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Regional and Gender Differences*

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Abstract:

Major economic reforms to move from a centrally planned to a market economy in Lao PDR since 1986 have exerted a number of impacts on the labor market, relative earnings, and returns to education. It is too soon to assess the full impact of these reforms, but this paper represents the first analyses of the monetary benefits of schooling in Lao PDR, on the basis of wage earnings data collected in LECS 2 in 1997/98.

The estimated rates of returns in Lao PDR are at approximately the same level with other transition economies, but relatively low by international standards. There are significant differences in the returns to schooling among regions and between genders. For example, the rate of return to schooling is 4.5% in Vientiane Capital, and only 2% in other provinces. Males are found to experience lower returns to schooling than do females in Vientiane Capital, but opposite results prevail in other provinces.

Key words: Education, Returns to Schooling, Regional disparity, Gender, Lao PDR

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I. Introduction

The human capital theory views wage earnings of a worker as returns 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. 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. 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) provides a survey of this literature, and Card (1999) surveys the literature on the causal relationship between education and earnings. On the other hand, Schultz (1988) surveys the work done in the context of developing countries. A detailed account of educational attainment and earnings across countries can be found in Psacharopolous and Patrinos (2002).

This paper focuses on Lao People's Democratic Republic (Lao PDR). Since the major economic reforms (the policy known as *Chintanakaan Mai* or *New Economic Mechanism*) aiming at transferring from a centrally planned to a market economy in 1986, the economic transition has led to certain issues in the labor market. 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 percent in 1990 to 61 percent in the early 2000s (Table 1), 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 percent in both sexes in 2002 (Table 2). 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 1: Structure of Literacy Rate (%) by Sex.

	Female		Male	
	1990	2000-2004	1990	2000-2004
Pupils Starting Grade 1 who Reach Grade 5	50.0[a]	65.0[b]	56.0[a]	64.0[b]
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 2005.

Note: [a] refers to 1991.

[b] refers to 2002.

Table 2: 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 2005.

Note: [a] refers to 1991.

Education is an important determinant of earnings in market economies. The higher one's level of education, the higher that person's starting salary is and the steeper the rise in earnings during the early working life. The evidence from centrally planned economies and transition economies is relative limited. Nevertheless, it has been shown that the rates of returns to schooling are usually low in centrally planned economies, for example, in China (Xie and Hannum 1996, and Wei, Tsang, Wu and Chen 1999), and also in the early state of transition economies, for example, in Vietnam (Moock, Patrinos and Venkataraman 1998). But they tend to increase as market reforms take hold, for example, in Hungary (Varga 1995), Slovenia (Orazem and Vodopivec 1995), and Czech Republic and Slovakia (Chase 1998). This paper examines the first analyses of the returns to education in Lao PDR on the basis of wage earnings data collected in Lao Expenditure and Consumption Survey 2 (LECS 2) in 1997/98. It is attempted to estimate differential returns to schooling for Vientiane Capital[1] and other provinces, and for males and females. It is hoped to provide a bench mark to examine the effects of market liberalization and education reforms in Lao PDR.

II. Recent Economic Developments, Education, and Earnings

A. Growth and Employment

Since the major economic reforms, the economy of Lao PDR has expanded remarkably with an annual real growth rate of 6.2 percent from 1990 to 2003. Also, the Lao economy was undergoing a notable degree of structural change (Table 3). The share of agricultural sector in GDP decreased by 12.6 percent from 61.2 in 1990 to 48.6 in 2003, the share of industrial sector increased sharply by 11.4 percent from 14.5 in 1990 to 25.9 in 2003, and the share of service sector was almost unchanged at 26 percent. On the other hand, the agricultural sector remains predominantly subsistence in nature; nonetheless, it performed quite well with an annual growth rate of 4.7 percent. The industrial sector performed very well with an annual growth rate of 11.5 percent, and the service sector also performed well with an annual growth rate of 6.1 percent.

[1] Vientiane Capital is the capital city of Lao PDR, and is not located within Vientiane Province. Vientiane Provice is categorized as one of the other provinces outside Vientiane Capital in this study.

