	180
Table 5A-6: Restrictions Households Faced by Provinces and Regions in 2002/03 (% of villages)	181
Table 5A-7: Agricultural Practices by Provinces and regions 2002/03	182
Table 5A-8: Agricultural production, by province and region in 2002/03. Annual income and costs, 1000 Kip/household	183
Table 5A-9:Productivity (revenue per hours of work) by sector and by provinces and regions.. Revenue and hours in millions per month. (Persons 10+)	184
Table 5A-10: Total Number of livestock by type and by province in 1000 heads .	185
Table 5A-11: Average number of livestock per household by type.....	186
Table 5A-12: Total number of poultry raised during last 4 weeks.....	187
Table 5A-13: Average number of poultry per household during last 4 weeks	188
Table 5A-14: Flood and Damaged Rice Fields in 1997 by Province.....	189
Table 5A-15: Flood and Damaged Rice Fields in 2002 by Province.....	190

EXECUTIVE SUMMARY

Lao society and education are embedded in a heritage of colonialism, socialist revolution and movement towards a market-economy and privatization. During the last two decades, Lao PDR has made advances in economic and educational growth, and poverty reduction. Nevertheless, Lao PDR is still classified as a “least developed country”. The GNI per capita was only 390\$ in 2004, and poverty incidence was 33.5% in 2002/03. Lao PDR ranked in the lowest countries at 133rd among 177 nations in term of human development index (UNDP, 2006). The development of education sector is one of the most priority strategies in national development plan (NGPES, 2003). At the present, universal primary education has not yet been achieved. The education sector remains inadequately planned, under-financed, and under-professionalized. The quality of instruction tends to be poor, and nearly half of those who enter do not complete the primary cycle.

The importance role of human capital on economic development and poverty reduction, through monetary/non-monetary benefits and macro/micro level, is widely recognized. Returns to investment in education based on human capital theory have been estimated since the late 1950s. Not only the academic literature on returns to schooling has increased both in quantity and quality, but the policy implications also have changed, too. No longer are returns to education seen as prescriptive, but rather as indicators, suggesting areas of concentration to guide macro policy decisions about the organization and financing of education reforms. Innovative use of rate of return studies is being used to both set overall policy guidelines and to evaluate specific programs. Unfortunately, evidence from Lao PDR has not yet been studied. Therefore, there is an urgent need to study the returns to education for Lao PDR.

This paper is the first comprehensive study on the role of human capital on economic development and poverty reduction for Lao PDR. The study consists of four empirical researches on the concepts of returns to investment in education and human capital accumulation by employing two sets of unusually rich national household survey (micro data) named LECS 2 in 1997/98 and LECS 3 in 2002/03. The empirical research works showed that the rates of return to education, for the representative of all sectors (wage earners, entrepreneurs, and farmers) and geographical regions, are relatively high.

First, for wage earners in Lao PDR, the research found that the rates of return to schooling are low by international standards, but relatively the same with other transition economies. The rates of return rise significantly during the transition from roughly 3% to 5%. The high rate of return observed for younger generations is one bright sign that the return would increase more as the market reforms take full effect. We also found a private sector earnings advantage, particularly workers with tertiary education level. The private-public sector wage differential suggests that it is difficult for the public sector to retain and attract skilled employees, and the widening wage gaps might promote inefficiency and moonlighting. Although painful, the best way to satisfy the need for higher public sector efficiency and ease the fiscal strain, may be to reduce public sector employment and pay higher wages to educated workers.

Second, for micro and small entrepreneurs (MSEs) in Lao PDR, the research found the rates of returns to schooling were high at 6-7%. For all groups, primary education was the most beneficial, whereas post-secondary education was found to be over-education. The findings suggested that basic literacy and numeracy are more important to their day to day operations. The advantages to conventional formal education had outweighed the returns to additional work experience. So far, skills

development is insufficiently linked to market demand and there is lack of integration of technical and business training. There are also ongoing problems with the basic quality and capacity building of teachers and trainers. Thus, local and international organizations should improve the delivery of business skills training programs suitable for MSEs.

Third, for farmers which cover over 80% of the total labor force in Lao PDR, The study found that farmer households in Lao PDR remain predominantly subsistent, labor intensive, short of irrigated land, lack of productive assets and chemical inputs. Present education levels of farmers are very low. In 2002/03, a half of household heads and three quarter of household spouses had less than primary education level. The very poor performance in human capital is that roughly 20% of the household heads and 44% of their wives were illiterate. Despite to the estimated results that farmers' education is quantitatively important in determining the farm productivity. The estimated rates of returns are relatively high by international levels and increase significantly over the study period, ranging from 4-5% to 6-7%.

Fourth, the study has analyzed the determinants of children's schooling attainment for rural farmers. Despite a high net enrollment rate for boys and girls, the fact is that only one-half of children starting at grade one reached grade five of primary school level. One of the most pressing immediate concerns of the education sector must be to increase timely enrollment of children and the completion rate at the primary school level. The analyzed outcomes showed that the role of parent educational levels is highly significant and quantitatively important on both the initial decision to send a child to school and a child's achievement in school. Generally, maternal education has a larger impact, particularly for completed of primary education. Moreover, girls continue to receive less education than boys. This study

has shown that the costs of uniform and textbooks/other educational materials are a heavy burden for rural farmers.

Overall, the study suggests that there is a high demand for education, particularly for primary level. Primary education, the most profitable sub-sector judging from the estimated rates of return results, especially outside of the capital, is much less subsidized than higher levels. In fact, the high subsidy levels for higher education contribute to the low rates of return for these sub-sectors. Currently, the supply of education in Lao PDR is significantly insufficient both quantitative and quality. The principal policy implications for policy makers are to allocate a higher government expenditure on education, especially to increase the supply of primary school and primary teachers. “Adult Literacy Campaigns” in rural areas may help to generate these improvements in well-being in the near future, and equally important is raising schooling levels among the current population of school-age children. Policies should be directed at reducing the delay enrollment and dropout rates of children by finding ways to relax the monetary constraint faced by households, particularly for the northern and the southern regions. Incentives such as free uniforms, free textbooks/other education materials, health support, and/or monetary payments to poor households may have roles to play here.

CHAPTER 1

INTRODUCTION

1.1. Background of the Study

Lao society and education are embedded in a heritage of colonialism, socialist revolution and movement towards a market-economy and privatization. During the last two decades, Lao People's Democratic Republic (PDR) has made advances in several areas, including economic and educational growth. Nevertheless, Lao PDR is still classified as a "least developed country". The GNI per capita was only 390\$ in 2004, and poverty incidence was 33.5% in 2002/03. Lao PDR ranked 133rd among 177 nations in terms of human development index (UNDP, 2006).

Lao PDR has undergone three basic reforms since its creation (ADB, 2000). The first reform, initiated in 1975, saw the elimination of French control and the emergence of independent Laos. A second reform was initiated in 1986 to move incrementally from a centrally-planned toward a market-oriented economy (policy known as *Chintanakaan Mai* or *New Economic Mechanism*). Major reforms in this transitional economy involved some divestment of state enterprises and development of a legal institutional framework for private economic and commercial activities. In 1991, a third reform was undertaken to respond to problems resulting from a period of decentralization, which had led to an increase in economic and educational inequities among provinces.

The long term development goals of Lao PDR are outlined in its National Development Framework while the National Growth and Poverty Eradication Strategy in 2003 (NGPES or Lao PDR version of PRSP) sets out actions and reforms to further its development agenda. Lao PDR aims to lift the country from least

developed country status by 2020. One of the most priority strategies is the development of education sector. Universal primary education has not yet been achieved. The education sector remains inadequately planned, under-financed, and under-professionalized. The quality of instruction tends to be poor, and nearly half of those who enter do not complete the primary cycle.

The importance of human capital as both a goal of economic development and a determinant of economic growth and poverty reduction is widely recognized. Human capital plays direct role in determining the welfare of households through increasing earnings (labor market outcomes). Schultz (1988) well-documented the monetary benefits of human capital. On the other hand, human capital also plays indirect role in determining the future welfare of households through its impacts on children's schooling, health, and etc. Strauss and Thomas (1995) provided a well review for the non-monetary benefits of human capital.

Interest in the returns to investment in education has been developed in economic research by both macro level [Solow (1956), Lucas (1988), and Romer (1990)] and micro level [Becker (1964) and Mincer (1974)]. For the literature in this subject, Krueger and Lindahl (2001) summarized these two disparate but related lines of research. On empirical works, Barro and Lee (2000) studied the affects of education on economic growth from cross-country data. Psachalopoulos and Patrinos (2002) established the world standard and patterns of the rate of return to schooling, using the Mincerian Human Capital Earnings Function. Moreover, Jamison and Lau (1982) surveyed the similar aspect for self-employed in worldwide.

Returns to investment in education based on human capital theory have been estimated since the late 1950s. Not only the academic literature on returns to schooling has increased both in quantity and quality, but the policy implications also

have changed, too. No longer are returns to education seen as prescriptive, but rather as indicators, suggesting areas of concentration to guide macro policy decisions about the organization and financing of education reforms. Innovative use of rate of return studies is being used to both set overall policy guidelines and to evaluate specific programs. Unfortunately, evidence from Lao PDR has not yet been studied. Therefore, there is an urgent need to study the returns to education for Lao PDR.

1.2. Objectives of the Study

This study is the result of an effort to analyze the role of human capital on economic development and poverty reduction, using econometric modeling of household level drawing on a detailed new micro-level dataset, the Lao Expenditure and Consumption Survey 1997/98 and 2002/2003. These surveys, known as LECS 2 and LECS 3 provide comprehensive socio-economic surveys of the living standards of households in all provinces of Lao PDR.

The principal objective of this study is to allow a comprehensive discussion of the returns to education in all key players in labor market in Lao PDR, namely paid employments, self-employed, and farmers. Each of these creates particular challenges concerning data availability and econometric method. The study will provide the first benchmark of demand for education by measuring the rates of return to schooling in each sector for Lao PDR. The study focuses on finding the determinants of earnings distribution, and regional differences and gender differences. Whenever the data is available, the changes in labor market will be monitored by comparing the results between 1997/98 and 2002/2003. A further objective of this analysis is to provide means to assess the likely impact on children's schooling in Lao PDR of specific policies seeking to improve the welfare of the future generation.

This study is of particular interest to policy makers, both domestic and in the donor community. The detailed findings would provide very helpful information for policy makers in order to plan and implement the educational finance in each sector more appropriately and effectively. Of course, it is clear that stable macroeconomic development is a precondition for generating growth and alleviating poverty. In brief, this study identifies four principal elements of a poverty reduction strategy for Lao PDR. These include (1) investments in primary education, particularly for female; (2) efforts to stimulate micro and small entrepreneurship; (3) adoption of measures to raise agricultural productivity; and (4) improved infrastructure.

1.3. Organizational Structure

The study begins from Chapter 2 with a macroeconomic overview covering significant changes to the Lao economy since the policy of NEM has launched. The broad trends of poverty incidence and the supply of education are especially analyzed. This is followed by three empirical researches related to monetary benefits of human capital, which cover all key players in labor market. Chapter 3 provides the analysis of the earnings distribution of wage earners. Chapter 4 considers self-employed and the investment in Micro/Small entrepreneurial ability. Chapter 5 focuses on the link between farmer education and farm productivity. The following Chapter 6, on the other hand, analyzes the non-monetary benefits of human capital on its impacts on children's schooling attainment. In each chapter, related literature reviews, theoretical frameworks and econometric models, and regression results are presented and discussed. The final Chapter 7 summarizes the research findings and proposes the appropriate and effective policy implications.

This paper is also accompanied by five appendixes, providing detailed data on

(2A) recent status of literacy rate and average schooling by regions and provinces; (3A) estimations of earnings functions using schooling years as the comparison to the results of using educational levels in Chapter 3; (4A) estimations of micro/small business performance using current work experience as the comparison to the results of using potential experience in Chapter 4; (5A) various information related to farming in Lao PDR, such as proportion of access to land and productive assets, agricultural practices, and restrictions farmers faced by regions and provinces; (6A) schooling indicators of delay enrollment, dropout rate, survival rate in primary education.

CHAPTER 2

OVERVIEW OF ECONOMIC DEVELOPMENT IN LAO PDR

Chapter 2 aims to provide a brief description and analysis of: (1) recent macroeconomic developments, particularly the structures of economy and labor market; (2) poverty and inequality; and (3) the supply of education in Lao PDR; as framework for the microeconomic analysis of the role of human capital that follows in later chapters. The focus is on the period of the large national household surveys conducted in 1997/98 and 2002/03. This period covers the Asian financial crisis and other significant macroeconomic changes that are likely to have an impact on this study.

Lao PDR is located in the middle of Indochina Peninsular, and landlocked by China (Yunnan), Vietnam, Cambodia, Thailand and Myanmar. Lao PDR has population of only about 6 million compared to the total area of 236,800 Km². After a long colonized era by France (1899 to 1953) and the civil war era, this country declared the independence in December 2, 1975. When Lao PDR initially moved from the central-planned to the market-oriented economy, the country has been engaged in a comprehensive program of economic reforms, especially the launching of the *New Economic Mechanism* (NEM) in 1986. The reforms marked the beginning of a major effort to overcome obstacles to the development of Lao PDR. The main objective of NEM is to utilize the approaches of the market-economy and to open up to international trade. The reform package is wide ranging¹.

¹ Details are available in *working paper* (2000), "Lao PDR: Post-1997 Macroeconomic Assessment and Future Directions," the Committee for Planning and Cooperation, Vientiane; and *document reports*, "Current Economic Developments in the Lao PDR and its Participation in AFTA," ASEAN Secretariat website.

Since the major economic reforms, the economy of Lao PDR has expanded remarkably. The growth recorded a relatively high rate at 7.3% in 2006. Broad economic growth has been relatively successful in raising incomes and reducing poverty since the early 1990s. But still, the economic position of Lao PDR ranks in as the latter development groups of ASEAN (CLMV: Cambodia, Lao PDR, Myanmar, and Vietnam) (see Table 2-1). The economic scale is the smallest among ASEAN, and the per capita GDP measured by purchasing power parity (P.P.P) was 2,280\$ in 2006. Roughly 80% of population lives in rural area. According to *Human Development Report in 2006*, CLMV countries, all together state in the bottom group in the world. Lao PDR ranked as 133rd among 177 nations and this indicates the lowest human development index among the ASEAN nations (see Table 2-2).

Table 2-1: Basic Indicators of ASEAN in 2006, (unit: U.S. Dollar)

	Total Area (1,000Km ²)	Population (million)	Nominal GDP (100 million)	Annual Growth Rate (%)	GDP per Capita Dollar	P.P.P
Cambodia	181	14.0	61.1	5.0	436	2,406
Lao PDR	237	6.1	35.3	7.3	575	2,280
Myanmar	677	57.3	119.5	7.0	209	1,589
Vietnam	330	84.2	609.7	8.2	724	3,600
Brunei Darussalam	5.8	0.38	118.5	3.8	30,929	25,940
Indonesia	1,819	222.1	3,642.9	5.6	1,641	4,930
Malaysia	330	26.7	1,497.3	5.9	5,611	11,993
The Philippines	300	86.9	1,171.3	5.4	1,348	5,102
Thailand	513	65.2	2,065.5	5.0	3,166	9,488
Singapore	0.7	4.5	1,322.7	7.9	29,500	29,066
ASEAN	4,466	567.4	10,643.7	5.8	1,876	5,392

Source: ASEAN Secretariat (2007), Basic ASEAN Indicators.

Table 2-2: Basic Social Indicators of Lao PDR and the Neighboring Countries, (unit: %)

	Urban Popul ation 2005	Life Expec tancy 2004	Adult Literacy 2000-2004		HDI Index 2006	Gini coeffici ent 2002	Population under 1\$(PPP) per day 2003	Poverty Line (each government definition)
			Female	Male				
Cambodia	17.7	56.5	64	85	129	0.450	33.8	34.7 (2004)
Lao PDR	21.6	55.1	61	77	133	0.347	28.8	33.5 (2002)
Myanmar	30.6	60.5	86	94	130	n.a	n.a	26.6 (2001)
Vietnam	27.0	70.8	87	94	109	0.370	9.7	19.5 (2004)
Thailand	32.5	70.3	91	95	74	0.420	0.7	9.8 (2002)

Source: ADB Key Indicators, 2006.

UNDP, Human Development Report 2006, (among 177 nations).

2.1. Recent Macroeconomic Developments of Lao PDR

2.1.1. Structures of Economy and Labor Market

Lao PDR is facing the problem of macroeconomic stabilization. The government budget deficit and trade deficit are constantly concerned issues. The budget revenue is much relied on the oversea grants and soft/long term loan. Nevertheless, the economy of Lao PDR has expanded remarkably since the major economic reforms, with an annual real growth rate of about 6% from 1990 to 2004. Also, the Lao economy was undergoing a notable degree of structural change (Table 2-3). The share of agricultural sector in GDP decreased by 12.6 percentage points from 61.2% in 1990 to 47.0% in 2004, the share of industrial sector increased sharply by 11.4 percentage points from 14.5% in 1990 to 27.3% in 2004, and the share of service sector was almost unchanged at about 26%. On the other hand, the agricultural sector remains predominantly subsistence in nature; nonetheless, it performed quite well with an annual growth rate of 3.5% in 2004. The industrial sector performed very well with an annual growth rate of 12.5%, and the service sector also performed well with an annual growth rate of 7.5%.

With respect to the labor market information, the total population of Lao PDR was 5.7 million in 2003 of which 49% were men and 51% were women. Of these 3.2 million were aged 15 years and over. This means the 44% of the population was below working age. According to the Lao Labor Market Indicators 2001-2003 (ILO, 2005), it showed that eight out of ten employed persons are working in agriculture, hunting, forestry and fishing during 2003. This did not change very much over the three years. However, the percentage in 2003 (82%) was slightly lower than in 1995 (86%). The proportion of persons employed in industry was almost the same as in services at around 9% in 2003. The numbers of people employed in industry and

services increased slightly over the three years. Thus, the agricultural sector accounts for 49% of the GDP compared to 82% of the employed population. The result is low productivity and low incomes placing a large number of the employed population among the working poor.

However, it is worth noting that the data for the proportion of the employed in agriculture is somewhat misleading since many workers classified as employed in agriculture have secondary jobs in off-farm activities such as household businesses. According to the LECS 2 (1997/98), 17% of rural households operated a business. Over one-half of the household businesses were operating on trade activities, especially as retails on a micro or small scale. Many rural households produced textiles for sale. On the other hand, it is also unclear whether self-employed and unpaid family workers will flow to which sector on each survey. In LECS 2, it showed that there was 13% of the employed population classified as self-employed, and another 10% as unpaid family workers. Only 10% was classified as paid employment (see Appendix 2A-1 for more details about labor market classification in LECS 3). Moreover, according to the Lao Labor Market Indicators 2001-2003 (ILO, 2005), 56% of the employed population was self-employed and another 26% was classified as unpaid family workers in 2003. Many people work on family farms and in the informal sector. Together, self-employed workers and contributing family members unpaid family workers in 2003. Many people work on family farms and in the informal sector. Together, self-employed workers and contributing family members accounted for 82% of the employed population. Official estimates for 2003 showed that only 14% were in paid employment, and a much smaller percentage (4%) were classified as private employers. Overall, various sources use different definitions making it difficult to paint a picture over time.

Table 2-3: Macroeconomic Indicators of Lao PDR

(unit:1 billion kips, where trade, foreign reserve, external debt, ODA and FDI=million \$)

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Nominal GDP	1,726	2,200	4,239	10,328	13,669	15,702	18,401	22,511	26,590
Growth Rate	6.9	6.9	4.0	7.3	5.8	5.8	5.9	5.8	6.9
Structure(%of GDP)									
Agriculture	52.9	52.8	53.3	53.7	52.6	51.2	50.4	48.6	47.0
Industry	20.9	21.1	22.5	22.6	22.9	23.7	24.7	25.9	27.3
Services	26.2	26.2	24.2	23.6	24.6	25.1	25.0	25.5	25.7
CPI (1995=100, 1999=100)	109.2	130.6	248.2	566.9	100.0	108.4	116.8	129.3	149.3
Kip/US\$ (average)	921	1,260	3,298	7,102	7,888	8,955	10,056	10,569	10,586
M2, % of GDP	14.2	18.4	20.4	14.9	16.5	17.2	18.7	18.2	18.8
Total Revenue ^a	217	228	376	929	1,691	1,979	2,329	2,327	3,325
Total Expenditure	375	412	847	1,719	2,513	3,169	3,136	3,379	5,189
Current exp.	168	192	268	449	808	1,134	1,371	1,452	n.a
Capital exp.	209	220	579	1,270	1,705	2,035	1,765	1,927	n.a
Budget deficit	-157	-184	-469	-790	-821	-1190	-807	-1051	-1864
Budget deficit/GDP (%)	-9.1	-8.4	-11.1	-7.6	-6.0	-7.6	-4.4	-4.7	-7.0
Trade deficit	-372	-335	-216	-253	-205	-191	-146	-127	-349
Export	317	313	337	302	330	320	301	336	363
Import	690	648	553	554	535	510	447	462	713
Current deficit	-233	-174	-30	-74	-5	-69	3	-43	-189
Foreign Reserve	170	113	113	105	140	134	194	213	227
External Debt	2,263	2,320	2,437	2,527	2,502	2,495	2,665	1,941	2,056
ODA (grants)	331	329	276	296	282	245	278	301	272
FDI	128	86	45	52	34	24	25	19	17

Source: ADB Key Indicators, 2006.

UNCTAD, Interactive database, Major FDI Indicators.

OECD, Aid Statistics, DAC Online.

^a excluding grants.

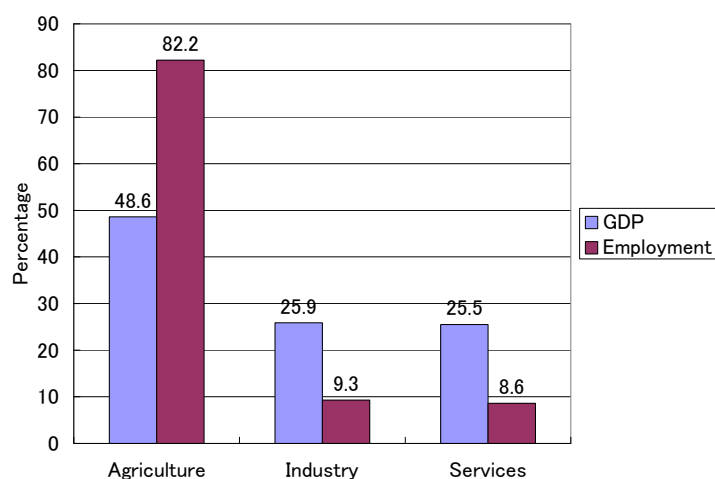


Figure 2-1: Distribution of GDP and Employment in Lao PDR, 2003.

2.1.2. The Influences of Asian Financial Crisis on Lao Economy

Since the Asian Financial Crisis occurred during 1997-1998, Lao PDR has also witnessed a period of very high inflation and an associated rapid decline in the Kip exchange rate. This price shock might have hurt poor households that are less capable to adjust to rapid inflation. The Asian crisis and the domestic price shock had far reaching effects on foreign economic relations as cross-border trade and investment flows were disrupted. Foreign investment flows declined rapidly during the 1997/98 to 2002/03 period. Yet, the declining exchange rate served to improve the Lao PDR trade balance: imports fell in 1997 and 1998, while the value of exports remained more or less stable. It is reasonable to expect that the macroeconomic turbulence caused by the Asian crisis mostly affect the internationally integrated parts of the Lao economy, with some secondary effects on income, consumption, and poverty levels in the household sector.

Although a slight slowdown in overall economic growth can be observed, it is likely that the impact has varied across provinces depending on how integrated they were in the international economy before the crisis. For example, households in Vientiane Capital and other provinces along the Mekong River may have been more dependent on developments in the Thai market than households in more remote areas of the country. Consequently, the decline in Thai demand immediately after the crisis probably had more severe effects in Vientiane Capital and the Mekong Valley provinces than in the northern and eastern parts of the country. The high rate of inflation may also have had asymmetric effects on different population groups, since it is uncommon that the prices of individual products increase at a homogenous rate in a high-inflation economy.

One notable change in the Lao PDR economic surroundings is the rise of China as a regional and global growth center. Vietnam to the east has also experienced rapid economic progress. This may have economic implications for regional development within Lao PDR. Traditionally, the Mekong Valley has been the center of economic activities, benefiting from favorable conditions for agriculture as well as trade and economic integration with Thailand. The northern part bordering China and eastern sections of the country adjacent to Vietnam has generally lagged in economic development and has been largely barred from outside trade and integration. However this might change as the Chinese and Vietnamese economies expand and as improved infrastructure opens up opportunities for economic exchange.

2.2. Poverty and Inequality in Lao PDR

Long-term changes in poverty incidence are closely linked to macroeconomic developments. It is undisputable that broad economic growth will lead to lower poverty, as long as there is not rapidly worsening income distribution. In brief, the gains in terms of poverty reduction are unevenly distributed across regions and population groups. Kakwani et. al (2002) studied LECS 2 highlighting a large number of determinants of poverty in Lao PDR. Warr (2005) analyzed the impact of roads on poverty using both LECS 2 and LECS 3 data, finding a positive effect of road access on household level consumption. Using LECS 3, Anderson et. al (2006) provided a more comprehensive discussion of the patterns and causes of poverty in Lao PDR.

During the period from the LECS 1 in 1992/93 to LECS 3 in 2002/03, Lao PDR experienced constantly high economic growth rates. Undoubtedly this contributed to a considerable fall in poverty rates. The rate of poverty reduction has slowed down during the following period up to LECS 3 in 2002/03. The period since

LECS2 is also associated with continued structural change as the agricultural sector's share in national GDP further declined as value added in industry expanded and the service sector had a largely constant share.

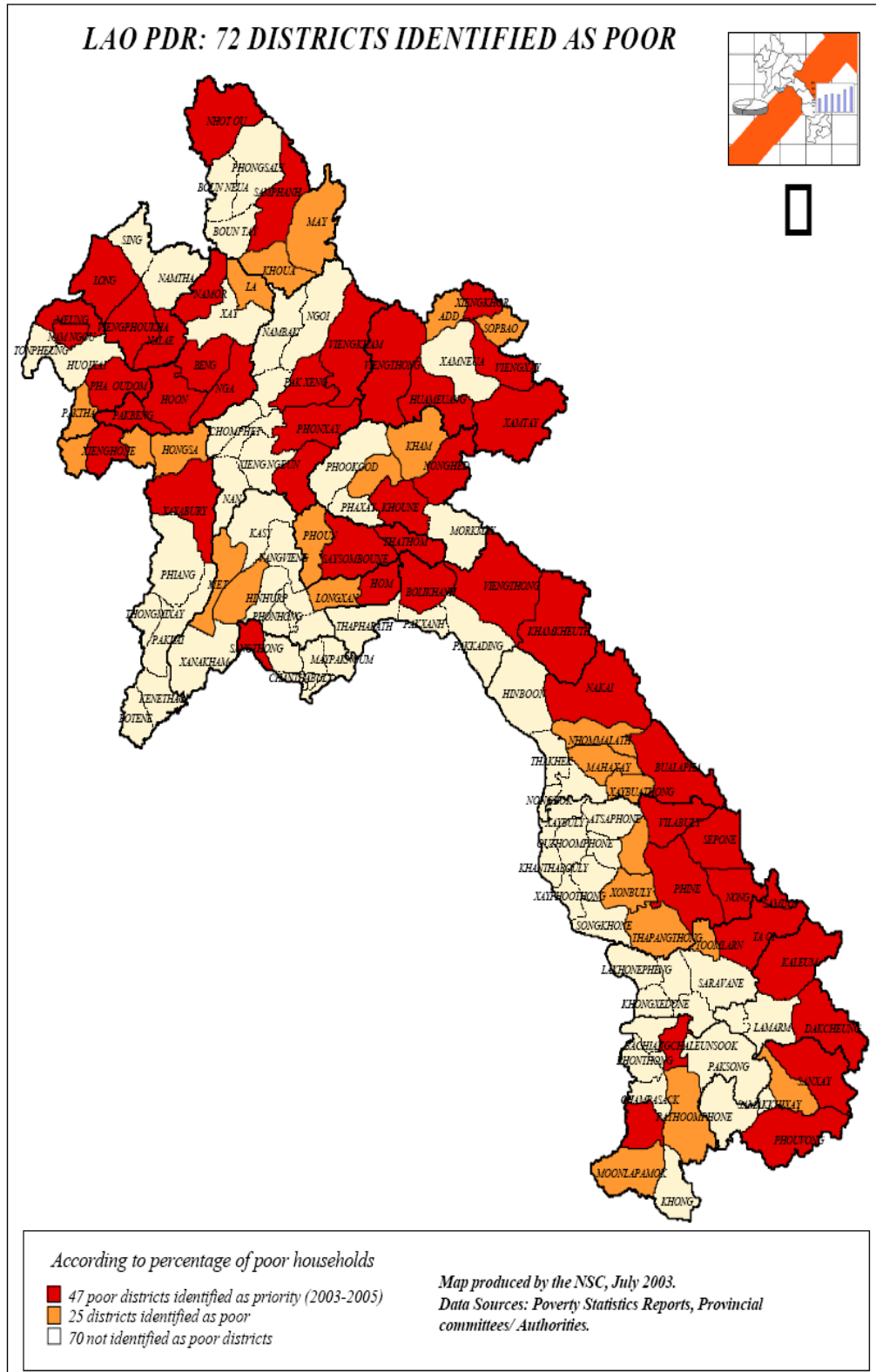
Transmitting the benefits of economic growth to the poor is essential to reduce poverty and raise the welfare of the most vulnerable. While poverty reduction requires economic growth, international evidence shows that growth alone is not sufficient to reduce poverty substantially. Given the lack of data, there is a very limited number of studies that concern the regional disparities in Lao PDR. Nevertheless, Bourdet (1998) has highlighted the disparities among the provinces and the regions, and evaluated the reform policy in force in Lao PDR since the mid-1980s. It showed that there was a large difference in GDP per capita between the provinces in LECS1 (1992/93). The wealthiest provinces of Vientiane Municipality (or Vientiane Capital in the present) and Vientiane province were more than two times larger than that of the poorest provinces of Huanphanh, Luangnamtha, and Phongsaly in the northern region. On average, the GDP per capita of the central region is 7% greater than that of the southern region and 62% larger than that of the northern one.

A large part of the country's population lives outside of the market economy and, as a result, the positive effects of growth were largely felt in urban areas and in lowlands. As shown in Table 2-4, evidence from LECS 1 in 1992/93 and LECS 2 in 1997/98 showed that the poverty incidence (the percentage of the population with consumption below the poverty line) dropped from 46.0% to 39.1%. This happened at a time when GDP growth averaged by 7.0%. In a similar period, the incidence of poverty in Vietnam dropped from 58% to 37%, albeit with an economic growth rate of 9.0%. During the same period inequality increased in Lao PDR, with the Gini indicator increasing from a relatively equitable 30.5 to 34.9. This is still quite

equitable compared with many other countries in the region; for example, Thailand has a Gini indicator around 50, indicating a substantial gap between wealthier and poorer households. Similarly, evidence from LECS 2 in 1997/98 and LECS 3 in 2002/03 showed that the poverty incidence dropped from 39.1% to 33.5%. During this period inequality slightly declined with the Gini indicator decreasing from 34.9 to 32.6.

Overall, Lao PDR has been relatively successful in reducing poverty since the early 1990s. However, the poverty reduction is unevenly distributed across regions and population groups. Only one half of provinces succeeded in reducing poverty over the period of 1992 to 2003. Many provinces experienced the down and up trend of poverty incidence, whereas the poverty level of Xayabury province, Borikhamxay province and Saravane province sadly kept on increasing over the study period.

As economic growth increases, the poor in Lao PDR face the risk of falling into a poverty trap. Households with human capital are in the best positions to take advantage of the opportunities generated by economic growth. Those without human capital may find themselves increasingly falling behind wealthier households, lacking the resources to invest in human capital for the future. While past economic growth in the country has benefited the poor, the biggest gainers have been the non-poor. Kakwani and Pernia (2000) estimate the elasticity between economic growth and poverty reduction is approximately 0.7, meaning that on average, a 1% increase in consumption growth will only reduce poverty by 0.7%. In the case of Lao PDR, economic growth does not contribute substantially to poverty reduction and the positive effect is largely offset by increases in inequality. This is low compared with growth-poverty elasticity in other countries in the region, such as Thailand.



Source: National Statistic Centre, 2003.

Figure 2-2: Poverty Map of Lao PDR

Table 2-4: percentage of the Population Living in Poverty, 1992/93, 1997/98, 2002/03

	1992/93	1997/98	2002/03	Change 92/93 to 97/98	Change 97/98 to 02/03
Lao PDR	46.0	39.1	33.5	-6.9	-5.6
North	51.6	47.3	37.9	-4.3	-9.3
Phongsaly	72.0	57.9	50.8	-14.1	-7.2
Luangnamtha	40.5	51.1	22.8	10.6	-28.3
Oudomxay	45.8	66.1	45.1	20.3	-21.0
Bokeo	42.4	38.9	21.1	-3.4	-17.8
Luangprabang	58.5	40.8	39.5	-17.7	-1.4
Huaphanh	71.3	71.3	51.5	0.0	-19.8
Xayaboury	22.4	17.7	25.0	-4.6	7.3
Center	45.0	39.4	35.4	-5.6	-4.0
Vientiane C.	33.6	13.5	16.7	-20.0	3.2
Xiengkhuang	63.0	42.9	41.6	-20.2	-1.3
Vientiane P.	30.7	27.8	19.0	-2.9	-8.8
Borikhamxay	16.6	27.9	28.7	11.3	0.8
Khammuane	47.1	44.5	33.7	-2.6	-10.8
Savannakhet	53.1	41.9	43.1	-11.2	1.2
Xaysomboon SR	-	62.8	30.6	-	-32.1
South	45.7	39.8	32.6	-5.9	-7.2
Saravane	43.6	39.2	54.3	-4.4	15.1
Sekong	67.0	49.7	41.8	-17.2	-7.9
Champasack	41.4	37.4	18.4	-4.0	-19.0
Attapeu	60.5	48.0	44.0	-12.4	-4.0

Source: Anderson et al. (2006)

Table 2-5: Inequality of Per Capita Real Consumption, 1992/93-2002/03.

	1992/93	1997/98	2002/03	Change 92/93 to 97/98	Change 97/98 to 02/03
Gini	30.5	34.9	32.6	4.4	-2.3
Quintile Shares					
First	9.3	8.1	8.6	-1.2	0.5
Second	12.9	12.0	12.4	-0.9	0.4
Third	16.2	15.5	16.1	-0.6	0.5
Fourth	21.6	20.7	21.4	-0.9	0.6
Fifth	40.0	43.7	41.6	3.7	-2.0

Source: Anderson et al. (2006)

As in most countries, the poor are located predominately in rural areas. The topography and the low population density of Lao PDR make many rural areas especially isolated and reduce the opportunities that the poor have to escape poverty. In terms of the percentage of the population living in poverty, the northern region is

the poorest in the country. Not surprisingly, Vientiane Capital and the central region have the lowest incidence of poverty. Poverty in Lao PDR is largely a problem located outside of the major cities. Although poverty has declined in all regions of the country, this decline has been slow.

2.3. The Supply of Education in Lao PDR

2.3.1. The levels of Educational Attainment in Lao PDR

In 1991, the government of Lao PDR launched the reform to respond to problems resulting from a period of decentralization, which had led to an increase in economic and educational inequities among provinces. The education systems that served in a command economy will have to be adapted to serve the needs of a market economy. This is reflected in high levels of improvement in adult literacy and school enrollment, especially a high increase in female literacy rate (15 years old and over) from 43% in 1990 to 61% in the early 2000s (Table 2-6), and a sharp increase in either gross secondary school enrollment or tertiary enrollment rate in both sexes from 1990 to 2002. Many adults who were illiterate have had access to primary school, which can be observed from the high gross primary school enrollment ratio over 100% in both sexes in 2002 (Table 2-7). Opening up the economy has provided many new income-earning opportunities, thus increasing the opportunity cost of schooling and perhaps reducing rates of return to schooling.

Table 2-6: Structure of Literacy Rate (%) by Sex.

	Female		Male	
	1990	2000-2004	1990	2000-2004
Pupils Starting	50.0 ^a	65.0 ^b	56.0 ^a	64.0 ^b
Grade 1 who Reach Grade 5				
Literacy Rate, 15 Years and Over	42.8	61.0	70.3	77.4
Literacy Rate 15-24 Years Old	60.6	75.0	80.0	83.0

Source: ADB, Key Indicators 2006.

Note: ^a refers to 1991.

^b refers to 2002.

Table 2-7: Structure of School Enrollment Ratio (%) by Sex.

	Female		Male	
	1990	2002	1990	2002
Gross Pre-Primary School	7.0	8.2	8.0	8.0
Gross Primary School	92.1	108.0	117.6	124.0
Gross Secondary School	19.2	37.0	31.1	50.0
Gross Tertiary	0.8	4.0	1.8 ^a	7.0

Source: ADB, Key Indicators 2006.

Note: ^a refers to 1991.

Table 2-8: Educational Services and Quality by Regions and Provinces in 2002/03.

Region/ Province	Primary school in village %	Lower secondary school in village %	Pupils per teacher Number	Primary schools			
				Textbooks available %	Regularly operating %	Operating mixed classes %	Operating half day classes %
Lao PDR	79	8	22	77	70	48	8
Urban	80	19	24	81	79	16	12
Rural with	81	11	21	78	72	48	8
Rural without	76	0	23	75	64	59	8
North	81	7	19	81	70	47	9
Phongsaly	95	0	15	95	95	60	8
Luangnamtha	75	4	18	75	71	63	12
Oudomxay	78	16	14	76	70	33	0
Bokeo	56	5	31	56	45	9	14
Luangprabang	78	4	29	78	61	52	9
Huaphanh	88	3	16	88	74	62	20
Xayaboury	94	10	15	94	79	39	5
Center	81	11	23	80	75	49	9
Vientiane C.	88	26	19	89	91	28	7
Xiengkhuang	88	9	18	88	71	59	44
Vientiane P.	73	14	23	73	71	21	2
Borikhamxay	88	6	37	88	81	67	1
Khammuane	84	7	25	84	72	68	6
Savannakhet	75	9	25	70	73	45	2
Xaysomboon	91	6	24	91	83	66	0
South	71	7	27	66	61	50	6
Saravane	63	7	27	58	52	42	11
Sekong	65	7	15	65	58	39	6
Champasack	77	5	32	69	65	59	2
Attapeu	89	22	22	87	89	44	7

Source: LECS 3, 2002/03

The education system in Lao PDR is categorized by 5 years of primary education, which children generally enter at age 6; 3 years of lower secondary and another 3 years of upper secondary education. A vocational education program is generally 2 years, and a technical education program is generally 3 years; both lead to a diploma. A higher education (university) lasts 4 to 6 years, depending on the program (see Figure 2-3). A post-graduate system did not exist until recent years. It first started in 2003 when an institute named NOSPA established a master program for MBA course. Later on, some faculties in National University have established the

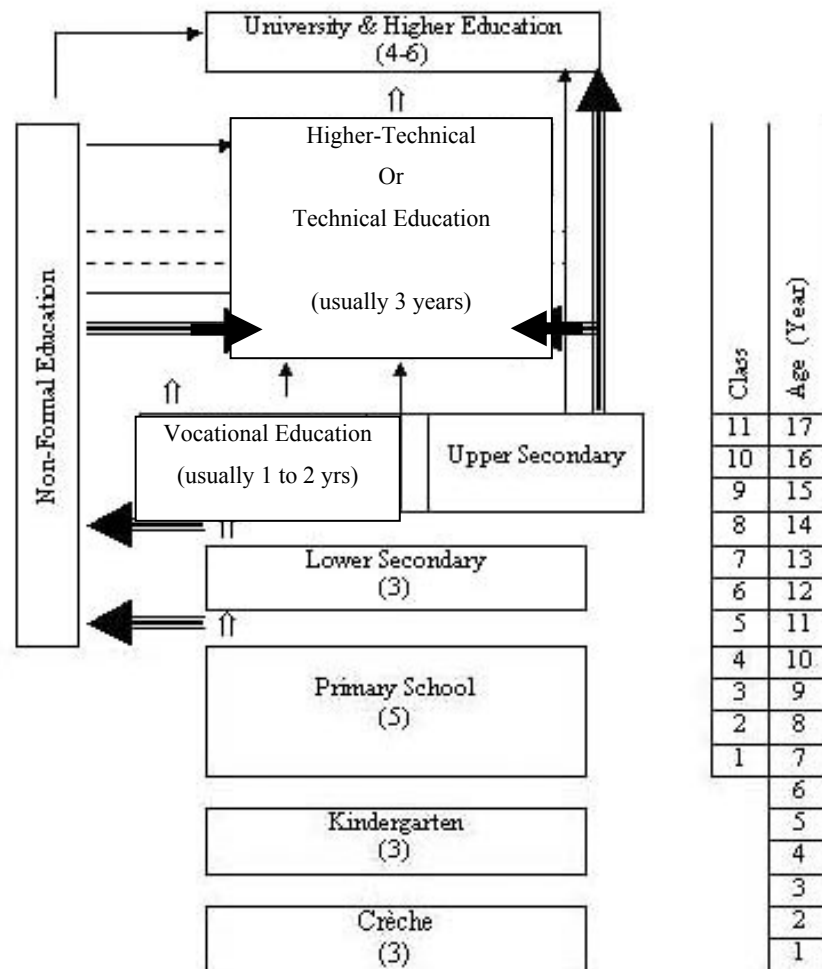


Figure 2-3: The Chart of Education System in Lao PDR

master programs. According to LECS 2, in all regions outside of Vientiane Capital, the average number of years of schooling is below 5 years which mean that most persons do not complete primary education. In general, the average schooling has been improved to 7-8 years, according to the report of LECS 3. Although most villages have their own primary school, less than half of the villages have a complete primary school and only 8% have a lower secondary school. Males tend to have both a higher literacy rate and longer schooling years in all regions (see Appendix 2A, Table 2A-3 and Table 2A-4). The insufficient educational services are a hard obstacle for those without completed primary school in rural regions.

In parallel to the insufficient supply of school in terms of numbers, the low quality of educational services is also the crucial problem (Table 2-8). Nearly one fourth of primary schools did not have textbooks available, especially for the southern provinces of Saravance, Sekong and Champasack. Similarly, roughly 30% of primary schools did not operate regularly. Less than half of primary schools in Bokeo province opened regularly. Furthermore, as many as one half of primary schools operated mixed classes. The issues of enrolment rate, delay enrolment, drop out rate and so on will be described more details in Chapter 6 of this study.

2.3.2. Government Expenditure on Education in Lao PDR

According to ADB key indicator 2005, a large amount of government expenditure has been expended on economic services, which consist of transport and communication, industry, agriculture, etc. It is concentrated on road improvement and other economic infrastructure. A very small amount of budget has been allocated to social infrastructure. Only about 1% of the budget was spent on the education sector

in the early 1990s. From 1997 to 2001, the expenditure on education has increased drastically to an average of 8%.

Table 2-9: Government Expenditure on Education by Levels (%).