According to the Lao Labor Market Indicators 2001-2003 (Syhalad, *et al* 2005), it shows that eight out of ten employed persons were 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 percent) was lower than in 1995 (86 percent). The proportion of persons employed in industry was almost the same as in services at around 9 percent in 2003. The numbers of people employed in industry and services increased slightly over the three years. Thus, the agricultural sector accounts for 49 percent of the GDP compared to 82 percent of the employed population. The result is low productivity and low incomes placing a large number of the employed population among the working poor.

Table 3: Structure of GDP and Employment by Sector and Sex.

	Share of GDP (%)[a]		Employment, Female (%)[b]		Employment, Male (%)[b]	
	1990	2003	2001	2003	2001	2003
Agriculture	61.2	48.6	82.6	82.1	82.7	82.3
Industry	14.5	25.9	8.7	9.2	8.7	9.3
Service	25.7	25.5	8.6	8.6	8.6	8.5

Source: [a] ADB, Key Indicators 2005.

[b] Syhalad, *et al* 2005, Lao Labor Market Indicators 2001-2003.

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 percent of rural households operate 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 produce 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 shows that there was 13 percent of the employed population classified as self-employed, and another 10 percent as unpaid family workers. Only 10 percent was classified as paid employment (Table 4). Moreover, according to the Lao Labor Market Indicators 2001-2003 (Syhalad, *et al* 2005), 56 percent of the employed population was self-employed and another 26 percent 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 accounted for 82 percent of the employed population. Official estimates for 2003 show that only 14 percent were in paid employment, and a much smaller percentage (4 percent) were classified as private employers.

Table 4: Economic Activities (Last 7 days) for Population 10+ by Regions in 1997/98.

	Paid Employee	Employer	Self-Employed	Subsistence Farmer	Unpaid Family Worker
Vientiane C.	35	0	19	35	10
Northern	6	0	8	80	5
Central	14	0	17	56	3
Southern	9	0	11	72	8
All	10	0	13	67	10

Source: LECS 2 in 1997/98.

B. Poverty and Inequality

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 Laos since the mid-1980s. It is shown that there was a large difference in GDP per capita between the provinces in 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. Evidence from LECS 1 in 1992/93 and LECS 2 in 1997/98 shows that the poverty incidence (the percentage of the population with consumption below the poverty line) dropped from 45.0 percent to 38.6 percent (Table 5). This happened at a time when GDP growth averaged by 7.0 percent. In a similar period, the incidence of poverty in Vietnam dropped from 58 percent to 37 percent, albeit with an economic growth rate of 9.0 percent.

During the same period inequality increased in Lao PDR, with the Gini indicator increasing from a relatively equitable 28.6 to 35.7. 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. 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 percent increase in consumption growth will

only reduce poverty by 0.7 percent. 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.

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. Not only does Vientiane Capital have the lowest incidence of poverty in the country, it also saw the largest decline in poverty between the two LECSs. 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.

Table 5: Percentage of the Population Living in Poverty, 1992/93 and 1997/98

Region	1992/93			1997/98		
	Urban	Rural	Total	Urban	Rural	Total
Vientiane C.	22.5	30.1	24.4	16.7	4.5	12.2
Northern	48.9	60.4	58.4	43.3	53.5	52.5
Central	37.4	39.9	39.5	27.7	35.9	34.9
Southern	27.6	49.6	45.9	35.8	38.7	38.4
All	33.1	48.7	45.0	26.9	41.0	38.6

Source: Kakwani et al. 2002.

C. Education and Government Expenditure

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 percent 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 percent.

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. A post-graduate system did not exist until recent years. According to LECS 2, in all regions outside of Vientiane Capital, the average number of years of schooling is below 5 which means that most students do not complete primary education. Although most villages have their own primary school, less than half of the villages have a complete primary school and only 11 percent have a lower secondary school. The

insufficient educational services are a hard obstacle for those without completed primary school in rural regions. Males tend to have both a higher literacy rate and longer schooling years in all regions (Table 6).

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 7).

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. 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.

Table 6: Educational Services and Education by Regions and Sex in 1997/98.

	Primary Sch. in Village	Completed Primary Sch.	Lower Secondary	Schooling		Literacy15+	
				F	M	F	M
Vientiane C.	88	76	18	5	7	84	96
North	83	32	9	2	3	44	74
Center	86	51	14	3	5	64	87
South	90	50	10	2	4	51	84
All	85	43	11	3	4	55	82

Source: LECS 2 in 1997/98.

Table 7: 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.*

D. Employment and Wages

Little quantitative data is currently available on wages and salaries (Table 8). 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 qualitative surveys during this period show that salaries in state-owned enterprises and the private sector are 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 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.

Table 8: Range of Monthly Wages[2] in Selected Occupations, Vientiane, 1993.

Occupation	Monthly Salary/Wage in Kip
Private Sector	
Garment Workers	29,000 – 90,000
Restaurant Workers	20,000 – 70,000
Motor Vehicle Mechanics	30,000 – 75,000
Unskilled Construction Workers	30,000 – 50,000
Skilled Workers	40,000 – 60,000
Brewery Workers	30,000 – 40,000
Supervisory Workers	60,000 – 80,000
Technician	40,000 – 80,000
Managers, Large Firm	140,000 – 300,000
Public Sector	
Government Employee	18,000 – 33,000
Production Worker, State Firm	30,000 – 70,000

Source: World Bank, 1994.

Since the LECS 2 data that is used in this paper was undertaken from March 1997 to February 1998, it is necessary to note about the impact of the Asian Financial Crisis. Although the level of inflation was high compared with rates reported in other Southeast Asian countries and probably has 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.

III. Data

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 contains 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 do not follow international standards for collecting

[2] Average market exchange rate in 1993 was at 716 kip/dollar.

labor statistics. “Lao labour market indicators 2001-2003” is the only survey that follow international standards for labor statistics. This, in turn, makes it difficult to paint a picture over time.

In this paper, we attempt to apply the data of LECS 2 as a bench mark to examine the returns to schooling among wage earners (paid employees) on the focus of regional and gender differences in Lao PDR during 1997-98. In view of limited data on labor statistics for this period, this survey is deemed very useful to study the impacts of schooling on income in the post-reform era. Also, as mentioned in the previous section, the data collection of LECS 2 is not affected by the Asian Financial Crisis. Hence, this paper is the first of its kind to study the return to schooling for this critical period – the pre-crisis period in the transition.

The LECS 2 was undertaken from March 1997 to February 1998, in which the sample was made up of 8,882 households, 57,624 persons from 450 villages. In this survey, there were 1,488 samples classified as paid employment in the last 12 months. About 2 percent of samples were found to be no education workers. These samples were dropped from the analysis because it was felt that the sample was too low to allow a precise estimation of any effects. After clearing the data, we finally have 1,315 observations: 484 from Vientiane Capital and 831 pooled from the remaining 17 provinces. 376 observations were female.

There are some limitations in the observations that need to be described. First, there were many observations that did not complete a level of schooling. Thus, we categorized the education levels by the following: 1 to 5 years of schooling as primary level, 6 to 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. Of course, in many countries – although fewer now than in the past – the majority of university graduates end up in public sector employment. The concentration of graduates in public sector employment is identified as a problem in growth studies (Pissarides 2000). Hence, it is expected that the rates of returns to schooling in this paper 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 9 presents the characteristics of the samples including, age, earnings (in thousand kip), schooling years, education levels, and 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.

On average, the schooling years were roughly 10 years in all regions because the interviews mainly covered paid employment in the urban city in each province. Similarly, for the same reason, education at the primary and secondary levels varied between 14% and 19%, and 49% and 63%, respectively. However,

the higher the education level, the larger the gap was between Vientiane Capital and other provinces. Specifically, the proportion of males in the capital accounted for 34%, whereas that of males in other provinces was only 25%. The average age of the interviewees was about 35 years old, which resulted in comparable experience. The earnings, on the other hand, recorded a significant difference between employees in the capital and the rest of the country despite the above-mentioned comparable characteristics, namely the average monthly earning in Vientiane Capital was 78,000Kip, whereas this amount was only 62,000 in other provinces. Like in many other economies, females earn lower rates than women. For example, males earned 28% more than females in Vientiane Capital, 24% in other provinces.

Table 9: Means of Selected Variables by Region and Sex.