	1990	1994/95	1999/00
Pre-Primary Education	4.1	3.3	3.6
Primary Education	43.7	46.0	48.7
Lower Secondary Education	18.5	16.9	16.7
Upper Secondary Education	9.1	7.1	8.3
Technical and Occupational Training	4.4	6.5	2.6
Teacher Training	7.1	4.8	2.7
Higher Education	5.8	8.4	6.8
Maintenance	7.3	7.2	11.1
Total	100	100	100

Source: WB, IMF, ADB (2002), *Lao PDR Public Expenditure Review: Country Financial Accountability Assessment*.

Table 2-10: Comparative data on selected macro variables across Asia countries

Country	F-LR	M-LR	PCR	PCI	GEE	PSE	PTR
Cambodia	64	85	63	279	2.9 ^e	65 ^g	53
Lao PDR	61	77	53	441	2.1	55	30
Malaysia	85	92	98 ^c	4305	4.9	37	19
Myanmar	86	94	55	191	1.2 ^f	48	32
Philippines	93	93	79	1201	3.4	55	35
Thailand	91	95	86 ^a	2656	4.8 ^e	50	21 ^h
Vietnam	87	94	86	314	3.0	43	28
Azerbaijan	98	100	88 ^a	395	3.0	15	17
Bangladesh	31	50	66	374	2.2	45	57
Bhutan	34	61	91	427	4.1	44	41
China	87	95	98 ^b	755	2.3 ^e	37	19
India	48	73	59	448	3.2 ^e	40	40
Kazakhstan	99	100	91 ^a	1323	4.4	10	19
Kyrgyz Republic	98	100	98 ^a	817	5.3 ^e	7	24
Mongolia	98	98	87 ^a	452	5.7	20	32
Nepal	35	63	46	229	3.2	49	37
Pakistan	36	63	70 ^d	511	2.7	48	44
Sri Lanka	89	92	98 ^a	799	3.4 ^e	75	23 ⁱ
Tajikistan	99	100	98 ^a	306	2.2 ^e	15	22
Average	75	86	79	854	3.4	40	31

Sources: World Bank (2001), United Nation (2004) and Asian Development Bank (2006)

Note: F-M LR= Female/Male Literacy Rate (%) (15years and over 2000-2004);

PCR= Primary Completion Rate (%) (2000); ^a refer to 1998-99, ^b 2001, ^c 2002, ^d 2004

PCI=Per Capita Income (\$) (1999);

GEE=Government Expenditure on Education (% GNP) (1997); ^e refer to 1996, ^f 1994

PSE=Pre-primary and Primary Expenditure as % of Total Education Expenditure (1996); ^g refer to 2000

PTR= Primary Pupil/Teacher Ratio (%) (2000); ^h refer to 1999, ⁱ 2002

In order to achieve universal primary education, the government of Lao PDR has spent a large amount of the budget on primary education. According to Lao PDR public expenditure review (2002), about one half of the government expenditure on the education sector was concentrated on primary education during the 1990s. Another one fourth was spent on secondary education (Table 2-9).

Given the lack of data, measuring the effect of government spending on the welfare of the poor is difficult. However, a study of the health and education needs of ethnic minorities in Lao PDR showed that education spending disproportionately benefits urban students. Estimates are that a university student receives a subsidy that is 20 times larger than the subsidy for a primary student (Research Triangle Institute, 2000). Likewise the increase in government capital expenditures probably tends to be biased towards wealthier households. In addition, it is believed that this caused the schooling gap between Vientiane Capital and other provinces increase, contributing to the overall increase in inequality.

It has long been well recognized that improvement in human capital is a key factor in economic growth; by this token, human capital – particularly human capital of farmers – has been sadly depreciated in most developing countries. Many countries in Asia, particularly those in the South Asian region, have performed at very low levels with respect to human capital. In many cases, one third of males, and two third of females are illiterate. Lao PDR provided slightly lower performance by the average levels related to human capital among Asian countries. However, with a higher per capita income than Cambodia, Myanmar and Vietnam, Lao PDR had the lowest literacy and primary completion rate among Southeast Asian nations. Whereas the literacy for women is about 60%, and for men is about 80%, the fact is that only one-half of children starting at grade 1 reach grade 5 of the primary school level. It also

can be observed that government expenditure on education of Lao PDR was very low compared to other countries in the region (Table 2-10).

Based on a brief description and analysis of recent macroeconomic developments related to the structures of economy and labor market, poverty and inequality and the supply of education in Lao PDR above, the following chapters will analyze the role of human capital on wage earnings (chapter 3), on micro/small enterprises' performance (chapter 4), on farm productivity (chapter 5), and on welfare of rural children (chapter 6).

CHAPTER 3

HUMAN CAPITAL AND THE DISTRIBUTION OF EARNINGS IN LAO PDR

Within the transition economies, Lao PDR is an interesting case study for the returns to investment in education. After a period of major economic reforms in 1986, macroeconomic stabilization is still far from being achieved. Privatization is progressing very slowly and the state continues to exert a strict control over the labor market. The state has adopted a very slow approach to economic reforms, which suggests that the incentive for human capital accumulation has been low. In fact, the public sector still represents an important part of overall economic output. This situation provides a unique study of many hypotheses developed in the economic transition literature about the size of the increase in the return to education, and about the determinants of such an increase. What role human capital plays in shaping economic transition in Lao PDR? How returns to education are affected by the ongoing economic transformation? More generally, does the speed of transition matter when looking at the evolution of returns to education during transition?

On the other hand, prior to the reforms, almost all non-agricultural employment was in the public sector and wages were determined by the state. In recent years, the economic transition in Lao PDR has resulted in sharp changes in the wage structure. Higher private sector wages are likely to have spillover effects on the public sector with resulting negative consequences for its fiscal position. Thus, the questions that need to be addressed are whether there are any wage differentials between the public and the private sectors and what are the implications of these differences.

In this chapter, we use recently collected earnings data from Lao PDR to estimate the private rates of return to education², particularly, the public-private sector earnings differentials. The above research questions will be answered by comparing two data sets from 1997/98 and 2002/03. In short, estimates of Mincerian earnings functions show significant differences in the returns to education over the transition for private and public sectors; for Vientiane Capital and other provinces; and also for females and males. The structure of this chapter is as follows: Section 3.1 reviews the returns to human capital and wage differentials in transition economies. Section 3.2 provides the context of the distribution of the public-private earnings in Lao PDR and Section 3.3 describes the data. Section 3.4 presents theoretical framework and empirical models. Section 3.5 analyses the estimation results, and Section 3.6 concludes.

3.1. Human Capital and Wage Differentials in Transition Economies

The human capital theory views wage earnings of a worker as return to his or her knowledge capital that have developed through years of schooling and work experience. Early works of Becker and Chiswick (1966) laid the foundation of this literature, and later Mincer (1974) proposed an empirical approach to distinguish the contributions of schooling and experience in wage earnings. Recent studies of education and wage determination are almost always embedded in the framework of Mincer, and combined with different contexts highlighting the additional importance of household and community characteristics, institutional factors, and other observable attributes such as gender, race, and religion. Willis (1986) provided a

² Note that the rates of return to education in this study mean the “private” rates of return. There is a concern in the literature with “social” rates of return that include true social benefits or externalities. Efforts to make such estimates are numerous, but the estimates vary widely. A recent review found that empirical evidence is scarce and inconclusive (Venniker, 2001).

survey of this literature, and Card (1999) surveyed the literature on the causal relationship between education and earnings. On the other hand, Schultz (1988) surveyed the work done in the context of developing countries. A detailed account of educational attainment and earnings across countries can be found in Psacharopoulos and Patrinos (2002).

In short, Psacharopoulos and Patrinos (2002) found that the classic pattern of falling returns to education by level of economic development and level of education are maintained. The world average rates of return by level to primary, secondary, and higher education are 27%, 17%, and 19%, respectively. Overall, the average rate of return to another year of schooling is 10%. The highest returns are recorded for low and middle-income countries in the Latin America/Caribbean and for the Sub-Saharan Africa region. Returns to schooling for Asia are at about the world average, and the returns are lower in the high-income countries of the OECD. Interestingly, average returns to schooling are lowest for the non-OECD European, Middle East and North African group of countries. Generally, women receive higher returns to their schooling investments. During the last decade, average returns to schooling have declined. At the same time, average schooling levels have increased. According to theory, everything else being the same, an increase in the supply of education has led to a slight decrease in the returns to schooling.

3.1.1. Returns to Human Capital in Transition Economies

For human capital and wage earnings in transition economies, on the other hand, the returns to education have been sketched some different pictures. The government used to set the wages of all workers employed in the public sector under the period of central planning. Wage equalization across individuals, regions and

sectors was a constant target of the central planner. However, regardless of differences in educational levels, some specific groups and sectors, such as the army and workers employed in the mining or manufacturing sectors, used to receive a special wage premium. How “high” were the rates of return to human capital under central planning? What are the effects of economic transition on the return to education? Should the return to education increase or decrease during transition? To answer these questions is not an easy task. The literature is not unanimous, which may also be because the evidence is still scarce. As suggested in Svejnar (1999) two possible routes can be taken when attempting to predict the return to education in transition economies. The first one would suggest that it should explode, as market mechanisms are supposed to wash away the egalitarian emphasis of communism. The opposite one implies that it should fall, as the “obsolete human capital” may not be very useful in the new economic environment. Various intermediate hypotheses are possible, such as the return to general and academic education should increase, especially for young people, whereas the return to work experience and tenure should decrease.

The evidence from centrally planned and transition economies is relatively limited. Nevertheless, it has been shown that the rates of return to education are usually low in centrally planned economies, for example, 3.1% in 1988 in China (Xie and Hannum, 1996), 4.8% in 1991 in China (Wei et al. 1999) and also in the early state of transition economies, for example, 4.8% in 1992/93 in Vietnam (Moock et al. 1998). More studies have been done in Central and Eastern European (CEE) countries as well as countries in the Commonwealth of Independent States (CIS), for example, for Hungary (Varga, 1995), Slovenia (Orazem and Vodopivec, 1995), Poland (Rutkowski, 1996), Czech Republic and Slovakia (Chase, 1998), and Belarus (Pastore

and Verashchagina, 2006). Most comprehensive analyses, relative to various CEE countries as well as countries in the CIS both in the pre- and post-transition era, suggested that the private rates of return to a year of education in centrally planned economies and transition economies were relatively low by international standards (Newell and Reilly, 1999; Svejnar, 1999; Brainerd, 2000; and Trostel et al., 2002). However, these studies found that the human capital payoff has increased almost constantly and universally though at a slow pace in the second half of the 1990s. In general, women had higher returns to education than men did.

More precisely, Newell and Reilly (1999) provided estimates of about 2% in the pre-transition period and between 4% and 5% over the first half of the 1990s. These figures give some indication of the extent to which human capital was undervalued under central planning. Similarly, generic and, even more so, job-specific work experience exhibits a lower return than in Western countries, also when combined with high education attainments (Orazem and Vodopivec, 1995; Newell and Reilly, 1999; and Svejnar, 1999). On the other hand, Brainerd (2000) found a larger increase in the returns to education in several CEE and CIS economies than that found in Newell and Reilly (1999). Surprisingly, Pastore and Verashchagina (2006) found that the skill payoff was high in Belarus in 1996, at about 10% and stable.

Moreover, Trostel et al. (2002) found that transition countries, over the period from 1985 to 1995, had rates of return to education that differed remarkably from one another. Two groups of countries can be disentangled: on the one hand, Bulgaria, Czechoslovakia, the Czech and the Slovak republic and Russia exhibited a coefficient for years of schooling ranging between 3.1% and 5.2%; on the other hand, Hungary, Latvia, Poland and Slovenia exhibited a coefficient for years of schooling ranging between 6.7% and 8.0%. The relevant coefficient in the pooled regression including

all the countries in the sample equaled 4.8%.

Using educational levels instead of years of schooling, most studies showed that workers with a higher level of education would receive a wage premium. Particularly, university education seemed to provide a much higher payoff than the reference level. But fewer studies have calculated “per year” returns to education. For instance, Varga (1995) found that private rates of return to secondary and higher education in Hungary are 8.2% and 13.4%, respectively. Moock et al. (1998) indicated that private returns to schooling by level of education are primary (13.5%), secondary (4.5%), and university (6.2%) in Vietnam. Chase (1998) provided the detailed in change of per year returns to education by gender in Czech Republic and Slovakia between 1984 and 1993.

The returns to experience were high, in some cases, but dramatically declined as soon as market mechanisms started to come into play and seniority rules to weaken. The returns to work experience were, for example, between 1.9% and 1.1 in Slovenia in 1987 and 1991 (Orazem and Vodopivec, 1995), between 3.1% and 2.1% in Poland from 1987 to 1993 (Rutkowski, 1996), slightly higher than 1% in Poland in 1996 (Adamchik and Bedi, 2000). The return to work experience was surprisingly high at 5% in Belarus in 1996 (Pastore and Verashchagina, 2006), and at 6.4% in Vietnam in 1992/93 (Moock et al. 1998). Brainerd (2000) concluded that the returns to work experience were mixed and did not show clear pattern.

3.1.2. Wage Differentials in the Public and Private Sectors in Transition Economies

Changes in the wage structure and wage differentials between the public and private sectors may have significant consequences. Increasing wage differentials may

make it difficult for the public sector to retain and attract workers (Katz and Krueger, 1991). Even if there are no recruitment problems, lower public sector wages may increase the incidence of moonlighting and adversely affect public efficiency. The issue of private-public wage differentials has been intensively explored for developed countries (for example, Smith, 1976; Shapiro and Stelcner, 1989; Rees and Shah, 1995; and Dustmann and van Soest, 1998). For recent work, as an example, Dustmann and van Soest (1998) found that potential wages for all educational groups are on average higher in the private sector than in the public sector in Germany, but this advantage fell according to age and education level.

However, fewer studies exist for developing countries (Van der Gaag et al., 1989; Rutkowski, 1996; Moock et al. 1998; and Adamchik and Bedi, 2000). For example, Van der Gaag et al. (1989) found that the wage disadvantage of civil servants is a determinant of the greater prevalence of moonlighting among public than private employees in Cote d'Ivoire and Peru. The evidence suggested that reductions in employment rather than pay, while being less palatable in the short term, will be more effective in the long run. Rutkowski (1996) displayed that there has been a complete reversal of the pre-transition wage structure and reports increasing returns to education, higher private sector educational returns, higher private sector wages, and an increase in wage inequality in Poland. Similar to Rutkowski (1996), Adamchik and Bedi (2000) came to the same results. They found a private sector earnings advantage in Poland, which was particularly pronounced at the university level. These findings may suggest that the public sector needs to pay in order to keep up. While wider wage gaps create problems, attempts to keep up are fraught with negative consequences. Paying higher wages will increase the wage bill and strain the fiscal position of the public sector.

On the contrary, Moock et al. (1998) found that workers in the public sector in Vietnam realize higher private rates of return to schooling than do private sector workers. However, they noted that this may not signal that productivity is better rewarded in the public sector. It may simply be a relic of the past policy of allocating educated labor to public sector positions. The fact that in the public sector workers with no or very little education earned more, on average, than primary, secondary or vocational school graduates suggests that there are significant distortions in public sector pay.

3.2. The Distribution of the Public-Private Earnings in Lao PDR

Little quantitative data is currently available on wages/salaries and incomes in Lao PDR (Table 3-1 and Table 3-2). In general, the salary scale in the government is low and increases very little with work experience. Government salaries appear to be well below the market level and salary increases are largely given as administrative rewards rather than as adjustments to market conditions. During the most recent bout of high inflation (1998 to 1999), public salaries were only adjusted once and in real terms fell dramatically. Evidence from the survey of wages by occupations in the capital in 1993 showed that salaries in state-owned enterprises and the private sector were substantially above those in the government, and that these salaries increased substantially faster than those in the public sector. The salary scale in the government is quite flat, with the salary of top managing officials about twice that of the low paid individuals. A top government official might earn only one tenth of the salary paid for a similar position in a private enterprise.

According to LECS 3, on average, workers in the public sector earned only one half or less compared to their counterparts in the private sector. Within the public

sector, public administration salaries are relatively high compared to their counterparts employed in the education and health sectors. In fact, government wages normally range from 150,000 to 500,000 kips. If additional income, for example, extra income from working with an international project, is excluded, the difference of earnings between the public and private sector is much larger.

For the private sector, the respondents were classified according to the International Industrial Standard Classification (ISIC). The manufacturing, construction and commerce are three main subsectors accounting for over two-third of total paid employees (see Figure 3-1). The manufacturing sector represented the biggest proportion at 29% in the capital, following by the construction and commerce sectors at 18% each. The other subsectors varied from electricity, hotel and restaurant, financial intermediation, and other business activities. On the other hand, the commerce was the biggest subsector represented at 31% in other provinces. The proportions of the construction and transport sector in other provinces were slightly higher than those in the capital. The remaining subsectors were mainly other service activities such as watch repair and motorbike/bicycle repair.

Table 3-1: Range of Monthly Earnings³ in Selected Occupations, Vientiane, 1993.

Occupation	Monthly Earnings in Kip	Ratio
Private Sector		
Garment Workers	29,000 – 90,000	1.6 – 2.7
Restaurant Workers	20,000 – 70,000	1.1 – 2.1
Motor Vehicle Mechanics	30,000 – 75,000	1.7 – 2.3
Unskilled Construction Workers	30,000 – 50,000	1.7 – 1.5
Skilled Workers	40,000 – 60,000	1.2 – 1.8
Brewery Workers	30,000 – 40,000	1.7 – 1.2
Supervisory Workers	60,000 – 80,000	3.3 – 2.4
Technician	40,000 – 80,000	1.2 – 2.4
Managers, Large Firm	140,000 – 300,000	7.8 – 9.1
Public Sector		
Government Employee	18,000 – 33,000	1.0 – 1.0
Production Worker, State Firm	30,000 – 70,000	1.7 – 2.1

Source: World Bank, 1994. (Note: Government Employee =1)

³ Average market exchange rate in 1993 was at 716 kip/dollar.

Table 3-2: Average Monthly Earnings⁴ in Kip by Type of Businesses, 2002/03

Type of Business	Vientiane Capital	Ratio	Other Provinces	Ratio	Lao PDR	Ratio
Private Sector						
Manufacturing	785,000	1.5	503,000	1.2	597,000	1.3
Construction	703,000	1.3	537,000	1.3	580,000	1.3
Commerce activities	2,535,000	4.8	1,192,000	2.9	1,450,000	3.1
Transport	1,222,000	2.3	812,000	1.9	885,000	1.9
Other service activities	647,000	1.2	634,000	1.5	639,000	1.4
Public Sector						
Public administration	527,000	1.0	418,000	1.0	463,000	1.0
Education and Health	373,000	0.7	383,000	0.9	380,000	0.8

Source: LECS 3 in 2002/03. (Note: Public Administration = 1)

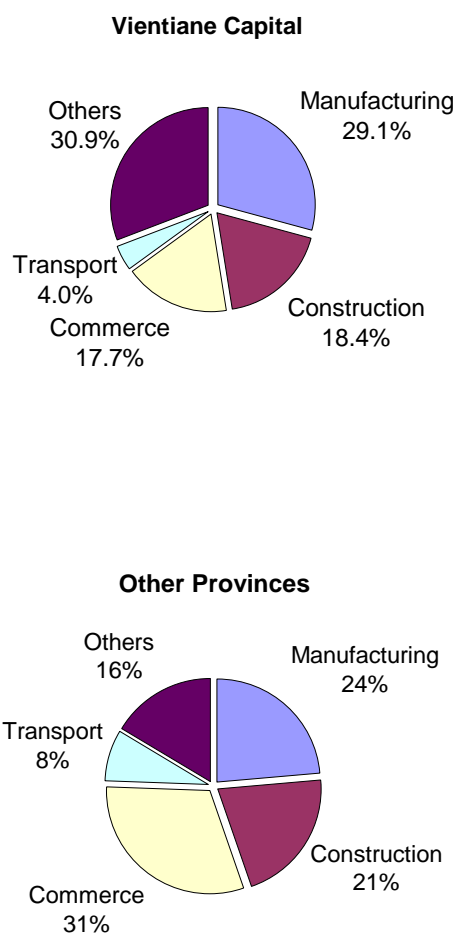


Figure 3-1 Distribution of Wage Earners by Type of Businesses in 2002/03

⁴ Average market exchange rate in 2002 was at 10,056 kip/dollar

Workers in the commerce activities and transport usually have (roughly two to five times) higher earnings than other subsectors, especially for workers in the capital. Conversely, workers in the manufacturing sector in other provinces seem to receive significantly lower earnings than other subsectors. With respect to gender disparities in earnings, there are many gender-specific jobs in Lao PDR that are difficult to compare. For example, males tend to work in construction and transportation sectors, whereas females tend to work in commerce activities, especially in retails on a micro or small-scale business. But, except the commerce activities, a male worker may receive 20% to 50% more than a female worker in each sector. Likewise, the average monthly earnings in Vientiane Capital is also 20% to 50% more than the amount in the remaining seventeen provinces, depending on type of business. The combined data showed a slightly upward trend in Vientiane Capital due to its dominance.

3.3. Theoretical Framework and Empirical models

3.3.1. Theoretical Framework

Becker and Chiswick (1966) presented a theoretical and empirical analysis on human capital and the distribution of earnings on two inter-related strands of research. One was a model of the supply and demand for funds for investment in human capital. While the basic idea that the individual's optimal level of human capital investment occurs where the marginal rate of return from the investment equals the marginal interest cost of funds had been developed earlier, the supply and demand functions for funds for investment were made explicit.

The other strand was an alternative approach for estimating rates of return from human capital to understand the determinants of the distribution of earnings. Previous estimates of the profitability of investments in human capital used earnings

streams and the net present value approach (Friedman and Kuznets, 1945; Mincer, 1962; and the references therein). In Becker and Chiswick (1966), the simplest formulation earnings for person i in year j (E_{ij}) were related to earnings if there were no investment (E_{i0}) plus the sum of annual return from past human capital investments, $\sum_{j=1}^n r_{ij} C_{ij}$, where r_{ij} is the i th person's rate of return from this person's investment (C_{ij}) in the j th period. Defining k_j as the investment (forgone earnings and direct costs) in year j relative to what the earnings would have been if there were no investments in year j , $k_j = C_j / E_{j-1}$. Then it can be shown:

$$E_{ij} = E_{i0} + \sum_{j=1}^n r_{ij} C_{ij} = E_{i0} + \sum_{j=1}^n r_{ij} k_{ij} E_{i,j-1} \quad (3-1)$$

Using the principle of mathematical induction and then taking logarithms,

$$E_{ij} = E_{i0} \prod_{j=1}^n (1 + r_{ij} k_{ij}) \rightarrow \ln E_{ij} = \ln E_{i0} + \sum_{j=1}^n \ln(1 + r_{ij} k_{ij})$$

Using the property that $\ln(1 + \partial) \approx \partial$ if ∂ is a small number,

$$\ln E_{ij} \cong \ln E_{i0} + \sum_{j=1}^n r_{ij} k_{ij} \quad (3-2)$$

Thus, the natural logarithm of earnings is expressed in terms of the rate of return from the investment (r_{ij}), the investment ratio (k_{ij}) and the number of periods of investment (n). The product rk is referred as the "adjusted rate of return = r' "⁵.

If r' is constant for all levels of investment, equation (3-2) can be written as:

$$\ln E_{ij} = \ln E_0 + r' n_i + U_i \quad (3-3)$$

⁵ Note that conceptually this coefficient is not the rate of return from investment in schooling, but rather is the product of the average rate of return and the average investment ratio. Only if it can be assumed that $k=1$ this is the rate of return. Nearly all estimates of rates of return from schooling using this procedure unwittingly assume that $k=1$. This need not be the case. For example, if out of pockets costs and some forgone earnings costs of schooling are subsidized, k is smaller than unity and r' is an underestimate of the rate of return from schooling.

where the error term U_i measures differences across individuals in the omitted variables that influence earnings, including other forms of human capital and luck. It was also demonstrated that estimates of rates of return for distinct levels of schooling can be obtained by creating separate variables, say, for years of primary, secondary, and higher education. However, the evaluation of the on-the-job training component had to wait for Mincer (1974).

In 1974, Jacob Mincer published his classic study, *Schooling, Experience and Earnings*. He showed that “the inclusion in the earnings function of even crude measures of post school investments in addition to schooling lends a great deal of scope to the analysis of income distribution”. To expand the earnings function in equation (3-3), Mincer made assumptions as to how the investment in on-the-job training in each year declines as years of experience increases. He developed four functional forms, one for each of the four cells defined by “dollar investments” vs. “time equivalent investments”, and “linear forms” vs. “exponential forms” of declines in investments. Largely due to data availability, time equivalent investment ratios are preferred. Even though the assumption of a linear decline is simplicity, the exponential decline in investment would have greater consistency with economic theory. Inequality in years of schooling and in years of labor market experience, as well as the rates of return from these investments could explain most of the variation in earnings inequality over time and across countries and regions of countries.

3.3.2 Empirical model

Turning to methodology in this study, our basic model is taken from Mincer (1974). Mincer has provided a great service and convenience in estimating return to education by means of the semi-log earnings function (raw-form), first done in Becker

and Chiswick (1966). The model of Mincer, which is well known as “Human Capital Earnings Function”, included the log of individual earnings as the explained variable, and schooling and experience as explanatory variables.

$$\ln Y_i = c + \alpha S_i + \beta Ex_i + \gamma Ex_i^2 + u_i \quad (3-4)$$

where Y_i is monthly earnings for an individual i , S_i is a measure of his/her schooling, Ex_i represents a measure of (potential) work experience defined by (age – schooling years – 6), and u_i is a residual error.

The earnings function method is used to estimate average rate of return to different levels of schooling by converting the continuous years of schooling variable S into a series of dummy variables representing the different levels of schooling, and other individuals’ characteristics. After fitting the extended earnings function (dummy-form):

$$\ln Y_i = c + \alpha_1 PRIM_i + \alpha_2 SEC_i + \alpha_3 TER_i + \beta Ex_i + \gamma Ex_i^2 + \theta X_i + u_i \quad (3-5)$$

where $PRIM_i, SEC_i, TER_i$ are primary, secondary, and tertiary (including vocational/technical and university) education by individual i , and X_i are dummy variables indicating female, rural area, type of businesses, and regions. The omitted category for the level of education is no education, for type of business is other service activities, and for regional dummy is Vientiane Capital.

Furthermore, we also attempt to monitor the rate of return to education in the pre- and post-transition era by dividing the sample into two groups:

- (1) workers with 11 years or less experience and workers with 12 years or more experience for the data set of LEC 2;
- (2) workers with 16 years or less experience and workers with 17 years or more experience for the data set of LEC 3.

In terms of rates of return per year to different levels of schooling are then calculated as follows:

$$\begin{aligned}
 r_{PRIM} &= \alpha_1 / S_{PRIM} \\
 r_{SEC} &= (\alpha_2 - \alpha_1) / (S_{SEC} - S_{PRIM}) \\
 r_{TECH} &= (\alpha_3 - \alpha_1) / (S_{TECH} - S_{SEC}) \\
 r_{UNIV} &= (\alpha_4 - \alpha_2) / (S_{UNIV} - S_{SEC})
 \end{aligned} \tag{3-6}$$

The average number of years of schooling for the four levels of education is: primary = 5, secondary = 6, technical = 3 and university = 5. However, it is incorrect to assume that primary school graduates forego earnings for the entire duration of their studies. Therefore, only one year of foregone earnings is assumed for primary school graduates. Unfortunately, for the case of data set in 1997/98, the educational levels were not clearly defined. We need to assume that schooling years of 5, 11, 14, and 16 equal to primary, secondary, technical, and university levels, respectively.

In addition, given the lack of data - such as family background information and school quality - that can be used to either directly control for unobserved ability or as an instrumental variable (IV) for completed education, we opt to use only OLS for the estimations. To correct for possible selection bias in the earnings equations, as seen in many literatures, we also apply Maximum Likelihood (ML) estimates. Since ML yields strongly similar results with OLS, we simply show OLS results. It is worth noting that Card (2001) reaffirmed Griliches' (1970, 1977) conclusion regarding to the effect of ability and related factors does not exceed 10% of the estimated schooling coefficient. IV estimates of the return to education are higher than classic OLS estimates (based on Mincer-Becker-Chiswick). The estimation method makes little difference on the return to education.

3.4. Data Descriptions

Ideally, a rate of return to investment in education should be based on a representative sample of the country's population. It is problematic when the estimated rates of return are based on a survey of firms – rather than households – because such approach leads to the use of samples on large firms in urban areas. Typically, the questionnaire is filled by the payroll department rather than by the individual employee. Despite the urgent need for labor market information, the current statistics in Lao PDR are very limited. Only two urban labor force surveys were conducted during 1992 and 1994. The 1995 population census contained useful data for employment and unemployment. It is also possible to obtain information from the Lao Expenditure and Consumption Surveys of 1992-1993, 1997-1998 and 2002-2003. While the LECS 1 was combined with a large module of social indicators, the LECS 2 and LECS 3 versions focused on economic activities of the households. These surveys did not follow international standards for collecting labor statistics. “Lao labour market indicators 2001-2003” is the only survey that follows international standards for labor statistics. This, in turn, makes it difficult to paint a picture over time.

In this research work, we attempt to apply the data of LECS 2 and LECS 3 as bench marks to examine the return to schooling among wage earners (paid employees) on the focus of regional and public-private sector differences in Lao PDR during 1997-2003. In view of limited data on labor statistics for this period, these surveys are deemed very useful to study the impacts of schooling on income in the post-reform era. Also, this paper is the first of its kind to study the return to human capital in Lao PDR during its economic transition and during the pre/post Asian Financial Crisis period.

These surveys were conducted by Swedish International Development Agency (SIDA) and National Statistical Centre of Lao PDR from March 1997 to February 1998 and from March 2002 to February 2003, respectively. For LECS 2, the sample was made up of interview conducted in 8,882 households, 57,624 persons from 450 villages, which covered 1% of total population. In this survey, there were 1,488 samples classified as paid employment in the last 12 months. After clearing the missing data, 1,354 samples were remained for the analysis. About top 1% and bottom 1% of data (outliers) are trimmed. Finally, we have 1,320 observations: 480 from Vientiane Capital and 840 pooled from the remaining 17 provinces. 382 observations were female. Since the LECS 2 data that is used in this study was undertaken during the period of the Asian Financial Crisis, it is necessary to note about its impact on earnings data. Although the level of inflation was high compared with rates reported in other Southeast Asian countries and probably had some harmful effect on economic growth, inflation was not a serious problem in Lao PDR until mid 1998. Moreover, the wages and salaries were not adjusted during the period of the survey. Therefore, it is believed that there is no impact of the regional financial crisis on the earnings data.

Similarly to LECS 2, the survey of LECS 3 was conducted by interviewing 8,092 households, 49,790 persons from 540 villages. In this survey, there were 6,890 samples reporting about income and transfers received in the prior to the interview month. The majority of samples was in the agriculture sector. After clearing the missing data, 2,219 samples of individual incomes (wages, salaries in cash) were remained: With respect to data clearing, since a minimum wage for the public sector is officially set, only top 1% of data (outliers) is trimmed. For the private sector, about top 1% and bottom 1% of data (outliers) are trimmed. Finally, 2,166 samples of

individual income data (wages, salaries in cash) are analyzed: 681 for the public sector and 1,485 for the private sector. 807 observations are female.

Despite the unusually rich data set of LECS 3, there were some limitations in the observations of LECS 2 that need to be described. First, the respondents only answered by number of schooling years without the clear levels of educational attainment. Thus, we categorized the education levels by the exact number of schooling as following: 0 to 4 years of schooling as less than primary level, 5 to 10 years of schooling as primary level, 11 years of schooling as secondary level, and 12 years of schooling or over as post-secondary level. The post-secondary education did not distinguish between vocational, technical or university level. Second, the income earnings data in LECS 2 were classified by the status of paid employment and other characteristics. Thus, it can not be distinguished whether paid employment was in the public sector or private sector. This causes a problem because public sector wages typically do not reflect market wages. Hence, it is expected that the rates of return to schooling in LECS 2 (1997/98) are low by including a part of the public employment. However, public employment pay-based rate of return estimates are useful in private calculations regarding the incentives set by the state to invest in education.

Summarizing the data of LECS 2, Table 3-3 presents the characteristics of the samples including, earnings (in thousand kip), schooling years, education levels, and age (potential work experiences). The samples are also classified into two geographical areas namely Vientiane Capital and the rest of the country. It is worth noting that Vientiane Capital alone comprises roughly one third of the sample size, which could justify the classification. The average age of the interviewees was about 35 years old.

Table 3-3: Means of Selected Variables by Region and Gender in 1997/98

Variable	Vientiane C.			Provinces			Lao PDR		
	Male	Female	All	Male	Female	All	Male	Female	All
Mixed Public and Private Sector									
Monthly Earnings (1,000 kip)	86	58	77	65	50	61	72	53	67
Years of Schooling	10.0	9.5	9.9	9.2	8.6	9.1	9.5	9.0	9.3
<i>Education Level (%)</i>									
Less than Primary	7.4	6.4	7.1	10.7	12.4	11.2	9.6	9.9	9.7
Primary	50.3	51.9	50.8	49.8	50.9	50.1	50.0	51.3	50.4
Secondary	8.6	20.5	12.5	15.8	17.7	16.3	13.3	18.8	14.9
Tertiary	33.6	21.2	29.6	23.6	19.0	22.4	27.1	19.9	25.0
Age	35.3	28.7	33.1	37.2	30.0	35.3	36.5	29.5	34.5
Observations <i>N</i>	324	156	480	614	226	840	938	382	1,320

Source: LECS 2 in 1997/98. (Average market exchange rate in 1997 was at 1,260 kip/dollar)

Table 3-4: Means of Selected Variables by Region, Gender and Sector in 2002/03

Variable	Vientiane C.			Provinces			Lao PDR		
	Male	Female	All	Male	Female	All	Male	Female	All
Public Sector									
Monthly Earnings (1,000 kip)	518	316	467	434	280	399	466	295	425
Years of Schooling	11.5	11.6	11.6	9.4	9.3	9.4	10.2	10.3	10.2
<i>Education Level (%)</i>									
Less than Primary	7.7	3.0	6.5	14.2	14.7	14.3	11.8	9.9	11.3
Primary	21.5	25.4	22.5	34.9	31.6	34.1	29.9	29.0	29.7
Secondary	11.3	16.4	12.6	12.7	12.6	12.6	12.1	14.2	12.6
Tertiary	59.5	55.2	58.4	38.3	41.1	38.9	46.2	46.9	46.4
Age	40.8	31.9	38.5	39.8	32.8	38.3	40.2	32.4	38.4
Observations <i>N</i>	195	67	262	324	95	419	519	162	681
Private Sector									
Monthly Earnings (1,000 kip)	883	1,230	1,034	745	814	775	785	934	850
Years of Schooling	8.3	6.9	7.7	6.3	5.0	5.7	6.9	5.6	6.3
<i>Education Level (%)</i>									
Less than Primary	18.1	28.9	22.8	29.6	37.6	33.1	26.3	35.0	30.1
Primary	42.8	42.8	42.8	50.8	54.4	52.3	48.5	51.0	49.6
Secondary	19.3	17.6	18.6	11.6	5.5	8.9	13.8	9.0	11.7
Tertiary	19.8	10.7	15.8	8.0	2.6	5.7	11.4	5.0	8.6
Age	34.7	30.8	33.0	36.5	34.0	35.4	36.0	33.1	34.7
Observations <i>N</i>	243	187	430	597	458	1,055	840	645	1,485

Source: LECS 3 in 2002/03. (Average market exchange rate in 2002 was at 10,056 kip/dollar)

Considering the levels of educational attainment in Lao PDR, the proportion of paid employees with less than primary education was surprisingly very low even in the other provinces. On the contrary, the proportion of paid employees with tertiary education was very high. On average, the schooling years were very high at roughly 10 years in all regions. Two main reasons can be noted for these results: first, the majority of samples was in the public sector mainly covered in the urban city in each province; second, the time spent on short term, for example training or learning languages such English and French that should not be counted, may take into account.

The earnings, on the other hand, recorded a significant difference between employees in the capital and the rest of the country, namely the average monthly earning in Vientiane Capital was 77,000 Kip, whereas this amount was only 61,000 in other provinces.

Like in many other economies, females earn lower rates than men. For example, males earned 33% more than females in Vientiane Capital, 23% in other provinces. Similar to the gross amount, earnings classified according to education levels also showed a clear difference between regions and among the education levels themselves. In Vientiane Capital, as expected, the higher education level one achieved, the higher the wage income. In other provinces, however, all salary levels were about the same as the primary level in the Capital, regardless of the education level reached.

Summarizing the data of LECS 3, Table 3-4 presents the brief characteristics of the samples in the private and the public sectors, which includes monthly earnings, schooling years, education levels, and age. The samples were also classified into two geographical areas namely Vientiane Capital and the rest of the country (17 provinces) as well as the case of LECS 2. Again, Vientiane Capital alone comprises roughly one third of the sample size, which could justify the classification.

On average, the schooling years ranged between 5 and 8 years in the private sector and between 9 and 12 years in the public sector. These were the exact same level as in neighboring Vietnam (Moock et al. 1998). Although fewer now than in the past, the majority of university graduates end up in public sector employment in many countries. The concentration of graduates in public sector employment is identified as a problem in growth studies (Pissarides, 2000). Workers in Vientiane Capital had a higher schooling year than those in other provinces in both sexes and sectors.

On the other hand, education at the primary and secondary levels did not vary much among gender, regions and sectors. However, the proportion of workers without education recorded a significant difference between male and female in all regions and sectors. The ratio for males was roughly one half of that for females. Moreover, the higher the education level, the larger the gap was between male and female, and between Vientiane Capital and other provinces. The average age of the interviewees was about 38 years old in the public sector and 35 years old in the private sector, which results in comparable potential work experience.

Monthly earnings by education showed significant differences in the private and public sectors among regions. On average, workers in the private sector received two times more than their counterparts in the public sector. The gap between two sectors was larger especially for tertiary educated workers and in other provinces. A private worker with a university education level may receive four times higher than his or her counterpart in the public sector in other provinces. In the public sector, on the other hand, a worker with a primary education level may earn more than higher education graduates in the other provinces suggesting that there are significant distortions in public sector pay. It is likely that factors other than education (perhaps,

as in China and Vietnam, membership in the Communist Party) have an impact on public sector pay in Lao PDR.

3.5. Estimation Results

3.5.1. Returns to Human Capital in 1997/98 (LECS 2)

The empirical analysis employed two types of the earnings function to estimate the rate of return to human capital in 1997/98, namely a dummy-form and a raw-form of earnings function⁶. The results of the analysis are presented in Table 3-5 for the dummy-form and in Table A3-1 of Appendix 3A for the raw-form. As discussed in the model description, dummy variables for various education levels, gender, and regions were also included. The results could be viewed into three aspects: (1) Vientiane Capital vs. Other Provinces; (2) Males vs. Females; and (3) Pre-transition vs. Post-transition.

In terms of regional differences, except for primary education, most variables of schooling/ educational levels and experiences are statistically significant at least at the 5% level. The dummies for secondary and post-secondary levels indicated a significant increase in earnings as the educational level rises. In particular, it is interesting to observe that the increment in the earnings at the post-secondary level for Vientiane Capital was about 37% compared to the less primary level, and much higher than the amount for the same level in other provinces. At the secondary level, the figure varied between 22% and 28% for Vientiane Capital and the other regions respectively. On average a female would earn roughly 16% to 25% less than a man regardless of her location. For the results of estimating a simple (raw-form) earnings function, the returns to human capital were marginal investments. An additional

⁶ All regressions in this study are tested for heteroskedasticity by White method (White, 1980). The null hypothesis is homoskedasticity. White's test statistic (cross terms) is distributed as Chi-squared and heteroskedasticity is corrected by White heteroskedasticity consistent covariance function embedded in software Eviews.

schooling year would yield 3.9% and 2.2% more earnings in Vientiane Capital and other provinces, respectively. The returns to one additional year of experience would increase earnings by 3.6% in Vientiane Capital and 1.1% in other provinces (Table A3-1). The estimates for the whole sample are upward biased due to the large number of observations in Vientiane Capital.

A more detailed categorization of data into the northern, central and southern regions has confirmed our expectation, that employment outside Vientiane Capital would yield a lower wage income. Especially, a worker in the northern, central and southern regions would earn lower than his/her counterpart in the capital among males and in the pre-transition period. These results lend support to the argument of Bourdet (1998). As can be noted, the regional differences are significant in these two variables due to the economic structure and working environment. Like many capital cities in the world, Vientiane Capital is the political, economic and cultural center of the country with the base of the government. The level of development and business activities is by far higher than any other urban cities. This implies that a person with a higher education background and experience is likely to have better opportunities in finding a well paid job in a private enterprise or an international organization. The salary paid largely reflects the education level and experiences. On the other hand, with a relatively small private sector, the public sector employs a significantly large portion of the labor force in other provinces, particularly those in more remote areas. By law, civil servants in Lao PDR receive the same wage rate regardless of location. This wage, however, does not reflect the market wages. Therefore, the upper end of education level (post-secondary) would not lead to an increase in earnings; rather imply an over-qualification in many cases.

Table 3-5: Earnings Functions by Region, Gender, and Pre/Post Transition in 1997/98.

Variable	Vientiane C.	Provinces	Lao PDR				
			All	Males	Females	Pre-transition	Post-transition
Primary	0.0912 (0.88)	0.0757 (1.44)	0.0804 (1.77)	0.0696 (1.16)	0.1441 (1.83)	0.0526 (1.01)	0.2783* (2.04)
Secondary	0.2826* (2.37)	0.2202** (3.46)	0.2378** (4.24)	0.2402** (3.28)	0.2927** (3.23)	0.1656* (2.51)	0.5076** (3.55)
Tertiary	0.3719** (3.38)	0.2416** (3.96)	0.3012** (5.73)	0.2989** (4.50)	0.3286** (3.63)	0.2662** (4.38)	0.4946** (3.59)
Experience	0.0390** (5.21)	0.0115* (2.04)	0.0235** (5.12)	0.0255** (4.45)	0.0266** (3.40)	0.0132 (1.45)	0.0098 (0.22)
Experience-squared/100	-0.0623** (-3.95)	-0.0142 (-1.22)	-0.0351** (-3.62)	-0.0375** (-3.27)	-0.0523** (-2.59)	-0.0196 (-1.22)	0.0764 (0.24)
Female	-0.2472** (-4.53)	-0.1562** (-4.20)	-0.1862** (-6.54)	-	-	-0.1951** (-4.99)	-0.1764** (-3.47)
Northern	-	-	-0.2438** (-5.66)	-0.3761** (-6.78)	0.0802 (1.20)	-0.3232** (-6.35)	-0.0168 (-0.19)
Central	-	-	-0.1807** (-5.12)	-0.1950** (-4.53)	-0.1682** (-3.31)	-0.2299** (-5.69)	-0.0858 (-1.36)
Southern	-	-	-0.1939** (-5.44)	-0.2342** (-5.20)	-0.1015 (-1.72)	-0.2458** (-5.68)	-0.1039 (-1.51)
Constant	10.5357 (86.58)	10.6441 (128.20)	10.6990 (156.73)	10.7057 (126.82)	10.4065 (102.44)	10.9205 (85.36)	10.4460 (52.32)
Adjusted R ²	0.160	0.061	0.120	0.098	0.079	0.115	0.089
F-test	16.23**	10.05**	21.04**	13.77**	5.07**	14.63**	5.04**
N	480	840	1,320	938	382	948	372

Note: Dependent variable is the natural log of monthly earnings.

t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.