Variable	Vientiane C.			Provinces			All		
	Male	Female	All	Male	Female	All	Male	Female	All
Earnings[3] (1,000Kip)	86.0	61.9	78.1	66.1	50.5	62.1	72.9	55.4	67.9
Schooling	10.0	9.7	9.9	9.5	9.1	9.3	9.6	9.3	9.6
Education Level (0,1)									
Primary (1-5)	0.17	0.14	0.16	0.17	0.19	0.17	0.17	0.17	0.17
Secondary (6-11)	0.49	0.63	0.54	0.58	0.61	0.59	0.55	0.62	0.57
Post-secondary (12+)	0.34	0.23	0.30	0.25	0.20	0.24	0.28	0.21	0.26
Experience	19.3	13.0	17.2	21.6	14.5	19.7	20.8	13.9	18.8
Age	35.3	28.7	33.1	37.0	29.6	35.1	36.4	29.2	34.3
Observations *N*	324	160	484	615	216	831	939	376	1,315

Source: LECS 2 in 1997/98.

Similar to the gross amount, earnings classified according to education levels also show a clear difference between regions and among the education levels themselves (Table 10). In Vientiane Capital, the average earning of an employee with primary education was recorded at 63,000Kip, while this figure was 54,000 for the other regions. As expected, the higher education level one achieved, the higher the wage income. Specifically, for a paid employee in Vientiane Capital, the salary increased to 71,000 and 99,000 as he/she completed secondary and post-secondary education, respectively. In other provinces, however, all salary levels were about the same as the primary level in Vientiane Capital, regardless of the education level reached. In terms of gender disparities, on average a male employee received 18% to 33% more than a female employee in each education level. Male workers in Vientiane Capital earned the highest wage at 103,000Kip per month, 33% more than male workers in other regions. The discrepancy is slightly higher, 38%, between female employees in the two regions.

With respect to age-earnings profiles, the data for males in Vientiane Capital showed a comparable trend with the international standard (Table 11). The earnings increased with the experiences (age), peaking at

[3] Average market exchange rate in 1997 was at 1,260 kip/dollar.

the age of 35-44, and decreasing afterward. The only exception is that the peak appears to arrive relatively earlier than in many other countries.

In contrast, for other provinces, age-earnings profiles showed a small difference in both sexes. Females achieved the highest level when a person first entered the labor force (at age of 15-24) and decreased steadily during her working age. Perhaps younger persons were more adaptable to the change in market systems, particularly among the increasing opportunities in the service sector. The combined data showed a similar trend in Vientiane Capital due to its dominance.

Table 10: Education Level-Earnings Profiles by Region and Sex.

Variable	Vientiane C.			Provinces			All		
	Male	Female	All	Male	Female	All	Male	Female	All
Earnings (1,000Kip)									
Primary	69	46	63	57	47	54	61	47	57
Secondary	80	57	71	67	51	63	71	54	66
Post-secondary	103	85	99	69	53	65	83	68	80
Observations *N*	324	160	484	615	216	831	939	376	1,315

Source: LECS 2 in 1997/98.

Table 11: Age-Earnings Profiles by Region and Sex.

Variable	Vientiane C.			Provinces			All		
	Male	Female	All	Male	Female	All	Male	Female	All
Earnings (1,000Kip)									
Age 15-24	58	51	55	73	52	63	66	52	59
Age 25-34	85	61	76	60	51	57	69	55	64
Age 35-44	102	86	98	68	48	64	76	63	74
Age 45-54	101	64	95	68	44	67	79	49	77
Age 55 or above	82	-*	80	71	-*	70	75	-*	74
Observations *N*	324	160	484	615	216	831	939	376	1,315

Source: LECS 2 in 1997/98.

Note: * An insufficient number of observations.

IV. Empirical Model

Our basic model is taken from the human capital earnings function (Mincer 1974):

$$\ln Y_i = c + \alpha S_i + \beta Ex_i + \gamma Ex_i^2 + u_i \qquad (1)$$

where Y_i represents the monthly earnings of the i th individual, S_i is the years of completed schooling, Ex_i represents the number of years an individual has worked since completing schooling, and u_i is a statistical residual. In the absence of direct information on experience, Mincer proposed the use of "potential experience": the number of years an individual of age A could have worked, assuming he started school at age 6, finished S years of schooling in exactly S years, and began working immediately thereafter:

$X \equiv A - S - 6$. In this semi-log specification the coefficient on $S(\alpha)$ is interpreted as the average rate of return to one additional year of schooling, regardless of the level of schooling.