The omitted category for the level of education is less than primary, and for regional dummy is Vientiane Capital

White heteroskedasticity consistent covariance is applied for an equation in column three "All".

The difference between males and females was not significant in all regions. Similar to the regional differences, the coefficients of schooling years/educational levels and experience are statistically significant at the 1% level except for primary level. For the years of schooling, the rates of return for females and males were both the same at about 3%. In terms of return to experience, the difference between the genders was also negligible (Table A3-1). As can be seen in Table 3-5, a marginal increase in earnings between persons with a secondary and post-secondary level in all regions was also very small. For example, a woman with secondary and post-secondary education was likely to earn about a 30% and 33% higher salary than a woman with a less primary education background, respectively. The figure for male workers at the secondary and post-secondary levels was about 24% and 30%, respectively.

In sum, the rates of return to human capital in 1997/98 were low compared with the return to education estimated for other developing countries. These results are supported by many previous studies. For example, in China the estimates of the return to schooling were 3.1% in 1988 (Xie and Hannum, 1996), and 4.8% in 1992/93 in Vietnam (Moock et al. 1998). When experienced workers (the pre-transition) and young workers (the post-transition) are estimated separately, the rate of return to education rise from 2.67% to 3.35%, particularly workers with secondary education or over. Scarce over-time evidence, however, seems to be showing that successful reform will eventually lead to higher return. More precisely, an empirical analysis of changes in the wage structure in Slovenia between 1987 and 1991 revealed that the return to human capital rise dramatically during transition. Workers with four years of university education gained the most in relative earnings, followed by those with two years of university. The education

group that gained the least, however, relative to the least educated, were holders of vocational degrees (Orazem and Vodoivec, 1995). In Hungary, the private rate of return almost doubled in secondary between 1971 and 1993, and there was a three-and-a-half-fold increase in the return to higher education (Vargaa, 1995). Moreover, in Czech Republic and Slovakia between 1984 and 1993, especially in the returns to male workers rise from 2.4% to 5.2% and 2.8% to 4.9% in Czech Republic and Slovakia, respectively (Chase, 1998).

3.5.2. Returns to Human Capital in Public and Private Sectors in 2002/03 (LECS3)

Similar to the previous section, the empirical analysis employed two types of the earnings function to estimate the rate of return to human capital in 2002/03 with further distinction between the public and private sectors in each analysis. The results of the analysis for the public and private sectors are presented in Table 3-6 and Table 3-7 for the dummy-form, and in Table A3-2 and Table A3-3 of Appendix 3A for the raw-form. Also the results could be viewed into three aspects: (1) Vientiane Capital vs. Other Provinces; (2) Males vs. Females; and (3) Pre-transition vs. Post-transition.

Most variables for schooling years/educational levels were statistically significant at least at the 5% level. However, the total results of R^2 were much better in the private sector than those in the public sector. Overall, the results of estimating an earnings function (raw-form) in the public sector showed education to be a marginal investment of 2.6% for Vientiane Capital, 1.9% for other provinces, and 2.2% for the whole country. The estimates for experience were extremely low and statistically insignificant regardless of regions (Table A3-2). On the other hand, in the private sector, an additional schooling

year would yield more earnings of 6.2%, 4.9% and 5.2% for the Capital, other provinces and the whole country, respectively. For all regions, the return to one additional year of experience would increase earnings by about 4% (Table A3-3).

Generally, the results indicated a significant increase in earnings as the education level rises in both sectors and regions, while the incremental earnings at these levels for the private sector were much higher than that for the public sector. By law, civil servants in Lao PDR receive the same wage rate regardless of ethnicity and regions, and wage increases would be reflected in educational level and experience. However, our results showed that in some cases wage increases in the public sector tend to be determined by factors other than education. For example, a worker with a secondary education level may earn more than a worker with a tertiary education level in the capital as reflected in the estimate of 44.6% for the former and 37.4% for the latter. This result would suggest that the majority of government staff completed secondary education and post-secondary education is merely a new trend. This issue was more apparent in the comparison between the pre- and post-transition periods (Table 3-6 and Table A3-2, column 6 and 7). For the this sector, the variables for the three educational levels and schooling are significant only for the pre-transition period suggesting that education tended to pay off for government workers at certain seniority, while returns to education are negligible for new entrance.

With respect to gender differences, the results of our analysis showed a bias toward male workers in all aspects (Table 3-6 and Table A3-2). All other things being equal, a male may earn about 22% higher than a female in all regions and in the pre-transition period. Within-group comparisons revealed that men with any education would

earn more than the reference group, while education did not seem to matter for women (Table 3-6 and Table A3-2, column 4 and 5). For the public sector, it is also interesting to observe that the estimates for experience were extremely low and insignificant as is to be expected. Government employees are promoted one grade every two years, but the additional reward is negligible. These may suggest that there are significant distortions in public sector pay, which resulted in very low adjusted R^2 s.

For the private sector, regardless of gender and regions, the larger gap between the educational levels the higher the levels. For example, a worker with a tertiary education may earn roughly 60% to 80% higher than a worker without completed primary education (Table 3-7). The estimation using the raw-form earnings function also revealed a similar trend, with rates of return to schooling ranging between 5% and 6% (Table A3-3). With regard to cross-gender differences, on average a female would earn 21% less than a male in other regions in the private sector, although there is no significant difference in Vientiane Capital. Similarly, ethnic workers may earn about 20% less in the private sector in provinces, while the difference is insignificant in the capital. This is most probably due to the fact that ethnic workers living in Vientiane have comparable educational levels compared to their counterparts (Lao Loum). Unlike the public sector, education and experience are shown to pay off for both male and female workers in the private sector. Compared to the reference groups, males and females with primary education or higher would receive more earnings and the rates of return seemed to increase as the educational level rises. This trend, however, does not seem to apply for female ethnic workers, most likely because they are engaged in home production or

production that does not require high education such as garment industry. Experience also tended to increase earnings regardless of geographical location and gender.

In terms of occupation, workers employed in commerce activities and transportation earn more than in any other sub-sectors in the capital, while workers employed in manufacturing (especially food processing, textile and garment) earn less than in any other sub-sectors in other regions. A more detailed categorization of data into the northern, central and southern regions has confirmed our expectation, that employment outside Vientiane Capital yields a lower income. More specifically, a worker in the northern, central and southern regions earns about 34%, 23%, and 23% lower than his/her counterpart in the capital, and this is a slightly greater difference than in 1997/98. Similar differences among the occupations and geographical locations can also be observed for the pre- and post-transition eras. Moreover, it is worth noting that older ethnic workers and females would earn about 22% to 27% lower than their counterpart, but these trends have been improved for younger generations. Commerce is always the highest earnings activities in both the pre-transition and the post-transition, especially for females. Workers in the northern region would receive the lowest earnings compared to the capital both older and younger generations (Table 3-7).

Another interesting point of the private sector is the returns to schooling before and after the transition. The analysis revealed that the return for young workers (7.0%) was considerably higher than that for older workers of 3.9% (Table A3-3). This trend is also reflected in all educational levels considered in this study (Table 3-7). This result might suggest that a labor market exists that places a value on human capital.

As can be noted, the wage differentials in the two sectors are significant due to the sharp changes in the wage structure that have resulted from the economic transition. The rapid emergence and spread of the private sector, with its emphasis on productivity, is the primary force shaping these changes. A person with a higher level of education and experience is likely to have better opportunities in finding a well paid job in a private enterprise or an international organization. The salary paid largely reflects the education level and experiences. On the other hand, the rate of return to education in the public sector is usually low. By law, civil servants in Lao PDR receive different wage rates according to education levels, but the gap between each level is relatively small. However, a worker with higher educational attainment, for instance, a university-educated worker in Vientiane Capital, is likely to have better chances to participate in an international development project which will yield a high additional income.

The estimates for Lao PDR are still very low compared with the return to education estimated for low income countries, that another year of schooling increases earnings by about 11% (Psacharopoulos and Patrinos, 2002). However, as mentioned above, estimated returns to education are generally low in centrally planned economies, but successful reform will eventually lead to higher return. By comparing with the study of 1997/98 in section 3.6.1, it is found that the rate of return to education in Lao PDR has risen significantly from 2.93% in 1997/98 to 5.23% in 2002/03. Nevertheless, this study should be viewed with caution as the results are based on data in which it could not be distinguished whether a worker was in the private and public sector. This may have lead to downward biased estimates for 1997/98.

Table 3-6: Earnings Functions of the **Public Sector** by Region, Gender, and Pre/Post Transition in 2002/03.

Variable	Vientiane C.	Provinces	Lao PDR				
			All	Males	Females	Pre-transition	Post-transition
Primary	0.2096 (1.09)	0.2983** (3.09)	0.2695** (3.06)	0.2922** (2.80)	0.0764 (0.47)	0.2335* (2.49)	0.4448 (0.97)
Secondary	0.4464* (2.10)	0.2456 (1.91)	0.3267** (2.98)	0.3475** (2.66)	0.0483 (0.24)	0.3506** (2.61)	0.3945 (0.86)
Tertiary	0.3743* (2.02)	0.3390** (3.22)	0.3589** (3.90)	0.4100** (3.81)	-0.0132 (-0.08)	0.3484** (3.48)	0.4627 (1.03)
Experience	0.0127 (1.09)	0.0104 (1.16)	0.0120 (1.70)	0.0240** (2.67)	-0.0118 (-1.11)	0.0189 (0.91)	0.0146 (0.38)
Experience-squared/100	-0.0127 (-0.54)	-0.0069 (-0.39)	-0.0105 (-0.75)	-0.0291 (-1.68)	0.0109 (0.42)	-0.0218 (-0.69)	-0.0515 (-0.25)
Female	-0.2153* (-2.08)	-0.2311** (-3.12)	-0.2216** (-3.67)	-	-	-0.3142** (-3.62)	-0.0991 (-1.16)
Ethnic	0.3536 (1.13)	0.0507 (0.78)	0.0816 (1.23)	0.1049 (1.33)	0.0034 (0.03)	0.0179 (0.22)	0.2427 (1.85)
Rural Area	-	-0.0154 (-0.25)	-0.0019 (-0.03)	0.0075 (0.11)	-0.0586 (-0.63)	0.0377 (0.53)	-0.1207 (-1.11)
Northern	-	-	-0.0966 (-1.24)	-0.0985 (-1.01)	-0.0910 (-0.82)	-0.0293 (-0.29)	-0.1768 (-1.43)
Central	-	-	-0.1107 (-1.56)	-0.1464 (-1.67)	-0.0171 (-0.16)	-0.0883 (-0.99)	-0.1338 (-1.08)
Southern	-	-	-0.0729 (-1.03)	-0.0613 (-0.72)	-0.1092 (-0.95)	-0.0584 (-0.64)	-0.0560 (-0.48)
Constant	12.0474 (53.33)	11.9812 (79.19)	12.0577 (91.72)	12.0994 (74.87)	12.5928 (58.73)	11.9270 (35.53)	11.9398 (24.98)
Adjusted R ²	0.034	0.052	0.049	0.033	-0.017	0.054	-0.002
F-test	2.23*	3.88**	4.15**	2.74**	0.73	3.28**	0.96
N	262	419	681	519	162	442	239

Note: Dependent variable is the natural log of monthly earnings.

t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.

The omitted category for the level of education is less than primary, and for regional dummy is Vientiane Capital

Table 3-7: Earnings Functions of the **Private Sector** by Region, Gender and Pre/Post Transition in 2002/03.

Variable	Vientiane C.	Provinces	Lao PDR				
			All	Males	Females	Pre-transition	Post-transition
Primary	0.3193** (2.83)	0.2192** (3.35)	0.2404** (4.23)	0.1737* (2.31)	0.2916** (3.38)	0.2238** (3.30)	0.3117** (2.72)
Secondary	0.6699** (4.32)	0.4409** (3.93)	0.5091** (5.72)	0.4864** (4.50)	0.5054** (3.18)	0.4238** (3.15)	0.6222** (4.65)
Tertiary	0.7909** (5.44)	0.6267** (4.44)	0.6461** (6.59)	0.6563** (5.78)	0.6177** (3.09)	0.4494** (3.17)	0.8508** (5.52)
Experience	0.0365** (3.57)	0.0409** (5.68)	0.0397** (6.60)	0.0439** (6.24)	0.0382** (3.63)	0.0040 (0.26)	0.0092 (0.22)
Experience-squared/100	-0.0409* (-2.22)	-0.0652** (-5.19)	-0.0587** (-5.43)	-0.0581** (-4.64)	-0.0701** (-3.70)	-0.0138 (-0.66)	0.1437 (0.65)
Female	-0.0725 (-0.67)	-0.2101** (-3.12)	-0.1562** (-2.74)	-	-	-0.2704** (-3.59)	0.0255 (0.30)
Ethnic	-0.1506 (-0.85)	-0.1982** (-2.89)	-0.1940** (-2.98)	-0.3057** (-3.58)	-0.0571 (-0.58)	-0.2220** (-2.81)	-0.1341 (-1.12)
Rural Area	-	-0.1092 (-1.82)	-0.0505 (-0.94)	0.0449 (0.65)	-0.1533 (-1.77)	-0.0829 (-1.22)	-0.0067 (-0.07)
Manufacturing	0.0604 (0.53)	-0.3374** (-3.64)	-0.1786* (-2.54)	-0.1250 (-1.19)	-0.2667** (-2.78)	-0.1370 (-1.34)	-0.2483** (-2.64)
Construction	0.1169 (1.07)	-0.1158 (-1.41)	0.0069 (0.11)	0.0103 (0.13)	-0.0267 (-0.20)	-0.0138 (-0.16)	0.0105 (0.11)
Commerce	0.9971** (6.30)	0.5425** (6.23)	0.6987** (9.34)	0.5373** (4.70)	0.7687** (7.67)	0.6957** (7.71)	0.6996** (5.06)
Transportation	0.4495* (2.05)	0.1109 (1.02)	0.2707** (2.81)	0.2431* (2.34)	0.4615 (0.64)	0.1827 (1.42)	0.3993** (2.76)
Northern	-	-	-0.3367** (-4.55)	-0.2117* (-2.15)	-0.5290** (-4.56)	-0.3788** (-4.08)	-0.3169** (-2.56)
Central	-	-	-0.2322** (-3.67)	-0.1298 (-1.58)	-0.4094** (-4.11)	-0.2272** (-2.67)	-0.2813** (-2.85)
Southern	-	-	-0.2252** (-2.65)	-0.2922** (-2.69)	-0.1741 (-1.34)	-0.3024** (-2.88)	-0.0710 (-0.45)
Constant	12.0709 (71.42)	12.1017 (92.17)	12.2577 (104.05)	12.3755 (88.23)	12.3426 (64.80)	12.8652 (45.48)	12.3540 (48.94)
Adjusted R ²	0.233	0.199	0.210	0.155	0.286	0.193	0.227
F-test	12.83**	22.87**	27.29**	12.02**	19.42**	15.62**	12.05**
N	430	1,055	1,485	840	645	919	566

Note: t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.

The omitted category for type of business is other service activities.

White heteroskedasticity consistent covariance is applied for all equations in this table.

A cross-sectional sample may not be very instructive in a rapidly changing economy. For this reason our sample is divided into two groups: workers with 16 years or less experience (pre-transition in 1986) and workers with 17 years or more experience (post-transition in 1986). One should focus on the private sector because it is assumed that here reforms have had a larger impact than on the public sector. Younger workers are expected to be more affected by recent changes as they enter directly into a free market wage economy. In fact, those with fewer years of labor market experience receive higher return to education in all regions. In Vietnam too, the return to education for younger workers are higher than for older workers, showing that in both Lao PDR and Vietnam the return to education increase as newer generations enter the labor market (Moock et al. 1998).

3.5.3. Returns to Education in the Private Sector in 2002/03 – Rate of Return per Year

In the previous sections, the rates of return on years of schooling have been estimated for the entire samples. In this section, the rates of return to schooling for various education levels (only those completed a level of schooling) will be addressed. The estimated coefficients are presented in Table 3-8. Except for males with completed primary education, all other coefficients are statistically significant at least at the 5% level.

As the table shows, the estimation results maintain the classic pattern of falling return to education by level of education. Overall, the return per year decreased from 27.7% for primary education, 4.8% for secondary, and to 3.4% for technical, before increasing again to 8.0% for university graduates. In particular, the return per year for higher education is more pronounced in the provinces than in the capital city owing

the scarcity of skilled labor in those regions (Table 3-8, column 1 to 3). In terms of gender differences, the per year return for females is higher than that for males in the primary or university level (Table 3-8, column 4 to 5). This might be because primary education is crucial for basic literacy and numeracy (e.g. book keeping in small business or family business), and university education is related to high-paid jobs (e.g. English speaking office workers, assistant in various offices and projects), for which skilled female workers are more scarce than men. This pattern also continues in the years following the transition (Table A3-4 and Table A3-5, column 4 and 5).

Reflecting the merit of a market economy, the transition has brought about an increase in return to education in all levels as compared to the era prior to the transition (Table 3-8, column 6 and 7). With respect to good fitness of the regressions, when earnings functions of workers by the pre-transition and post-transition are estimated separately, the results of R^2 in the pre-transition are observed to be lower which could justify the overall R^2 . Table A3-4 and Table A3-5 in Appendix present the results of a more detailed comparison between the pre- and post-transition period.

For Lao PDR as a whole, for the pre-transition, the return to primary education (26%) is strongly positive. While the wage premium is pronounced for secondary and technical-educated workers, the rates of return per year to secondary and technical education levels are both very low at 3%. The return to university education cannot be estimated due to its insufficient sample. As can be seen, following the transition the return per year in provinces increased drastically from 23.8% to 43.0% for primary education, and from 1.5% to 9.3% for technical education.

In Vientiane Capital, the trend differs significantly from the rest of the country. Here the results revealed an opposite trend of return to schooling for all levels. The per year rate of return for the primary level decreased dramatically from 49.8% in the

Table 3-8: Earnings Functions with Education Levels in the **Private sector** in 2002/03 – Rates of Return per Year.

Variable	Vientiane C.	Provinces	Lao PDR				
			All	Males	Females	Pre-transition	Post-transition
Primary	0.5275* (2.52) [0.5275]	0.2690* (2.57) [0.2690]	0.2766** (3.14) [0.2766]	0.1881 (1.45) [0.1881]	0.3367** (2.63) [0.3367]	0.2645* (2.47) [0.2645]	0.4272* (2.02) [0.4272]
Secondary	0.8269** (3.61) [0.0499]	0.5441** (3.59) [0.0459]	0.5630** (4.89) [0.0477]	0.4982* (3.19) [0.0620]	0.6530** (3.23) [0.0527]	0.4407** (2.60) [0.0294]	0.7799** (3.47) [0.0588]
Technical	0.8600** (3.53) [0.0110]	0.6916** (3.79) [0.0492]	0.6648** (4.71) [0.0339]	0.6647** (3.88) [0.0555]	0.6007* (2.38) [-0.0174]	0.5348** (2.85) [0.0314]	0.8701** (3.39) [0.0301]
University	1.1728** (3.67) [0.0692]	1.2190** (2.81) [0.1350]	0.9613** (4.03) [0.0797]	0.8432** (3.34) [0.0690]	1.9970** (2.73) [0.2688]	-	1.4255** (4.34) [0.1291]
Experience	0.0281 (1.89)	0.0552** (4.63)	0.0414** (4.41)	0.0384** (3.40)	0.0519** (3.07)	0.0118 (0.52)	-0.0392 (-0.65)
Experience-squared/100	-0.0218 (-0.89)	-0.0857** (-4.24)	-0.0581** (-3.64)	-0.0459* (-2.35)	-0.0842** (-3.03)	-0.0250 (-0.82)	0.3987 (1.26)
Female	-0.0190 (-0.12)	-0.1720 (-1.75)	-0.1249 (-1.58)	-	-	-0.2306* (-2.15)	0.0064 (0.05)
Ethnic	-0.1276 (-0.57)	-0.2560* (-2.54)	-0.2598** (-2.90)	-0.4075** (-3.23)	-0.0461 (-0.34)	-0.2143 (-1.85)	-0.1963 (-1.14)
Rural Area	-	-0.1098 (-1.23)	-0.0293 (-0.38)	0.0096 (0.09)	-0.0897 (-0.71)	-0.0922 (-0.96)	0.0577 (0.41)
Manufacturing	-0.1508 (-1.02)	-0.3652** (-2.73)	-0.2559** (-2.62)	-0.1342 (-0.94)	-0.3994** (-3.06)	-0.1849 (-1.33)	-0.4185* (-2.49)
Construction	-0.0342 (-0.21)	-0.1339 (-1.00)	-0.0458 (-0.47)	-0.0486 (-0.42)	-0.0356 (-0.18)	-0.0301 (-0.21)	-0.1778 (-1.02)
Commerce	1.075** (4.56)	0.4598** (3.51)	0.6575** (6.05)	0.4430** (2.89)	0.7151** (5.02)	0.5920** (4.46)	0.6887** (3.79)
Transportation	0.0412 (0.18)	0.2435 (1.40)	0.2843* (2.07)	0.2160 (1.44)	1.5220** (7.55)	0.1792 (0.92)	0.3785 (1.64)
Northern	-	-	-0.3944** (-3.67)	-0.1779 (-1.25)	-0.7037** (-4.07)	-0.5288** (-3.76)	-0.2674 (-1.42)
Central	-	-	-0.2635** (-2.91)	-0.0666 (-0.57)	-0.5435** (-3.78)	-0.2399* (-1.96)	-0.4062** (-2.81)
Southern	-	-	-0.3475** (-2.87)	-0.3623* (-2.25)	-0.3909* (2.07)	-0.3922** (-2.63)	-0.1806 (-0.78)
Constant	12.1082 (47.14)	11.8832 (53.90)	12.2769 (69.13)	12.3871 (51.99)	12.2772 (44.23)	12.8193 (29.11)	12.5396 (32.06)
Adjusted R ²	0.239	0.239	0.249	0.156	0.351	0.216	0.308
F-test	6.84**	13.78**	16.54**	6.16**	12.94**	9.68**	8.74**
N	224	529	753	421	332	474	279

Note: t-statistics in parentheses. "Per year" return education in brackets.

White heteroskedasticity consistent covariance is applied for equations in column 1, 3, and 5 namely "Vientiane C., All, and Females".

pre-transition to 5.4% in the post-transition. Also estimates for the latter period were all insignificant. This result might reflect the development stage in the capital, which is much higher than anywhere else in the country. Being the political and economic center, basic education has been the common standard for average people and higher education is affordable the majority. Combined with migration of educated people, skilled labor is available in a larger number compared to other provinces. Also high-paid jobs, which require higher educational levels, are available in significant numbers. All these have probably contributed to a decrease in return for lower levels of education.

In sum, for the post-transition, the return to primary education is the highest at 43%. This rate is much higher than the rate of 26% for low income countries (Psacharopoulos and Patrinos, 2002). However, the rates of return to secondary, technical, and university education levels are at about 6%, 3%, and 13%, respectively. These rates are very low when compared with the 20% for secondary education level and 26% for tertiary education level of the standards of low income countries. Although large earnings premiums translate into workers with a high level of education in the private sector, the best investment (most profitable) for a large number of the employed population, is still the primary level.

3.6. Concluding Remarks

This research work provides the analyses on the returns to education in Lao PDR. The estimated results of the private rates of return to education are summarized in Table 3-9. The research found that the returns in Lao PDR are low by international standards, but relatively the same with other transition economies. Although the results should be watched with some cautions, these findings firstly show that there is

a high demand for education in the labor market for wage earners in Lao PDR. The rates of return rise significantly during the transition. The high rate of return observed for younger generations is one bright sign that the return would increase more as the market reforms take full effect. Of course, for new entrant workers, the high expected rate of return to schooling gives a big hope on finding a high earnings job. Together, they also have to be aware on the probability of job availability in the relatively small labor market.

Table 3-9: Summary of the rates of return to schooling in Lao PDR (%)

	Sector	Vientiane C.	Regions	Lao PDR				
				All	Males	Females	Pre-	Post-
1997/98	Mixed	3.89	2.22	2.96	2.97	2.99	2.67	3.35
	Public	2.62	1.85	2.17	2.53	-	2.33	-
	Private	6.23	4.90	5.23	5.13	5.32	3.94	7.01
2002/03	<i>Primary</i>	52.75	26.90	27.66	-	33.67	26.45	42.72
	<i>Secondary</i>	4.99	4.59	4.77	6.20	5.27	2.94	5.88
	<i>Technical</i>	1.10	4.92	3.39	5.55	-1.74	3.14	3.01
	<i>University</i>	6.92	13.50	7.97	6.90	26.88	-	12.91

Source: Authors' estimations based on LECS 2 and LECS 3.
 Note: All variables are significant at least at the 5% level.

In brief, the research findings have important implications for public sector salaries and the financing of education in Lao PDR. First, we found a private sector earnings advantage, particularly workers with tertiary education level. The two sector wage differential suggests that it is difficult for the public sector to retain and attract skilled employees, and the widening wage gaps might promote inefficiency and moonlighting. Attempts to decrease the wage gap will increase the wage bill and strain the fiscal position of the public sector. Although painful, the best way to satisfy the need for higher public sector efficiency and ease the fiscal strain, may be to reduce public sector employment and pay higher wages to educated workers.

Second, primary education, the most profitable sub-sector judging from the estimated rate of return results, especially outside of Vientiane Capital, is much less subsidized than higher levels. In fact, the high subsidy levels for higher education

contribute to the low rates of return for these sub-sectors. Family contributions to direct cost financing at the primary level are a heavy burden, especially for the poor, and this is neither socially optimal nor equitable. Thus, Lao's policy makers may need to improve the supply of primary education services, and consider a more direct subsidy of primary school education for the poor.

CHAPTER 4

ENTREPRENEURIAL HUMAN CAPITAL AND MICRO/SMALL BUSINESS IN LAO PDR

It is argued that micro and small enterprises (MSEs) can play the role in poverty reduction, building the foundations of an expanding private sector and creating decent work for greater numbers of people in developing countries. This chapter reviews literature on the MSEs and provides an empirical research on entrepreneurial human capital in Lao PDR so that key stakeholder agencies and groups could better understand this crucial sector, the constraints it still faces, and how best to promote its quantitative and qualitative development.

The Lao society is highly dependent on agriculture. There are small differences between the provinces, except of course for Vientiane Capital. According to the official estimates (ILO, 2005), eight out of ten employed persons were working in agriculture sector during 2003. The proportion of persons employed in industry sector was almost the same as in services sector at around 9%. Over one-half of the employed population was self-employed and another one-fourth was classified as an unpaid family worker in family farms and informal economy. Together, self-employed workers and contributing family members accounted for 82% of the employed population. Only 14% were in paid employment. A much smaller percentage was classified as a private employer. These data did not indicate significant differences between men and women. In rural areas children were more likely to be economically active than in urban areas.

However, the data for the proportion of the employed in agriculture are somewhat misleading since many workers classified as employed in agriculture have

secondary jobs in off-farm activities such as “*family business or micro and small business*”. The recent national household survey (NSC, 2004) showed that 28% of the Lao households operate at least one household business. It is more common among urban households (63%) to operate a business compared to rural households (17%). Some households have registered business incomes without having a family business. This is mainly the case in rural households where home-made textiles and garments are produced for sale. If taking those households into account, we found that 46% of the households have micro and small business activities (68% of urban households and 38% of rural households).

Lao PDR presents an interesting case study for a number of reasons. Since the introduction of a market oriented economy in 1986, the private sector in Lao PDR has made significant strides in the generation of employment and increase in household income. Educational opportunity expanded to provinces at accelerated rates following reforms beginning in 1991 (ADB, 2000). According to the survey by ILO (2002), MSEs employed over ten times than that of employed by larger enterprises. Despite the urgent need and its importance to understand more about the MSEs in Lao PDR, to our knowledge, none of empirical research has been done. This study seeks to provide insight into a dimension of micro/small business research for which there are very limited data.

This chapter is structured as follows: Section 4.1 reviews the relationships between human capital, entrepreneurship and micro/small business. Section 4.2 provides the context of micro and small business in Lao PDR. Section 4.3 presents the theoretical framework and empirical models. Section 4.4 describes the data. Section 4.5 analyses the estimation results, and Section 4.6 concludes.

4.1. Human Capital, Entrepreneurship and Micro/Small Business

Considerable effort continues to be expended promoting entrepreneurship and micro/small business in developing countries through the resources of bilateral and multilateral agencies, as well as non-governmental organizations such as the Grameen Bank (Hossain, 1988). Much of local government and international support activities target on “informal sector” which contain many MSEs, defined as micro/small businesses that employ less labor and often only one or two (Birks et al. 1992). Although entrepreneurship has been linked theoretically with economic development for quite some time, few studies have systematically attempted to examine the micro/small environment in a developing country (Leff, 1979). Little is known about the micro/small level social processes that influence success for MSEs. Is education important, or is practical experience more helpful? Is success governed by constraints on starting capital or access to credit? What, if any, is the influence of technology on the success of micro/small businesses? It is an important area of research, as in many developing countries informal employment represents the largest share of job growth, for example, comprising 40% to 60% of the urban labor force of most African countries (Fluitman, 1989).

In general, as owner of a commercial enterprise, a businessperson is concerned with sales, markets, and ultimately, profits. When examined from a purely economic perspective, successful firms should realize an evident return on capital invested, as operating profits. It is argued that the firm performance is determined not only by his talent, the circumstances and good luck, but also by his human, financial, and social capital. A number of studies have argued that human capital can enhance entrepreneurial performance (Bosma et al. 2002; Cooper et al. 1994; Kurosaki and Khan, 2004; Gimeno et al. 1997; Honig, 1998; Pennings et al. 1998; van Praag and

Cramer, 2001). This is easy to understand since entrepreneurship is a fundamental characteristic of modern knowledge-based economic activities. Human capital, in this study, is distinguished by two types: general human capital (education) and specific human capital (specific skills or experience). Education pertains to knowledge and skills that are applicable to a broad range of activities, whereas experience pertains to skills relevant to a particular context, e.g., skills relevant to a particular firm or industry.

In terms of the role of education, previous researches have mainly devoted attention to its effect on (new and existing) venture performance regarding to survival, profit, and generated employment, rather than on the likelihood of new venture creation (Clercq, 2003). For example, Gimeno et al. (1997) found a positive association between the overall level of human capital, as measured by education level and work experience, and economic performance at both the entrepreneur's level and the firm's level. Cooper et al. (1994) found that the unique and specific capabilities of the prospective entrepreneur are an important source of the human capital to the new venture, and can contribute to its survival and growth. Furthermore, Pennings et al. (1998) found a negative effect of human capital on firm dissolution. In other words, firm-level human and social capital could be important sources of competitive advantage, especially when the capital was specific to a firm or was held by its owners. Reynolds and White (1997) found a positive relationship between the size of the start-up team and the level of sales and growth in the subsequent years.

Honig (1998) found the importance of considering heterogeneity when examining micro entrepreneurship and the influence of human capital variables. Where as the returns to experience in current business was universal positive, different structural environments (with vs. without employees and low vs. high

technological tier) may considerably alter the returns to schooling. Similarly, Kurosaki and Khan (2004) indicated that the educational level of enterprises and type of business (low-end vs. high-end) are positively correlated. High educational attainment seemed to enhance the ability on the management of (valued-added) enterprises, which was necessary for the household to enter into high-end business.

Bosma et al. (2002) found that the endowed level of talent of a small business founder is not the unique determinant of performance. Rather, investment in industry-specific and entrepreneurship specific human and social capital contributes significantly to the explanation of the cross-sectional variance of the performance of small firm founders. In addition, van Praag and Cramer (2001) used a unique measure of success (labor demand) which has some interesting policy implications compared to other measures in the literature (for example, survival and profit/earnings). They concluded that education strongly influences successful entrepreneurship, particularly if it is intermediate levels.

On the other hand, owners of MSEs in low-income economies rarely keep financial records and typically fail to distinguish between household and business transactions. Due to this lack of separation, detecting fully how much, if any, return to capital has occurred over a specific period is very difficult. Because access to credit is a primary track of assistance to MSEs for bilateral and multilateral agencies, as well as governmental and nongovernmental organizations, a close examination of the owners of firms who received credit support is both warranted and useful. The constraint of insufficient financial capital for informal sector has been well documented (Von Pischke et al. 1983; Stiglitz and Weiss, 1981; Hashemi et al. 1996; Holt and Ribe, 1991).

4.2. Micro and Small Business in Lao PDR

In terms of employment size, in this study, MSEs were defined by micro (1-2 workers) and small (3-19 workers). There is no agreed definition in Lao PDR for different sizes of enterprises in different sector. The classification system adopts here based on the number of worker employed by its nature. About 80% of MSEs of the sample was in the “micro” group, which was a slightly lower in the capital.

The national survey, LECS 3, classified MSEs according to the International Industrial Standard Classification (ISIC). The commerce sector is the largest accounting for 55% of all MSEs and generating 53% of MSEs based employment in 2002/03. This sector has been the largest since the introduction of market liberalization. The biggest proportion of this sector and indeed of all MSEs is retailing. The trend remains the same with a *National Survey – SMEs in Lao PDR* conducted in 1996 (see the details of the 1996 MIH-GTZ survey at ILO, 2002). The manufacturing sector represented only 15% of MSEs in 2002/03 compared to 34% in 1996. Perhaps, this decrease occurred due to the expansion of textile (sewing) factories that absorbed the individual workers. Manufacturing as well as agriculture is characterized by low levels of productivity. Most production is small scale and many activities are in rural areas. Much of the production is textiles and garments, food/wood processing and construction materials. By contrast, the transport sector increased up to 8%, where as the hotel and restaurant sub-sector accounted for a relatively small percentage of MSEs. The number of enterprises in the construction sector was very small in 1996.

The characteristics of the business vary between female- and male-owned enterprises. Females tend to operated in the commercial sector (vending and retailing) and textiles. Males dominate most of the construction, transport, manufacturing sub-sectors (food processing, wood processing and metal products) and other services

activities. The high proportion of male-owned enterprises in food processing may come as surprise. As can be observed, the dominant activities in this sub-sector are rice milling and ice-making, which involve the use of machinery and are often thought as “male” occupations. Similarly, other services activities include mainly watch repair, motorbike/bicycle repair, etc.

Education does not seem to be a significant factor in the ownership of a business: about 18% of MSEs had secondary education or over. Except for construction sector, the average schooling of owners was around five years or primary level. Rural entrepreneurs had fewer educational opportunities than those in urban areas in all categories. More rural entrepreneurs than urban had less than primary education, 41% to 28%. They also had fewer opportunities for tertiary education, 5% to 12%. Similarly, females have less educational opportunities than males. 16% of female entrepreneurs received no education, 46% had primary education, and 13% had secondary education or over. The corresponding education levels for males were 10%, 51%, and 22%.

Most micro and small business owners receive informal training from family members or friends. Indeed very few have formal vocational training. For demand side, entrepreneurs want skills in management and marketing. The majority of training, however, is technical rather than managerial and specific to certain kinds of enterprise (e.g. textiles). Technological level of MSEs is very low. Many entrepreneurs had made no technology improvement in their business in the past year. For supply side, there are serious concerns about the capacity of teachers (both the formal and informal training systems) to match with regional investment and labor markets.

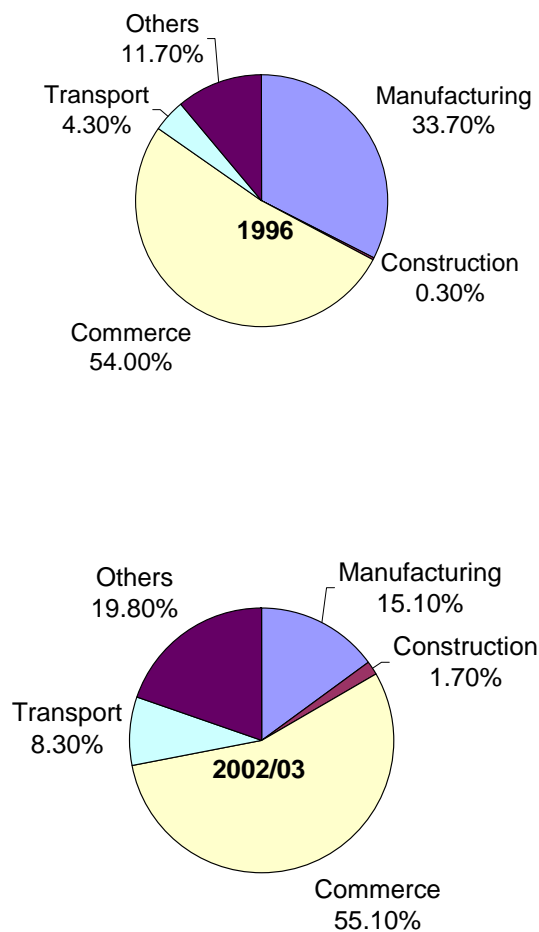


Figure 4-1: Distribution of Micro/Small Enterprises by Sub-sector

In terms of employment creation, MSEs have played a very important role in providing employment opportunities during the process of economic transition in developing countries. The contribution by MSEs is about ten times greater than that of large enterprises. It is estimated that MSEs account for nearly a half of the active non-agricultural labor force. Except for the construction sector, the average number of workers including the owners of the enterprises was only 1.95, although this varies across regions. The workforce in this sector is mainly enterprise owners and unpaid family members. Only 20% were paid employees. Characteristically, part-time workers are less common in Lao PDR. Two-thirds of the employed persons in Lao

PDR worked at least 40 hours per week. Very few worked less than 20 hours and about 30% worked between 20 to 39 hours per week.

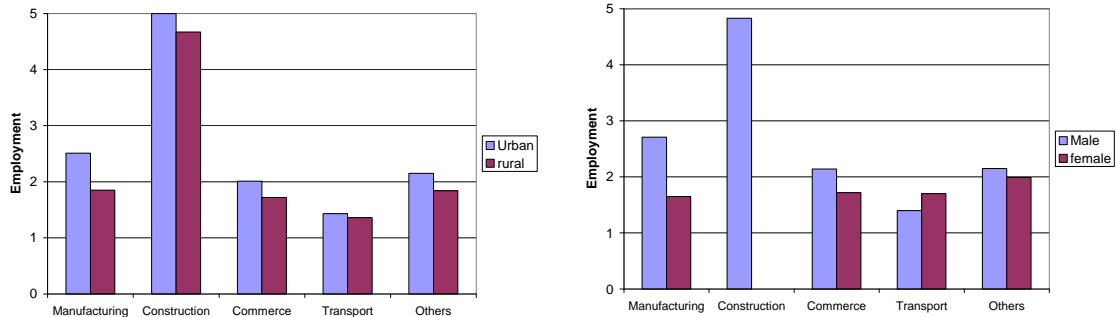


Figure 4-2: Employment in Micro/Small Enterprises by Region and Gender (2002/03)

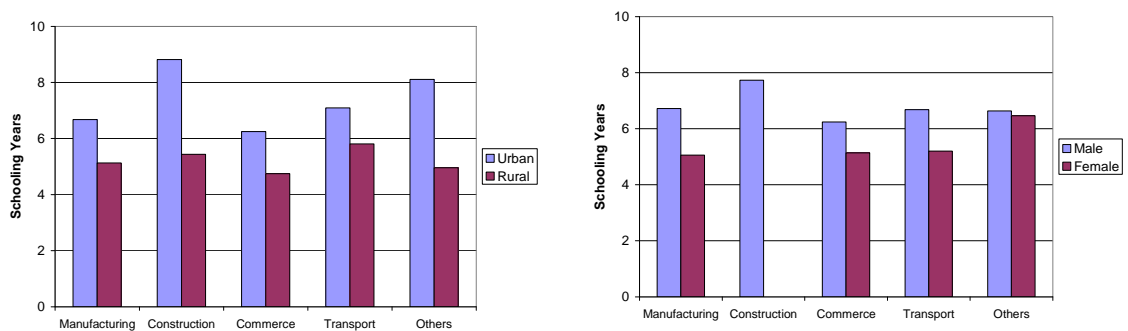


Figure 4-3: Micro/Small Entrepreneurs and Education by Region and Gender (2002/03)

With respect to business start-up and financial aspects, most entrepreneurs have started their business in the age of 20-29 years old and follow followed by the age of 30-39 years old, together accounting for about 70% of the total (ILO, 2004). The majority of respondents (63% for women and 70% for men) claimed that they establish the business by themselves. Only about 10% of them were successor to their family. Thus, most entrepreneurs in Lao PDR run a business as of first generation with a small scale of financial capital and they tend to face with financial problems both investment funds and operating funds.

Access to credit in Lao PDR is generally poor and only a few MSEs manage to obtain some form of formal or informal credit. This information is absent in the survey used in this study. According to the 1996 MIH-GTZ survey, one enterprise in five had ever received a loan. Less than 2% of all MSEs had ever received a bank loan. 11% of MSEs, which is about half of those receiving any kind of credit, obtained their loans from family members. The pattern for both rural and urban MSEs in accessing credit was strongly similar. While female entrepreneurs managed to obtain credit more than male entrepreneurs, the average loan for a woman was substantially smaller than that for a man. MSEs often lack legally recognized assets as collateral for the bank. There appeared to be a greater chance of finding finance from the informal sector in various forms, such as village revolving funds (VRF), household-to-household loans, rotating fund groups (or *Houay*), rice/buffalo banks, and moneylenders (see UNDP/CDF, 1997). These were most easily done despite the fact that the interest rates charged could reach up 20% a month or be as much as 60% a year.

4.3. Theoretical Framework and Empirical Models

4.3.1 Theoretical Framework

In pioneering work, Knight (1933) argued that uncertainty bedevils many economists in analyzing entrepreneurship. In his book, he mentioned about advances in knowledge as the most pervasive and important part of the risk problem. Although much of Knight's treatise is devoted to the function of entrepreneurs in a dynamic market economy, this part has received all too little attention. The economics of the acquisition of entrepreneurial ability is still in its infancy. Later on, Baumol (1968) proposed that the entrepreneurial function is an essential part of the process of

economic growth. Kirzner (1973) also argued that there is no room for the entrepreneur in equilibrium theory. He presented a theory of the market and prices in which the entrepreneur is a necessary active agent. Moreover, Kihlstrom and Laffront (1979) provided a useful review of part of the literatures bearing on risk aversion and they presented a model to determine who chooses to be or not to be an entrepreneur.

Schultz (1980) argued that the entrepreneur does not appear as an explicit economic agent in nearly all of the production function literature. In the part of theory that deals with “pure profit”, the entrepreneur is indentured to risk and uncertainty. The abilities of entrepreneurs to deal with disequilibria that are pervasive in a dynamic economy are a part of the stock of human capital. It is well documented that experience, health and particularly schooling enhance the acquired abilities of entrepreneurs.

Schultz (1980) added that a modern dynamic economy would fall apart were it not for the entrepreneurial activities of a wide array of human agents who reallocate their resources and thereby bring their part of the economy back into equilibrium. What entrepreneurs do has an economic value. Although the reward (earnings) for the entrepreneurship of most human agents is small, in the aggregate in a dynamic economy it accounts for a substantial part of the increases in national income. In his paper, he well described the demand for entrepreneurship and the supply of entrepreneurship in a dynamic economy.

4.3.2 Empirical Models

Schultz (1980) theorized that individuals may reallocate and augment their activities in an entrepreneurial fashion due to environmental circumstances. He suggested that investment in entrepreneurial ability implies the returns that actually

occur to education are substantially undervalued. In order to measure the returns to entrepreneurial human capital, this study applies Mincerian Human Capital Function, which hypothesized that education is an investment that yields higher earnings in return for individual variations of schooling and work experiences.

Our basic model is taken from Mincer (1974):

$$\ln Y_i = c + \alpha S_i + \beta_1 Ex_i + \beta_2 Ex_i^2 + \gamma X + u_i \quad (4-1)$$

where Y_i is average monthly sales for an entrepreneur i . S_i is a measure of his/her schooling, Ex_i represents a measure of (potential) work experience or current business experience, and u_i is a residual error. An assumption that the skills in workers have diminishing returns, thus expressed in a nonlinear form by experience squared. Whereas most models rely on age less schooling for a proxy of experience, this study also uses the exact number of years of experience in the same business for which micro/small entrepreneurs were engaged.

The earnings function method is used to estimate average rate of returns to different levels of schooling by converting the continuous years of schooling variable S into a series of dummy variables representing the different levels of schooling, and other individuals' characteristics. After fitting the extended earnings function:

$$\ln Y_i = c + \alpha_1 PRI_i + \alpha_2 SEC_i + \alpha_3 TER_i + \beta_1 Ex_i + \beta_2 Ex_i^2 + \gamma X_i + u_i \quad (4-2)$$

where PRI_i, SEC_i, TER_i are primary, secondary, tertiary (mainly technical level) education by individual i , and X_i are dummy variables indicating female, rural area, type of businesses, business locations, operation months and regional areas. The omitted category for the level of education is less than primary, for type of business is other service activities and for regional area is Vientiane Capital.

In terms of rates of return per year to different levels of schooling are then calculated as follows:

$$r_{PRI} = \alpha_1 / S_{PRI} \quad (4-3)$$

$$r_{SEC} = (\alpha_2 - \alpha_1) / (S_{SEC} - S_{PRI}) \quad (4-4)$$

$$r_{TEC} = (\alpha_3 - \alpha_2) / (S_{TEC} - S_{SEC}) \quad (4-5)$$

$$r_{UNI} = (\alpha_4 - \alpha_2) / (S_{UNI} - S_{SEC}) \quad (4-6)$$

The typical route: primary 5 years + secondary 6 years (lower 3 years + upper 3 years) + tertiary (technical 3 years or university 5 years) is analyzed in this study. However, it is incorrect to assume that primary school graduates forego earnings for the entire duration of their studies. Therefore, only one year of foregone earnings is assumed for primary school graduates.

4.4. Data Description

Despite the urgent need for labor market information, the current statistics in Lao PDR are very limited. In this paper, the author attempt to apply the data of Lao Expenditure and Consumption Surveys 3 (LECS 3) in 2002/03 to examine the influence of human capital on the performance of micro and small business representative of all industry sectors and geographical regions in Lao PDR. While the LECS 1 (1992/93) was combined with a large module of social indicators, the LECS 2 and LECS 3 versions focused on economic activities of households. Particularly, LECS 3 is deemed very useful to provide unusually rich data related to micro and small business in all categories. Also, this study is the first empirical study on the returns to human capital to entrepreneurs in Lao PDR.

The LECS 3 conducted by the Swedish International Development Agency (SIDA) and the National Statistical Center of Lao PDR was undertaken from March

2002 to February 2003. The sample was conducted by interviewing 8,092 households, 49,790 persons from 540 villages. The dependent variable used in this study, log of average monthly sales, was determined through extensive interviews with business owners at the site of their activities. In this survey, there are 1,956 samples reporting about average monthly sales of the business. 76 samples were dropped due to missing data. It is worth noting that most enterprises have only self-employed owner without employee. Unpaid family workers tend to support the business partly by preparing the materials and opening or closing the shop. Some entrepreneurs are purely small family business, while some are in farmer households but they generally do not provide labor force on farming. By checking the data of labor survey in LECS 3 as categorized by ISIC code, therefore, the sample of entrepreneurs used in this chapter is regularly not overlap with the labor of farmer households applying in the next Chapter.

Estimates of income, particularly in developing countries, and most especially among informal labor markets, often are be considerable speculation as to their accuracy, particularly regarding issues that are sensitive to regulation and taxation. Moreover, the proprietor of an informal firm will have little accurate conception of profit or income, as accounting and bookkeeping are rarely evident, whereas personal and business accounts typically mix within a single cash box. To establish more accurate incomes (the average sales volume) for this study, the ranges of data were compared with a field survey of 250 MSEs conducted in similar period by a different organization (ILO, 2004).

As a result, each of variables were carefully evaluated for consistency and developed into a standard format which asserted the data to be much more reliable.

Table 4-1: Mean of Selected Variables

Variables	Vientiane C.	Provinces	Lao PDR	
			All	Commerce
Average Monthly Sales (1,000 kip)	2,879	1,569	1,860	2,109
Number of Labor (Persons)	2.36	1.83	1.95	1.87
Micro Size (1 to 2, %)	70.6	82.9	80.2	80.8
Small Size (3 to 19, %)	29.4	17.1	19.8	19.2
Schooling years	7.67	5.44	5.90	5.55
Less than Primary (%)	22.1	37.0	34.0	38.1
(No Education)	(4.1)	(15.5)	(13.0)	(14.4)
Primary (%)	44.8	49.3	48.4	46.9
Secondary (%)	16.2	7.5	9.2	7.6
Tertiary (%)	16.9	6.2	8.5	7.4
Age / Experiences	40.3	39.7	39.9	39.8
Current Business Exp.	6.5	5.2	5.5	5.5
Potential Work Exp.	26.6	28.3	28.0	28.3
Female (%)	56.2	46.3	48.3	62.2
Business Location at Traditional market, Roadside, etc. (%)	38.3	46.9	44.6	45.7
(Base-line= Home)				
Yearly Operation (%)	72.9	53.8	57.9	62.2
(Base-line = Seasonal Operation)				
Vientiane Capital (%)	-	-	22.2	21.7
Northern Region (7 Provinces)	-	-	28.7	25.9
Central Region (6 Provinces)	-	-	32.2	32.1
Southern Region (4 Provinces)	-	-	16.9	20.3
Observations	394	1,382	1,776	978

Source: LECS 3 (2002-03). (Average market exchange rate in 2002 was at 10,056 kip/dollar)

Thus, the highest 1% and lowest 4% of data (outliers) are eliminated. Finally, 1,776 samples of earnings (average sales) are analyzed: 394 for the capital and 1,382 for the grouped remaining provinces. 857 observations are female.

Summarizing the data used in this study, Table 4-1 presents the brief characteristics of the samples in MSEs, which includes average monthly sales, size, schooling years, education levels, experience, and locations. The samples are also

classified into two geographical areas namely Vientiane Capital and the rest of the country (17 provinces). It is worth noting that Vientiane Capital alone comprises roughly one fifth of the sample size, which could justify the classification.

For the entire samples, the average schooling of micro/small entrepreneurs was at 5.9 years, which was above the national average. Entrepreneurs in the capital had a much higher educational attainment than rural entrepreneurs. In general, education at the primary level did not vary much among gender and regions. However, the higher the education level, the larger the gap was between male and female, and between Vientiane Capital and other provinces. Many of entrepreneurs in provinces had less than primary level (37%) and only 6% had a tertiary level. About 16% of owners in provinces had no schooling, which was four times as high as the proportion of owners in the capital.

The average age of micro/small entrepreneurs was at 40 years, regardless regions and sectors. The average experience in the same business was roughly six years. Whereas potential experience of entrepreneurs was quite long, they seemed to have multiple business experiences in the past. According to the report by ILO (2002), new MSEs were born at an annual rate of 25%. A death rate of 15% meant average annual growth rate was 10%. Approximately 55% of MSEs closed within four years. Specific impediments to survival included an unsupportive regulatory environment and the lack of access to credit, technical and business skills.

The approximate volume of monthly sales showed significant differences among sectors and regions. The average monthly sales for owners in the capital (2,878,834 kip) was almost twice higher than owners in provinces (1,569,091 kip). A female-owned enterprise had slightly lower monthly sales than a male-owned enterprise. The difference in sales figures could be a result of the women

entrepreneurs' limited mobility and greater dependence on business location at home. Over half of MSEs were based at home rather than traditional market, roadside and mobile. Moreover, over 70% of MSEs in the capital operated their businesses yearly, but nearly one-half of MSEs in provinces were seasonal operation, particularly in off-farm season.

4.5. Estimation Results

The results of the econometric analysis on entrepreneurial human capital and micro/small business are presented in Table 4-2 to Table 4-4. The estimates were classified into two geographical areas and industrial specifics. Together with regional differences, it is argued that each industrial sector/business shall be estimated separately due to its own specific. In this study, the commerce sector as the largest sector in MSEs was estimated separately. The constraint of insufficient sample, however, did not allow us to estimate the remaining other sectors separately.

This research found that most variables for schooling years and educational levels were statistically significant at the 1% level. Education seemed to be a good predictor of success in terms of sales levels. All educational variables were positive and statistically significant across the entire sample, as well as between firms in the capital and other regions, supporting findings by other researchers. Education appeared to have similar outcomes with the two different regions. For all cases, owners appeared to be capitalizing as increase of educational levels. Owners outside the capital took advantage of secondary education in the particular, but failing to capitalize on practical experience in the current and in the past. The estimating entrepreneurial performances showed a slightly difference results in using potential work experience and current work experience (see Appendix 4A for the results of

estimates using the current business). While most potential and current work experience were both insignificant, the influences of work experience in the past and schooling on volume of monthly sales were positive and generally larger than those of current experience in the same business. As can be noted, most owners had very long experience in their past businesses, these should be considered in survival and growth of the current business.

More precisely, as shown in Table 4-2, an additional schooling year yielded 6.2% and 6.8% more monthly sales in the capital and the provinces, respectively. For the biggest sector of commerce, the rate of return to education showed a similar positive effect at 6.6%. On average, the rate of return to education was at 6.4%. Since the research related to micro/small entrepreneurial human capital, especially for developing countries is still scarce, it is difficult to compare these results directly with other studies. The estimated rates of returns to schooling in this study were approximately same with the finding (6.8%) by Gimeno et al. (1997) for the case of U.S. However, Psacharopoulos and Patrinos (2002) studied returns to investment in education in worldwide and they concluded that mean rate of returns to schooling of wage earners for low income countries are higher than that of high income countries (10.9% vs. 7.4%). Considering this pattern, the beneficial of investment in education may be a relatively low for Lao PDR. Nevertheless, the findings in this study showed that there is demand for schooling among micro/small entrepreneurs (self-employed) in Lao PDR.

In terms of educational levels (Table 4-3), we found very interesting results. The estimates indicated a significant increase in business performance as the educational level rises up to secondary level in all categories. For the entire sample, as an example, the returns to primary, secondary, and tertiary education were at 33%,

Table 4-2: Use of Schooling Years and Potential Work Experience
(Dependent Variable is Log(average monthly sales) in Kip)

Variables	Vientiane C.	Provinces	Lao PDR	
			All	Commerce
Schooling	0.0615** (4.31)	0.0680** (7.04)	0.0644** (7.97)	0.0659** (5.81)
Potential Work Experience	0.0219 (1.31)	0.0125 (1.25)	0.0193* (2.26)	0.0049 (0.41)
Experience-Squared /100	-0.0218 (-0.78)	-0.0140 (-0.90)	-0.0240 (-1.77)	0.0006 (0.03)
Female	-0.1058 (-0.90)	-0.0256 (-0.37)	-0.0136 (-0.23)	-0.0277 (-0.35)
Number of Workers (log)	0.5421** (6.01)	0.7264** (12.42)	0.6710** (13.61)	0.5554** (7.58)
Manufacturing	0.0306 (0.18)	-0.3465** (-3.28)	-0.2559** (-2.85)	-
Construction	0.0206 (0.06)	0.3767 (1.45)	0.1863 (0.90)	-
Commerce	0.7068** (5.10)	0.2238** (2.73)	0.3142** (4.45)	-
Transport	-0.0250 (-0.10)	0.5724** (4.59)	0.5144** (4.63)	-
Business Locations	0.3200** (2.85)	0.1346* (2.07)	0.1575** (2.80)	0.1337 (1.82)
Yearly Operation	0.4556** (3.98)	0.2699** (4.38)	0.3073** (5.71)	0.4334** (5.80)
Rural Area	-	-0.4198** (-6.53)	-0.3994** (-6.76)	-0.4359** (-5.39)
Northern	-	-	-0.3167** (-3.94)	-0.4188** (-3.68)
Central	-	-	-0.2549** (-3.21)	-0.5439** (-5.01)
Southern	-	-	-0.0147 (-0.17)	-0.1537 (-1.32)
Constant	12.8404 (41.25)	12.4539 (63.91)	12.5849 (69.63)	13.2801 (54.94)
Adjust R-squared	0.250	0.247	0.289	0.259
F-test	12.90**	38.80**	49.09**	32.07**
Observations	394	1,382	1,776	978

Note: t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.

The omitted category for type of business is other service activities, and for regional dummy is Vientiane Capital.

Table 4-3: Use of Educational Levels and Potential Work Experience
(Dependent Variable is Log(average monthly sales) in Kip)

Variables	Vientiane C.	Provinces	Lao PDR	
			All	Commerce
Primary	0.3098* (2.31)	0.3215** (4.48)	0.3325** (5.29)	0.2841** (3.39)
Secondary	0.6306** (3.37)	0.7945** (5.85)	0.7254** (6.60)	0.8767** (5.50)
Tertiary	0.5979** (3.33)	0.5622** (4.02)	0.5642** (5.15)	0.5076** (3.25)
Potential Work Experience	0.0218 (1.27)	0.0114 (1.14)	0.0181* (2.10)	0.0056 (0.47)
Experience-Squared /100	-0.0240 (-0.85)	-0.0156 (-0.99)	-0.0248 (-1.81)	-0.0034 (-0.18)
Female	-0.1254 (-1.07)	0.0065 (0.09)	-0.0324 (-0.55)	-0.0435 (-0.56)
Number of Workers (log)	0.5474** (6.01)	0.7334** (12.49)	0.6764** (13.68)	0.5598** (7.63)
Manufacturing	0.0340 (0.20)	-0.3569** (-3.37)	-0.2608** (-2.90)	-
Construction	0.0770 (0.23)	0.3664 (1.40)	0.2070 (0.99)	-
Commerce	0.7082** (5.07)	0.2284** (2.77)	0.3200** (4.52)	-
Transport	-0.0238 (-0.09)	0.5651** (4.51)	0.5075** (4.56)	-
Business Locations	0.3300** (2.91)	0.1302* (1.99)	0.1605** (2.84)	0.1380 (1.87)
Yearly Operation	0.4325** (3.74)	0.2732** (4.42)	0.3051** (5.64)	0.4338** (5.79)
Rural Area	-	-0.4336** (-6.73)	-0.4141** (-7.00)	-0.4491** (-5.56)
Northern	-	-	-0.3371** (-4.19)	-0.4274** (-3.75)
Central	-	-	-0.2912** (-3.66)	-0.5729** (-5.28)
Southern	-	-	-0.0359 (-0.41)	-0.1679 (-1.44)
Constant	12.9794 (42.39)	12.5946 (66.33)	12.7300 (72.57)	13.4292 (57.80)
Adjust R-squared	0.239	0.242	0.285	0.257
F-test	10.48**	32.56**	42.56**	27.03**
Observations	394	1,382	1,776	978

Note: t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.
The omitted category for the level of education is less than primary.

73%, and 56%, respectively. Secondary education was the most beneficial in terms of increasing the firm performance, particularly in provinces (80%) and the commerce sector (88%). These suggested that vocational, technical, and university education together seemed to be over-education for entrepreneurs in Lao PDR. These results were contradictory to the findings by other researchers. For example, Bosma et al. (2002) and van Praag and Cramer (2001) found that the returns to higher education were the largest for Dutch entrepreneurs. Kurosaki and Khan (2004) came to the same result for the case of Pakistan. It is not easy to explain this reverse phenomenon. Perhaps, it could be interpreted in both directions of causality - a low level of development (a short history) of market-oriented economy in Lao PDR; a reflection of the “seriousness” of the activity.

The low returns to higher education for entrepreneurs in Lao PDR could be clearly observed when rates of return to education per year were examined (see Table 4-4). A technical education and a university education were shown to be significantly negative, particularly for the commerce sector. These findings may be the result of individuals seeking higher returns to human capital by self-selecting themselves into businesses that have a certain amount of market potential. Those with higher education degrees may simply have been waiting for a better opportunity, whereas those with basic education degrees may have considered their firms from a quicker response to market environments. On the other hand, the rates of return per year to primary education were strongly positive and as high as from 32% to 49%. These rates are much higher than the average rate of 26% for wage earners in low income countries (Psacharopoulos and Patrinos, 2002). The rates of return per year to secondary education were low between 8 to 12%. These rates are only about one-half when compared to the 20% of the standards of low income countries. Thus, the best

Table 4-4: Returns to Education per Year and Potential Work Experience
(Dependent Variable is Log(average monthly sales) in Kip)

Variables	Males	Females	Lao PDR	
			All	Commerce
Primary	0.4904** (3.56) [0.4904]	0.3231* (2.45) [0.3231]	0.4265** (4.56) [0.4265]	0.3338** (2.71) [0.3338]
Secondary	1.0750** (5.90) [0.0974]	0.7911** (3.62) [0.0780]	0.9654** (6.96) [0.0898]	1.0560** (5.48) [0.1204]
Technical	0.9665** (4.84) [-0.0362]	0.6576** (2.76) [-0.0445]	0.8352** (5.53) [-0.0434]	0.6906** (3.17) [-0.1218]
University	0.9898** (3.26) [-0.0170]	0.9234 (1.67) [0.0265]	0.8479** (3.27) [-0.0235]	0.9571** (2.96) [-0.0198]
Potential Work Experience	0.0505** (3.03)	0.0057 (0.33)	0.0267* (2.23)	0.0189 (1.13)
Experience-Squared /100	-0.0640* (-2.53)	-0.0066 (-0.25)	-0.0319 (-1.76)	-0.0202 (-0.80)
Female	-	-	0.0380 (0.47)	0.0189 (0.18)
Number of Workers	0.7272** (8.61)	0.6869** (6.37)	0.7129** (10.74)	0.5656** (5.78)
Manufacturing	-0.2507 (-1.64)	-0.3336 (-1.68)	-0.2884* (-2.45)	-
Construction	-0.1461 (-0.42)	-	-0.0109 (-0.03)	-
Commerce	0.3116* (2.57)	0.3374* (2.06)	0.2996** (3.12)	-
Transport	0.3859* (2.27)	0.9048* (2.08)	0.3736* (2.49)	-
Business Locations	0.0634 (0.58)	0.1728 (1.60)	0.1510* (1.99)	0.2033* (2.08)
Yearly Operation	0.2035* (1.97)	0.5535** (5.18)	0.3642** (4.95)	0.5374** (5.28)
Rural Area	-0.3658** (-3.31)	-0.5162** (-4.27)	-0.4540** (-5.65)	-0.5194** (-4.78)
Northern	-0.3110* (-2.01)	-0.2330 (-1.43)	-0.2574* (-2.32)	-0.3362* (-2.21)
Central	-0.0473 (-0.32)	-0.3059 (-1.89)	-0.1663 (-1.55)	-0.5005** (-3.47)
Southern	-0.1486 (-0.82)	0.0483 (0.28)	-0.0320 (-0.26)	-0.1770 (-1.11)
Constant	11.7645 (33.22)	12.8406 (33.83)	12.3522 (49.03)	13.0855 (39.21)
Adjust R-squared	0.331	0.355	0.340	0.339
F-test	15.21**	16.24**	27.78**	19.45**
Observations	490	445	935	505

Note: * Statistically significant at the 5% level, ** at the 1% level.
t-statistics in parentheses. "Per year" returns education in brackets.
Insufficient samples for construction sector in females.

investment in education for micro/small entrepreneurs in Lao PDR is obviously the primary level.

Considering gender, women earned less than men, although the difference was very little and insignificant. We would expect that larger amounts of gap can be observed. The finding regarding female income was not matched by many studies. A 1% increase in number of workers resulted in 54% to 73% increase in monthly sales, particularly greater in rural areas. It seemed that number of workers is not a determinant factor in increasing the sales for MSEs in the commerce sector and the capital. While the average number of workers was about the same in both urban and rural areas, MSEs in rural areas seemed to be more labor intensive than in urban areas. In terms of industry specific, micro and small entrepreneurs in commerce activities earned more than in any other sector in the capital. There were minor differences in firms' performance for the remaining sectors in the capital. For other provinces, owners in commerce activities and transport had some advantages, whereas owners in manufacturing earned less than in any other sector. It is worth nothing that the manufacturing sector in Lao PDR is characterized by low levels of productivity. Most production is textiles and garments, food/wood processing, and construction materials, which are often small scale in rural areas.

Over half of MSEs were based at home rather than traditional market, roadside and mobile. Owners who based their businesses at home earned about 13% less than owners who located in business locations. In the capital, the advantage of operating in business locations was as much as 30% higher than operating business at home. Furthermore, nearly one-half of MSEs in provinces were seasonal operation, particularly in off-farm season. They earned about 28% less than yearly operation

firms. In opposite, most MSEs in the capital operated their businesses yearly and their monthly sales were about 50% higher than those did not operate yearly.

Entrepreneurs in rural area earned 40% to 50% less than entrepreneurs in urban area. Rural enterprises are significantly disadvantaged in access to roads and electrical power. About 80% of rural villages was reachable by road in dry season, but the condition was worse in rainy season. Although most urban villages had electricity, less than one-third of rural villages had access to electricity. Access to infrastructure in rural areas is generally lower in northern part. Taxes and bureaucratic obstacles also impede the movement of goods within the country. In addition, entrepreneurs in northern and central regions significantly underperformed compared to entrepreneurs in the capital, especially in the commerce sector. Surprisingly, entrepreneurs in southern region had a fairly well performance compared to the capital. This was, perhaps, due to the imbalance distribution of the samples. Champasack, one of the three major provinces in the country, solely occupied over one-half of the samples grouped by four provinces in the south. Thus, considering the regional differences, it may cause upward bias.

4.6. Concluding Remarks

Entrepreneurs in MSEs in Lao PDR have limited education, experiences and access to resources. Poor access by all forms of MSEs to finance and business knowledge impedes their competitiveness. Financial problems defined as the lack of investment and operating funds are most common at the business startups and performance. Marketing problems become much more important over time for micro/small entrepreneurs. The domestic market is limited in terms of the number of consumers and the value of their purchasing power. Many entrepreneurs, particularly

in rural areas, produce poor quality products and services. They are unaware of the market place and competition, as well as the pricing, range and types of products that are demanded by the market.

The research work on MSEs in Lao PDR in this paper provides a number of specific variables useful to policy makers and agencies who are engaged in promoting this sector in marginal market environments:

First, this study showed the importance of micro/small entrepreneurial human capital in increasing the performance of the firms. For all cases, the model showed the advantage of having educational attainments when operating a business. The rates of return to schooling were at about 6-7%. The advantages to conventional formal education had outweighed the returns to additional work experience. Whereas education demonstrated favorable returns to the performance of the businesses, post-secondary education was found to be over-education to enhance the average sales of entrepreneurs, particularly for the commerce sector. For all groups, primary education was the most beneficial. The findings suggested that basic literacy and numeracy are more important to their day to day operations, whereas more higher education may be somewhat esoteric and provide little economic advantage for micro/small entrepreneurs. Therefore, policy makers should target to provide education opportunities to micro/small entrepreneurs who have less primary education, especially illiterate entrepreneurs.

Second, the estimated results showed experiences in both the potential and the current business to be a marginal investment. Most owners run their enterprises in isolation, and they did not interact extensively with existing business associations and networks. So far, skills development is insufficiently linked to market demand and there is lack of integration of technical and business training. There are also ongoing

problems with the basic quality and capacity building of teachers and trainers. Thus, local and international organizations should improve the delivery of business skills training programs suitable for MSEs.

Finally, the study found that entrepreneurs in the certain sectors and locations have greater disadvantages. Initiatives to develop MSEs used by related agencies should be made more sensitive to the entrepreneurs in manufacturing sector, home-based and seasonal operation, and rural areas. At the present, the Lao government aims to reduce poverty through agriculture-related businesses and to target rural entrepreneurs, minorities, and family businesses. However, the existing legal and policy framework favors large enterprises. There is no national policy or agency dedicated to development of micro/small enterprises (MSEs) as means of generating employment and improving living conditions.

A mechanism such as the National Micro and Small Enterprises Promotion Committee should be established. The committee should have powers and responsibilities to: (1) review existing policies and regulations, and develop new laws and regulations that protect and promote the interests of disadvantaged groups; (2) to encourage cooperation and coordination among government agencies, between domestic and foreign organizations, and with the private sector in their efforts to promote MSEs development; and (3) plan and implement programs/projects on MSEs development from both central and local levels, and have effective follow-up and monitoring systems and learn from both achievements and mistakes.

In addition, there is a need to have updated statistics for MSEs in general, and for financial variables in particular. On a cautionary note, how financial capital effects success remains a subject for future study. Thus, some of the particular findings of this study may lack generality.

CHAPTER 5

HUMAN CAPITAL AND FARM PRODUCTIVITY IN LAO PDR

It has long been well recognized that improvement in human capital is a key factor in economic growth; by this token, human capital – particularly human capital of farmers – has been sadly depreciated in most developing countries. This chapter attempts to explore the relation between the education farmers have obtained and their subsequent efficiency as farm operators. Economists assess the monetary benefits of education in the wage sectors of an economy by attempting to ascertain the effect of educational level on earnings; for farmers, however, this approach breaks down and other methods must be used to ascertain the nature of education's effect and role. Our concern here is with the small farmers in agriculture in Lao PDR.

Using the two sets of large national household survey data from Lao PDR, this chapter aims to evaluate the effects of adult educational attainment on farm productivity. Given the fact that farmers comprise over 80% of the labor force, investigating impacts of education on welfare of farmers would shed some light on one of the essential issues of the country and undoubtedly provide useful information for policy makers in planning and formulating certain poverty reduction and development strategies.

The structure of this chapter is as follows: Section 5.1 reviews the literature on farmer education and farm efficiency. Section 5.2 describes the key features of agriculture sector in Lao PDR. Section 5.3 presents the theoretical framework and empirical models, Section 5.4 outlines data description. Section 5.5 shows the estimation results, and section 5.6 provides some concluding remarks.

5.1. Farmer Education and Farm Efficiency

The majority of human capital literature for developing countries focuses on wage earnings, in spite of the fact that the largest share of labor force is engaged in self-employed activities. A rate of return is a key factor in determining the demand for education, but why are there returns to education, especially for farm households? Bowman (1976) has argued that education and information relevant to the small farmer might usefully be categorized along “formation of competences” and “transmission of information”. Basic competences – literacy, numeracy, and general cognitive skills – are best formed through schools or similar institutions. Information – on prices, new seeds or techniques, irrigation methods, and so forth – can be transmitted through a variety of institutional or non-institutional frameworks. Whereas the goals of information transfer services can be stated in narrowly economic terms, the development of competence can be expected to have not only economic benefits in agriculture, but also in the improvement of other aspects of household life.

Concepts of education and farm efficiency through worker effect, allocative effect, and choice of production technique are well-defined in Welch (1970) and Schultz (1975) (see more details in Section 5.3.1). Another concept of efficiency, market efficiency, is defined as a farmer’s ability to obtain the highest net sale price for his outputs and the lowest net purchase price for his inputs. Education enhances a farmer’s ability to know his alternatives, to know when and where to buy and sell. A better educated farmer is more likely to know what prices are likely to prevail in equilibrium, and can therefore become a better bargainer. He or she may also have a finer discrimination of differences in quality and may be able to judge quality more accurately.

On the empirical work, a number of studies [for example, Huffman (1974), Fane (1975), Wu (1977), Lockheed et al. (1980), Jamison and Moock (1984), Rosenzweig (1995), Singh and Santiago (1997), and Yang (1998)] have analyzed the effects of education on farm efficiency. The large majority of the literature uses either the education level of one individual in the household or the average level of education in the household.

Jamison and Lau (1982) surveyed the literature worldwide on education and small farm production in countries of Asia, Africa, and Latin America has produced 37 data sets. Of these studies, 20 used the education level of the household head or the farm operator, and 14 use the average level of education of the household. They pointed out the positive correlation between education attainment and farm productivity in 31 out of 37 studies. In the studies with statistically significant positive results, the rates of returns to schooling ranged from 0.70% to 6.47% with an average of about 2.87%. The effects of education were much more likely to be positive in modernizing agricultural environments than in traditional ones. Similarly, other studies have also usually found the positive effect of education on farm productivity, but its effect is often small.

Furthermore, Lin (1991) examined whether the education level of the head of household and the average level of household education affect adoption of new farm technologies in China. Foster and Rosenzweig (1996) and Behrman *et al.* (1999) showed that anyone within a household having primary education is an important predictor of adopting new farming technology and profitability during the time of the “Green Revolution” in India. However, recent studies on the effects of education on farming pay more attention to the motivation of investing in human capital. Several studies [for example, Huffman (1980), Yang (1997), Fafchamps and Quisumbing

(1999), Lanjouw (1999), Yang and An (2002), and Kurosaki and Khan (2004)] found that farmers respond to higher returns to education in the non-farm sector by reallocating labor away from agriculture.

5.2. Key Features of the Agriculture Sector in Lao PDR

Laotian society is highly dependent on agriculture. The self-employed, mainly farmers, as a percent of the total labor force was 82% in 2003, and barely changed from 86% in 1995 (ILO, 2005). It is worth noting that a farmer may also work in household business or temporarily work as paid employee in off-farm season. According to LECS 2, most of households in Lao PDR were engaged in some agricultural production either as the main or the side activity. The outputs consist of productions for own final use and for market sale. Two thirds of all households had some market sale of their products, and one fourth was purely subsistence farmers. Farmers tend to have several activities in producing rice, vegetables/fruits, and livestock. Most of them produce glutinous rice rather than ordinary rice. Fishing is a wide spread activity. More than 90% of households in rural area do fishing for own consumption and for sale. With regard to regional differences, farmers in the northern and central regions mainly produce glutinous rice (73% and 71%, respectively), while the dependency on rice is far less in the south (58%).

Measured from the income side, however, agriculture was not that dominant as it appears. It provided only about 45% of all household income. This low share is due to the low level of access to market. The fact is that less than 13% of rice production was for market despite its dominant in the total agricultural outputs. In terms of income generation, livestock and vegetables/fruits are the most important

outputs. Meat (including wild animals) has a large market share, whereas fish is mostly for own final consumption.

LECS 3, on the other hand, shows that the structure of household agricultural output is generally similar to LECS 2. The outstanding difference is that nearly one-third of rice production is for market, compared to 13% in the previous survey. As shown in Figure 5-1 to Figure 5-3, crops (rice) remain the most important product. For most products, less than one third of the production is sold at the market. The structure of the market outputs is somewhat more diversified than the outputs for own final use. It is worth noting that there are large differences between provinces and regions for the market share. For instance, the proportion of agriculture outputs for market was only 7% in Phonsaly, while the proportion for Xayabury was at 64% (see Appendix 5A-1 for more details of share of agriculture outputs for market in 2002/03).

With respect to farm operating system, LECS 2 showed that over 60% of farm households own buffaloes and only 7% have tractors. In general, livestock are an important source of cash income for farmers in other economies. However, owning buffaloes is probably an important factor on increasing productivity in Lao farming, since they provide labor for farming (ploughing, cart, etc.). Therefore, together with testing the effects of using mechanical or chemical inputs as in other studies, the effects of inputting buffaloes on farm productivity will also be analyzed in this study. LECS 3 showed that about 28% of households used chemical fertilizers in the productions. There were large differences between the regions, particularly very low in the North (see Figure 5-4). Less than 10% of farmers in the North used fertilizers compared to 40% of farmers in the Center, and 30% of those in the South. About 12% to 18% of households used insecticide in their farming, which had small differences

between the regions (see Appendix 5A, Table 5A-2 for more details of the share of holding agriculture productive assets in 2002/03).

Furthermore, it can be noted that farmer households in Lao economy tend to have a small family business as a side job (e.g. retail, handicraft, etc.). Out of total households, 21% in 1997-98 and 28% in 2002/03 engaged in informal sectors as a family business, mostly without paid employees. If none legally registered family businesses are included, the estimates showed that as many as 46% of households (68% in urban vs. 38% in rural areas) operate micro or small business in 2002/03. Operating a family business in parallel to farming may cause various contradicting impacts on productivity. The first one suggests that it would reduce the productivity by allocating time away from farming to operating the family business. The opposite one implies that it would increase the productivity by having incentives to produce more for market sale and having management skills gained through operating the family business. In this study, thus, it will be tested whether or not having a family business would yield a higher output for farmer households.

In addition, there are number of restrictions for farmers including lack of irrigation, insects, and animal disease. Lack of knowledge, lack of credits, and lack of market ranked high, particularly for farmers in rural areas. Flooding was an important restriction in some of the provinces in the Center and the South (see Appendix 5A, Table 5A-14 and Table 5A-15 for the report of damaged planting areas in 1997 and 2002, respectively). The most common agricultural practice in Lao PDR is rotational (shifting) cultivation (77%). The frequency of pioneering cultivation (slash and burn) in 2002/03 has been reduced to about half the level it was in 1997/98 (see Appendix 5A, Table 5A-4 for the more details of agricultural practices in 2002/03).

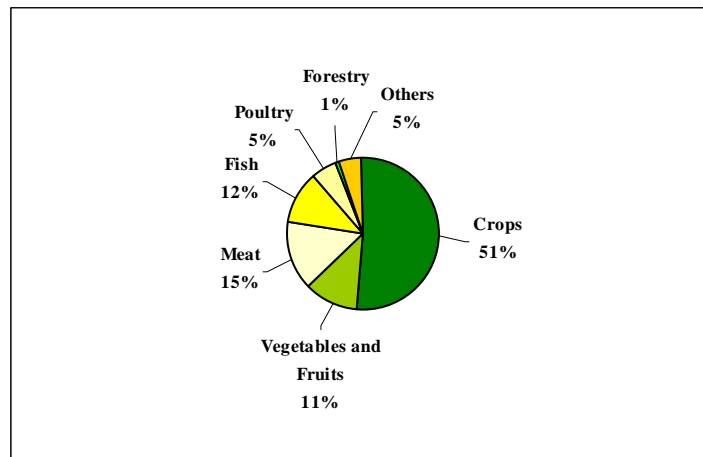


Figure 5-1: Household Agriculture Outputs in 2002/03

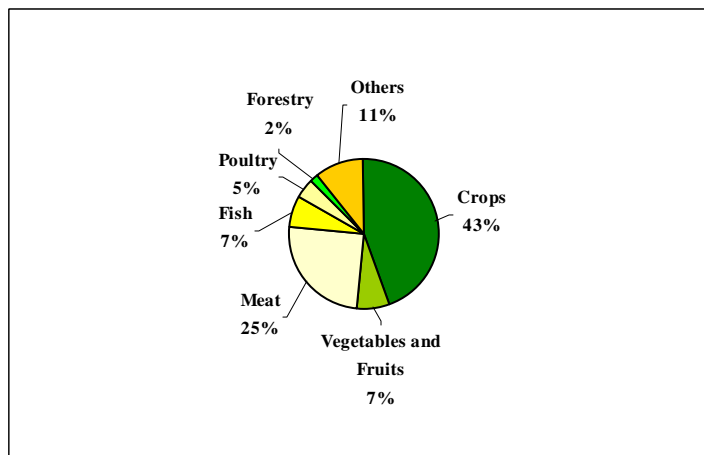


Figure 5-2: Household Agriculture Outputs for *Market* in 2002/03

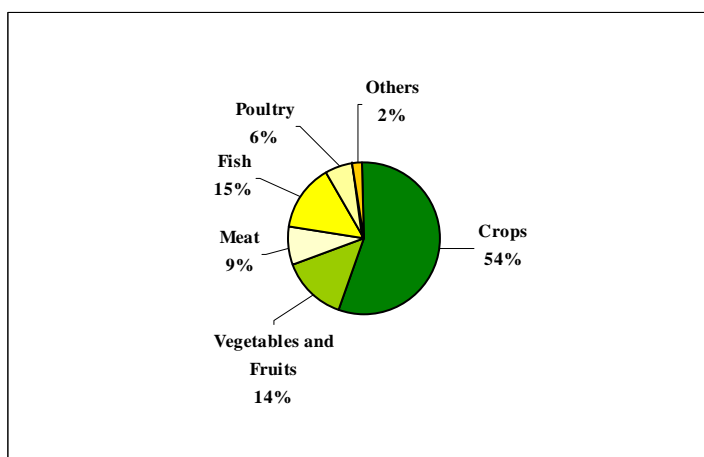


Figure 5-3: Household Agriculture Outputs for *Own Final Use* in 2002/03

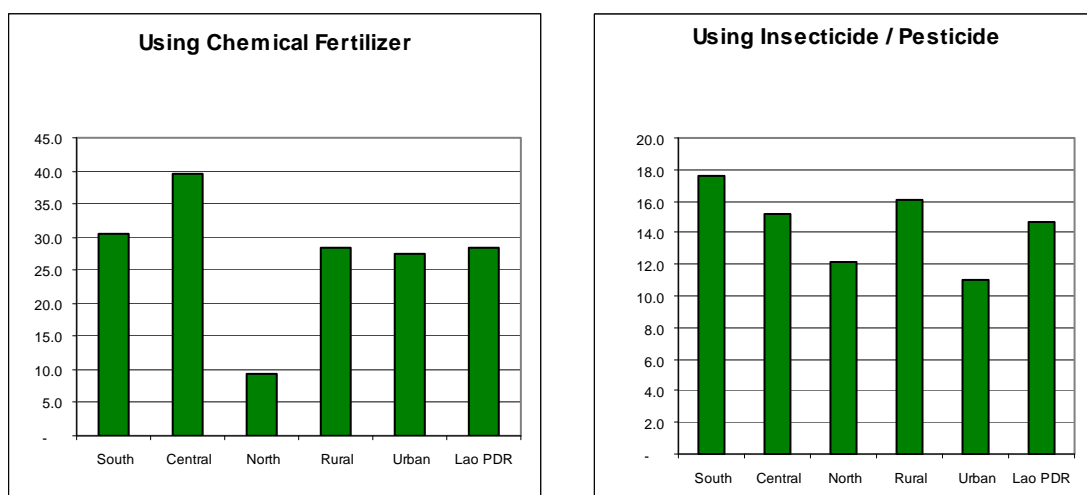


Figure 5-4: Percent of Households Using Chemical Inputs in 2002/03

5.3. Theoretical Framework and Empirical models

5.3.1 Theoretical Framework

In pioneering work, Schultz (1961) emphasized the role of education in improving farm efficiency and in modernizing agriculture. Schultz (1975) proposed that education improves a household's ability to efficiently adjust production decisions during periods of disequilibria or change. Along similar lines, Welch (1970) suggested that education may have two distinct effects. First, education may enhance a worker's ability to produce more with the given resources, the so-called "worker effect" (productivity effect). Second, education may improve the worker's ability to select the mix of inputs, the so-called "allocative effect". In more recent work, Kremer (1993) modeled heterogeneity in the quality of labor inputs in production functions, and he proposed a weak-link production function in which workers of similar skill are matched together.

The model of how education affects production has implications for the appropriate empirical specification of education in the production process. Yang

(1997) proposed that using the maximum number of schooling in the household will serve as a reasonable proxy for the allocative effect, while the average number of schooling will proxy for the worker effect. The allocative effect will likely be captured in managerial decisions, which are presumed to be made by the best-educated individual in the household. The natural implication of Kremer's O-Ring theory is that the minimum number of schooling in the household is the appropriate measure of household education, as it is the weakest link that will ultimately determine the value of the output. Overall, the large majority of the literature on farmer education and farm productivity use the education level of one individual in the household (usually household head).

5.3.2 Empirical models

The basic method of analysis in this study follows the model proposed by Yotopoulos (1967), cited in the book of Jamison and Lau (1982) page 19-21. Yotopoulos used a production function for agricultural output as his basic tool to analyze the effect of education on productivity. Subsequent studies use much the same methodology with variations of either the Cobb-Douglas (or ln – ln) production function or the linear production function to relate output, and to the various inputs. In this study, we examine the quantity of output, since the value of rice production depends on price structures (which may vary widely both within and among regions) and we are lack of this detail information.

The studies we have reviewed typically used data from surveys that contain for each farm on some or all of the following variables used in this study.

The output production model is specified as:

$$\ln(Y_i) = \alpha_0 + \alpha_1 \ln(T_i) + \alpha_2 \ln(L_i) + \beta_i Sch_i + \gamma X_i + u_i \quad (5-1)$$

$$\ln(Y_i) = \alpha_0 + \alpha_1 \ln(T_i) + \alpha_2 \ln(L_i) + \beta_i Edu_i + \gamma X_i + u_i \quad (5-2)$$

Y = total rice output (kilograms); T = area under cultivation; L = labor input (family labor used); Sch = Heads/Spouses' years of schooling; Edu = Heads/Spouses' years of educational level dummies; X = other factors: farm experiences, use of irrigation, buffalo, and regional dummies. In equation (5-1) and equation (5-2), the coefficients α on the input variables estimated from the data indicate how strongly each input affects output. The coefficients β give the percentage increase in output in response to a unit change in schooling or educational level.

In the recent literature, Jolliffe (2002) estimated the effects of several alternative measures of household education on household income differentiated into farm and non-farm income. The findings supported for using the maximum and average level of school attainment when estimating household income. In this study, however, we use the education attainment of household head (spouse) as assumed in a significant portion of the published literature in this field. This way fits much more with the farmer education and the farming system in Lao PDR, and it also derives a clearer result for the policy implications.

5.4. Data Description

This study employs the national household survey data, the so-called Lao Expenditure and Consumption Survey, LECS 2, in 1997-98 and LECS 3 in 2002-03. These surveys were conducted by SIDA and NSC, which covered about 1% of total population. For LECS 2, after clearing the missing data, we finally use the subsample of 4,565 farmer households: 2,143 from seven provinces of the northern region, 1,619 from seven provinces of the central region, and 803 from four provinces of the southern region. Similarly for LECS 3, the subsample of 4,755 farmer households:

1,993 from the north, 1,846 from the center, and 916 from the south are used in the analyses.

Summarizing the data of LECS 2 and LECS 3, Table 5-1 presents the characteristics of the samples including: schooling years/education levels of the household head and spouse, total rice output, land, labor, and percentage of farm household having productive assets, chemical inputs and access to irrigation. The samples are also classified into three geographical areas namely North, Center, and South. On average, the schooling years were about 4 years for head of households, and 2 years for their spouses. The schooling years were roughly the same for the North and the South, which were both lower compared to the Center. The higher the education level, the larger the gap between head and spouse. In 1997/98, over one half of household heads and eight out of ten household spouses had less than primary education level. Roughly 23% of the household heads and 54% of their wives had no schooling. Even in 2002/03, a half of household heads and three quarter of household spouses had less than primary education level. The very poor performance in human capital is that roughly 20% of the household heads and 44% of their wives were illiterate. Less than 15% of the heads and less than 25% of the spouses had education attainment over the primary level. Overall, however, the levels of school attainment show the slightly improvement along 1997/98 to 2002/03 for both household head and spouse in all regions.