The earnings function method is used to estimate average rate of returns to mainly 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 individual's characteristics. After fitting the extended earnings function:

$$\ln Y_i = c + \alpha_1 Sec_i + \alpha_2 Post_i + \beta Ex_i + \gamma Ex_i^2 + \theta X_i + u_i \qquad (2)$$

where Sec_i and $Post_i$ are secondary and post-secondary education by individual *i*, and X_i is dummy variable indicating female, married status, and regions. The omitted category for level of education is primary education.

Finally, we attempt to estimate the rate of returns to schooling per year for each academic year from the age of 11 to 18, with the completed primary education of 5 years being the reference point. After fitting the extended earnings function:

$$\ln Y_i = c + \sum_{n=11}^{18} \alpha^n S_i^n + \beta Ex_i + \gamma Ex_i^2 + u_i \qquad (3)$$

Since the data set does not distinguish between vocational, technical and university, we opt for this approach to compare the rate of returns for each academic year. Thus, the rate of returns to schooling per year for each academic year λ are calculated as dividing each schooling coefficient by the different between academic year and primary education of 5 years or $\lambda = \frac{\alpha^n}{n-5}$.

In the empirical literature, it is customary to estimate the return to schooling by ordinary least squares (OLS) or Instrumental Variable (IV) techniques. In terms of estimating the returns to schooling, Griliches (1977) provides a landmark survey of the first-wave literature. Griliches points out that in optimizing models the "ability bias" need not be positive and shows that measurement errors in schooling would lead to a downward bias in the OLS estimate of the effect of schooling in earnings (The actual attenuation of an OLS may be less than 10 percent). Card (2001) reviews a set of recent studies that have attempted to measure the causal effect of education on labor market earnings, with regard to the properties of OLS and IV estimators. Card points out that IV estimated return is as big as or bigger than OLS (between 20% and 40% above). In this paper, 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 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; hence, we simply show OLS results.

V. Estimation Results

A. Regional Differences

The results of econometric analysis on rate of returns to schooling are presented in Table 12. Except for experience-squared in other provinces, all the variables are statistically significant at the 5% and 1% levels. The results of estimating a simple earnings function show education to be a marginal investment. An additional schooling year would yield 4.5% and 2% more earnings in Vientiane Capital and other provinces, respectively. The returns to one additional year of experience would increase earnings by 3.5% in Vientiane Capital and 1.2% in other provinces. The estimates for the whole sample are upward biased due to the large number of observations in Vientiane Capital as mentioned in Section III.

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.

The estimates for Lao PDR are low compared with the returns to education estimated for other developing countries. Worldwide, another year of schooling increases earnings by about 10% (Psacharopoulos and Patrinos 2002). However, estimated returns to schooling are low in general in centrally planned and transition economies. For example, in China the estimates of the returns to schooling were 3.1% in 1988 (Xie and Hannum 1996), 4.8% in 1991 (Wei, Tsang, Wu and Chen 1999), and 4.8 percent in 1992/93 in Vietnam (Moock, Patrinos, and Venkataraman 1998). Scarce over-time evidence, however, seems to be showing that successful reform will eventually lead to higher returns. An empirical analysis of changes in the wage structure in Slovenia between 1987 and 1991 reveals that the returns 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 returns to higher education (Vargaa 1995). Moreover, in Czech Republic and Slovakia between 1984 and 1993, especially in the returns to male workers from 2.4% to 5.2% and 2.8% to 4.9% in Czech Republic and Slovakia, respectively (Chase 1998).

Table 13 shows the estimated results of an extended version of the Mincer model. As discussed in the model description, dummy variables for various education levels, sex, marital status and regions were included. Except for the experience and marital status in other provinces, all other coefficients of independent variables are statistically significant at least at the 10% level. The dummies for secondary and post-secondary levels indicated a significant increase in earnings as the education level rises. In particular, it is interesting to observe that the increment in the earnings at the post-secondary level for Vientiane Capital is about 36% compared to the primary level, and more than double the amount for the same level in other provinces. At the lower level, the figure varied between 14% and 10% for Vientiane Capital and the other regions respectively. For the combined data, these results are similar with the cases of Czech Republic and Slovakia (Chase 1998), and Cote d'Ivoire (Vijerberg 1993), but a relatively lower than in Indonesia (Deolalikar 1993).

With regard to gender differences, on average a female would earn roughly 18% to 20% less than a man regardless of her location. This issue will be treated in more details in the next section. As expected, married employees tend to earn more than unmarried counterparts (27% for 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. More specifically, a worker in the northern, central and southern regions would earn about 28%, 16%, and 21% lower than his/her counterpart in the capital. These results lend support to the argument of Bourdet (1998).

Table 12: Earnings Functions by Region.

(Dependent variable is the natural log of monthly earnings)

Variable	Vientiane C.	Provinces	All
Constant	10.2117***	10.5607***	10.4171***
	(105.54)	(130.78)	(165.99)
Years of Schooling	0.0453***	0.0195***	0.0321***
	(7.26)	(4.18)	(8.43)
Years of Experience	0.0355***	0.0115**	0.0183***
	(4.82)	(1.99)	(3.99)
Experience-squared	-0.0005***	-0.0001	-0.0002**
	(-3.14)	(-1.15)	(-2.32)
R-squared	0.152	0.026	0.064
Observations *N*	484	831	1,315

Note: t-statistics in parentheses.

** Statistically significant at the 5% level; *** at the 1% level.

Table 13: Extended Earnings Functions by Region.

(Dependent variable is the natural log of monthly earnings)

Variable	Vientiane C.	Provinces	All
Constant	10.6104***	10.7687***	10.8102***
	(105.14)	(138.32)	(171.27)
Secondary	0.1352*	0.0958**	0.1002**
	(1.85)	(2.10)	(2.54)
Post-Secondary	0.3569***	0.1693***	0.2353***
	(4.33)	(3.03)	(5.04)
Experience	0.0166**	0.0105	0.0112**
	(2.02)	(1.51)	(2.10)
Experience-squared	-0.0003*	-0.0002	-0.0002*
	(-1.70)	(-1.26)	(-1.72)
Female	-0.1953***	-0.1790***	-0.1798***
	(-3.61)	(-4.54)	(-5.57)
Married	0.2716***	-0.0487	0.1155***
	(4.33)	(-0.90)	(2.81)
Northern	-	-	-0.2840***
			(-6.20)
Central	-	-	-0.1590***
			(-4.56)
Southern	-	-	-0.2115***
			(-5.53)
R-squared	0.185	0.044	0.108
Observations *N*	484	831	1,315

Note: t-statistics in parentheses.

The omitted category for level of education is primary education,

and the omitted category for regional dummy is Vientiane Capital.

* Statistically significant at the 10% level; ** at the 5% level; *** at the 1% level.

B. Gender Differences

The difference between males and females is significant in Vientiane Capital, which is the same with international standards (Psacharopoulos and Patrinos 2002), but it cannot be observed in others regions (Table 14). For the capital, the coefficients of schooling years and experience are statistically significant at the 5% and 1% levels. For the years of schooling, the rate of returns for females is about 1.5% higher than that for males, comparing the figure of 5.29% for females to 3.82% for males. In terms of returns to experience, the difference between the genders is negligible. The discrepancy between the two sexes for other provinces is just the opposite, i.e. the rate of returns to schooling is statistically significant and higher for males (1.71%), whereas that for women is statistically not significant and smaller in magnitude (1.18%). Again, as mentioned above, the level of development and business activities in other provinces is by far behind than the capital. It is likely that there was lack of opportunities for persons with a higher education background and experience to find a well paid job. As can be seen in table 10, a marginal increase in earnings between persons with a secondary and post-secondary level in other provinces is almost negligible.

Table 14: Earnings Functions by Gender.