The agricultural incomes are not examined in this study due to the insufficient and often unreliable samples. The total rice output, on the other hand, recorded a significant difference between the Center and the rest of the country. The total output increased nearly twofold from 1,413 kilograms in 1997/98 to 2,564 kilograms in 2002/03, especially in the Center and the South. Specifically, for the

Table 5-1: Mean of Selected Variables in Lao Farming in 1997/98 and 2002/03

Variables	1997/98				2002/03			
	North	Center	South	Total	North	Center	South	Total
Schooling of <i>Head</i> (Years)	3.61	4.79	3.52	4.01	3.66	4.77	3.98	4.15
<i>Less than Primary (%)</i>	59.5	46.8	65.4	56.1	54.5	41.0	58.1	49.9
<i>(No Education)</i>	(28.4)	(15.2)	(23.3)	(22.8)	(24.6)	(15.1)	(16.8)	(19.5)
<i>Primary (%)</i>	28.2	33.8	23.4	29.4	34.9	39.2	28.9	35.5
<i>Lower-Secondary (%)</i>	9.6	12.4	8.6	10.4	8.2	12.4	9.1	10.0
<i>Upper-Sec. or higher (%)</i>	2.6	6.9	2.6	4.1	2.3	7.4	3.9	4.6
Schooling of <i>Spouse</i>	1.77	2.59	1.55	2.03	2.03	2.82	1.99	2.33
(Years)								
<i>Less than Primary (%)</i>	80.6	72.5	87.2	78.9	77.6	68.6	84.4	75.4
<i>(No Education)</i>	(60.5)	(44.1)	(57.5)	(54.2)	(50.3)	(37.9)	(44.5)	(44.4)
<i>Primary (%)</i>	15.8	20.5	10.8	16.6	19.7	24.1	12.8	20.1
<i>Lower-Secondary (%)</i>	3.2	5.6	1.9	3.8	2.1	5.2	2.2	3.3
<i>Upper-Sec. or higher (%)</i>	0.4	1.4	0.0	0.7	0.7	2.2	0.7	1.2
Total Rice Output (Kgs)	1,443	1,622	909	1,413	2,169	3,137	2,267	2,564
Land Area (Hectares)	1.35	1.40	1.36	1.37	1.05	1.41	1.32	1.24
Farm Labor (Persons)	3.48	3.57	3.52	3.52	3.93	4.00	3.87	3.95
Family size (Persons)	6.60	6.97	6.60	6.73	6.32	6.29	6.29	6.30
Head Age	40.8	42.5	42.7	41.7	40.7	42.7	43.7	42.1
Spouse Age	37.0	37.7	38.0	37.4	36.7	38.0	38.6	37.6
% of farmers having a family business (% of farmers)	14.7	17.1	12.1	15.1	11.5	16.3	9.6	13.0
Use of Fertilizer	-	-	-	-	8.3	42.4	29.7	25.7
Insecticide	-	-	-	-	12.2	18.5	17.1	15.6
Two-wheeled tractor	-	-	-	-	10.3	23.1	4.5	14.2
Four-wheeled tractor	-	-	-	-	3.8	4.1	3.2	3.8
Cart	-	-	-	-	3.7	6.7	5.1	5.1
Number of Buffaloes	3.09	5.41	3.77	4.03	-	-	-	-
Use of Irrigation								
All land irrigated	13.8	13.9	4.2	12.1	11.1	17.6	7.3	12.9
Some land irrigated	38.5	22.5	4.7	26.9	13.2	22.9	12.4	16.8
None land irrigated	47.7	63.6	91.0	61.0	75.7	59.6	80.2	70.3
Observations <i>N</i>	2,143	1,619	803	4,565	1,993	1,846	916	4,755

Source: LECS 2 (1997/98) and LECS 3 (2002/03)

northern part, Xayaboury province usually has the highest agricultural production, but the differences in output among provinces are generally small. Vientiane Capital and Vientiane province have the highest production in the Center and the country. For the Southern part, Sekong province usually has the lowest output in the region and the country. It is worth noting that the recent severe floods⁷ that occurred in 1995, 1996 and 2000, resulted in damaged rice paddies in some parts of the central and the majority of southern provinces may explain the differences in output among regions in 1997/98 compared to 2002/03. There are also small floods occurred during the period of this study. The levels of disasters affected on planting area are relatively low about 10% in 1997 and 8% in 2002 (see Appendix 5A, Table 5A-14 and Table 5A-15 for the reports of 1997 and 2002, respectively). While land and labor size are constant, the improvement of education attainments, the introduction of new seeds and productive agricultural tools are probably the key factors that explain the increasing total output.

In general, the average age of household heads and spouse were about 42 years old and 38 years old respectively, which resulted in comparable farm experience. In both the two sample sets, farm lands were revealed to be of a small size, about 1.3 hectares on average, although this was quite equally distributed among regions. The average family size (or labor size) was about 6 persons (or 4 persons), which was also roughly the same among regions. However, information related to hired labor and the use of mechanical or chemical equipments was not reported in LECS 2. The average farmer usually used 3 to 5 buffaloes as productive assets due to the lack of tractors and other farming machinery. In LECS 3, the use of fertilizer, insecticide, and productive agricultural assets (tractor and cart) was reported. Farming in the Center

⁷ Asian Disaster Reduction Center, for an example, "Lao PDR country report 2003" provides the overview of disasters occurred in Lao PDR, including floods.

appeared to be much more modernization than the rest of the country. Both LECS 2 and LECS 3 reported that nearly 15% of farmer households operated a family business, particularly those located in urban areas.

Furthermore, farming remains predominantly subsistence in nature. Only a small number of farmers in the North and the Center had full access to irrigation (i.e. all of their productive land is irrigated), and less than 7% of farmers in the South could enjoy this service. 50% or more of farmers own dry land without an irrigation system. Since it is difficult to make comparisons based on the extent of irrigation, the dummy variable of access to irrigation will be used for both all and some land irrigated in this study.

5.5. Estimation Results

The OLS results of the estimated returns to education on the model of total rice output in two datasets of 1997/98 and 2002/03 are presented in four subsections from 5.5.1 to 5.5.4. In brief, all the coefficients for schooling years/education levels are statistically significant at the 1% level. The results showed that an additional schooling year would yield about 4.7% and 6.1% more output for household heads in 1997/98 and 2002/03, respectively. Although the returns to education increased significantly in all education levels over the study period, the rates of returns per year were particularly high for primary level.

It is interesting to compare the present estimates with other research results. Psacharopoulos and Patrinos (2004) have made valuable contributions to the literature related to economic returns to education by providing a global update. However, the findings reported in their studies are overall estimates without providing a distinction between farm and non-farm income differentials (most of estimates are for wage

earners). The returns to schooling for wage earners are generally reported to be higher than that of farmers. Hence, it is more appropriate to compare the results in this study with Jamison and Lau (1982) and other studies that are based on farm schooling and farm productivity.

In the studies with statistically significant positive results, Jamison and Lau (1982) concluded that the rates of returns to schooling range from 0.70% to 6.47% with an average of about 2.87%. Although the results of different studies must be compared with caution, the results of this study indicated that the estimated rates of returns to education are relatively high considering the generally low levels of education attainment of farmers, with the majority having the primary education level or lower. This result is not contradicting with previous studies. For example, Kurosaki and Khan (2004) suggested that the effects of primary education on crop productivity are remarkable but the additional gain from higher education is very small.

5.5.1 Education of Household Heads and Farm Productivity in 1997/98

The estimated results of returns to education on farm productivity in 1997/98 are presented by using schooling variables and educational level variables in Table 5-2-1 and Table 5-2-2, respectively. It is worth noting that the floods occurred in the years prior to 1997 could have severely damaged rice paddies in southern provinces, which may distort the estimated results of the South from the rest. Thus, the estimated results on farm productivity in the South must be interpreted with the cautions.

The results showed that an additional schooling year would yield about 4.9%, 4.1%, and 4.8% more rice production for household heads in the North, Center, and South, respectively. We also found that the returns to schooling generally

Table 5-2-1: Results of the Estimated Output Production Model in 1997/98 – Use of Schooling Years

Variables	North	Center	South	All
log(Land)	0.6567** (21.81)	0.6655** (17.86)	0.8269** (13.88)	0.6885** (31.49)
log(Labor)	0.2663** (5.60)	0.2918** (4.98)	0.2852** (3.24)	0.2716** (7.96)
Years of Head Schooling	0.0490** (7.96)	0.0410** (5.85)	0.0481** (3.84)	0.0466** (10.80)
Farm experience (Head age)	0.0209 (1.87)	0.0094 (0.67)	0.0008 (0.23)	0.0218** (2.66)
Farm experience squared/100	-0.0196 (-1.55)	-0.0104 (-0.67)	0.0088** (2.72)	-0.0222* (-2.44)
Number of buffaloes	0.0347** (7.16)	0.0135** (3.74)	0.0473** (4.76)	0.0263** (9.73)
Access to irrigation	-0.0993** (-2.58)	0.2263** (4.73)	-0.3141** (-2.76)	0.0048 (0.16)
Farmers with a family business	0.0862 (1.65)	0.0973 (1.50)	0.2014 (1.82)	0.1036** (2.69)
Northern	-	-	-	0.6990** (16.73)
Central	-	-	-	0.6347** (14.66)
Constant	5.6216 (24.17)	6.1556 (20.58)	4.8723 (24.47)	5.0043 (27.67)
Adjusted R ²	0.288	0.273	0.323	0.324
F-test	109.31**	77.10**	48.72**	219.21**
Observations	2,143	1,619	803	4,565

Note: Dependent variable = log of household total rice output.

t-statistics is in parentheses. *Significant at the 5%, and ** at the 1% level.

Except for an equation in column 1 (North), White's heteroskedasticity test rejected the null hypothesis of homoskedasticity, and White heteroskedasticity consistent covariance is applied.

increased as educational level rise. The effects of primary education (23%) on productivity were remarkable but the additional gains from lower secondary (31%) and upper secondary education (38%) were fairly small. In terms of the elasticity of output with respect to land and labor inputs, a 1% increase in unit of land and labor would yield roughly 0.7% and 0.27% more rice output. An additional year of farm experience showed a marginal impact on output, and usually statistically insignificant.

Table 5-2-2: Results of the Estimated Output Production Model in 1997/98 – Use of Educational levels

Variables	North	Center	South	All
log(Land)	0.6632** (21.91)	0.6711** (17.99)	0.8304** (13.43)	0.6940** (31.64)
log(Labor)	0.2552** (5.35)	0.2813** (4.81)	0.2928** (3.26)	0.2638** (7.72)
Primary level	0.2041** (4.71)	0.1889** (3.45)	0.3694** (4.24)	0.2343** (7.41)
Lower secondary level	0.3249** (4.98)	0.2496** (3.51)	0.3133* (2.41)	0.3079** (6.85)
Upper secondary or higher	0.4156** (3.58)	0.3628** (4.23)	0.1338 (0.60)	0.3780** (5.94)
Farm experience (Head age)	0.0251* (2.24)	0.0126 (0.90)	0.0012 (0.37)	0.0249** (3.02)
Farm experience squared/100	-0.0247 (-1.95)	-0.0140 (-0.89)	0.0069* (2.11)	-0.0257** (-2.80)
Number of buffaloes	0.0356** (7.31)	0.0130** (3.64)	0.0474** (5.34)	0.0263** (9.76)
Access to irrigation	-0.0883* (-2.28)	0.2257** (4.69)	-0.3199** (-2.59)	0.0070 (0.24)
Farmers with a family business	0.1035* (1.98)	0.1109 (1.72)	0.2053 (1.83)	0.1197** (3.14)
Northern	-	-	-	0.6874** (16.47)
Central	-	-	-	0.6399** (14.77)
Constant	5.6330 (24.09)	6.1772 (20.49)	4.9270 (25.16)	5.0210 (27.61)
Adjusted R ²	0.281	0.269	0.323	0.320
F-test	84.78**	60.49**	39.64**	179.88**
Observations	2,143	1,619	803	4,565

Note: Dependent variable = log of household total rice output.

t-statistics is in parentheses. **Significant at the 5%, and *** at the 1% level.

White heteroskedastisity consistent covariance is applied for equations 2 and 4, (Center and All).

Interestingly, the effects of irrigation explored the opposite results between the North and the Center. Whereas farmers in the Center were much enjoyed from the irrigation system, those in the North could not utilize the usefulness of irrigation. Moreover, as the typical characteristic related to buffalo input and side business of

Lao farmer households, the estimated results showed that inputting an additional buffalo gives about 2.6% more output in 1997-98. This effect is fairly high when considering the average number of buffaloes that a household owns. Similarly, farmers with a family business tend to have roughly 10% to 12% more output than the others in 1997-98. It suggests that farmers may have the incentives to produce more for market sale and have higher management skills learned through operating a family business. In addition, farmers in the North and the Center have harvested 64-70% more rice than in the south in 1997-98. These output gaps between regions have decreased to 10-13% in 2002-03 (see section 5.5.2 for the details).

As mentioned above, the floods that occurred in the years prior to 1997 could have severely damaged rice paddies in southern provinces, which may explain the differences of the South and the rest. This suggests that under normal conditions there is a small difference in rice production among regions.

5.5.2 Education of Household Heads and Farm Productivity in 2002/03

Similarly to section 5.5.1, the estimated results of returns to education on farm productivity in 2002/03 are presented by using schooling variables and educational level variables in Table 5-3-1 and Table 5-3-2, respectively.

The results showed that the rates of return to schooling would yield about 6.4%, 6.1%, and 4.7% more rice production for household heads in the North, Center, and South, respectively. Except for the South, the returns to schooling increased significantly over the study period. The trend of increasing in rice production as educational level rise has remained. The effects of primary education (29%) and lower secondary (44%) on productivity were remarkable but the additional gain from upper secondary education (47%) was very small.

In terms of the elasticity of output with respect to land and labor inputs, a percent increase in unit of land and labor would yield roughly 0.63 percent and 0.23 percent more rice outputs, which are slightly lower compared to the results in 1997/98. An additional year of farm experience showed a marginal impact on output, only about 1%. This result is consistent with the previous estimates, and it suggests that farm experience is not an important determinant for farm efficiency in Lao PDR. While farmers in the North could not enjoy the merit of accessibility to irrigation, the effects of irrigation were positive for farmers in the Center and South. But its effect was significantly very small.

With respect to productive agricultural assets, all variables of using fertilizer, two wheeled tractor, and cart, yielded statistically significant effects on rice output, 15-16%, 22-23%, and 18-19% respectively. While the impacts of using insecticide and four wheeled tractor were not statistically significant in all regressions, the affects of using fertilizer and two wheeled tractor were fairly higher in the North and the South than that of the Center. Thus, the impacts of productive agricultural assets are the more dominant factors on increasing rice productions in Lao farming. Perhaps, the usefulness of irrigation may be limited during weather conditions in which sufficient rainfall.

Furthermore, farmers operating a family business tended to a positive impact in increasing more output than the pure subsistent farmers. Although this effect is smaller compared to 1997/98, it suggests that farmers may have the incentives to produce more for market sale and have higher management skills learned through operating a family business.

In addition, farmers in the North and the Center have harvested 10-13% more rice than in the south in 2002/03. These output gaps between regions have drastically

Table 5-3-1: Results of the Estimated Output Production Model in 2002/03 – Use of Schooling Years

Variables	North	Center	South	All
log(Land)	0.6112** (27.05)	0.6545** (36.00)	0.6210** (21.13)	0.6285** (49.48)
log(Labor)	0.2050** (7.09)	0.3022** (9.20)	0.1650** (3.30)	0.2310** (11.48)
Years of Head Schooling	0.0637** (16.22)	0.0614** (15.96)	0.0474** (8.84)	0.0607** (24.72)
Farm experience (Head age)	0.0098 (1.53)	0.0064 (0.91)	0.0044 (0.46)	0.0092* (2.18)
Farm experience squared/100	-0.0088 (-1.24)	-0.0080 (-1.06)	-0.0073 (-0.73)	-0.0101* (-2.21)
Access to irrigation	-0.0116 (-0.41)	0.1083** (4.57)	0.1696** (4.22)	0.0711** (4.26)
Use of fertilizer	0.1709** (4.27)	0.0986** (3.74)	0.2734** (7.36)	0.1536** (8.19)
Two-wheeled tractor	0.3078** (8.35)	0.1503** (4.83)	0.2758** (4.50)	0.2215** (9.89)
Cart	0.2959** (5.44)	0.1259** (2.77)	0.1152 (1.39)	0.1807** (5.57)
Farmers with a family business	0.1277** (3.90)	0.0277 (0.87)	0.0432 (0.79)	0.0712** (3.36)
Northern	-	-	-	0.1292** (6.27)
Central	-	-	-	0.1125** (5.33)
Constant	6.6965 (50.43)	6.8468 (45.65)	7.0157 (34.36)	6.6786 (73.50)
Adjusted R ²	0.514	0.636	0.542	0.583
F-test	211.61**	323.87**	109.23**	555.72**
Observations	1,993	1,846	916	4,755

Note: Dependent variable = log of household total rice output.

t-statistics is in parentheses. **Significant at the 5%, and *** at the 1% level.

White heteroskedastisity consistent covariance is applied for all equations in this table.

The all coefficients of using insecticide and four-wheeled tractor were statistically insignificant.

Table 5-3-2: Results of the Estimated Output Production Model in 2002/03 – Use of Educational Levels

Variables	North	Center	South	All
log(Land)	0.6137** (26.75)	0.6609** (37.48)	0.6304** (21.15)	0.6339** (50.16)
log(Labor)	0.2206** (7.51)	0.3072** (9.30)	0.1855** (4.06)	0.2468** (12.18)
Primary level	0.2983** (12.68)	0.3432** (12.38)	0.1415** (3.58)	0.2930** (17.67)
Lower secondary level	0.4395** (10.38)	0.4614** (11.83)	0.3420** (5.60)	0.4363** (17.33)
Upper secondary or higher	0.4325** (6.95)	0.5316** (12.55)	0.3344** (3.77)	0.4703** (15.38)
Farm experience (Head age)	0.0118 (1.88)	0.0043 (0.62)	0.0064 (0.64)	0.0097* (2.30)
Farm experience squared/100	-0.0113 (-1.63)	-0.0057 (-0.76)	-0.0097 (-0.93)	-0.0109* (-2.39)
Access to irrigation	-0.0045 (-0.16)	0.1204** (5.08)	0.1638** (3.91)	0.0787** (4.70)
Use of fertilizer	0.1744** (4.33)	0.1046** (3.97)	0.2936** (7.44)	0.1635** (8.68)
Two-wheeled tractor	0.3239** (8.60)	0.1486** (4.80)	0.2806** (3.42)	0.2248** (9.98)
Cart	0.3110** (5.79)	0.1312** (2.97)	0.1224 (1.61)	0.1914** (5.96)
Farmers with a family business	0.1471** (4.47)	0.0368 (1.15)	0.0415 (0.72)	0.0803** (3.76)
Northern	-	-	-	0.1055** (5.03)
Central	-	-	-	0.0949** (4.43)
Constant	6.7229 (51.05)	6.9465 (46.84)	7.0454 (32.38)	6.7533 (74.58)
Adjusted R ²	0.506	0.638	0.531	0.579
F-test	170.98**	271.93**	87.25**	467.05**
Observations	1,993	1,846	916	4,755

Note: Dependent variable = log of household total rice output.

t-statistics is in parentheses. **Significant at the 5%, and *** at the 1% level.

White heteroskedastisity consistent covariance is applied for equations 1, 2 and 4, (North, Center and All).

The all coefficients of using insecticide and four-wheeled tractor were statistically insignificant.

decreased from 64-70% in 1997/98. These results may reflect to severely damaged rice paddies in the South due to the floods that occurred in the years prior to 1997. Therefore, under normal conditions, it suggests that there is a small difference in rice production among regions.

5.5.3 Education of Household Spouses and Farm Productivity

Now we turn our particular interest to household spouses' education and farm productivity. The estimated results of returns to education on farm efficiency in 1997/98 and 2002/03 is presented by using schooling variables and educational level variables in Table 5-4. Here, the estimates for three regions are omitted in this subsection. We found that the rates of return to schooling increased significantly over the study period. The results showed that an additional schooling year would yield about 4.7%, and 6.5% more output for household spouses in 1997/98 and 2002/03, respectively. Similar to household heads' education, the trend of increasing in rice production as educational level of household spouses rise has remained. For example, in 2002/03, the effect of primary education (30%) on productivity was remarkable but the additional gain from and lower secondary (38%) and upper secondary education (45%) were very small.

Overall, the estimations for household spouses in two datasets are found to be strongly similar results with those for household heads. The rates of return to schooling for household spouses were slightly higher for both schooling years/education levels than those of heads. Unlike many studies that have said that the female rate of return on human capital is usually higher than that of the male, the rates of return for female and male in the case of Lao PDR is almost equal. This result,

Table 5-4: Results of the Estimated Output Production Model – Farm Household Spouses

Variables	LECS 1997-98		LECS 2002-03	
log(Land)	0.6932**	0.6972**	0.6290**	0.6655**
	(32.12)	(31.95)	(51.88)	(52.00)
log(Labor)	0.2453**	0.2333**	0.2194**	0.2339**
	(7.10)	(6.77)	(10.35)	(10.89)
Years of Spouse Schooling	0.0472**	-	0.0648**	-
	(8.58)		(21.50)	
Primary level	-	0.2428**	-	0.3027**
		(6.46)		(16.97)
Lower secondary level	-	0.2915**	-	0.3780**
		(4.24)		(9.44)
Upper secondary or higher	-	0.4185**	-	0.4477**
		(2.71)		(8.45)
Farm experience (Wife age)	0.0225**	0.0259**	0.0100*	0.0135**
	(2.90)	(3.33)	(2.25)	(3.03)
Farm experience squared/100	-0.0220*	-0.0266**	-0.0103	-0.0157**
	(-2.34)	(-2.84)	(-1.92)	(-2.91)
Number of buffaloes	0.0261**	0.0260**	-	-
	(9.68)	(9.61)		
Access to irrigation	-0.0030	0.0111	0.0671**	0.0694**
	(-0.10)	(0.37)	(3.96)	(4.05)
Use of fertilizer	-	-	0.1429**	0.1760**
			(7.35)	(9.06)
Two-wheeled tractor	-	-	0.2198**	0.2286**
			(9.54)	(9.83)
Cart	-	-	0.1796**	0.2011**
			(5.59)	(6.16)
Farmers with a family business	0.1202**	0.1413**	0.0456*	0.0695**
	(3.14)	(3.70)	(2.14)	(3.19)
Northern	0.6984**	0.6847**	0.1143**	0.1025**
	(16.74)	(16.40)	(5.52)	(4.83)
Central	0.6496**	0.6543**	0.1129**	0.1049**
	(14.96)	(15.02)	(5.30)	(4.82)
Constant	5.0995	5.1078	6.7810	6.7783
	(32.09)	(32.05)	(80.60)	(79.71)
Adjusted R ²	0.317	0.314	0.574	0.562
F-test	213.13**	175.44**	534.58**	435.73**
Observations	4,565	4,565	4,755	4,755

Note: t-statistics is in parentheses. *Significant at the 5%, and ** at the 1% level.

White heteroskedasticity consistent covariance is applied for all equations in this table.

Table 5-5: Results of the Estimated Output Production Model – Rates of Return per Year

Variables	LECS 1997-98		LECS 2002-03	
	Head	Wife	Head	Wife
log(Land)	0.7036** (22.70)	0.7266** (27.96)	0.6131** (38.03)	0.6440** (39.96)
log(Labor)	0.2411** (4.74)	0.2567** (6.17)	0.2256** (8.72)	0.2313** (8.47)
Primary level	0.3166** (6.64) [0.3166]	0.3028** (6.14) [0.3028]	0.4140** (18.23) [0.4140]	0.3801** (17.72) [0.3801]
Lower secondary level	0.4009** (6.12) [0.0281]	0.3918** (4.61) [0.0297]	0.5761** (18.78) [0.0540]	0.4632** (10.46) [0.0277]
Upper secondary	0.4242** (4.48) [0.0078]	-	0.5619** (12.12) [-0.0047]	-
Farm experience (Age)	0.0309* (2.55)	0.0164 (1.80)	0.0048 (0.92)	0.0036 (0.67)
Farm experience squared/100	-0.0306* (-2.26)	-0.0150** (-1.37)	-0.0047 (-0.84)	-0.0027 (-0.42)
Number of buffaloes	0.0288** (6.80)	0.0287** (8.64)	-	-
Access to irrigation	-0.0287 (-0.65)	-0.0451 (-1.24)	0.0874** (4.04)	0.0841** (3.85)
Use of fertilizer	-	-	0.1472** (6.17)	0.1773** (6.67)
Two-wheeled tractor	-	-	0.2091** (7.69)	0.2045** (6.48)
Cart	-	-	0.1947** (4.48)	0.1873** (4.11)
Farmers with a family business	0.1795** (2.90)	0.1674** (3.32)	0.0477 (1.73)	0.0211 (0.71)
Northern	0.6475** (9.94)	0.7327** (14.32)	0.1517** (5.21)	0.1297** (4.58)
Central	0.5469** (7.91)	0.6440** (11.62)	0.1441** (4.90)	0.1457** (4.93)
Constant	4.7910 (17.99)	5.1355 (27.30)	6.7143 (59.11)	6.8680 (65.50)
Adjusted R ²	0.316	0.325	0.609	0.556
F-test	83.41**	136.05**	313.45**	295.87**
Observations	2,139	3,086	2,811	3,058

Note: t-statistics is in parentheses. “per year rate of return” in blanket.

*Significant at the 5%, and ** at the 1% level.

White heteroskedasticity consistent covariance is applied for all equations in this table.

perhaps, is due to the large proportion of women members being illiterate, and having a relatively low involvement in the decision-making of managing family farms.

5.5.4 Farmer Education and Farm Productivity – Rates of Return per Year

In this subsection, we will pay our attention to the rates of return per year of household heads' and spouses' education on farm productivity. The estimated result of per year returns to education on farm efficiency in 1997/98 and 2002/03 is presented in Table 5-5. Here, the estimates for three regions are also omitted in this subsection. (See the details of method for calculating the rate of return per year in Chapter 3, section 3.3.2).

First, we found that the rates of return per year were particularly high for farmers with a completion of primary level, and this trend also increased significantly over the study period. For both household heads and spouses in the two datasets, the estimated results showed that per year rates of return to primary education were roughly 30% in 1997/98 and 40% in 2002/03.

On the contrary, the rates of return per year to lower secondary education were statistically significant with a small positive value of roughly 3% for both household heads and spouses over the study period. The rates of return per year to lower secondary education for household heads in the two datasets were also statistically significant with almost negligible value.

Overall, the most profitable investment to education is the primary level. The effects of primary education on rice production were remarkable but the additional gain from higher education is very small.

5.6. Concluding Remarks

This chapter has analyzed the affects of education on pure (non-monetary) household output. The applied methodology is intensively used until the 1980s. While recent studies tend to focus on the effects of education on household income according to farm and non-farm income, this analysis is deemed to fit with the characteristics of the farmer households in Lao PDR which remain predominantly subsistent, labor intensive, short of irrigated land, lack of productive assets and chemical inputs. Lao farming system is mainly family-based small scale. Only about one fourth of farmers hire outside labor and often temporally in planting and harvesting season. Also, this analysis is very interesting to measure the direct effects of education on farm productivity. In general, it is argued that farmers with higher income tend to have higher education attainment. This kind of endogeneity problem is believed to be small due to many factors such as high equity level in land distribution, subsistent farming system, and so on.

Present education levels in Lao PDR are very low. It is reasonable to ask whether education, which is often seen as a key investment area for poverty reduction in other developing countries, can be expected to have the same impact in Lao PDR. Even in 2002/03, a half of household heads and three quarter of household spouses had less than primary education level. The very poor performance in human capital is that roughly 20% of the household heads and 44% of their wives were illiterate.

The results from this study showed that the role of farmers' education is quantitatively important in determining the well-being of farmer households. The estimated rates of returns for both heads and spouses are relatively high by international levels and increase significantly over the study period, ranging from 4-

5% to 6-7%. Particularly, the returns to primary education are the highest. Clearly, more attention should be paid on women's schooling in rural farmers.

The principal policy implications of the results presented in this study pertain to the potential social and economic benefits of improving education, particularly in rural areas. Adult literacy campaigns (equals to a completion of primary education level) may help to generate these improvements in well-being in the near future. Up to now, large amount of public investments have been spending on the expansion of irrigation system. The estimated results found in this study showed that the effect of access to irrigation is obviously very low, especially for the northern region. Thus, rather than the facilitation of irrigation, policy makers should focus on promoting the use of new high-yield seeds, use of productive assets and chemical inputs by finding ways to relax the monetary constraints (access to credits) faced by households.

Chapter 6

Human Capital Accumulation of Young Generations in Lao PDR

This chapter presents the issue of human capital accumulation for young generations in Lao PDR, providing an empirical study of the existing stock of human capital, the association between parental education and the determinants of investments in schooling for their children. Time and time again, investments in human capital have been shown to affect labor market outcomes, fertility, child health and child educational attainment [For example, see T. P. Schultz (1988) and Strauss and Thomas (1995) for the comprehensive reviews]. Parental education plays an important direct role in determining the overall welfare of households through increased wage/income earnings, as well as an indirect role in the welfare of future households through its impact on children's schooling, health, etc.

A number of studies have found that children of educated parents are more likely to go to school and to stay in school longer. In the case of Lao PDR, the primary school delay enrollment, grade repetition, and dropout rate are the crucial problems. Despite a high net enrollment rate for boys and girls, the fact is that only one-half of children starting at grade one reached grade five of primary school level. Given the low level of the current stock of human capital in Lao PDR – especially human capital of rural farmers –, one of the most pressing immediate concerns of the education sector must be to increase timely enrollment of children and the completion rate at the primary school level.

In addition to the fact that farmers comprise over 80% of the labor force, investigating impacts of parental education on children's welfare would shed some

light on one of the essential issues of this country. For policy implications in the educational sector to be more effective in terms of both efficiency and equity, it is necessary to have a solid understanding of the process by which some children are sent to school and others are not.

Using an unusually rich set of national household survey data recently collected from Lao PDR, this chapter analyzes several dimensions of the schooling decision of rural farmers, which particular interest will be paid on children's education attainment in the primary level.

First, the study begins with the analysis of the impact of parental education and household resources on the decision of child age 7 to 14 years old is currently attending school or has never been attended school. This is probably the most important stage for the schooling of young children because it is well known that children whose entry into school is delayed are unlikely to ever attend school. Second, for children who have ever been to school, the decision of household expenditures on primary education and primary schooling achievement measured by the delayed enrollment/the presence of grade repetition are also analyzed. Finally, the possible policy levers available to the government to increase the primary completion rate from Asian cross countries will be analyzed.

The structure of this chapter is as follows: Section 6.1 reviews the related literature on school enrollment choice, expenditure, and achievement. Section 6.2 briefly describes the key features of the educational sector in Lao PDR. Section 6.3 presents the theoretical framework and the empirical models. Section 6.4 outlines the data description. Section 6.5 shows the estimation results, and section 6.6 provides some concluding remarks.

6.1. Literature on School Enrollment Choice, Expenditure, and Achievement

The positive correlation between education and labor market outcomes is well-documented in T. P. Schultz (1988). There have been an enormous number of studies that estimate Mincer-type earnings functions with data from worldwide. These studies have almost universally demonstrated that (private) rate of returns to education tend to be high [Psacharopoulos and Patrinos (2002) for wage earners and Chapter 3 in this study; and Jamison and Lau (1982) for farmers and Chapter 5 in this study]. Similarly, education also plays an important role in affecting nonmarket outcomes and input allocations. Most studies report very strong associations between parental education and infant or child mortality [for instance, Caldwell (1979)] as well as child anthropometrics [for instance, Thomas *et al.* (1990)]. The determinants of children's welfare (health care and schooling) are well-documented in Strauss and Thomas (1995).

This chapter focuses on the analysis of: (1) the impacts of household education on the demand for children's schooling, and (2) the decision of expenditures on education and schooling achievement for children who have ever been to school. Firstly, based on household survey data from developing countries, an enormous number of studies showed that family background or socioeconomic status, measured by parental education, household resources and resources in the community, is an important determinant of children's education. Children schooling outcomes may measure by current school enrollment or years of schooling attainment. Examples of these studies include Rosenzweig and Wolpin (1982) for India, Behrman and Wolfe (1984) for Nicaragua, Birdsall (1985) for Brazil, Hossain (1989) for Bangladesh, Singh (1992) for Brazil, Deolalikar (1993) for Indonesia, Alderman *et al.* (1996) for Pakistan, Singh and Santiago (1997) for Mexico, Sawada and Lokshin

(2001) for Pakistan, and Handa *et al.* (2004) for Mozambique. Most research outcomes showed that the educational level of parents is one of the most important determinants of children school enrollment, after controlling for income, assets, location and environmental conditions. In general, the impact of maternal education is often significantly larger than that of paternal education. Moreover, some studies showed that higher levels of parental education, such as completion of primary education, are key factors in influencing the children schooling choices but lower levels of education, such as basic literacy, are not.

Secondly, economists have focused on parental expenditures and investments in children primarily with respect to major expenditures such as food, clothing, shelter, transportation, and health care. They have also examined about time parents allocate to their children. However, direct expenditures or investments in a child's schooling have received little attention [for example, Lazear and Michael (1988), Huston (1995), and Mauldin *et al.* (2001)]. These studies found that educational level of household head has strong positive effects on total education expenditures as well as family income and other factors such as age of parents, family size, race, and region. Although most primary education is financed by tax, parents often spend additional money on their children's schooling such as uniforms, textbooks and other materials. Thus, empirical study on parental spending, specifically on children's primary education in developing countries, is needed to understand this aspect of parents' investments in their children.

Similarly to parental expenditures on education, on the other hand, the study related to schooling achievement that measured by delayed enrollment, grade repetition, and completed years of schooling (dropout rates), is also relatively limited [for example, Glewwe and Jacoby (1994) and Handa *et al.* (2004)]. More able

children start school earlier and stay in school longer. Interestingly, expenditures per capita is strongly in both enhancing grade attainment and on-time enrollment. Glewwe and Jacoby (1994) found that some of the school characteristics (e.g. travel time) are significant and have plausible signs in both the grade attainment and enrollment delays regression, but some variables (e.g. teacher experience and fraction of classrooms) do not explain very well in the both regression. The benefits from certain school improvements are greatly understated and the returns to improve teacher qualifications are low. However, they noted that future studies undertaken in poor countries should not ignore the physical condition of school attributes on enrollment and attendance decisions. Handa *et al.* (2004) indicated that dimensions of school quality, access or availability, and efficiency all work to stimulate enrollment, although the effects are small and differ somewhat by gender of the child.

6.2. Key Features of the Educational Attainments in Rural Lao PDR

The average school enrollment rate of children is nearly 80%, and it is generally lower for girls, and in northern region and southern region (see ADB, 2000 and NSC, 2004). However, about seven out of ten children who currently attending school are students who delayed enrollment or had grade repetitions (see Appendix 6, A1 to A5 for the details of delay enrollment, dropout rate, grade repetition, and survival rate in Lao PDR). The main reason why a child in school age had never been to school is presented in Figure 6-1. The lack of educational resource supplies (school is too far and no teacher supplies, 29%) was one of the biggest constraints. The parental preferences in schooling measured by “too young” and “no interest” recorded at 27% and 30%, respectively. It is surprisingly that “had to work and too expensive” ranked only at 8%. Perhaps, it is shamed to report the monetary constraint faced by

households and inherently avoided the answer to another reasons such as too young or no interest. For an example, over 40% of parents that answered “too young” are children who have age over eight years old.

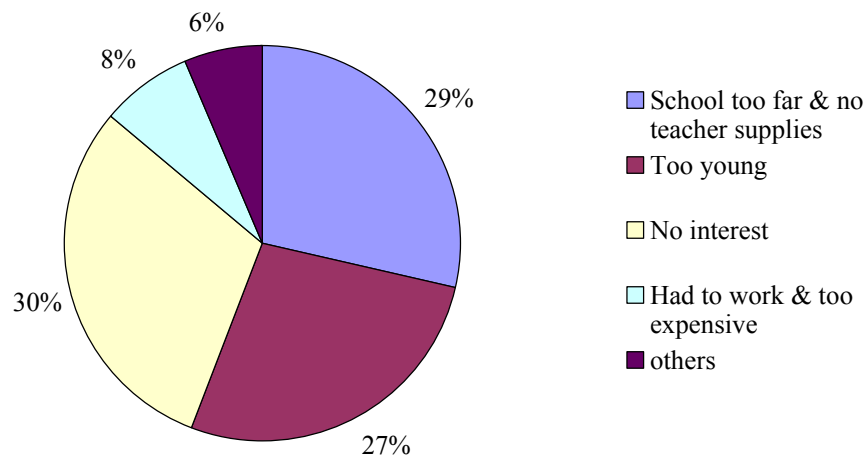


Figure 6-1: Reasons why a child had never attended to school in 2002/03

For children who have ever been to school, on average, a total school cost was at 124,000kip/year. Since private schools are very rare in Lao PDR, the proportion of tuition fees and parent association fees was only 5% of total school cost. The cost of uniforms occupied almost one-half of total school cost that households spent. The cost of Textbooks and other education materials ranked at 20%, which is the second highest item. Most of students walk to school and come back home for lunch that resulted in a low share of food and transportation cost. However, the characteristics of farmer households in Lao PDR remain predominantly subsistent, labor intensive, and short of irrigated land and productive assets. Although rice is the main product of agricultural outputs, only one-third of its production is for market. The expenditures on education that household spent for a child is a heavy burden, when we compare to a low level of per capita income of rural farmers. Therefore,

Policy makers should be directed at increasing the enrollment rates of children by finding ways to relax the monetary constraint faced by farmers.

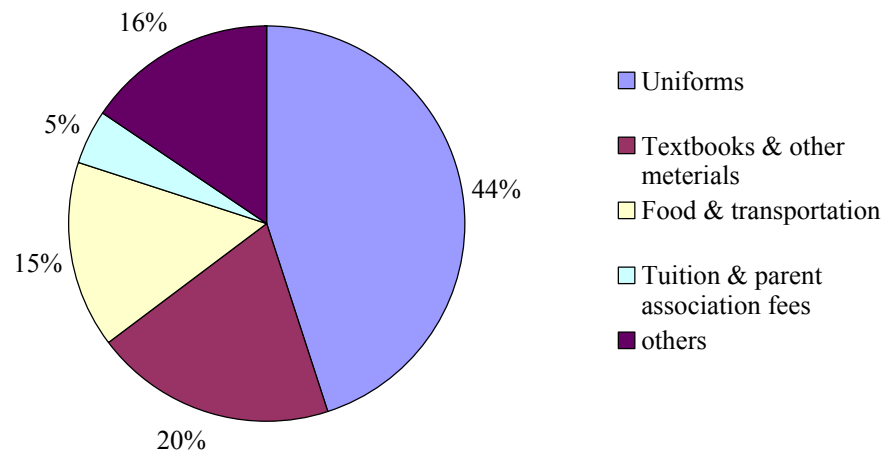


Figure 6-2. Household expenditures on education per child in this / the last school year in 2002/03

6.3. Theoretical Framework and Empirical Models

6.3.1 Theoretical Framework

The estimations of the determinants of children's welfare are guided by the familiar New Households Economics model of household decision-making as pioneered work by Becker (1965), and the extensions to the model well-described by Strauss and Thomas (1995). In this framework, we view parents as making schooling decisions in two stages (see Glewwe and Jacoby (1994) for elaboration). In the first stage, they decide on the best school for each child based on the characteristics of available schools, such as travel time, fees, and quality attributes. In the second stage, conditional on the chosen school, they decide when to enroll each child, how regularly each child will attend school over the year, and how many years each child will attend school. These choices are made by weighing the benefits of attending school (a

child's future productivity gain) against the costs of school attendance (both direct costs and opportunity cost of a child's time).

For the first stage problem, parents choose the school that the child will attend. For each schooling option j , the solution to the second stage problem gives a certain lifetime indirect utility, V_j , where

$$V_j = V_j(S_V, X_V, Z_{Vj}, C_V) \quad j = 1, 2, \dots, K \quad (6-1)$$

and parents choose the school that provides the highest V_j .

The second stage decision includes an initial school enrollment date (t_0), a school leaving date (t_1), and a time path of school attendance over the period $[t_0, t_1]$. School attendance at each point in time helps determine a child's achievement, H . Parental schooling choices are summarized by the functions below:

$$\begin{aligned} t_0 &= t_0(S_0, X_0, Z_0, C_0) \\ t_1 &= t_1(S_1, X_1, Z_1, C_1) \\ H(t) &= H(t - t_0, S_H, X_H, Z_H, C_H) \quad \text{for } t_0 \leq t \leq t_1 \end{aligned} \quad (6-2)$$

Conditional on entering school at time t_0 , a child's grade, $t - t_0$, is exogenous, in that it is just elapsed time. All equations depend on vectors of parental education attainment S , household characteristics X including those reflecting its economic circumstances (income), school characteristics Z , and child characteristics C . Some characteristics such as tastes for schooling and child motivation are, of course, unobservable.

6.3.2 Empirical models

There is abundant evidence that examined school enrollment choice in developing countries, and the empirical model in this study is basically followed to the past researches which mentioned in Section 6.1, and combined with the

availability of data set. In particular, this study obtains the idea about delay enrollment model from Glewwe and Jacoby (1994).

If parents can borrow against the future earnings of their children, then optimal human capital investment is a pure wealth maximization problem, unaffected by household income and asset holdings. As long as education is a worth investment, there would be no economic motive for delaying initial school enrollment, and child labor would not interfere with school attendance. Under these ideal conditions, children would leave school at the point where the marginal rate of return to schooling equals the interest rate. However, farmer households in Lao PDR probably do not face perfect credit markets, so we expect t_0 , t_1 , and H to all depend on the economic circumstances of the households⁸.

The primary school enrollment choice (probability to attend school) model, household expenditures on child's schooling model and school achievement model are specified respectively as following:

$$EN_i = \alpha_0 + \alpha_1 Sch_{jk} + \alpha_2 HR_i + \beta_i C_i + \gamma X_i + u_i \quad (6-3)$$

$$\log(EduExp)_i = \alpha_0 + \alpha_1 Sch_{jk} + \alpha_2 HR_i + \beta_i C_i + \gamma X_i + u_i \quad (6-4)$$

$$SA = \alpha_0 + \alpha_1 Sch_{jk} + \alpha_2 HR_i + \beta_i C_i + \gamma X_i + u_i \quad (6-5)$$

Dependent variable: EN=1 if child ever enrolled school and 0 otherwise, EduExp=household expenditures on child's schooling, and SA=school achievement (child age – current grade attainment – 6) measured by delay enrollment and grade repetition. Exogenous household variables: Sch=educational levels of parents, HR=household resources: namely family size, per capita outputs, dummy variables of

⁸ Imperfect credit markets are not the only reason that educational choices might depend on household income and assets. Wealthier parents may value education more highly; this would explain why poorer households quit school earlier, but this is a less convincing explanation for why they are more likely to delay enrollment and attend school irregularly.

holding two-wheel tractor, four-wheel tractor, and operating a family business, C=child characteristics: namely gender, child age, and number of siblings, X=regional dummy variables, and u=a residual error.

The estimation Methods for equation (6-3) is Probit Model (binary choices); for equation (6-4) is Ordinary Least Squared (OLS); and for equation (6-5) are Probit Model and Tobit Model (zero and small positive numbers). Huber-White consistent standard errors and covariance is applied to correct for heteroskedasticity [Huber (1967) and White (1980)].

Finally, using cross-country data on schooling drawn from selected Asian nations (see Chapter 2, Table 2-10), this study also analyzes the relationship between the successful participation of children in schooling, and some public policy variables that are proposed by Singh and Santiago (1997) using data for selected South/Central American countries. A macro schooling model is of the following form:

$$PCR_i = \alpha_0 + \alpha_1 \ln PCI_i + \alpha_2 GEE_i + \alpha_3 PSE_i + \alpha_4 PTR_i + u_i \quad (6-6)$$

PCR= Primary Completion Rate; PCI=Per Capita Income; GEE=Government Expenditure on Education as % of GNP; PSE=Pre-primary and Primary Expenditure as % of Total Education Expenditure; and PTR= Primary Pupil/Teacher Ration.

6.4. Data Description

This study employs an unusually rich set of national household survey data, the so-called Lao Expenditure and Consumption Survey, LECS 3 in 2002-03 as described in the previous chapters. The total samples of rural children by farmer households of origin were selected from the dataset of Chapter 5. After clearing the missing data, the subsample of 5,215 children age 7-14 of rural farmer households: 4,061 of children who ever attended to primary school and 1,154 of children who

never been to school are used in the analyses. The LECS 3 is the only household survey that provides detailed information on the educational sector; which contains reasons why a child had never been sent to school, what grade a child currently enroll now, how much a household spent on a child's schooling in this/the last school year, and other important information related to schooling. Thus, this study is the first of its kind to study the parental decision and other determinants on children's school expenditure and school achievement in Lao PDR. Using the same database as the one used here, Chapter 5 has shown that the education level of adult household members is one of the most important determinants of farm productivity in Lao PDR.

Table 6-1: Means of Key Variables in Education Determinants Analysis

	Never Enrolled				Currently Enrolled			
	North	Center	South	All	North	Center	South	All
Fathers' schooling	1.78	2.80	2.52	2.15	3.88	4.68	4.52	4.32
<i>No education</i>	0.55	0.42	0.34	0.48	0.23	0.20	0.15	0.20
<i>Some primary education</i>	0.28	0.29	0.47	0.33	0.30	0.23	0.40	0.29
<i>Primary education or over</i>	0.17	0.29	0.20	0.20	0.46	0.57	0.45	0.50
Mothers' schooling	0.61	0.95	1.21	0.82	2.22	2.86	2.49	2.53
<i>No education</i>	0.82	0.74	0.61	0.75	0.48	0.38	0.37	0.42
<i>Some primary education</i>	0.12	0.18	0.31	0.18	0.27	0.28	0.43	0.30
<i>Primary education or over</i>	0.06	0.08	0.08	0.07	0.25	0.33	0.21	0.28
Mothers age	37.2	37.0	36.6	37.0	37.2	37.4	38.8	37.6
Family size	7.18	6.99	7.24	7.16	6.92	6.60	6.83	6.77
Rice outputs (per capita, Kgs)	333	338	336	335	373	480	420	425
Holding two-wheel tractor	0.05	0.10	0.05	0.06	0.11	0.22	0.06	0.15
Holding four-wheel tractor	0.01	0.02	0.01	0.02	0.04	0.04	0.03	0.04
Operating a family business	0.01	0.06	0.02	0.02	0.12	0.15	0.11	0.13
Number of school age siblings	2.16	2.14	2.11	2.14	2.19	2.21	2.14	2.19
Child Age	9.46	9.54	9.26	9.42	10.1	9.97	10.0	10.0
Girl	0.63	0.57	0.55	0.60	0.46	0.45	0.47	0.46
Northern region	-	-	-	0.56	-	-	-	0.41
Central region	-	-	-	0.18	-	-	-	0.40
Southern region	-	-	-	0.25	-	-	-	0.19
Observations	651	212	291	1,154	1,653	1,630	778	4,061

Source: LECS 3, 2002/03

Given the overall low attainment level of human capital in Lao PDR, and the importance of education as a factor in determining poverty, it is thus important for policymakers to know the distribution of human capital as well as its full impact on household well-being, especially for rural farmers.

Summarizing the data of LECS 3, Table 6-1 presents the characteristics of rural farmer households, namely schooling/educational level of parents, household resources, children's characteristics, and so on. The samples are also classified into two categories of children who never attended school and currently attending primary school. For children who never attended school groups, on average, the schooling years were about two years for fathers (head) of households and one year for mothers (spouses), which particularly lower for farmers in the northern region. About eight out of ten fathers and nine out of ten mothers had less than primary educational level. The very poor performance in human capital is that roughly one half of the household heads and as many as three quarters of their wives were illiterate.

For children who are currently attending school groups, the average schooling years were four years for fathers and three year for mothers among. Significantly, the educational levels of parents who sent their children to school are much higher than those who had not sent. However, even in the groups that they sent their children to school, one half of fathers and seven out of ten mothers had less than primary educational level. About 20% of the household heads and as many as half of their wives were illiterate. The average age of mothers is about 37 years old in both groups, which resulted in comparable farm experience. Similarly, the average size of family is roughly same at about seven persons.

The agricultural incomes, however, are not examined in this study due to the insufficient and often unreliable samples. Instead of using family income (in cash),

this study attempts to use per capita rice outputs, the status of holding productive agricultural assets and operating a family business as the instrument variables. LECS 3 reported that nearly 15% of farmer households operate a family business, particularly those located in urban areas. Having a family business is a key factor to generate income for rural farmers. Clearly, households which sent their children to school seem to have higher per capita rice outputs, and higher rate of holding two-wheel tractor, four-wheel tractor, and operating a family business than that of households which not sent their children to school.

With respect to the characteristics of children, boys tend to be sent to school more than girls. It seems that girls have a role to take care of housework and their younger brothers/sisters, particularly for a big family size. The average number of siblings in school age and child age are almost the same in two groups. In regards to regional differences, the north and the south have a lower school enrollment rate than the center due to the levels of economic development.

6.5. Estimation Results

6.5.1. Household Demand for Schooling (probability of ever attending school)

Estimates for the probability of ever attending school by gender are presented in Table 6-2. Except for the variable of father with some primary education in the central region, all other household education variables are statistically significant positive determinants of the probability of a child ever attending school. These results are consistent with the findings reported by King and van de Walle (2005). On average, Table 6-2 column 4 indicated that having a father who is literate with some primary education or completed of primary education increases the probability of a girl ever having attended school by (mean) marginal effects of 0.0577 and 0.0608,

respectively. Similarly, the table indicated that having a mother who is literate with educational levels of some primary or completed of primary increases the probability of a girl ever having attended school by (mean) marginal effects of 0.0514 and 0.0396, respectively. The impacts of parental education on demand for children's schooling were particularly higher for the northern region.

There are important differences in the influences of parental educational attainment (father and mother) among boys and girls. For boys, the (mean) marginal effects of parental education on increasing in probability were 0.0484 and 0.0283, while for girls the impacts were significantly higher by 0.0709 and 0.0518. Traditionally, boys are preferably treated than girls in family but if the mother has some education, girls would get better treatment and have a higher probability to be sent to school. Overall, these findings showed that higher levels of parental education, specifically completion of primary education, are key factors in influencing the demand for children's schooling. These results are consistent with much past researches mentioned in Section 6.1.

On the other hand, household well-being characteristics were found to be the important determinants of entering the school system. For example, on average, household well-being measured by per capita outputs, holding two-wheel tractor, holding four-wheel tractor, and operating a family business (usually a micro/small scale of retails) would increase the probability of ever attending school. For example, the (mean) marginal effect of operating a family business was about 0.0295, which means 2.95% higher probability to be sent to school. The positive impacts of household well-being are generally higher for girls and for the northern region. Perhaps, boys would be sent to school even if families are poor, but if there is more

Table 6-2: Determinants on Probability of Ever Attending Primary School Enrollment

Variables	North	Center	South	Lao PDR		
				All	Boy	Girl
Father with some primary education	0.4310** (5.49)	0.0679 (0.58)	0.3331** (2.77)	0.3157** (5.61)	0.3246** (4.00)	0.3054** (3.87)
Father with Primary education or over	0.7780** (8.84)	0.3516** (3.00)	0.7993** (5.76)	0.6741** (10.88)	0.6847** (7.50)	0.6474** (7.66)
Mother with some primary education	0.5002** (5.68)	0.4055** (3.58)	0.3082** (2.93)	0.4192** (7.28)	0.2919** (3.53)	0.5501** (6.91)
Mother with Primary education or over	0.7190** (6.43)	0.7015** (4.93)	0.5346** (3.51)	0.6527** (8.60)	0.5058** (4.65)	0.7863** (7.46)
Mother age	-0.0093 (-0.30)	0.0774 (1.91)	-0.0234 (-0.55)	0.0130 (0.61)	0.0370 (1.21)	-0.0129 (-0.43)
Mother age squared/100	0.0169 (0.45)	-0.0906 (-1.77)	0.0601 (1.10)	-0.0043 (-0.16)	-0.0450 (-1.18)	0.0389 (1.03)
Family size	-0.0378* (-2.24)	-0.0700* (-2.93)	-0.0747** (-2.65)	-0.0559** (-4.53)	-0.0346 (-1.83)	-0.0713** (-4.34)
LOG(per capita outputs)	0.0352 (0.66)	0.1826** (3.03)	0.1198 (1.64)	0.1039** (2.99)	0.1270* (2.52)	0.0920** (1.91)
Holding two wheel tractor	0.3355* (2.52)	0.2960* (2.40)	0.0839 (0.42)	0.2644** (3.21)	0.2048 (1.74)	0.3350** (2.94)
Holding four wheel tractor	0.4091 (1.77)	0.1106 (0.44)	0.4679 (1.54)	0.3452* (2.27)	0.2517 (1.27)	0.4316 (1.83)
Operating a family business	1.0149** (5.35)	0.2612 (1.63)	0.9149** (3.94)	0.6781** (6.08)	0.5949** (3.90)	0.7722** (4.86)
Number of siblings (school age 7 to 14)	0.0486 (1.07)	0.0989 (1.57)	0.0676 (0.99)	0.0602 (1.87)	0.0412 (0.88)	0.0713 (1.60)
Child age	1.2278** (8.38)	1.1226** (6.44)	1.1267** (5.46)	1.1866** (11.78)	1.0825** (7.33)	1.2867** (9.21)
Child age squared/100	-5.4940** (-7.72)	-5.7270** (-6.14)	-5.0842** (-5.02)	-5.3815** (-10.93)	-4.6902** (-6.50)	-6.0305** (-8.81)
If child is girl (Dummy = 1)	-0.4414** (-7.06)	-0.2537** (-3.01)	-0.2030* (-2.26)	-0.3215** (-7.40)	-	-
Northern region	-	-	-	-0.4308** (-8.02)	-0.3641** (-4.67)	-0.5020** (-6.71)
Southern region	-	-	-	-0.5153** (-8.04)	-0.5506** (-6.02)	-0.4944** (-5.49)
Constant	-6.7197 (-7.07)	-7.9850 (-6.48)	-6.3690 (-4.64)	-6.6439 (-10.09)	-6.5025 (-6.79)	-6.4979 (-7.14)
Log likelihood	-1,086.66	-550.01	-520.92	-2,246.34	-1,001.90	-1,001.90
Observations (obs with dep = 0)	2,304 (651)	1,842 (212)	1,069 (291)	5,215 (1,154)	2,649 (461)	2,566 (693)

Note: Dependent variable equals 1 if child ever attended school and 0 otherwise. (Method of estimation is Probit)

z-statistic is in parentheses. * Significant at 5% level, and ** significant at 1%.

Huber-White standard errors and covariance is applied to correct heteroskedasticity for all equations.

income, girls would benefit from this marginal income gains. As mentioned above, rural farmers in Lao PDR are predominantly subsistent and lack of access to income generation activities. Thus, operating a family business is the essential factor in increasing the probability of school enrollment.

An increase in family size negatively affected the probability of ever attending school, while age of mother and number of siblings did not explain the school enrollment decision (statistically insignificant). A strongly positive influence as age of children rise has confirmed the issue of delayed enrollment. As shown in Appendix 6, Figure 6A-1 and Figure 6A-2, a high proportion of boys and girls age 6 to 7 years old are not yet attending school. Here the very important child characteristic is gender. Boys were likely to have ever attended school than girls. This preference is a well know issue, and the results here confirmed the tradition practices in Lao PDR that girls are thought to work and help in households. As expected, children who live in the northern and the southern regions had largely lower probability of ever attending school than that of the central region, due to both economic development stages and educational service resources.

In summary, education of parents in rural farmer households in Lao PDR is an extremely important determinant of the decision to send children to primary schooling, and together with household well-being (income) and gender of child.

6.5.2. Household Expenditures on Children's Schooling

Estimates for the household expenditures on children's schooling by regions and gender are presented in Table 6-3. The estimated results showed that having a father who is literate with some primary education or completed of primary education does not increase the expenditures on education of a child ever having attended school.

Similarly, having a mother who is literate with educational levels of some primary also does not raise the expenditures on schooling of a child, but having a completed of primary slightly increases the spending on a child's schooling at about seven percentage points. Overall, the impacts of parental education on household expenditures on children's schooling are generally small and statistically insignificant. Also, they have no differences in the impact of parental education between boys and girls exist. These results do not support the findings of previous studies that educational level of household head has strong positive effects on total education expenditures [Lazear and Michael (1988), Huston (1995), and Mauldin *et al.* (2001)]. However, it is worth noting that evidence about expenditures on children's education is scarce, and perhaps this study is the first case for rural farmer households in developing countries. Clearly, more work needs to be done in other countries to strengthen these findings.

The average parental expenditure on children's schooling was a relatively low at about 124,000 kip/year. We significantly found that the higher the household well-being, the more likely parents are to spend money on a child's primary education, and a higher grade attainment, a higher total school costs. Whereas operating a family business largely increases the probability of attending school, its effect on school expenditure is very limited. Operating a family business may increase the total amount of spending on school by only 10%.

In many cases, parents tend to invest more on a son than a daughter because of lower expected earnings for women and etc. But this trend is not observed in this study. The estimates were not shown any differences of school expenditure for boys and girls in anywhere of the country. Furthermore, age of mother and age of child do not affect the total spending on school, but the number of siblings statistically

Table 6-3: Determinants of Household Expenditures on Child's Education

Variables	North	Center	South	Lao PDR		
				All	Boy	Girl
Father with some primary education	-0.0890 (-1.68)	-0.0437 (-0.67)	0.0687 (0.70)	-0.0601 (-1.59)	-0.0556 (-1.07)	-0.0602 (-1.10)
Father with Primary education or over	-0.0445 (-0.83)	0.0504 (0.078)	0.1227 (1.21)	0.0126 (0.32)	0.0027 (0.05)	0.0315 (0.56)
Mother with some primary education	-0.0029 (-0.06)	0.0024 (0.05)	0.0917 (1.22)	0.0259 (0.80)	0.0063 (0.14)	0.0481 (1.04)
Mother with Primary education or over	0.0520 (0.97)	0.0256 (0.40)	0.2117* (2.18)	0.0740* (1.97)	0.0730 (1.44)	0.0728 (1.30)
Mother age	0.0005 (0.03)	0.0352 (1.62)	-0.0090 (-0.28)	0.0081 (0.60)	0.0013 (0.07)	0.0133 (0.73)
Mother age squared/100	-0.0025 (-0.11)	-0.0471 (-1.68)	0.0231 (0.59)	-0.0090 (-0.53)	-0.0002 (-0.01)	-0.0160 (-0.69)
Family size	-0.0186 (-1.85)	-0.0022 (-0.18)	-0.0400* (-1.97)	-0.0142* (-1.99)	0.0102 (0.98)	-0.0395** (-4.09)
LOG(per capita outputs)	0.0847** (2.84)	0.1777** (6.67)	0.1174* (2.44)	0.1369** (7.45)	0.1478** (5.99)	0.1236** (4.51)
Holding two wheel tractor	0.1057 (1.78)	0.1029* (2.20)	-0.0359 (-0.27)	0.0819* (2.38)	0.0937* (1.94)	0.0637 (1.30)
Holding four wheel tractor	0.2277* (2.40)	0.1614 (1.57)	0.1897 (1.05)	0.1955** (3.13)	0.2092* (2.54)	0.1863 (1.94)
Operating a family business	0.2355** (4.19)	-0.1024 (-1.88)	0.3526** (3.61)	0.0978** (2.74)	0.0615 (1.28)	0.1394** (2.63)
Number of siblings (school age 7 to 14)	-0.0964** (-3.65)	-0.0949** (-3.34)	0.0497 (1.05)	-0.0671** (-3.73)	-0.0910** (-3.61)	-0.0388 (1.51)
Child age	0.0211 (0.24)	-0.1217 (-1.21)	0.0009 (0.01)	-0.0501 (-0.82)	0.0385 (0.46)	-0.1760 (-1.94)
Child age squared/100	0.1156 (0.27)	0.5415 (1.13)	-0.0980 (-0.14)	0.2884 (0.98)	-0.1471 (-0.37)	0.9107* (2.06)
If child is girl (Dummy = 1)	-0.0274 (-0.76)	0.0004 (0.01)	0.0070 (0.012)	0.0100 (0.41)	-	-
Grade currently enroll now (grade 1 to 5)	0.2058** (12.22)	0.2033** (10.56)	0.2496** (8.73)	0.2143** (18.15)	0.2124** (13.15)	0.2190** (12.64)
Northern region	-	-	-	-0.1176** (-4.36)	-0.1046** (-2.79)	-0.1329** (-3.42)
Southern region	-	-	-	-0.2111** (-5.70)	-0.2172** (-4.28)	-0.2095** (-3.88)
Constant	10.2925 (17.77)	10.1284 (15.69)	9.9612 (9.74)	10.3316 (26.15)	9.8734 (17.84)	11.0136 (19.58)
Adjusted R ²	0.219	0.174	0.192	0.204	0.192	0.221
F-test	29.87**	22.52**	12.53**	58.87**	31.50**	32.30**
Observations	1,645	1,638	788	4,061	2,189	1,872

Note: Dependent variable is logarithm of household expenditures on child's education.

t-statistic is in parentheses. * Significant at 5% level, and ** significant at 1%

White consistent standard errors and covariance is applied for equations 2, 4, 5 and 6.

significant decreases the total school spending on education by seven percentage points. Having siblings in the school age give many advantages for the family. For example, a young boy/girl can use uniforms and other materials of elder brothers and sisters. These would save some extra expenditure and decrease the total expenditure on school for a younger boy/girl. Children in the northern and the southern regions have a lower monetary spent on education than that of the central region.

6.5.3. Children School Achievement (delay enrollment and grade repetition)

Estimates for children school achievement by regions and gender are presented in Table 6-4-1 and Table 6-4-2. It is well known that age of a child is the very important characteristic in the study of delay enrollment and grade repetition. Thus, two estimation methods are applied: (a) Probit Model, to examine purely whether a child had ever delayed enrollment and/or grade repetition; (b) Tobit Model, to examine the influence of time (number of years) in delay enrollment and/or grade repetition.

The estimated results of both Probit Model and Tobit Model showed the strongly similar estimates. The only significant difference observed from the north is that the estimates by Probit Model were relatively larger than the estimates by Tobit Model. The following discussion would be derived from Table 6-4-2 due to the better good of fitness estimated by Tobit Model. Most variables of having a father who is literate with some primary education or completed of primary education do not affect the children delay enrollment and grade repetition. In opposite, all variables of having a mother who is literate with educational levels of some primary and completed of primary showed the significantly strong effects in decreasing the delay enrollment and grade repetition. For example, the children who have mother with some primary and

completed of primary education tended to have lower level of delay enrollment and grade repetition by 38 percentage points and 76 percentage points, respectively. In short, all maternal education variables are highly statistically significant determinants of decreasing a child delay enrollment/grade repetition. Similar to the results shown in 6.5.1, it is interesting to observe that maternal education have a higher impact for girl than for boy. This is because mothers usually tend to teach kids than fathers. These findings lend a support to Berhman *et al.* (1999) in their study of the linkage between mother and child, namely “home teaching” in India.

Moreover, similar to the previous sections, household well-being characteristics (measured by per capita outputs, holding agricultural productive assets, and operating a family business) are the important determinants to decrease the delay enrollment/grade repetition. A richer household is more likely to send their kids to school timely. Also, the kids may be able to concentrate on learning and do not have to help much in household.

On the other hand, age of mother, child gender and number of siblings do not have impacts on the school achievement. As expected, children who live in the northern and the southern regions have largely higher levels (35% to 40%) of delay enrollment/grade repetition than that of the central region.

Here the very interesting characteristic is age of child. This study considers children age between 7 to 14 years old, who currently enrolled in primary education. An older child is more likely to delay enrollment and have grade repetition than that of a younger child. This result suggests that younger generation is seemed to have a better opportunity to be sent to school timely and to have a higher quality of schooling.

Table 6-4-1: Determinants of Child School Achievement – Estimation Method: *Probit Model*

Variables	North	Center	South	Lao PDR		
				All	Boy	Girl
Father with some primary education	0.0292 (0.13)	0.2512 (1.88)	-0.0667 (-0.33)	0.0886 (1.07)	0.1627 (1.44)	0.0122 (0.10)
Father with Primary education or over	-0.0645 (-0.28)	0.1007 (0.35)	0.0196 (0.09)	0.0017 (0.02)	-0.0288 (-0.26)	0.0459 (0.38)
Mother with some primary education	-0.7875** (-3.70)	-0.2478* (-2.23)	-0.3644* (-2.36)	-0.3519** (-4.98)	-0.2811** (-2.92)	-0.4349** (-4.18)
Mother with Primary education or over	-1.1326** (-5.04)	-0.6654** (-5.67)	-0.7618** (-3.97)	-0.6533** (-8.52)	-0.4983** (-4.82)	-0.8419** (-7.39)
Mother age	0.1032 (1.28)	-0.0161 (-0.38)	-0.0869 (-1.33)	-0.0084 (-0.30)	-0.0319 (-0.83)	0.0126 (0.31)
Mother age squared/100	-0.1301 (-1.25)	0.0096 (0.18)	0.1098 (1.35)	0.0065 (0.19)	0.0309 (0.63)	-0.0144 (-0.28)
Family size	0.1324** (2.91)	0.0170 (0.66)	-0.0500 (-1.23)	0.0282 (1.73)	0.0492* (2.10)	0.0078 (0.34)
LOG(per capita outputs)	-0.0681 (-0.51)	-0.1393* (-2.55)	-0.3535** (-3.62)	-0.1444** (-3.68)	-0.0989 (-1.83)	-0.1993** (-3.48)
Holding two wheel tractor	-0.3743 (-1.48)	-0.1827 (-1.88)	-0.3788 (-1.70)	-0.2098** (-2.84)	-0.1976 (-1.92)	-0.2326* (-2.16)
Holding four wheel tractor	-1.2423** (-2.97)	-0.0099 (-0.05)	-1.0759** (-2.96)	-0.4272** (-3.13)	-0.4603** (-2.62)	-0.4136 (-1.89)
Operating a family business	-0.9736** (-3.94)	-0.0410 (-0.38)	-0.1037 (-0.55)	-0.2197** (-2.89)	-0.2739** (-2.62)	-0.1462 (-1.31)
Number of siblings (school age 7 to 14)	-0.1531 (-1.30)	0.0775 (1.29)	0.1000 (1.10)	0.0127 (0.33)	-0.0495 (-0.94)	0.0802 (1.38)
Child age	3.4150** (10.01)	1.1106** (6.63)	2.0440** (7.80)	1.6481** (14.90)	1.5707** (10.44)	1.7717** (10.70)
Child age squared/100	-11.9356** (-7.28)	-2.6518** (-3.07)	-7.3666** (-5.95)	-5.3584** (-10.04)	-4.9390** (-6.82)	-5.9919** (-7.48)
If child is girl (Dummy = 1)	-0.1998 (-1.27)	-0.0915 (-1.17)	-0.0619 (-0.50)	-0.0898 (-1.73)	-	-
Northern region	-	-	-	0.1970** (3.36)	0.1971* (2.47)	0.1898* (2.18)
Southern region	-	-	-	0.1856* (2.47)	0.1573 (1.50)	0.2122* (1.97)
Constant	-21.6570 (-8.85)	-6.5368 (-5.61)	-7.7459 (-4.05)	-9.1457 (-11.83)	-8.5167 (-8.22)	-9.8238 (-8.36)
Log likelihood	-547.67	-669.92	-266.34	-1507.70	-802.03	-698.13
Observations (obs with dep = 0)	1,645 (463)	1,638 (585)	778 (228)	4,061 (1,276)	2,189 (654)	1,872 (622)

Note: Dependent variable is number of years of school achievement measured by delayed enrollment or grade repetition (child age – current grade attainment – 6).

z-statistics is in parentheses. * Significant at 5% level, and ** significant at 1%.

Huber-White standard errors and covariance is applied to correct heteroskedasticity for all equations.

Table 6-4-2: Determinants of Child School Achievement – Estimation Method: *Tobit Model*

Variables	North	Center	South	Lao PDR		
				All	Boy	Girl
Father with some primary education	0.0721 (0.83)	0.0403 (0.37)	-0.2394 (-1.70)	0.0023 (0.04)	-0.1121 (-1.34)	0.1439 (1.60)
Father with Primary education or over	-0.0669 (-0.72)	-0.1007 (-0.98)	-0.2372 (-1.58)	-0.1109 (-1.76)	-0.2253** (-2.60)	0.0320 (0.35)
Mother with some primary education	-0.5228** (-6.09)	-0.2818** (-3.18)	-0.2523* (-2.23)	-0.3751** (-6.92)	-0.3410** (-4.61)	-0.4276** (-5.42)
Mother with Primary education or over	-0.7228** (-7.52)	-0.7751** (-7.80)	-0.7530** (-4.62)	-0.7621** (-12.02)	-0.6544** (-7.63)	-0.8998** (-9.63)
Mother age	0.0221 (0.69)	-0.0348 (-1.00)	-0.0420 (-0.90)	-0.0162 (-0.76)	-0.0164 (-0.56)	-0.0132 (-0.43)
Mother age squared/100	-0.0341 (-0.84)	0.0322 (0.73)	0.0317 (0.54)	0.0080 (0.30)	0.0066 (0.18)	0.0058 (0.15)
Family size	0.0550** (3.02)	0.0361 (1.66)	-0.0629* (-2.06)	0.0300** (2.35)	0.0525** (2.94)	0.0051 (0.28)
LOG(per capita outputs)	-0.1965** (-3.51)	-0.1847** (-4.15)	-0.3287** (-4.63)	-0.2073** (-6.58)	-0.1341** (-3.09)	-0.2953** (-6.53)
Holding two wheel tractor	-0.2911* (-2.57)	-0.2285** (-2.65)	0.1969 (0.89)	-0.2098** (-3.18)	-0.1664 (-1.81)	-0.2835** (-3.05)
Holding four wheel tractor	-0.3158 (-1.49)	0.0056 (0.03)	-0.5879 (-1.63)	-0.2375 (-1.86)	-0.2456 (-1.51)	-0.2691 (-1.31)
Operating a family business	-0.5630** (-4.81)	-0.0144 (-0.15)	-0.3271* (-2.00)	-0.2626** (-3.81)	-0.3406** (-3.63)	-0.1559 (-1.55)
Number of siblings (school age 7 to 14)	-0.0675 (-1.39)	0.0205 (0.41)	0.0930 (1.23)	-0.0072 (-0.23)	-0.0739 (-1.72)	0.0677 (1.49)
Child age	1.9631** (12.30)	1.1711** (7.46)	1.9252** (8.59)	1.6740** (16.55)	1.5565** (11.28)	1.8190** (12.29)
Child age squared/100	-5.7078** (-7.45)	-2.0908** (-2.80)	-5.4342** (-5.04)	-4.3561** (-9.00)	-3.7725** (-5.74)	-5.0938** (-7.17)
If child is girl (Dummy = 1)	-0.0754 (-1.17)	-0.0814 (-1.21)	-0.1054 (-1.10)	-0.0833* (-1.98)	-	-
Northern region	-	-	-	0.3474** (7.22)	0.3481** (5.31)	0.3501** (4.98)
Southern region	-	-	-	0.3927** (6.46)	0.4180** (4.99)	0.3638** (4.16)
Constant	-11.3162 (-10.62)	-6.5537 (-6.28)	-8.4720 (-5.34)	-9.2878 (-13.62)	-8.9848 (-9.58)	-9.5944 (-9.74)
Adjusted R ²	0.643	0.591	0.639	0.627	0.643	0.626
Observations (obs with dep = 0)	1,645 (463)	1,638 (585)	778 (228)	4,061 (1,276)	2,189 (654)	1,872 (622)

Note: Dependent variable is number of years of school achievement measured by delayed enrollment or grade repetition (child age – current grade attainment – 6).

z-statistics is in parentheses. * Significant at 5% level, and ** significant at 1%.

Huber-White standard errors and covariance is applied to correct heteroskedasticity for all equations.

6.5.4 The Role of Public Policy

The primary school dropout rate is a crucial problem in Lao PDR. The fact is that only one-half of children starting at grade 1 reached grade 5 of primary school level in 2000, despite a high net enrollment rate of 85% for boys and 78% for girls. Using cross-country data of 19 selected Asian nations, the possible public policy for the successful participation of children in schooling is analyzed (see Chapter 2, Table 2-10 for the details of the data).

The dependent variable, primary completion rate, is measured by the percentage of primary first grade entrants who reach five years of schooling. Public policy variables include government expenditure on education and the supply of primary teachers measured by the pupil-teacher ratio. It is undoubtedly believed that the successful completion of education at the primary level does eventually influence the overall human capital building of a population.

Table 6-5: Results of the estimated macro-level schooling model

Variables	Equation (a)	Equation (b)
log(per capita income)	9.8191* (2.52)	-
Govt. expenditure on education as % of GNP	1.3614 (0.44)	5.0538* (2.21)
Pre-primary and primary expenditure as % of total govt. expenditure on education	-0.3441 (-1.56)	-
Primary pupil/teacher ratio	-	-0.7774** (-3.37)
Constant	26.1384 (1.22)	86.7664 (6.12)
Adjusted R ²	0.338	0.437
Observations <i>N</i>	19	19

Note: Dependent variable= PCR, % of the total first grade entrants completing primary schooling. t-statistics is in parentheses. * Significant at the 5% level, ** at the 5% level.

The Generalized Method of Moments (GMM) is preferred for the estimation due to a small number of samples. The GMM model is selected as a regression model, since this consistently yielded better performance in terms of the estimated

coefficients of the variables compared to the OLS. The macro-schooling model is estimated by 2 equations in order to separate the impacts of the two variables: per capita income and government expenditure on education as a percentage of GNP (GEE).

The results presented in Table 6-5 showed that the per capita income has a significantly strong association with the primary completion rate. The share of primary expenditure as a percentage of total government expenditure on education, however, did not affect the schooling participation of children (equation (a)). On the contrary, without considering the effect of income levels of the 19 nations, GEE and the primary pupil-teacher ratio (PTR) alone could play a critical role on the degree of primary completion of children (equation (b)). The GEE variable showed a significantly strong numerical value in improving the primary completion rate across the countries. As expected, the PTR variable appeared to be a negative sign, which mean the insufficient supply of teachers would yield a negative impact on the quality of primary children schooling. The findings in the selected Asian countries in this study are consistent with those reported by Singh and Santiago (1997) for South/Central American nations.

6.6. Concluding remarks

Present educational levels of rural farmers in Lao PDR are very low. Based on the outcomes analyzed in this study, the role of parent educational levels is found to be highly significant and quantitatively important, especially maternal educational level. For both the initial decision to send a child to school and the child's performance in school (as measured by delay enrollment/grade repetition), mother's education has a large impact, and higher levels of mother schooling (completed of

primary education) have the largest effects. Gender of child is also interesting and important determinant of the schooling choice of households. The analysis of the household schooling choices showed that boys are more likely to be sent to school than girls. In other words, girls continue to receive less education than boys. The other essential factor after parental education is household well-being or family income: better-off households are much more likely to send their children to school and to send on timely enrollment age. Although the impact of parental educational levels is not found to be significant in increasing household expenditures on child schooling, this study has shown that the costs of uniform and textbooks/other educational materials are a heavy burden for rural farmers.

Women's schooling in rural farmers is especially important, with estimated impacts that are usually larger than those associated with literacy of the household head. The principal policy implications of the results presented in this research pertain to the potential social and economic benefits of improving education, particularly for women's schooling. Parental schooling brings an important private benefit to households in terms of higher levels of farm productivity (chapter 5), but it also brings important benefits to society in terms of children's schooling in both enrollment choices and school achievements.

From the macro level perspective, allocating a higher government expenditure on education, and increasing the supply of primary teachers is found to be a critical factor in increasing the primary completion rate of children. For policy implications in the educational sector to be effective, "Adult Literacy Campaigns" in rural areas may help to generate these improvements in well-being in the near future, and equally important is raising schooling levels among the current population of school-age children. Policies should be directed at reducing the delay enrollment and

dropout rates of children by finding ways to relax the monetary constraint faced by households, particularly for the northern and the southern regions. Incentives such as free uniforms, free textbooks/other education materials, health support, and/or monetary payments to poor households may have roles to play here.

CHAPTER 7

CONCLUSION

This paper is the first comprehensive study on the role of human capital on economic development and poverty reduction for Lao PDR. Following by a brief introduction of the study in Chapter 1, the descriptions and analysis of recent macroeconomic developments, poverty issues and the supply of education in Lao PDR were provided in Chapter 2. The study consisted of four empirical researches, from Chapter 3 to Chapter 6, on the concepts of returns to investment in education and human capital accumulation by employing two sets of unusually rich national household survey (micro data) named LECS 2 in 1997/98 and LECS 3 in 2002/03.

In brief, the empirical research works showed that the rates of return to education for the representative of all sectors (wage earners, entrepreneurs, and farmers) and geographical regions are relatively high. This suggests that there is a high demand for education, particularly for the primary level. Currently, the supply of education in Lao PDR is significantly insufficient both quantitative and quality. The principal policy implications for policy makers are to allocate a higher government expenditure on education, especially to increase the supply of primary schools and primary teachers. “Adult Literacy Campaigns” in rural areas may help to generate these improvements in well-being in the near future, and equally important is raising schooling levels among the current population of school-age children. Policies should be directed at reducing the delay enrollment and dropout rates of children by finding ways to relax the monetary constraint faced by households, particularly for the northern and the southern regions. Incentives such as free uniforms, free

textbooks/other education materials, health support, and/or monetary payments to poor households may have roles to play here.

7.1. Research Findings and Policy Implications

Chapter 3 analyzed the returns to education for wage earners in Lao PDR. The research found that the rates of return to schooling in Lao PDR are low by international standards, but relatively the same with other transition economies. The rates of return rise significantly during the transition. The high rate of return observed for younger generations is one bright sign that the return would increase more as the market reforms take full effect.

We also found a private sector earnings advantage, particularly workers with tertiary education level. The private-public sector wage differential suggests that it is difficult for the public sector to retain and attract skilled employees, and the widening wage gaps might promote inefficiency and moonlighting. Although painful, the best way to satisfy the need for higher public sector efficiency and ease the fiscal strain, may be to reduce public sector employment and pay higher wages to educated workers.

Primary education, the most profitable sub-sector judging from the estimated rates of return results, especially outside of the capital, is much less subsidized than higher levels. In fact, the high subsidy levels for higher education contribute to the low rates of return for these sub-sectors. Thus, Lao's policy makers may need to improve the supply of primary education services, and consider a more direct subsidy of primary school education for the poor.

Chapter 4 analyzed the returns to human capital for micro and small entrepreneurs (MSEs) in Lao PDR. The research found the importance of micro/small

entrepreneurial human capital in increasing the performance of the firms. The rates of returns to schooling were at about 6-7%. The advantages to conventional formal education had outweighed the returns to additional work experience. For all groups, primary education was the most beneficial, whereas post-secondary education was found to be over-education. The findings suggested that basic literacy and numeracy are more important to their day to day operations. Therefore, policy makers should target to provide education opportunities to MSEs who have less primary education, especially illiterate entrepreneurs.

The estimated results also showed experiences in both the potential and the current business to be a marginal investment. Most owners run their enterprises in isolation, and they did not interact extensively with existing business associations and networks. So far, skills development is insufficiently linked to market demand and there is lack of integration of technical and business training. There are also ongoing problems with the basic quality and capacity building of teachers and trainers. Thus, local and international organizations should improve the delivery of business skills training programs suitable for MSEs.

At the present, the Lao government aims to reduce poverty through agriculture-related businesses and to target rural entrepreneurs, minorities, and family businesses. However, there is no national policy or agency dedicated to development of MSEs. Initiatives to develop MSEs used by related agencies should be made more sensitive to the entrepreneurs in manufacturing sector, home-based and seasonal operation, and rural areas.

Chapter 5 analyzed the affects of education on farm productivity (rice output). This analysis is deemed to fit with the characteristics of the farmer households in Lao

PDR which remain predominantly subsistent, labor intensive, short of irrigated land, lack of productive assets and chemical inputs.

Present education levels of farmers, which cover over 80% of the total labor force in Lao PDR, are very low. In 2002/03, on average, the schooling years were about 4 years for head of households, and 2 years for their spouses. A half of household heads and three quarter of household spouses had less than primary education level. The very poor performance in human capital is that roughly 20% of the household heads and 44% of their wives were illiterate. In other words, less than 15% of the heads and less than 25% of the spouses had education attainment over the primary level.

The estimated results showed that the role of farmers' education is quantitatively important in determining the well-being of households. The estimated rates of returns to education of household heads and spouses are relatively high and increase significantly over the study period, ranging from 4-5% to 6-7%. These rates are much higher than the results found in the majority of other studies.

The principal policy implications of the results presented pertain to the potential social and economic benefits of improving education, particularly in rural areas. Adult literacy campaigns (equals to a completion of primary education level) may help to generate these improvements in well-being in the near future. Rather than the facilitation of irrigation which has a very low effectiveness, policies should be directed at promoting the use of productive assets and chemical inputs by finding ways to relax the monetary constraints (access to credits) faced by households.

Chapter 6 analyzed the determinants of children's schooling attainment (future generation) in rural farmer households. Despite a high net enrollment rate for boys and girls, the fact is that only one-half of children starting at grade one reached

grade five of primary school level. One of the most pressing immediate concerns of the education sector must be to increase timely enrollment of children and the completion rate at the primary school level.

The analyzed outcomes showed that the role of parent educational levels is highly significant and quantitatively important on both the initial decision to send a child to school and the child's performance in school (as measured by delay enrollment/grade repetition). Generally, maternal education has a larger impact, particularly for completed of primary education. The analysis of the household schooling choices showed that boys are more likely to be sent to school than girls. In other words, girls continue to receive less education than boys. Although the impact of parental educational levels is not found to be significant in increasing household expenditures on child schooling, this study has shown that the costs of uniform and textbooks/other educational materials are a heavy burden for rural farmers.

Similar to the previous chapter, the principal policy implications of the results presented in this research pertain to the potential social and economic benefits of improving education, particularly for women's schooling. Parental schooling not only brings an important private benefit to households in terms of higher levels of farm productivity, but it also brings important benefits to society in terms of children's schooling in both enrollment choices and school achievements.

7.2. Remarks for Further Development

This dissertation has analyzed the role of human capital on economic development and poverty reduction in Lao PDR, by fully utilized micro data of LECS 2 and LECS 3. They are the only comprehensive data currently available, but may be

limited for a number of reasons. This study ends with two major remarks for further development.

First, it is very important to monitor future labor market trends. Since the labor market in transition economies are changing rapidly, it would be desirable to update these estimates as soon as recent micro data are available. Therefore, future updates of this analysis, based on more recent data, could not only provide more robust estimates, but also provide evidence on whether the impact of labor market reforms is increasing over time, more rapidly and deeply.

Second, this study intensively focused on the analysis of returns to investment in education for present generation (adults) of all sectors. The analysis of the accumulation of human capital for future generation (children) is limited to rural farmers in a small scope.

Education is often viewed as the principal route out of poverty in developing countries. Yet, poverty, it is also suggested, constrains schooling investment. Education is expensive and there is only a very limited scope for borrowing in order to invest in education. Whenever new data are available, it is desirable to further analyze about children's schooling in more wide scope. Example of these include Foster and Rosenzweig (1996), Behrman and Knowles (1999), Duflo (2004), Glewwe and Jacoby (2004), and Schultz (2004). From a policy perspective, further studies on how household income and schooling subsidies/loans or even direct income subsidies could increase the demand for education and enhance long-run social mobility are very useful indicators.

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Appendix 2A

*Table 2A-1: Main Economic Activities for Population 10+,
by Provinces and Regions 2002/03.*

Region/province	% of population 10+ working			Main activity last 7 days, % of total hours worked		
	Female	Male	Total	Paid employee	Self-employed Non-farm activity	Own operated farm
Lao PDR	81	83	82	6	24	71
<i>Urban</i>	73	76	75	17	49	34
<i>Rural with road</i>	83	86	85	3	16	81
<i>Rural without road</i>	86	87	87	1	11	88
North	82	84	83	3	13	84
Phongsaly	90	91	90	0	7	92
Luangnamtha	82	84	83	3	15	82
Oudomxay	81	84	83	3	3	94
Bokeo	72	80	76	1	15	84
Luangprabang	78	82	80	5	12	84
Huaphanh	88	88	88	1	18	81
Xayaboury	83	84	84	5	19	76
Center	77	80	79	9	30	61
Vientiane C.	74	76	75	22	47	31
Xiengkhuang	71	72	72	2	16	82
Vientiane P.	73	79	76	5	26	69
Borikhamxay	85	82	84	3	34	63
Khammuane	85	88	86	3	21	76
Savannakhet	79	83	81	5	22	73
Xaysomboon SR	77	78	78	5	15	80
South	87	91	89	3	24	73
Saravane	98	99	98	0	11	88
Sekong	89	90	89	3	14	83
Champasack	83	88	85	5	32	63
Attapeu	81	83	82	2	30	68

Source: LECS 3, 2002/03.