(Dependent variable is the natural log of monthly earnings)

Variable	Vientiane C.		Provinces		All	
	Males	Females	Males	Females	Males	Females
Constant	10.3504***	10.0498***	10.6644***	10.5837***	10.5490***	10.3182***
	(81.88)	(62.28)	(100.49)	(87.91)	(128.09)	(103.48)
Years of Schooling	0.0382***	0.0529***	0.0171***	0.0118	0.0279***	0.0332***
	(4.98)	(5.01)	(3.02)	(1.52)	(6.01)	(5.13)
Years of Experience	0.0370***	0.0362**	0.0093	0.0092	0.0155***	0.0196**
	(3.90)	(2.36)	(1.26)	(0.93)	(2.65)	(2.25)
Experience-squared	-0.0006***	-0.0007	-0.0001	-0.0003	-0.0002*	-0.0004
	(-2.93)	(-1.58)	(-0.87)	(-0.96)	(-1.77)	(-1.56)
R-squared	0.122	0.162	0.016	0.017	0.043	0.073
Observations *N*	324	160	615	216	939	376

Note: t-statistics in parentheses.

* Statistically significant at the 10% level; ** at the 5% level; *** at the 1% level.

Table 15: Extended Earnings Functions by Gender.

(Dependent variable is the natural log of monthly earnings)

Variable	Vientiane C.		Provinces		All	
	Males	Females	Males	Females	Males	Females
Constant	10.6027***	10.3451***	10.7399***	10.6206***	10.8091***	10.5499***
	(83.75)	(64.74)	(109.89)	(100.71)	(139.63)	(111.21)
Secondary	0.0986	0.2083*	0.1021*	0.0710	0.1033**	0.1245**
	(1.05)	(1.80)	(1.79)	(1.04)	(2.10)	(1.98)
Post-Secondary	0.3006***	0.4873***	0.1806***	0.1283	0.2238***	0.2896***
	(2.90)	(3.57)	(2.61)	(1.47)	(3.91)	(3.72)
Years of Experience	0.0230**	0.0170	0.0114	0.0144	0.0128*	0.0177*
	(2.10)	(1.05)	(1.26)	(1.26)	(1.86)	(1.81)
Experience-squared	-0.0004*	-0.0004	-0.0002	-0.0004	-0.0002	-0.0004*
	(-1.88)	(-0.92)	(-1.04)	(-1.29)	(-1.56)	(-1.73)
Married	0.2400***	0.3099***	-0.0414	-0.0636	0.1208**	0.0965*
	(2.82)	(3.46)	(-0.53)	(-1.00)	(2.14)	(1.76)
Northern	-	-	-	-	-0.4084***	0.0171
					(-7.10)	(0.24)
Central	-	-	-	-	-0.1611***	-0.1781***
					(-3.67)	(-3.30)
Southern	-	-	-	-	-0.2403***	-0.1537***
					(-5.18)	(-2.34)
R-squared	0.122	0.194	0.013	0.018	0.090	0.095
Observations *N*	324	160	615	216	939	376

Note: t-statistics in parentheses.

The omitted category for level of education is primary education,

and the omitted category for regional dummy is Vientiane Capital.

* Statistically significant at the 10% level; ** at the 5% level; *** at the 1% level.

Table 15 illustrates the estimation results of the extended Mincer model for males and females, which yielded statistically significant outcomes for Vientiane Capital (compared with results in Table 13). Of particular interest is the estimated coefficient of women and men in the capital. A woman with secondary and post-secondary education is likely to earn about a 20% and 50% higher salary than a woman with a primary education background, respectively. The figure for male workers at the post-secondary level is about 30%. In the provinces, the gap in earnings between the secondary and post-secondary level for males is 10% and 18%, respectively. In terms of marital status, married men and women in Vientiane Capital tend to earn 24% and 31% more as compared to unmarried counterparts, but it cannot be observed in other regions.

C. Returns to Schooling by Education Level

In the previous section, the rate of returns on years of schooling has been estimated for the entire samples and males and females (Table 12 and 14). In this section, we will address the rate of returns to schooling for each academic year from the ages of 11 to 18, with the completed primary education of 5 years being the reference point. Since the data set does not distinguish between vocational, technical and university, we opt for this approach to compare the rate of returns for each academic year. The estimated coefficients are presented in Table 16.