Appendix 2A

*Table 2A-2: Net School Enrolment (%) among Children 6-15 years old
by Gender in 2002/03.*

Region/province	Age 6-10			Age 11-15		
	Girls	Boys	Total	Girls	Boys	Total
Lao PDR	70	73	72	70	82	76
<i>Urban</i>	91	88	89	87	90	88
<i>Rural with access to road</i>	72	75	74	71	82	76
<i>Rural without access to road</i>	50	56	53	49	71	60
North	61	67	64	63	80	71
Phongsaly	48	55	52	56	70	63
Luangnamtha	43	49	46	54	64	59
Oudomxay	53	56	54	59	81	69
Bokeo	59	58	59	64	82	72
Luangprabang	66	73	69	67	83	74
Huaphanh	57	68	62	65	83	74
Xayaboury	82	87	85	66	82	74
Center	78	78	78	77	86	82
Vientiane C.	96	92	94	85	95	90
Xiengkhuang	73	70	72	71	88	79
Vientiane P.	89	91	90	85	91	88
Borikhamxay	86	90	88	82	90	86
Khammuane	70	73	71	74	80	77
Savannakhet	69	67	68	70	77	74
Xaysomboon SR	83	80	81	78	96	88
South	69	73	71	66	75	71
Saravane	48	54	51	49	66	58
Sekong	60	63	62	69	86	77
Champasack	84	86	85	71	76	74
Attapeu	63	68	65	82	89	86

Source: LECS 3, 2002/03

Appendix 2A

*Table 2A-3: Average Schooling Years and Literacy Rate
by Regions and Provinces in 1997/98*

	No. of schooling years				Literacy rate 15+	
	Female	Male	F 15-19	M 15-19	Female	Male
Lao PDR	3	4	4	5	55	82
Urban	5	6	7	7	82	96
Rural	2	4	4	5	49	79
North	2	3	3	5	44	74
Phongsaly	1	2	3	3	33	55
Luangnamtha	1	2	2	3	19	51
Oudomxay	1	3	2	4	36	78
Bokeo	1	2	3	4	33	70
Luangprabang	2	4	4	5	50	77
Huaphanh	2	3	3	4	38	72
Xayaboury	3	4	5	6	68	87
Center	3	5	5	6	64	87
Vientiane C.	5	7	8	8	84	96
Xiengkhuang	3	4	4	6	58	83
Vientiane P.	4	5	6	7	69	89
Borikhamxay	3	4	5	6	63	87
Khammuane	2	4	4	5	60	87
Savannakhet	2	4	4	4	50	81
Xaysomboon SR	2	3	3	5	43	76
South	2	4	4	5	51	84
Saravane	2	3	3	4	41	78
Sekong	1	2	2	3	37	72
Champasack	3	4	4	6	57	89
Attapeu	2	4	4	5	57	81
2002/03						
Lao PDR	5	5	6	6	65	86
Urban	7	7	8	8	86	96
Rural	7	7	8	8		

Source: LECS 2, 1997/98 and LECS 3, 2002/03

Appendix 2A

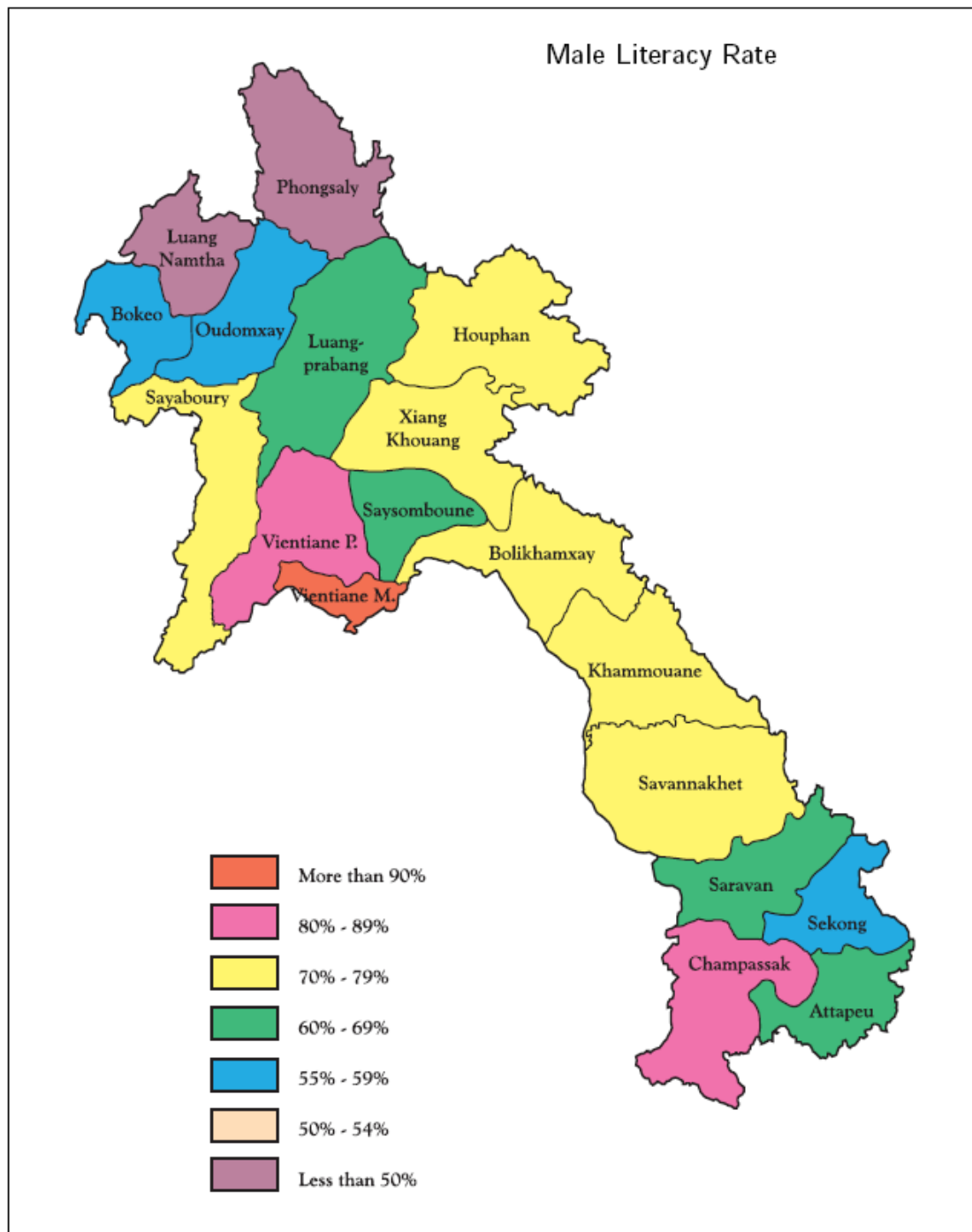
*Table 2A-4: Average Schooling Years and Literacy Rate
by Regions and Provinces in 2002/03*

	No. of schooling years				Literacy rate 15+	
	Female	Male	F 15-19	M 15-19	Female	Male
Lao PDR	5	5	6	6	65	86
Urban	7	7	8	8	86	96
Rural	7	7	8	8		
North	4	5	5	6	55	80
Phongsaly	4	4	4	4	38	57
Luangnamtha	4	5	6	6	37	60
Oudomxay	3	4	5	5	45	78
Bokeo	4	4	5	6	49	78
Luangprabang	4	5	5	6	54	84
Huaphanh	4	5	6	6	54	85
Xayaboury	5	6	6	7	81	91
Center	6	6	7	7	71	89
Vientiane C.	7	8	8	8	91	97
Xiengkhuang	4	5	6	6	60	85
Vientiane P.	5	6	7	7	77	93
Borikhamxay	5	5	6	7	82	90
Khammuane	4	5	6	6	57	85
Savannakhet	5	5	6	6	58	83
Xaysomboon SR	4	5	5	6	54	84
South	4	5	5	6	65	88
Saravane	4	4	5	5	47	79
Sekong	3	4	4	5	55	82
Champasack	5	5	6	6	74	93
Attapeu	4	5	5	6	71	91
1997/98						
Lao PDR	3	4	4	5	55	82
Urban	5	6	7	7	82	96
Rural	2	4	4	5	49	79

Source: LECS 3, 2002/03

Appendix 2A

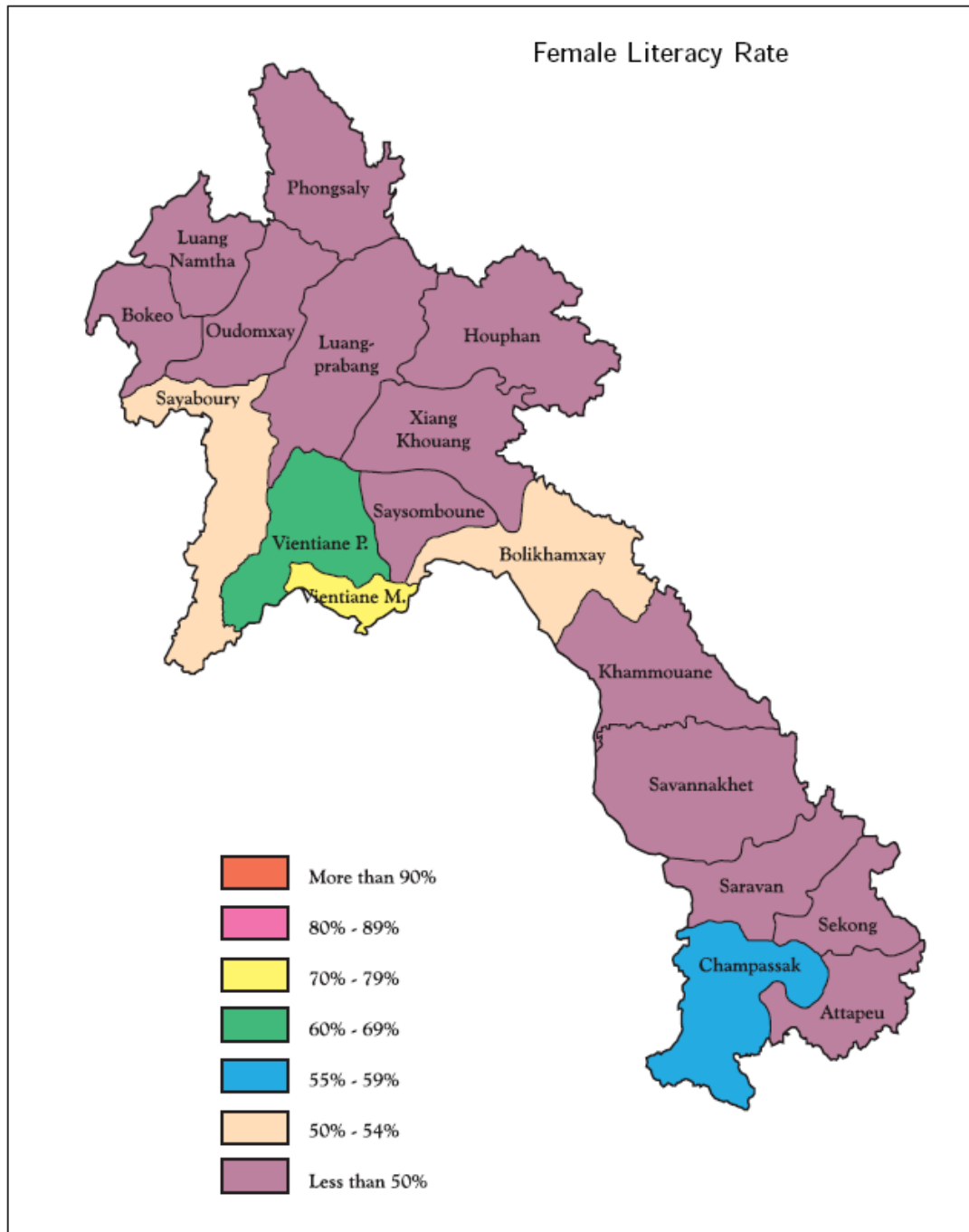
Figure 2A-1: Map of Male Literacy Rate



Source: Asian Development Bank (2000), Lao: Education Sector Development Plan.

Appendix 2A

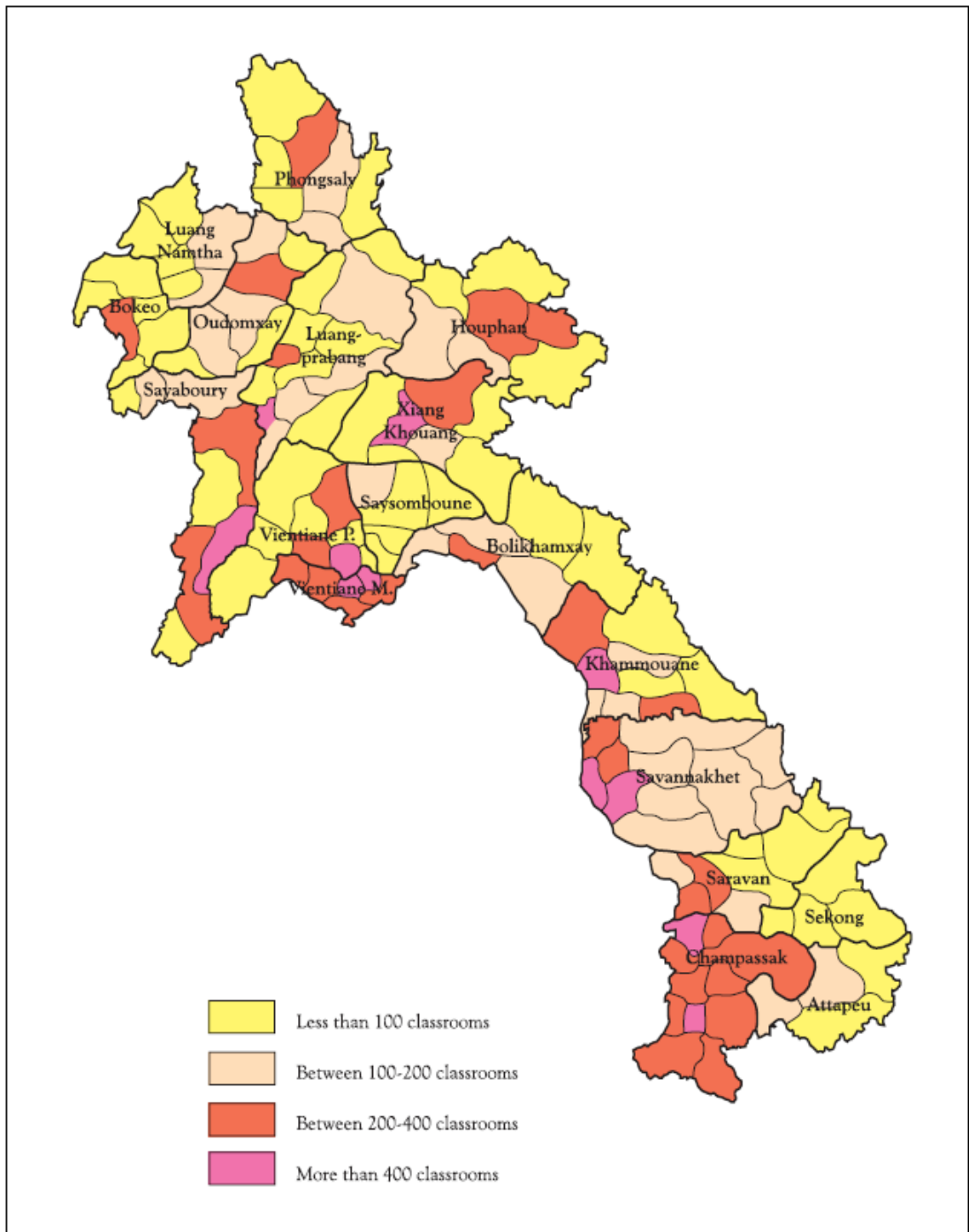
Figure 2A-2: Map of Female Literacy Rate



Source: Asian Development Bank (2000), Lao: Education Sector Development Plan.

Appendix 2A

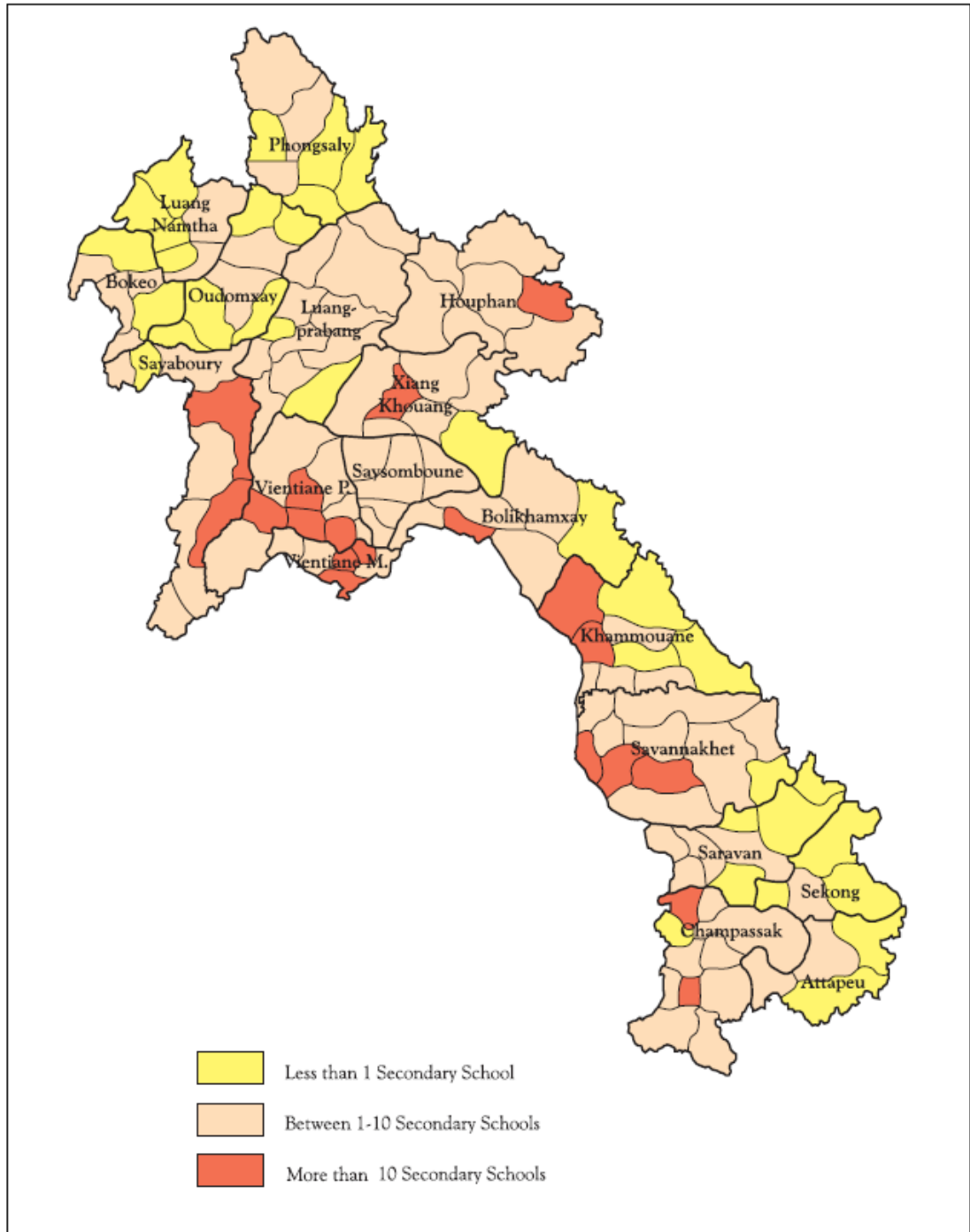
Figure 2A-3: Distribution of Primary School by District.



Source: Asian Development Bank (2000), Lao: Education Sector Development Plan.
Data derived from the school years 1995/96 to 1996/97 for MOE statistics

Appendix 2A

Figure 2A-4: Distribution of Secondary School by District.



Source: Asian Development Bank (2000), Lao: Education Sector Development Plan.
Data derived from the school years 1995/96 to 1996/97 for MOE statistics.

Appendix 3A:

Table 3A-1: Earnings Functions by Region, Gender, and Pre/Post Transition in 1997/98 – Use of Schooling Years.

Variable	Vientiane C.	Provinces	Lao PDR				
			All	Males	Females	Pre-transition	Post-transition
Schooling	0.0389** (5.89)	0.0222** (5.15)	0.0296** (8.09)	0.0297** (6.69)	0.0299** (5.08)	0.0267** (5.99)	0.0335** (5.04)
Experience	0.0360** (5.10)	0.0110* (1.97)	0.0223** (4.90)	0.0246** (4.28)	0.0240** (3.19)	0.0123 (1.25)	0.0008 (0.02)
Experience-squared/100	-0.0543** (-3.45)	-0.0120 (-1.04)	-0.0308** (-3.18)	-0.0342** (-2.96)	-0.0438* (-2.26)	-0.0156 (-0.90)	0.1124 (0.35)
Female	-0.2363** (-4.82)	-0.1471** (-3.94)	-0.1749** (-6.19)	-	-	-0.1878** (-5.48)	-0.1536** (-3.02)
Northern	-	-	-0.2314** (-5.34)	-0.3653** (-7.39)	0.0858 (1.31)	-0.3101** (-6.46)	-0.0267 (-0.30)
Central	-	-	-0.1685** (-4.80)	-0.1831** (-3.95)	-0.1529** (-3.05)	-0.2177** (-5.12)	-0.0706 (-1.12)
Southern	-	-	-0.1861** (-5.31)	-0.2247** (-5.22)	-0.0989 (-1.70)	-0.2328** (-5.51)	-0.1165 (-1.69)
Constant	10.3581 (104.33)	10.5663 (127.75)	10.5656 (163.27)	10.5642 (131.79)	10.3397 (112.32)	10.7779 (78.23)	10.5111 (64.18)
Adjusted R ²	0.182	0.064	0.130	0.107	0.098	0.124	0.091
F-test	27.71**	15.24**	29.14**	19.65**	7.89**	20.20**	6.28**
N	480	840	1,320	938	382	948	372

Note: Dependent variable is the natural log of monthly earnings.

t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.

The omitted category for regional dummy is Vientiane Capital.

White heteroskedasticity consistent covariance is applied for equations in column 1, 3, 4, and 6 or “Vientiane C., All, Males and Pre-transition”.

Appendix 3A:

Table 3A-2: Earnings Functions of the **Public Sector** by Region, Gender, and Pre/Post Transition in 2002/03 – Use of Schooling Years.

Variable	Vientiane C.	Provinces	Lao PDR				
			All	Males	Females	Pre-transition	Post-transition
Schooling	0.0262* (2.40)	0.0185* (2.40)	0.0217** (3.44)	0.0253** (3.39)	-0.0031 (-0.28)	0.0233** (3.23)	0.0091 (0.64)
Experience	0.0119 (1.03)	0.0121 (1.35)	0.0121 (1.72)	0.0240** (2.67)	-0.0099 (-0.96)	0.0178 (0.86)	0.0146 (0.38)
Experience-squared/100	-0.0105 (-0.45)	-0.0101 (-0.57)	-0.0107 (-0.76)	-0.0286 (-1.64)	-0.0055 (-0.22)	-0.0198 (-0.63)	-0.0515 (-0.25)
Female	-0.2004 (1.95)	-0.2272** (-3.04)	-0.2161** (-3.56)	-	-	-0.3117** (-3.58)	-0.0919 (-1.08)
Ethnic	0.2952 (0.95)	0.0621 (0.96)	0.0793 (1.20)	0.0984 (1.25)	0.0195 (0.17)	0.0092 (0.11)	0.2655* (2.09)
Rural Area	-	-0.0163 (-0.27)	-0.0056 (-0.10)	0.0038 (0.05)	-0.0589 (-0.65)	0.0269 (0.38)	-0.1209 (-1.12)
Northern	-	-	-0.0745 (-0.96)	-0.0759 (-0.78)	-0.0900 (-0.82)	-0.0056 (-0.06)	-0.1677 (-1.36)
Central	-	-	-0.1035 (-1.45)	-0.1317 (-1.51)	-0.0312 (-0.29)	-0.0779 (-0.87)	-0.1395 (-1.15)
Southern	-	-	-0.0695 (-0.98)	-0.0554 (-0.65)	-0.1174 (-1.04)	-0.0524 (-0.58)	-0.0680 (-0.59)
Constant	12.0823 (64.07)	12.0528 (80.41)	12.1178 (94.89)	12.1458 (75.86)	12.6382 (64.73)	11.9649 (35.74)	12.2746 (47.19)
Adjusted R ²	0.039	0.043	0.046	0.031	-0.010	0.053	0.003
F-test	3.14**	4.11**	5.27**	3.05**	0.81	3.75**	1.07
N	262	419	681	519	162	442	239

Note: Dependent variable is the natural log of monthly earnings.
t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.
The omitted category for regional dummy is Vientiane Capital.

Appendix 3A:

Table 3A-3: Earnings Functions of the **Private Sector** by Region, Gender and Pre/Post Transition in 2002/03 – Use of Schooling Years

Variable	Vientiane C.	Provinces	Lao PDR		Pre-transition	Post-transition	
			All	Males			Females
Schooling	0.0623** (5.64)	0.0490** (5.48)	0.0523** (7.56)	0.0513** (6.02)	0.0532** (4.31)	0.0394** (4.37)	0.0701** (6.29)
Experience	0.0361** (3.51)	0.0427** (5.91)	0.0408** (6.75)	0.0444** (5.90)	0.0396** (3.76)	0.0040 (0.26)	0.0182 (0.45)
Experience-squared/100	-0.0391* (-2.10)	-0.0656** (-5.28)	-0.0583** (-5.40)	-0.0572** (-4.30)	-0.0698** (-3.69)	-0.0126 (-0.61)	0.1132 (0.52)
Female	-0.0695 (-0.64)	-0.1924** (-2.84)	-0.1423* (-2.48)	-	-	-0.2555** (-3.38)	0.0372 (0.43)
Ethnic	-0.1731 (-0.98)	-0.1770* (-2.56)	-0.1743** (-2.71)	-0.2940** (-3.54)	-0.0286 (-0.29)	-0.2164** (-2.76)	-0.0938 (-0.79)
Rural Area	-	-0.1054 (-1.75)	-0.0466 (-0.87)	0.0409 (0.60)	-0.1465 (-1.71)	-0.0825 (-1.22)	0.0214 (0.24)
Manufacturing	0.0621 (0.55)	-0.3463** (-3.73)	-0.1858** (-2.64)	-0.1296 (-1.34)	-0.2775** (-2.83)	0.0825 (1.44)	-0.2507** (-2.66)
Construction	0.1234 (1.14)	-0.1127 (-1.37)	0.0108 (0.16)	0.0095 (0.12)	-0.0074 (-0.05)	-0.1465 (-0.05)	0.0087 (0.09)
Commerce	1.0010** (6.25)	0.5226** (5.96)	0.6837** (9.11)	0.5338** (5.14)	0.7500** (7.47)	0.6860** (7.60)	0.6756** (4.91)
Transportation	0.4535* (2.12)	0.1123 (1.03)	0.2712** (2.82)	0.2474* (2.34)	0.4577 (0.62)	0.1821 (1.43)	0.3934** (2.72)
Northern	-	-	-0.3469** (-4.72)	-0.2220* (-2.31)	-0.5323** (-4.57)	-0.3737** (-4.05)	-0.3459** (-2.81)
Central	-	-	-0.2265** (-3.59)	-0.1281 (-1.56)	-0.3934** (-3.92)	-0.2050* (-2.43)	-0.2951** (-2.99)
Southern	-	-	-0.2174** (-2.56)	-0.2873** (-2.62)	-0.1688 (-1.30)	-0.2865** (-2.76)	-0.0694 (-0.46)
Constant	11.9758 (72.21)	11.9850 (87.95)	12.1460 (100.22)	12.2294 (80.19)	12.2405 (61.69)	12.8068 (44.27)	12.1676 (49.51)
Adjusted R ²	0.231	0.202	0.211	0.153	0.289	0.194	0.232
F-test	15.30**	27.61**	31.54**	13.65**	22.77**	17.96**	14.12**
N	430	1,055	1,485	840	645	919	566

Note: t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.

Except for column 4 (Males), White heteroskedasticity consistent covariance is applied for all equations in this above.

Appendix 3A:

Table 3A-4: Earnings Functions with Education Levels in the **Private Sector** in the **Pre-Transition** 2002/03.

Variable	Vientiane C.	Provinces	Lao PDR		
			All	Males	Females
Primary	0.4982* (2.12) [0.4982]	0.2379* (1.98) [0.2379]	0.2645* (2.47) [0.2645]	0.1587 (1.08) [0.1587]	0.3338* (2.03) [0.3338]
Secondary	0.7018* (2.30) [0.0339]	0.4730* (2.33) [0.0392]	0.4407** (2.60) [0.0294]	0.4004* (1.98) [0.0403]	0.4468 (1.35) [0.0188]
Technical	0.6661* (2.19) [-0.0119]	0.5171* (2.20) [0.0147]	0.5348** (2.85) [0.0314]	0.4409* (2.04) [0.0135]	0.7338* (1.96) [0.0957]
University	-	-	-	-	-
Experience	-0.0220 (-0.55)	0.0348 (1.12)	0.0118 (0.52)	-0.0157 (-0.53)	0.0574 (1.54)
Experience-squared/100	0.0268 (0.52)	-0.0602 (-1.38)	-0.0250 (-0.82)	0.0150 (0.39)	-0.0937 (-1.86)
Female	0.0074 (0.03)	-0.2658* (-2.22)	-0.2306* (-2.15)	-	-
Ethnic	-0.1992 (-0.60)	-0.2461* (-2.01)	-0.2143 (-1.85)	-0.4491** (-2.97)	0.0443 (0.25)
Rural Area	-	-0.1496 (-1.38)	-0.0922 (-0.96)	-0.0565 (-0.44)	-0.1114 (-0.71)
Manufacturing	0.0536 (0.19)	-0.2947 (-1.82)	-0.1849 (-1.33)	-0.0013 (-0.01)	-0.4608* (-2.06)
Construction	0.0794 (0.28)	-0.1178 (-0.71)	-0.0301 (-0.21)	0.0161 (0.10)	-0.0930 (-0.22)
Commerce	0.8517** (2.88)	0.5070** (3.30)	0.5920** (4.46)	0.4614* (2.33)	0.5380** (2.75)
Transportation	0.1577 (0.47)	0.1786 (0.77)	0.1792 (0.92)	0.1821 (0.92)	-
Northern	-	-	-0.5288** (-3.76)	-0.2973 (-1.65)	-0.8295** (-3.60)
Central	-	-	-0.2399* (-1.96)	-0.0272 (-0.18)	-0.5572** (-2.73)
Southern	-	-	-0.3922** (-2.63)	-0.3483 (-1.74)	-0.5090* (-2.22)
Constant	13.2810 (16.61)	12.1834 (22.63)	12.8193 (29.11)	13.4292 (23.95)	12.3392 (17.21)
Adjusted R ²	0.204	0.227	0.241	0.183	0.336
F-test	2.19*	8.70**	9.68**	3.99**	7.60**
N	106	368	474	265	209

Note: * Statistically significant at the 5% level, ** at the 1% level.

t-statistics in parentheses. "Per year" return education in brackets.

Insufficient samples for university education level in the pre-transition.

White heteroskedasticity consistent covariance is applied for an equation in column 5 "Females".

Appendix 3A:

Table 3A-5: Earnings Functions with Education Levels in the **Private sector** in **Post-Transition 2002/03**.

Variable	Vientiane C.	Provinces	Lao PDR		
			All	Males	Females
Primary	0.0536 (0.16) [0.0536]	0.4302 (1.90) [0.4302]	0.4272* (2.02) [0.4272]	0.4012 (1.18) [0.4012]	0.6121* (2.41) [0.6121]
Secondary	0.3350 (1.00) [0.0469]	0.7318** (2.78) [0.0503]	0.7799** (3.47) [0.0588]	0.8145* (2.47) [0.0689]	0.7954** (2.97) [0.0306]
Technical	0.1688 (0.43) [-0.0554]	1.0116** (3.28) [0.0933]	0.8701** (3.39) [0.0301]	1.0082** (2.82) [0.0646]	0.6647 (1.91) [-0.0436]
University	0.7306 (1.53) [0.0791]	1.7227** (3.36) [0.1422]	1.4255** (4.34) [0.1291]	1.3427** (3.27) [0.1056]	1.8954** (2.63) [0.2200]
Experience	-0.2043 (-1.88)	0.0644 (0.78)	-0.0392 (-0.65)	0.0748 (0.91)	-0.0841 (-0.74)
Experience-squared/100	1.2313* (2.17)	-0.1151 (-0.27)	0.3987 (1.26)	-0.1105 (-0.26)	0.4907 (0.82)
Female	-0.0887 (-0.44)	0.0874 (0.49)	0.0064 (0.05)	-	-
Ethnic	-	-0.2906 (-1.54)	-0.1963 (-1.14)	0.0546 (0.25)	-0.4027 (-1.35)
Rural Area	-	0.0819 (0.46)	0.0577 (0.41)	0.1421 (0.75)	0.0041 (0.02)
Manufacturing	-0.2893 (-1.65)	-0.6643* (-2.59)	-0.4185* (-2.49)	-0.3833* (-1.63)	-0.2831 (-1.41)
Construction	-0.1250 (-0.55)	-0.3468 (-1.36)	-0.1778 (-1.02)	-0.3111 (-1.58)	-0.0523 (-0.18)
Commerce	1.2070** (3.25)	0.2879 (1.10)	0.6887** (3.79)	0.2272 (0.86)	1.0259** (3.23)
Transportation	-0.2000 (-0.76)	0.2272 (0.82)	0.3785 (1.64)	0.1754 (0.72)	1.5188** (4.66)
Northern	-	-	-0.2674 (-1.42)	-0.1586 (-0.62)	-0.4127 (-1.41)
Central	-	-	-0.4062** (-2.81)	-0.3708 (-1.86)	-0.4553 (-1.93)
Southern	-	-	-0.1806 (-0.78)	-0.5810 (-1.93)	0.4776 (1.38)
Constant	13.4361 (22.62)	12.0597 (23.61)	12.5396 (32.06)	12.1105 (22.42)	12.6112 (19.24)
Adjusted R ²	0.342	0.277	0.308	0.260	0.435
F-test	6.54**	5.71**	8.74**	3.57**	7.32**
N	118	161	279	155	124

Note: * Statistically significant at the 5% level, ** at the 1% level.

t-statistics in parentheses. "Per year" return education in brackets.

White heteroskedasticity consistent covariance is applied for equations in column 1 and 5 "Vientiane C. and Females".

Appendix 4A:

Table 4A-1: Proportion of Households operating a business by Province

	Households operating business %	Households operating one business %	Households operating two businesses %	Households operating three or more businesses %
Total country	28	23	4	1
Urban	63	50	12	2
Rural	17	14	2	0
North	23	18	4	1
Phongsaly	5	4	1	0
Luangnamtha	14	13	1	0
Oudomxay	7	6	1	0
Bokeo	16	13	2	0
Luangprabang	39	27	10	2
Huaphanh	10	9	0	0
Xayaboury	36	30	6	1
Center	34	27	6	1
Vientiane C.	63	49	12	2
Xiengkhuang	20	17	3	0
Vientiane P.	31	27	4	1
Borikhamxay	17	15	3	0
Khammuane	26	21	4	1
Savannakhet	23	18	4	1
Xaysombone	12	11	1	0
South	24	21	2	1
Saravane	11	10	2	0
Sekong	13	11	1	0
Champasack	31	28	2	1
Attapeu	23	21	2	0

Source: LECS 3, 2002/03.

Appendix 4A:

Table 4A-2: Selected Infrastructure Indicators by Provinces and Regions in 2002/03.
(% of villages or KM)

	Electri city	Distan ce to neares t road	Reach -able in dry season	Reach able in rainy season	Distan ce to post office	Bus stop in village	Distan ce to public transp ort
Lao PDR	33	5	71	54	23	45	10
<i>Urban</i>	95	0	100	97	5	96	0
<i>Rural with road</i>	33	2	84	65	22	54	6
<i>Rural without road</i>	13	12	35	17	32	11	22
North	22	9	52	39	27	36	14
Phongsaly	23	16	32	27	38	19	19
Luangnamtha	6	16	47	34	30	34	23
Oudomxay	9	7	51	26	29	26	15
Bokeo	14	8	76	44	23	46	10
Luangprabang	34	10	53	51	23	45	11
Huaphanh	26	9	41	28	31	23	19
Xayaboury	28	2	77	71	17	68	4
Center	49	2	89	66	22	52	7
Vientiane C.	100	0	100	100	9	98	0
Xiengkhuang	41	8	83	41	26	18	18
Vientiane P.	54	2	93	92	18	74	4
Borikhamxay	54	5	74	63	16	53	5
Khammuane	48	1	78	54	29	48	5
Savannakhet	35	1	96	64	22	44	7
Xaysomboon SR	14	-	-	54	52	47	22
South	25	3	73	57	18	49	9
Saravane	18	1	83	65	22	52	8
Sekong	42	12	74	58	20	46	21
Champasack	26	2	64	52	16	50	3
Attapeu	16	3	85	53	16	38	25

Source: LECS 3, 2002/03.

Appendix 4A:

Table 4A-3: Use of Schooling Years and Current Work Experience
(Dependent Variable is Log(average monthly sales) in Kip)

Variables	Vientiane C.	Provinces	Lao PDR	
			All	Commerce
Schooling	0.0490** (3.98)	0.0620** (7.55)	0.0575** (8.60)	0.0579** (6.06)
Current Business Experience	0.0272 (1.22)	0.0070 (0.44)	0.0137 (1.10)	0.0086 (0.51)
Experience-Squared /100	-0.0481 (-0.58)	0.0509 (0.66)	0.0119 (0.22)	0.0406 (0.57)
Female	-0.1517 (-1.31)	0.0135 (0.20)	-0.0314 (-0.53)	-0.0468 (-0.61)
Number of Workers (log)	0.5411** (5.99)	0.7198** (12.84)	0.6675** (13.79)	0.5463** (7.47)
Manufacturing	0.0351 (0.21)	-0.3573** (-3.40)	-0.2679** (-3.04)	-
Construction	-0.0006 (-0.00)	0.4024* (2.01)	0.1963 (1.09)	-
Commerce	0.7539** (5.46)	0.2286** (2.77)	0.3230** (4.54)	-
Transport	0.0096 (0.04)	0.5893** (4.81)	0.5310** (4.79)	-
Business Locations	0.3042* (2.70)	0.1236 (1.90)	0.1459* (2.56)	0.1160 (1.58)
Yearly Operation	0.4188** (3.50)	0.2508** (4.04)	0.2818** (5.14)	0.4067** (5.24)
Rural Area	-	-0.4076** (-6.41)	-0.3823** (-6.45)	-0.4194** (-5.14)
Northern	-	-	-0.3043** (-3.83)	-0.4151** (-3.64)
Central	-	-	-0.2624** (-3.32)	-0.5560** (-5.09)
Southern	-	-	-0.0049 (-0.06)	-0.1474 (-1.27)
Constant	13.1299 (60.91)	12.6272 (105.58)	12.8371 (104.23)	13.3845 (88.92)
Adjust R-squared	0.249	0.251	0.291	0.263
F-test	12.86**	39.53**	49.53**	32.67**
Observations	394	1,382	1,776	978

Note: t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.

The omitted category for type of business is other service activities, and for regional dummy is Vientiane Capital.

Appendix 4A:

Table 4A-4: Use of Educational Levels and Current Work Experience
(Dependent Variable is Log(average monthly sales) in Kip)

Variables	Vientiane C.	Provinces	Lao PDR	
			All	Commerce
Primary	0.2720* (2.10)	0.3071** (4.67)	0.3142** (5.40)	0.2508** (3.24)
Secondary	0.5120** (3.08)	0.7507** (6.06)	0.6674** (6.72)	0.8174** (5.66)
Tertiary	0.5009** (3.04)	0.5532** (4.17)	0.5334** (5.41)	0.4726** (3.23)
Current Work Experience	0.0280 (1.25)	0.0073 (0.49)	0.0142 (1.13)	0.0112 (0.66)
Experience-Squared /100	-0.0511 (-0.61)	0.0471 (0.70)	0.0090 (0.16)	0.0291 (0.41)
Female	-0.1645 (-1.42)	0.0041 (0.06)	-0.0418 (-0.71)	-0.0526 (-0.68)
Number of Workers (log)	0.5424** (5.95)	0.7233** (12.38)	0.6692** (13.76)	0.5468** (7.47)
Manufacturing	0.0366 (0.22)	-0.3662** (-3.47)	-0.2717** (-3.06)	-
Construction	0.0461 (0.14)	0.3947 (1.51)	0.2168 (1.22)	-
Commerce	0.7533** (5.41)	0.2330** (2.84)	0.3283** (4.65)	-
Transport	0.0104 (0.04)	0.5852** (4.67)	0.5262** (4.71)	-
Business Locations	0.3124** (2.75)	0.1220 (1.87)	0.1504** (2.64)	0.1213 (1.65)
Yearly Operation	0.3944** (3.28)	0.2525** (4.02)	0.2778** (5.65)	0.4006** (5.15)
Rural Area	-	-0.4183** (-6.47)	-0.3943** (-6.63)	-0.4255** (-5.22)
Northern	-	-	-0.3216** (-4.05)	-0.4202** (-3.67)
Central	-	-	-0.2944** (-3.72)	-0.5817** (-5.32)
Southern	-	-	-0.0254 (-0.30)	-0.1611 (-1.38)
Constant	13.2044 (60.83)	12.7107 (106.10)	12.9218 (108.01)	13.4919 (91.67)
Adjust R-squared	0.240	0.246	0.287	0.262
F-test	10.56**	33.23**	43.07**	27.64**
Observations	394	1,382	1,776	978

Note: t-statistics in parentheses. * Statistically significant at the 5% level, ** at the 1% level.
The omitted category for the level of education is less than primary.

Appendix 4A:

Table 4A-5: Returns to Education per Year and Current Work Experience
(Dependent Variable is Log(average monthly sales) in Kip)

Variables	Males	Females	All	Lao PDR Commerce
Primary	0.4718** (3.49) [0.4718]	0.3083* (2.55) [0.3083]	0.3858** (4.33) [0.3858]	0.2811* (2.46) [0.2811]
Secondary	0.8542** (5.38) [0.0637]	0.7414** (4.17) [0.0722]	0.8030** (6.89) [0.0695]	0.9000** (5.62) [0.1032]
Technical	0.7978** (4.39) [-0.0188]	0.6166** (2.91) [-0.0416]	0.7035** (5.20) [-0.0332]	0.5690** (2.93) [-0.1103]
University	0.7833** (2.69) [-0.0142]	0.8746 (1.61) [0.0266]	0.7204** (2.88) [-0.0165]	0.8553** (2.75) [-0.0089]
Current Work Experience	-0.0175 (-0.66)	0.0250 (0.99)	0.0108 (0.60)	0.0007 (-0.03)
Experience- Squared /100	0.2015 (1.57)	-0.9070 (-0.91)	0.0122 (0.15)	0.0822 (0.79)
Female	-	-	0.0079 (0.10)	-0.0063 (-0.06)
Number of Workers	0.7549** (8.97)	0.6811** (6.32)	0.7261** (10.98)	0.5757** (5.90)
Manufacturing	-0.2414 (-1.57)	-0.3407 (-1.72)	-0.2934* (-2.48)	-
Construction	-0.2011 (-0.58)	-	-0.0136 (-0.04)	-
Commerce	0.3235** (2.64)	0.3435* (2.10)	0.3122** (3.23)	-
Transport	0.4226** (2.44)	0.9061* (2.08)	0.4052** (2.67)	-
Business Locations	0.0964 (0.88)	0.1615 (1.49)	0.1392 (1.82)	0.1886 (1.92)
Yearly Operation	0.2011 (1.91)	0.5321** (4.81)	0.3543** (4.70)	0.5337** (5.13)
Rural Area	-0.3670** (-3.30)	-0.5132** (-4.22)	-0.4453** (-5.51)	-0.4999** (-4.56)
Northern	-0.3185* (-2.05)	-0.2431 (-1.49)	-0.2459* (-2.21)	-0.3234* (-2.13)
Central	-0.0900 (-0.60)	-0.3175* (-1.97)	-0.1682 (-1.56)	-0.4966** (-3.44)
Southern	-0.1432 (-0.79)	0.0508 (0.30)	-0.0200 (-0.16)	-0.1761 (-1.11)
Constant	12.6732 (52.50)	12.8727 (47.51)	12.7591 (71.64)	13.4300 (65.27)
Adjust R-squared	0.325	0.356	0.338	0.341
F-test	14.83**	16.32**	27.54**	19.63**
Observations	490	445	935	505

Note: * Statistically significant at the 5% level, ** at the 1% level.
t-statistics in parentheses. "Per year" returns education in brackets.
Insufficient samples for construction sector in females.

Appendix 5A

Table 5A-1: Share of Household Agriculture Outputs for Market by Province and Region in 2002/03 (%)

	Crops	Vegetable and Fruit	Meat	Fish	Poultry	Forestry	Others	Total
Lao PDR	31.9	21.7	62.4	21.3	30.2	100.0	76.1	36.5
Urban	23.3	37.2	72.0	32.0	41.7	100.0	90.9	39.4
Rural	33.2	19.3	61.5	19.1	27.8	100.0	69.9	36.1
North	38.9	18.6	58.6	14.8	18.3	100.0	65.0	37.6
Phongsaly	9.4	1.6	8.2	4.0	2.9	-	1.2	7.0
Luangnamtha	11.5	22.3	41.1	16.1	16.8	100.0	95.2	24.1
Oudomxay	9.4	6.2	37.5	32.2	24.3	100.0	61.5	18.9
Bokeo	14.6	9.1	73.7	20.5	11.6	-	68.5	30.3
Luangprabang	21.7	13.4	70.0	17.0	27.4	100.0	52.0	33.9
Huaphanh	17.3	8.9	33.0	4.7	18.7	100.0	31.2	18.4
Xayabury	70.7	43.5	75.5	11.3	17.2	100.0	81.2	63.7
Center	28.0	25.7	69.3	21.9	36.5	100.0	85.4	38.4
Vientiane C.	50.9	57.3	88.0	26.5	50.3	100.0	95.8	57.1
Xiengkhuang	20.9	35.5	64.4	13.1	18.0	100.0	45.5	30.8
Vientiane	28.9	35.2	86.1	20.7	36.0	100.0	96.3	49.4
Borikhamxay	6.6	24.1	36.5	45.0	35.4	100.0	82.2	25.5
Khammuane	19.8	11.1	69.3	15.1	28.5	100.0	71.1	29.3
Savannakhet	26.9	17.8	63.5	14.1	36.5	100.0	75.4	34.1
Xaysomboun SR	6.1	20.7	75.9	17.1	35.3	100.0	82.1	31.0
South	24.2	19.9	49.6	27.6	42.9	100.0	40.3	29.0
Saravane	17.0	16.1	33.5	16.0	34.8	100.0	53.8	20.9
Sekong	1.6	2.5	65.0	5.3	14.1	100.0	10.6	22.0
Champasack	34.3	25.5	49.7	31.5	38.8	100.0	39.6	35.0
Attapeu	6.9	27.6	67.5	32.8	68.7	100.0	4.9	28.0

Source: LECS 3, 2002/03

Appendix 5A

Table 5A-2: Access to Land and Productive Assets by Provinces and Regions in 1997/98 (%)

	Owning land	Access to land	Irrigat ion	Cow/ buffal oes	Tractor	Cart	Rice huski ng m.	Boat	Fishing net
Lao PDR	65	86	25	61	7	6	7	18	62
<i>Urban</i>	42	51	21	30	6	2	3	8	38
<i>Rural</i>	70	93	26	68	7	7	8	20	66
North	44	94	44	61	7	3	11	12	60
Phongsaly	29	100	36	61	0	2	7	8	61
Luangnamtha	33	93	35	59	8	4	7	2	41
Oudomxay	37	91	38	58	2	0	7	6	62
Bokeo	61	94	61	61	11	5	8	11	39
Luangprabang	42	90	25	48	2	0	9	24	61
Huaphanh	3	98	59	80	1	1	8	8	66
Xayaboury						1			
	87	94	62	66	22	1	23	11	67
Center	72	80	20	61	9	7	5	19	62
Vientiane C.	49	56	21	28	13	1	2	13	39
Xiengkhuang	64	94	62	79	2	1	10	2	60
Vientiane P.	82	85	31	57	14	7	6	20	76
Borikhamxay	86	89	8	57	17	5	5	35	74
Khammuane	87	89	4	74	4	4	7	28	75
Savannakhet	80	88	12	80	8	16	5	20	64
Xaysomboon SR	74	76	30	71	3	0	6	23	74
South	80	88	7	62	2	9	6	23	64
Saravane						1			
	83	91	5	65	2	1	8	7	61
Sekong	86	87	2	0	5	3	2	4	57
Champasack	90	96	21	56	1	2	3	10	66
Attapeu	91	92	1	78	0	1	7	37	85

Source: LECS 2, 199/98

Appendix 5A

Table 5A-3: Access to Land and Productive Assets by Provinces and Regions in 2002/03 (%)

	Access to land	Owning land	Busi. bld. ^a	Agri. bld. ^b	T-W ^c	F-W ^d	Cart	Boat	Fishing net
Lao PDR	92	89	5	5	15	4	6	17	58
<i>Urban</i>	87	85	11	4	11	3	6	11	40
<i>Rural with road</i>	94	92	4	5	19	5	7	21	66
<i>Rural without road</i>	89	83	1	4	8	2	4	10	58
North	89	85	2	2	12	4	5	9	55
Phongsaly	97	97	2	-	2	3	2	4	58
Luangnamtha	69	66	3	1	22	5	4	8	52
Oudomxay	88	76	1	11	5	3	1	2	52
Bokeo	96	94	1	0	25	6	4	8	59
Luangprabang	87	83	1	0	4	2	1	14	44
Huaphanh	83	77	3	0	6	2	16	8	73
Xayaboury	97	94	4	2	23	8	5	9	56
Center	92	90	8	6	20	4	6	18	58
Vientiane C.	86	84	14	8	17	5	6	10	38
Xiengkhuang	96	92	4	6	10	3	9	3	51
Vientiane P.	97	97	10	25	22	5	5	14	60
Borikhamxay	91	91	6	-	29	2	2	30	65
Khammuane	93	89	3	1	20	5	6	31	76
Savannakhet	95	93	4	1	24	3	8	23	64
Xaysomboon SR	97	95	5	-	10	1	14	15	75
South	94	92	4	4	6	4	7	26	65
Saravane	96	95	3	14	7	4	9	10	65
Sekong	87	86	2	0	5	3	2	4	57
Champasack	93	91	4	1	5	4	7	33	64
Attapeu	96	96	8	-	6	2	8	42	76

Source: LECS 3, 2002/03

Note: ^a Owning business building, ^b Access to Agriculture building, ^c Two- wheeled tractor, and ^d Two- wheeled tractor.

Appendix 5A

Table 5A-4: Agricultural Operated Land in 2002/03.

(Last Agricultural Season, 1000 hectares)

	Operated land	
	Wet season plots	Dry season plots
Lao PDR	1170	115
North	340	20
Center	560	80
South	270	20
Urban	150	30
Rural with road	760	70
Rural without to road	260	20

Source: LECS 3, 2002/03

Appendix 5A

Table 5A-5: Harvested areas and production of paddy rice in 2002/03.

	Wet season				Dry season			
	Glutinous rice		Ordinary rice		Glutinous rice		Ordinary rice	
	Harvested area, 1000 Ha	Production in 1000 ton	Harvested area, 1000 Ha	Production in 1000 ton	Harvested area, 1000 Ha	Production in 1000 ton	Harvested area, 1000 Ha	Production in 1000 ton
Lao								
PDR	792	1730	80	160	86	220	9	17
North	205	490	40	90	10	20	4	7
Center	422	910	20	40	63	170	3	7
South	164	310	20	30	13	30	2	3
Urban	118	280	10	20	17	50	2	6
Rural with road	515	1150	40	80	56	140	4	7
Rural without road	159	310	30	60	13	30	3	4

Source: LECS 3, 2002/03

Appendix 5A

Table 5A-6: Restrictions Households Faced by Provinces and Regions in 2002/03 (% of villages).

	Lack of					Insects	Animal disease
	Jobs	Credits	Irrigation	Knowledge	Market		
Lao PDR	42	61	62	56	56	63	59
Urban	62	46	50	50	21	40	33
Rural with road	39	63	66	56	63	69	66
Rural without road	29	72	63	61	71	68	68
North	31	61	58	49	54	63	61
Phongsaly	14	38	35	19	54	62	38
Luangnamtha	25	51	86	55	38	69	75
Oudomxay	32	71	72	46	74	68	71
Bokeo	85	83	69	53	64	55	51
Luangprabang	11	68	40	60	49	62	75
Huaphanh	21	60	59	57	45	52	47
Xayaboury	52	52	64	40	54	69	54
Center	44	61	64	58	55	56	58
Vientiane C.	57	61	42	61	40	43	33
Xiengkhuang	20	59	61	53	62	41	58
Vientiane P.	46	61	64	58	66	65	76
Borikhamxay	29	37	73	57	49	52	37
Khammuane	50	74	68	48	49	61	58
Savannakhet	43	64	75	62	63	62	72
Xaysomboon SR	33	60	62	47	10	68	49
South	53	61	65	61	61	81	60
Saravane	46	63	68	71	61	74	61
Sekong	33	61	69	54	44	88	53
Champasack	63	64	65	61	67	86	61
Attapeu	35	37	55	40	41	66	55

Source: LECS 3, 2002/03

The data was answered by the village chiefs.

Appendix 5A

Table 5A-7: Agricultural Practices by Provinces and regions 2002/03, % of villages

	Agricultural practices mostly used in the villages		Villages with deforestation	Villages receiving agriculture extension workers	Land and forestry allocation project implemented	Villages with development project
	Rotational (shifting cultivation)	Pioneering (slash and burn)				
Lao PDR	77	23	13	48	42	46
<i>Urban</i>	75	25	21	50	39	47
<i>Rural with road</i>	84	16	14	55	48	49
<i>Rural without road</i>	64	36	7	34	31	38
North	63	37	9	49	46	36
Phongsaly	65	35	0	19	38	64
Luangnamtha	40	60	5	50	34	52
Oudomxay	49	51	3	58	69	30
Bokeo	49	51	6	30	65	58
Luangprabang	83	17	7	61	30	23
Huaphanh	50	50	2	31	12	16
Xayaboury	100	0	53	87	100	56
Center	86	14	11	47	34	52
Vientiane C.	80	20	17	69	28	65
Xiengkhuang	70	30	8	25	9	43
Vientiane P.	97	3	29	74	59	61
Borikhamxay	92	8	21	45	80	44
Khammuane	97	3	10	45	24	65
Savannakhet	83	17	2	41	30	44
Xaysomboon SR	87	13	6	49	71	32
South	86	14	24	49	48	51
Saravane	60	40	34	63	31	58
Sekong	97	3	10	64	52	47
Champasack	81	19	25	34	54	51
Attapeu	66	34	0	48	81	30

Source: LECS 3, 2002/03

The data was answered by the village chiefs.

Appendix 5A

Table 5A-8: Agricultural Production by Province and Region in 2002/03.
(Annual income and costs, 1000 Kip/household)

	Income					Costs				
	Grain	Vegetables and Fruits	Meat	Fish	Others Forestry	Seed and fodder	Equipment	Wages	Others	
Lao PDR	3,129	694	1,234	732	40	313	183	137	189	228
Urban	1,696	379	543	508	37	375	222	151	308	233
Rural	3,598	797	1,460	805	41	292	170	132	149	227
North	4,128	867	1,497	583	42	277	128	95	144	127
Phongsaly	3,127	888	950	529	0	144	2	10	3	55
Luangnamtha	3,479	968	1,281	461	70	448	34	33	166	36
Oudomxay	2,971	872	1,154	534	19	313	31	370	166	229
Bokeo	2,626	1,034	2,162	829	0	539	26	110	203	112
Luangprabang	2,376	678	1,615	425	87	142	143	78	151	96
Huaphanh	3,934	776	1,194	715	73	217	399	16	21	52
Xayabury	8,112	990	1,833	657	19	302	144	32	229	211
Central	2,745	595	1,227	837	48	422	235	188	256	330
Vientiane M	2,224	231	511	435	50	557	298	217	484	424
Xiengkhuang	3,957	976	1,867	602	21	291	644	460	277	252
Vientiane	2,673	553	1,767	811	152	752	402	166	308	369
Borikhamxay	2,471	934	917	1,539	33	98	19	110	155	87
Khammuane	2,804	740	1,277	1,254	35	327	243	325	165	222
Savannakhet	2,948	609	1,374	807	10	338	55	77	135	391
Xaysomboun SR	2,259	881	1,710	761	61	233	455	65	129	151
South	2,498	656	853	715	18	118	144	85	102	152
Saravane	2,719	761	836	469	5	169	250	27	46	48
Sekong	2,217	1,079	2,003	466	1	141	43	50	4	59
Champasack	2,441	573	664	786	29	91	124	125	139	244
Attapeu	2,355	510	1,139	1,221	8	97	17	59	133	18

Source: LECS 3, 2002/03

Appendix 5A

Table 5A-9: Productivity (revenue per hours of work) by Sector and Provinces and Regions. Revenue and hours in millions per month. (Persons 10+)

	Agriculture			Household business		
	Revenue	Hours	Rev. Kip/hrs	Revenue	Hours	Rev Kip/hrs
Lao PDR	439,242	316	1,392	1,160,835	85	13,701
Urban	62,513	42	1,506	898,295	56	16,042
Rural	376,729	274	1,375	262,540	29	9,139
North	165,468	112	1,473	260,446	16	16,034
Phongsaly	11,618	13	882	1,158	1	986
Luangnamtha	13,110	11	1,242	13,162	2	8,151
Oudomxay	19,386	19	1,033	12,774	1	11,510
Bokeo	15,023	6	2,455	4,716	1	7,436
Luangprabang	27,300	21	1,280	113,719	5	21,122
Huaphanh	21,337	19	1,099	14,201	1	10,644
Xayabury	57,694	23	2,513	100,717	5	20,174
Central	202,452	138	1,464	754,840	54	13,978
Vientiane C.	32,291	19	1,674	335,180	25	13,415
Xiengkhuang	19,104	12	1,535	21,201	2	12,362
Vientiane	36,200	21	1,715	82,436	7	11,474
Borikhamxay	20,227	16	1,227	75,344	8	8,969
Khammuane	29,635	19	1,570	31,406	3	11,544
Savannakhet	61,984	48	1,299	208,246	9	23,618
Xaysomboun SR	3,010	2	1,294	1,026	0	5,755
South	71,323	65	1,098	145,549	14	10,053
Saravane	21,161	25	858	30,507	2	14,345
Sekong	5,882	5	1,160	6,717	1	10,695
Champasack	36,482	30	1,202	72,939	10	6,995
Attapeu	7,797	5	1,592	35,387	1	27,315

Source: LECS 3, 2002/03

Appendix 5A

Table 5A-10: Total Number of livestock by type and by province in 1000 heads

	Number of livestock in 2002/03 in 1000 heads				
	Cattle	Buffaloes	Pigs	Goats	Other
Lao PDR	1,365	1,200	1,499	186	36
Urban	191	111	118	25	2
Rural	1,174	1,090	1,381	161	34
North	362	365	738	89	22
Phongsaly	19	39	85	2	2
Luangnamtha	25	32	56	7	0
Oudomxay	22	60	100	18	1
Bokeo	66	34	79	5	-
Luangprabang	66	55	145	42	11
Huaphanh	54	64	138	14	6
Xayabury	109	81	133	1	1
Central	724	533	501	81	12
Vientiane C.	89	25	19	3	-
Xiengkhuang	109	73	76	9	11
Vientiane P.	116	81	87	7	0
Borikhamxay	38	39	38	5	-
Khammuane	80	100	67	7	0
Savannakhet	276	204	200	49	1
Xaysomboun SR	16	11	12	1	0
South	279	302	261	15	2
Saravane	82	81	110	4	0
Sekong	9	24	32	5	1
Champasack	168	137	80	3	1
Attapeu	19	60	39	4	-

Source: LECS 3, 2002/03

Appendix 5A

Table 5A-11: Average number of livestock per household by type and by province.

	Number of livestock per household in 2002/03				
	Cattle	Buffaloes	Pigs	Goats	Other
Lao PDR	2.0	1.8	2.0	0.3	0.1
Urban	1.7	1.0	0.9	0.2	0.0
Rural	2.0	1.9	2.3	0.3	0.1
North	1.5	1.5	3.1	0.4	0.1
Phongsaly	0.8	1.6	3.6	0.1	0.1
Luangnamtha	1.2	1.6	2.7	0.4	0.0
Oudomxay	0.6	1.7	2.8	0.5	0.0
Bokeo	2.8	1.5	3.3	0.2	-
Luangprabang	1.4	1.2	3.0	0.9	0.2
Huaphanh	1.6	1.9	4.0	0.4	0.2
Xayabury	2.1	1.5	2.5	0.0	0.0
Central	2.4	1.8	1.5	0.3	0.0
Vientiane C.	2.1	0.6	0.1	0.1	-
Xiengkhuang	4.0	2.7	2.8	0.3	0.4
Vientiane	2.4	1.7	1.5	0.1	0.0
Borikhamxay	1.5	1.5	1.3	0.2	-
Khammuane	1.8	2.2	1.2	0.2	0.0
Savannakhet	2.7	2.0	1.9	0.5	0.0
Xaysomboun SR	2.9	2.0	2.1	0.2	0.0
South	1.9	2.0	1.5	0.1	0.0
Saravane	1.8	1.8	2.3	0.1	0.0
Sekong	0.8	2.1	2.7	0.4	0.0
Champasack	2.2	1.8	0.7	0.0	0.0
Attapeu	1.2	3.7	2.0	0.2	-

Source: LECS 3, 2002/03

Appendix 5A

Table 5A-12: Total number of poultry raised during last 4 weeks, 1000 heads

	Poultry by type							Total
	Local chicken	Commercial chicken	Turkeys	Small breed	Large breed	Geese	Other	Total
Lao PDR	9,561	789	266	1,312	1,567	27	182	13,706
Urban	2,152	689	89	243	628	20	124	3,946
Rural	7,409	100	177	1,069	939	7	58	9,760
North	3,857	26	121	481	280	2	20	4,788
Phongsaly	203	-	5	50	7	-	0	266
Luangnamtha	342	3	10	31	22	-	1	409
Oudomxay	418	9	21	54	12	-	4	517
Bokeo	756	2	8	32	20	0	0	818
Luangprabang	593	3	19	75	54	-	1	746
Huaphanh	612	1	6	108	38	1	1	768
Xayabury	934	8	52	129	128	1	12	1,264
Central	4,307	699	115	529	975	23	158	6,806
Vientiane C.	968	655	13	98	355	9	123	2,222
Xiengkhuang	340	0	24	71	25	2	3	466
Vientiane	669	27	33	76	197	2	14	1,019
Borikhamxay	410	7	10	36	72	1	-	536
Khammuane	602	-	1	31	63	1	1	698
Savannakhet	1,281	9	30	211	258	9	13	1,811
Xaysomboun SR	37	-	3	7	4	-	4	55
South	1,397	65	31	302	312	2	4	2,112
Saravane	379	1	7	93	54	0	2	536
Sekong	96	6	0	11	11	0	0	125
Champasack	699	55	19	176	204	1	3	1,158
Attapeu	223	2	4	22	43	0	-	293

Source: LECS 3, 2002/03

Appendix 5A

Table 5A-13: Average number of poultry per household raised during last 4 weeks.

	Poultry by type							Total
	Local chicken	Commercial chicken	Turkeys	Small breed	Large breed	Geese	Other	Total
Lao PDR	14	16	4	7	7	1	7	11
Urban	15	52	4	7	9	2	12	13
Rural	14	3	4	6	6	0	4	10
North	17	2	5	7	6	0	3	12
Phongsaly	10	-	5	11	6	-	3	10
Luangnamtha	17	2	4	5	6	-	22	12
Oudomxay	13	6	4	5	3	-	4	10
Bokeo	32	4	4	6	5	2	4	23
Luangprabang	13	1	4	6	5	-	0	9
Huaphanh	18	1	5	7	8	2	2	14
Xayabury	19	2	5	8	7	0	4	12
Central	14	32	4	7	7	1	12	11
Vientiane C.	15	89	2	7	9	1	15	15
Xiengkhuang	12	0	5	7	6	1	5	10
Vientiane	14	10	5	6	7	1	13	10
Borikhamxay	15	3	3	6	6	0	-	10
Khammuane	13	-	2	5	6	1	2	10
Savannakhet	13	1	7	8	7	3	9	10
Xaysomboun SR	9	-	3	5	3	-	16	6
South	10	4	3	6	6	0	1	7
Saravane	9	0	3	5	4	0	1	6
Sekong	9	6	1	7	5	0	0	7
Champasack	9	6	3	6	6	0	1	7
Attapeu	17	2	4	6	8	0	-	11

Source: LECS 3, 2002/03

Appendix 5A

Table 5A-14: Flood and Damaged Rice Fields in 1997 by Province.

Item	Province	Planting area (ha)	Damage area (ha)	Damage rate (%)
I	Central	260,905	28,555	10.94
1	Vientiane C.	38,660	4,700	12.16
2	Vientiane	47,500	2,800	5.89
3	Borikhamxay	26,700	5,870	21.99
4	Khammouane	41,750	6,900	16.53
5	Savannakhet	106,295	8,285	7.79
II	South	80,160	5,750	7.17
6	Champasack	80,160	5,750	7.17
	Total	341,065	34,305	10.06

Source: Asian Disaster Reduction Center, Country Report 1998, Lao PDR.

Appendix 5A

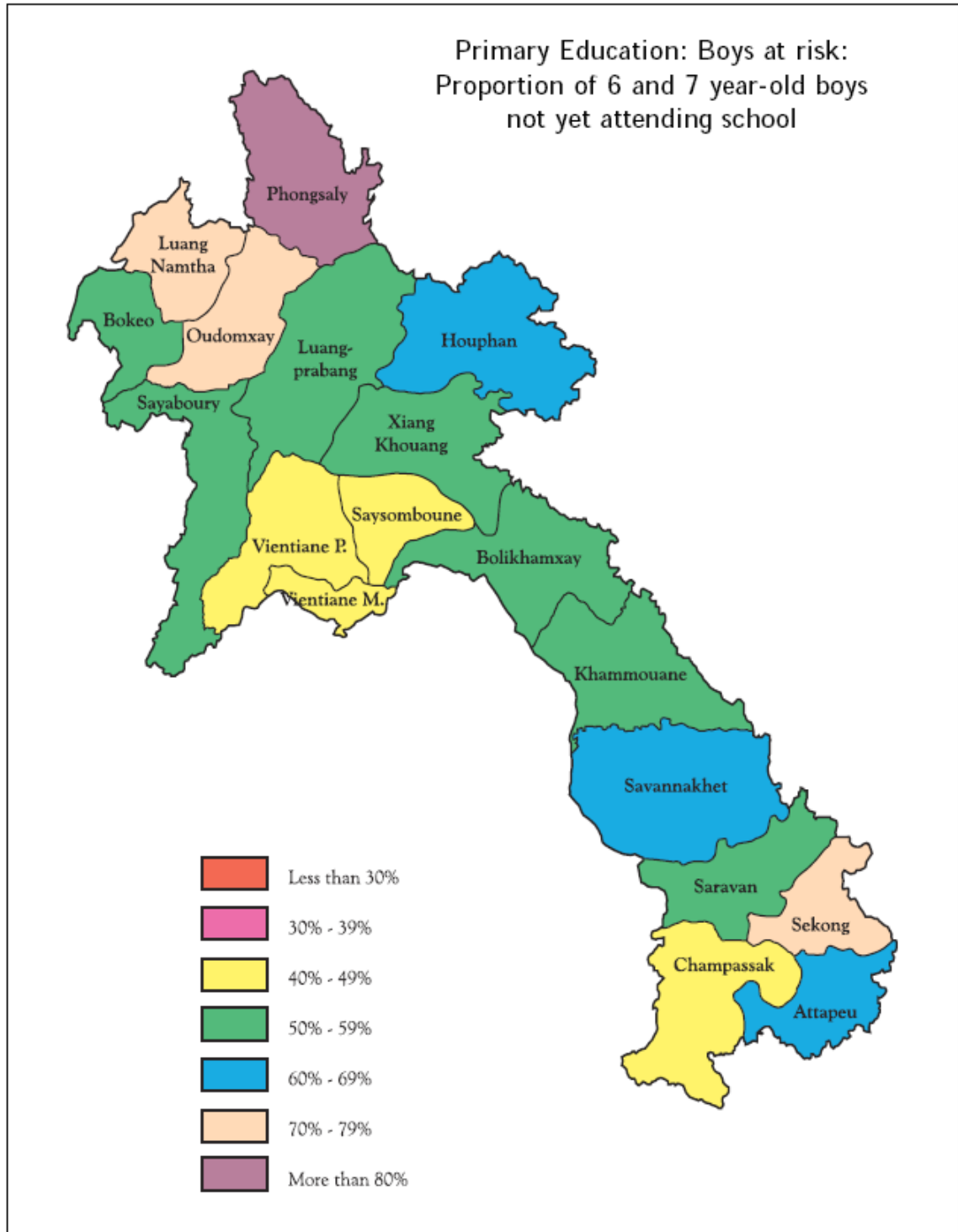
Table 5A-15: Flood and Damaged Rice Fields in 2002 by Province.

Item	Province	Agriculture			
		Planting area (ha)	Flooded area (ha)	Damage area (ha)	Damage rate (%)
I	North	48,100	2,551	1,670	3.47
1	Phongsaly	6,000	1,599	962	16.03
2	Luangnamtha	10,500	275	157	1.50
3	Oudomxay	10,800	110	110	1.02
4	Bokeo	10,500	378	377	3.59
5	Luangprabang	10,300	189	64	0.62
II	Central	288,000	40,119	24,151	8.39
6	Vientiane C.	52,000	8,018	5,493	10.56
8	Xiengkhouang	15,000	57	57	0.38
7	Vientiane	42,500	1,825	761	1.79
9	Borikhamxay	21,000	7,133	5,644	26.88
10	Khammouane	46,500	11,300	7,040	15.14
11	Savannakhet	111,000	11,786	5,156	4.65
III	South	96,800	15,128	7,881	8.14
12	Champasack	84,300	13,623	7,432	8.82
13	Attapue	12,500	1,505	449	3.59
	Total	432,900	57,598	33,702	7.79

Source: Asian Disaster Reduction Center, Country Report 1998, Lao PDR.

Appendix 6A

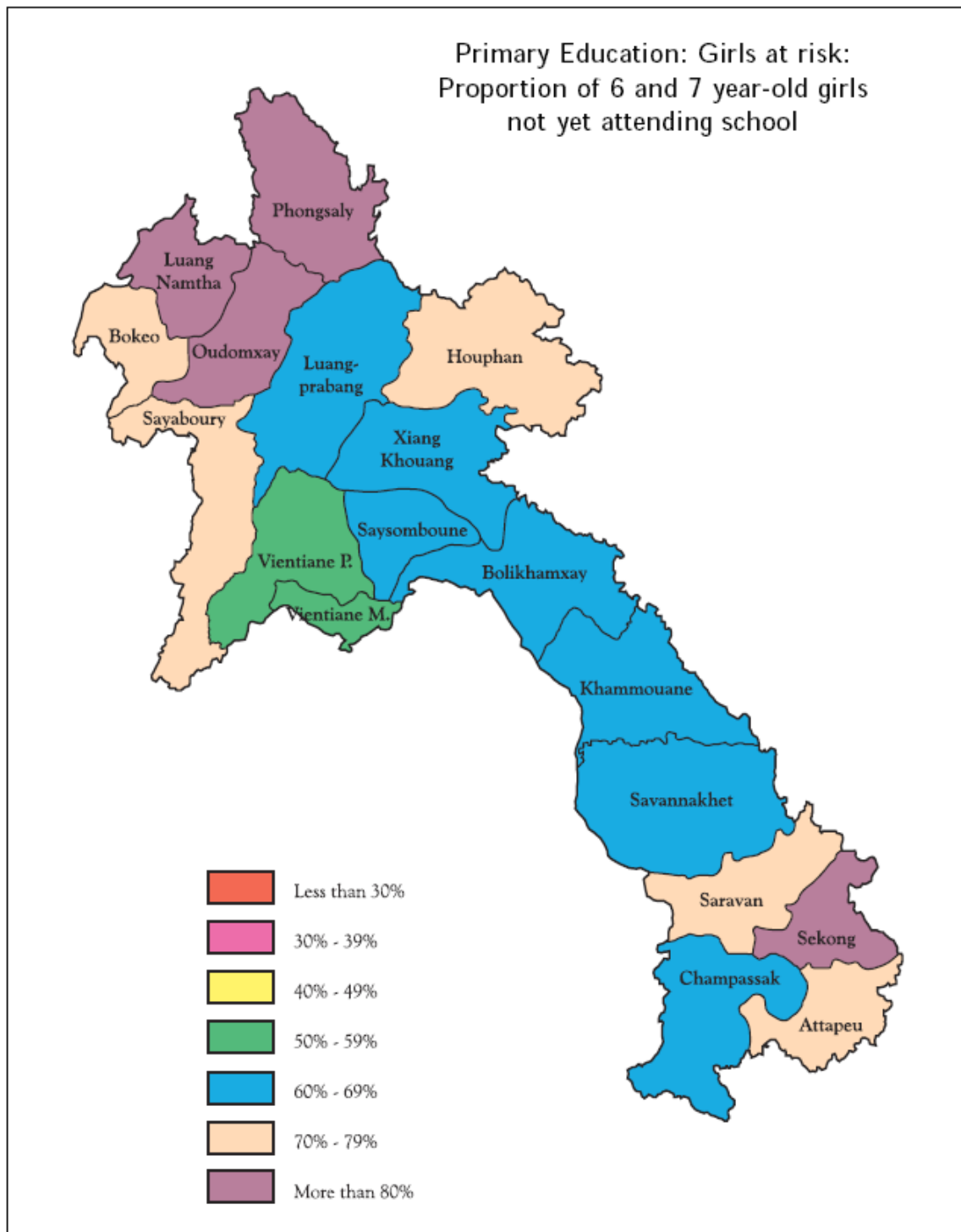
Figure 6A-1: Boys at Risk to Delay Enrollment in Primary Education



Source: Asian Development Bank (2000), Lao: Education Sector Development Plan.
Data referred to population census 1995.

Appendix 6A

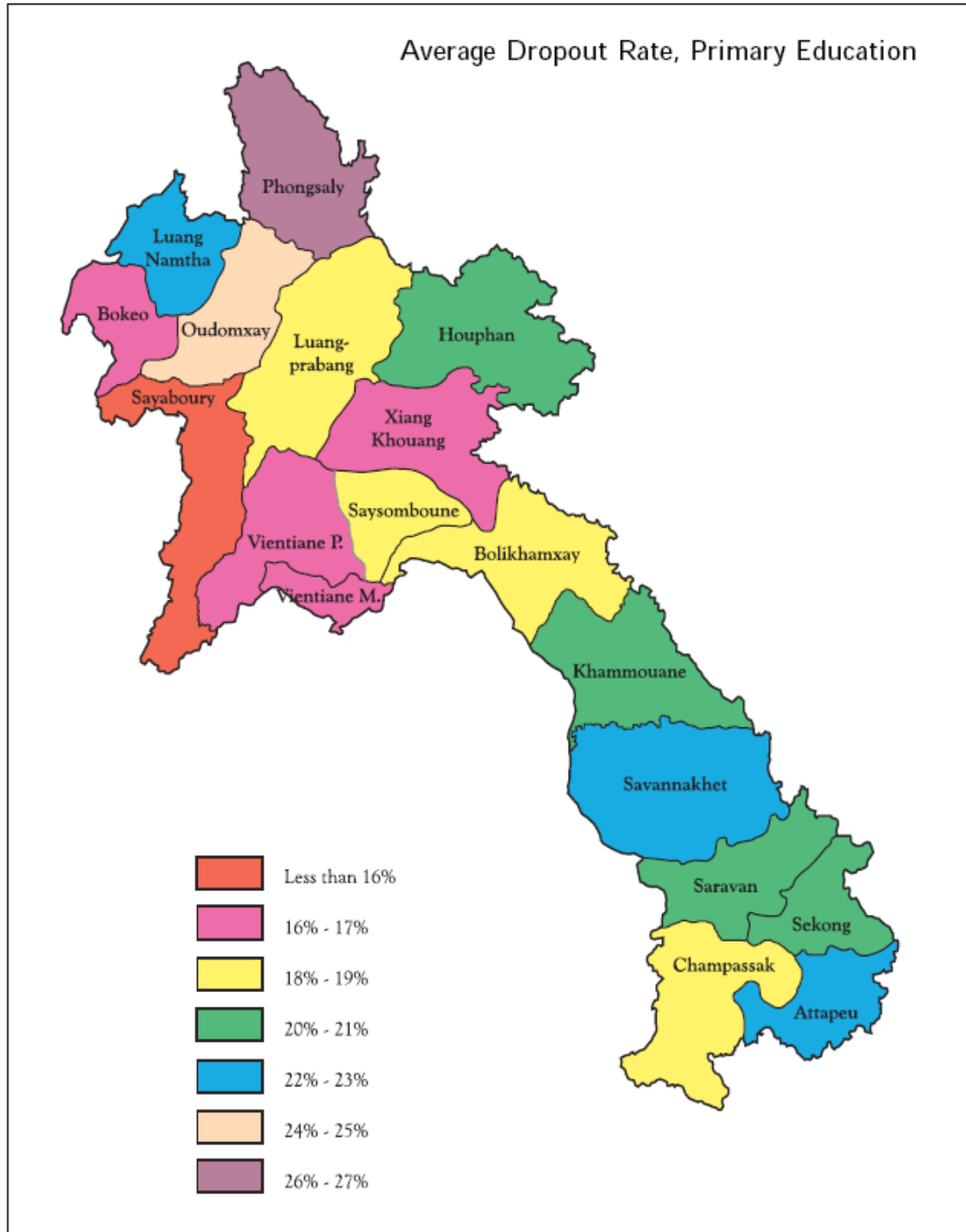
Figure 6A-2: Girls at Risk to Delay Enrollment in Primary Education



Source: Asian Development Bank (2000), Lao: Education Sector Development Plan.
Data referred to population census 1995.

Appendix 6A

Figure 6A-3: Internal Efficiency Indicators (Average Dropout Rate)

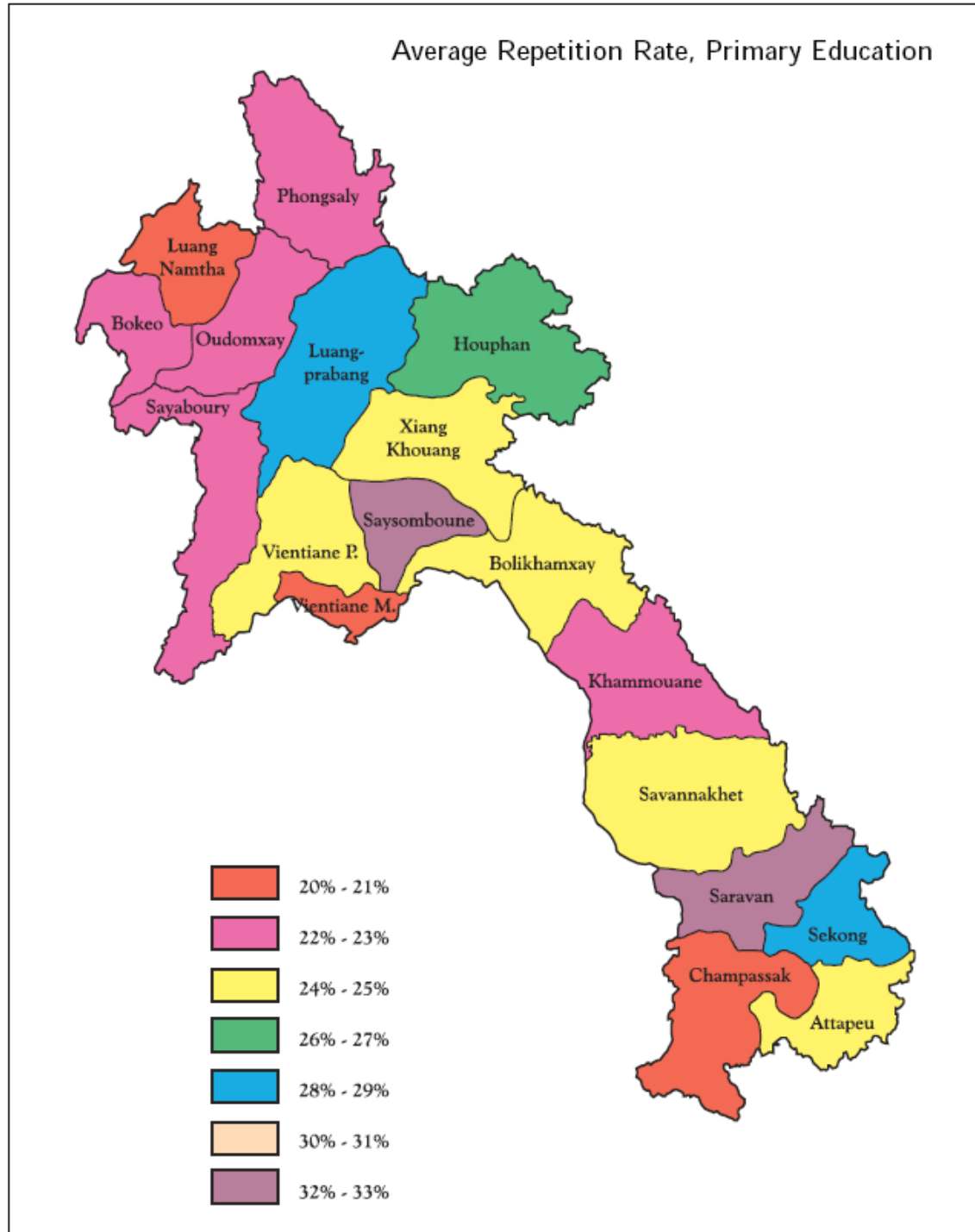


Source: Asian Development Bank (2000), Lao: Education Sector Development Plan.

Data derived from the school years 1995/96 to 1996/97 for MOE statistics and assumed graduation as the final point in primary schooling.

Appendix 6A

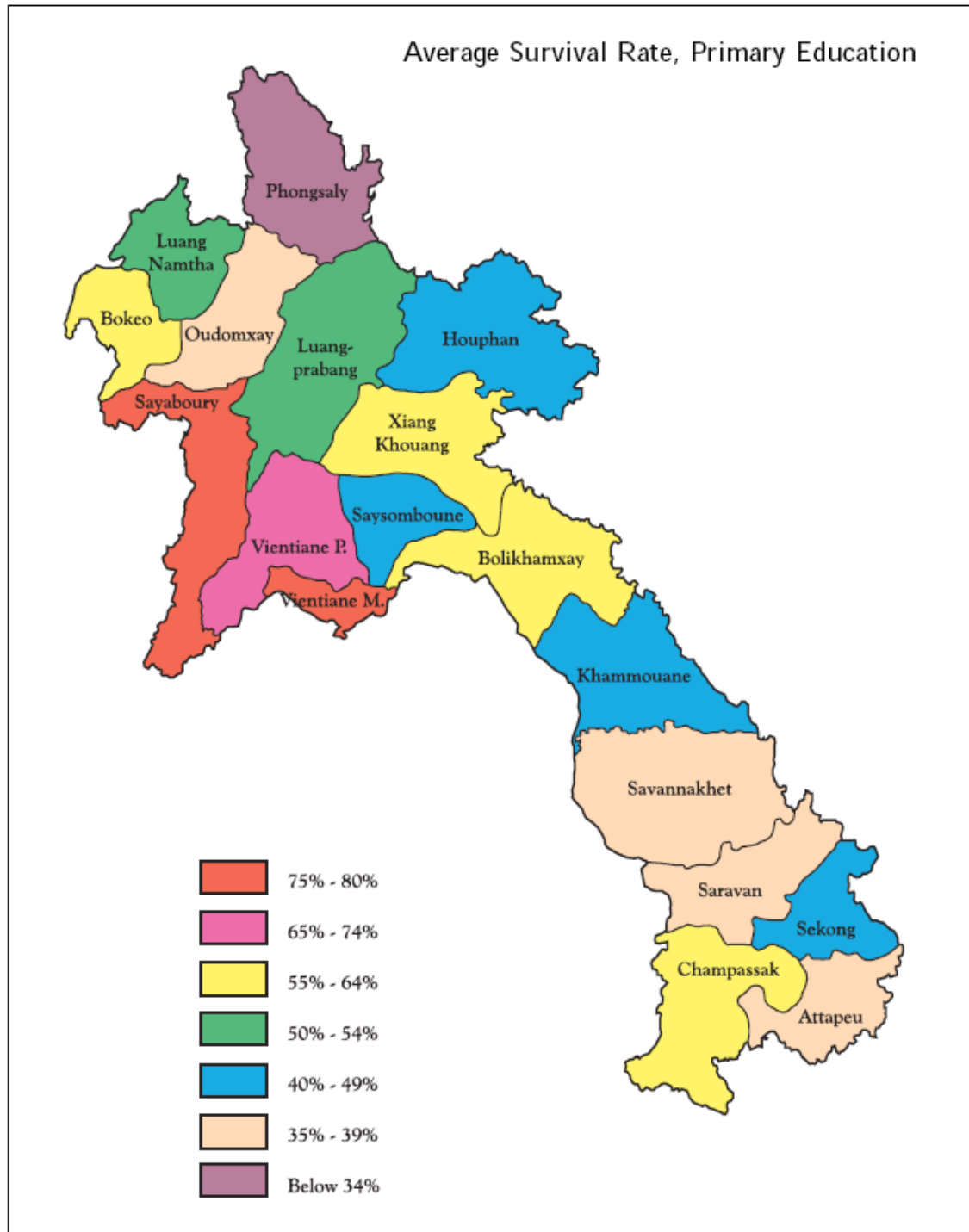
Figure 6A-4: Internal Efficiency Indicators (Average Repetition Rate)



Source: Asian Development Bank (2000), Lao: Education Sector Development Plan.
 Data derived from the school years 1995/96 to 1996/97 for MOE statistics and assumed graduation as the final point in primary schooling.

Appendix 6A

Figure 6A-5: Internal Efficiency Indicators (Average Survival Rate)



Source: Asian Development Bank (2000), Lao: Education Sector Development Plan.
Data derived from the school years 1995/96 to 1996/97 for MOE statistics and assumed graduation as the final point in primary schooling.