As the table shows, the estimation results are somewhat mixed for both Vientiane Capital and other provinces. For Vientiane Capital, the rate of returns to schooling showed a fluctuating trend over the period under study. Initially it increased from 3.5% for 11 years of schooling to 5.1% for 13 years (Vocational level), and started to decline 2.4% for 15 years (Technical level), and increased again to 6% for 18 years of schooling (University level). The first increase for 13 years of schooling might be attributable to vocational education, while the second increase might be returns to university education. These results are similar with the case found in Czech Republic and Slovakia, that rates of returns to schooling were high in vocational and university (also post graduate) education level, whereas a relatively lower in the technical education level (Chase 1998).

On the contrary, for other provinces, this rate showed a decreasing trend from 2.7% for 11 years to 2% for 18 years of schooling. This downward trend is the same with international standards (Psacharopoulos and Patrinos 2002), and it also lends support to the argument described in the previous section that the private sector being too small to absorb skilled labor and the wage rate of the public sector being flat. Hence, the higher end of education level tends to yield a lower return and is often considered overqualified. Perhaps, a secondary or vocational education level is well enough for serving the needs of the market.

Table 16: Earnings Functions with schooling levels.

(Dependent variable is the natural log of monthly earnings)

Variable	Vientiane C.	Provinces	All
Constant	10.5244***	10.6524***	10.6249***
	(76.54)	(111.27)	(132.91)
Years of schooling S=11	0.2076*	0.1637***	0.1655***
	(1.83)	(2.40)	(2.73)
	[0.0346]	[0.0273]	[0.0276]
Years of schooling S=12	0.1319	0.1863**	0.1530*
	(0.77)	(2.12)	(1.87)
	[0.0188]	[0.0266]	[0.0219]
Years of schooling S=13	0.4046***	0.0507	0.2173***
	(2.73)	(0.47)	(2.43)
	[0.0506]	[0.0063]	[0.0272]
Years of schooling S=14	0.4203***	0.1004	0.2449***
	(3.26)	(1.11)	(3.22)
	[0.0467]	[0.0112]	[0.0272]
Years of schooling S=15	0.2384*	0.1925*	0.2240***
	(1.72)	(1.88)	(2.66)
	[0.0238]	[0.0193]	[0.0224]
Years of schooling S=16	0.2021	0.1907	0.2046*
	(1.16)	(1.4062)	(1.88)
	[0.0184]	[0.0173]	[0.0186]
Years of schooling S=17	0.3931**	0.2430*	0.3172***
	(2.12)	(1.88)	(2.90)
	[0.0328]	[0.0203]	[0.0264]
Years of schooling S=18	0.7793***	0.2747**	0.5680***
	(4.91)	(2.10)	(5.58)
	[0.0599]	[0.0211]	[0.0437]
Experience	0.0336***	0.0132	0.0178***
	(2.96)	(1.58)	(2.65)
Experience-squared	-0.0005**	-0.0002	-0.0003*
	(-2.12)	(-1.09)	(-1.72)
R-squared	0.166	0.035	0.069
Observations *N*	238	397	635

Note: t-statistics in parentheses.

"Per year" returns to schooling in brackets.

The omitted category for level of education is completed primary education S=5.

* Statistically significant at the 10% level; ** at the 5% level; *** at the 1% level.

VI. Conclusions

The returns to schooling in Lao PDR are low by international standards, but relatively the same with other transition economies. The estimates come from earnings data for 1997/98. It is very useful from the limited data currently available, but may be distorted for a number of reasons. First, interviewees are classified by number of schooling years rather than a clear education level, and they are not distinguished by the public or private sectors. Also, we have limited the analysis to wage earners, while over 80 percent of the Lao labor force is self-employed and many have multiple jobs.

This study has implications for the financing of education in Lao PDR, even though it is based on admittedly poor data. Lower education (primary and secondary), 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. Lao's policy makers may consider a more direct subsidization of poor primary school age children to ensure that they enroll in school and remain enrolled.

It is very important to monitor future earnings and labor market trends. It would be desirable to update these estimates as soon as recent earnings data are available. The Higher Education Graduate Tracer Study, for example, in Vietnam (World Bank 1997) suggests that the labor market is changing rapidly. 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.

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