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Two Decades of Declining Poverty but Rising Inequality in Laos

by

Peter Warr, Sitthiroth Rasphone and Jayant Menon

Abstract

Over the past two decades consumption inequality has risen within Laos, while absolute poverty incidence halved. The estimated Gini coefficient of private household expenditures per person rose from 0.311 to 0.364. This increase in the sample-based estimate of inequality was statistically significant and occurred in all regions, in both rural and urban areas and among all major ethnic, educational and sectoral employment categories. Within-group increases in inequality dominated between-group changes, but official policy largely overlooks this point, focusing on reducing inequality between, rather than within major groups. This assessment argues that economic inequality should become a more pressing policy concern.

JEL Classification: D31, D39, I39

Keywords: Expenditure inequality; poverty reduction; Gini coefficient; Laos

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Outline

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1. Introduction

This paper describes changes in inequality over the last two decades in the Lao People's Democratic Republic – Lao PDR, subsequently Laos, for brevity – and relates them to the poverty reduction that occurred simultaneously. Since the early 1990s, five rounds of the official Lao Expenditure and Consumption Surveys (LECS) have been conducted and these data are the principal information source used in this paper.[1] The data measure consumption expenditures but not incomes, at the household level. Over the two decades covered by the survey data, measured inequality increased at the national level, within both rural and urban areas, within all provinces, within each of the four major ethnic groups and within all major educational attainment and employment categories.

Over the two decades 1992-93 to 2012-13 the estimated Gini coefficient of expenditure inequality rose from 0.311 to 0.364 at the national level and the increase in this sample-based estimate of population-wide inequality was statistically significant. At the same time, the estimated incidence of absolute poverty halved, from 46 percent of the population to 23 percent. Put together, these data mean that the poor of Laos became better off in real terms, but that the rich gained more, in both absolute and proportional terms.

Throughout the 1970s and early 1980s, Laos remained extremely poor and isolated—the outcome of decades of conflict and inward-looking policies derived from the central planning policy framework in place since the communist takeover of 1975. In 1986 the government began decentralizing control and introducing market-oriented reforms under a revised economic strategy called the New Economic Mechanism (NEM). Early reforms under the NEM removed price controls, unified exchange rates, expanded foreign and inter-provincial trade, and encouraged private enterprise in agriculture and manufacturing. Structural reforms continued in the 1990s through a legislative program providing the foundation for market-based rules and private sector development.

These early reforms produced impressive results. Between 1990 and 1997, just prior to the Asian Financial Crisis (AFC), real GDP growth averaged 6.4 percent a year. Growth contracted in 1998, following the AFC. Expanded public infrastructure expenditures financed by monetary expansion produced a hyperinflation in 1997 and 1988, but the increased aggregate demand fortuitously enabled the worst effects of the AFC (as experienced in neighboring Thailand, for example) to be avoided. By 1999 real economic growth had recovered and continued reforms have since facilitated growth at an average of 7 percent a year, despite the Global Financial

[1] The survey has been conducted, analysed and reported upon at five-yearly intervals from 1992-93 to 2012-13. The survey is conducted by the government's Lao Statistics Bureau (LSB), Ministry of Planning and Investment, with the technical assistance of Statistics Sweden and the World Bank.

Crisis of 2008. Real per capita income more than tripled, from $262 in 1990 to $887 in 2016, in constant 2005 dollar terms.[2]

Until recently, official planning documents of the Lao government made no explicit reference to economic inequality, or the government's official data relating to it, focusing instead on economic growth and poverty reduction, both of which have been impressive. A shift in focus has seemingly begun, with the publication of the 8th Five-Year Socio-Economic Development Plan (Ministry of Planning and Investment, 2016), covering the years 2016 to 2020. For the first time, the Plan mentions the 'lack of inclusive socio-economic development', presumably meaning that poorer groups have not shared equitably in the growth that has occurred. The persistent 'development gap between urban and rural areas' is cited as a major cause (p. 74).

The linkages between inequality, poverty reduction and growth are complex and subject to continuing controversy. What is not controversial is that for social, economic and political reasons, economic inequality must be monitored and understood. Moreover, since changes in inequality typically occur only gradually, and since the distinction between temporary and persistent changes in inequality is so important, the study of inequality should cover the longest period that available data permit. That is the central task of this paper.

Section 2 summarizes the data on poverty and inequality in Laos over the past two decades, for which data are available. Section 3 then reviews the economic literature dealing with these issues in Laos. Section 4 asks whether the increase in the sample-based estimated level of inequality in Laos is a statistically significant indicator of a rise in inequality for the full population, and concludes that it is. Section 5 asks whether the population-wide increase in inequality can be attributed to between-group or within-group changes, where the five groupings considered are provinces, rural/urban areas of residence, and the educational attainment, ethnicity, and sector of employment of the household head. It is shown that within-group changes dominate in all these cases. Section 6 concludes, returning to the above policy statements relating to inequality.

[2] A fuller summary of economic change in Laos is provided in Menon and Warr (2013).

2. Rising Inequality, Declining Poverty

Table 1 summarizes the mean and median levels of real consumption expenditure per person in Laos for the years 1992-93 and 2012-13, using the Lao Expenditure and Consumption Survey (LECS) data, deflated by spatially-adjusted consumer prices[3] and using population weights to adjust for sampling fractions.[4] The data also show the P10 to P90 decile range, meaning the levels of real expenditure per person below which the poorest 10 percent and poorest 90 percent of the population are located, respectively. These data are shown for the total population and for rural and urban areas. The mean exceeds the median in all cases, reflecting the asymmetry of the distribution of expenditures - skewed towards higher levels of expenditure. Both mean and median real expenditures increased in all cases. The P90 to P10 decile values both increased, but the range between them expanded because the proportional increases in the P90 values were much larger, reflecting an increase in the spread of the distribution. The final column shows the coefficient of variation of real expenditures (standard deviation divided by the mean), indicating a 38 percent rise in the dispersion of the distribution of the total population, with similar increases in both rural and urban areas.

This widening of the distribution can also be seen in Table 2, which summarizes shares of total consumption expenditure per person, classified by population quintile group (poorest 20 percent, next poorest 20 percent, and so on, up to the richest 20 percent). Over the two decades since the early 1990s, the poorest quintile's share of total consumption declined from 8.7 to 7.6 percent, while the richest quintile's share rose from 40.2 to 44.8 percent. Only the richest quintile group experienced an increase in its share of total consumption; every other quintile share declined.

[3] The deflator is calculated as the monthly average of the CPI over the 12 months of LECS data collection for each survey period, adjusted for spatial price differences. LECS data are collected from March of one year to February of the following year. For example, LECS 1 data were collected March 1992 to February 1993. The CPI deflator for the LECS 1 survey is thus the simple average of the monthly CPI levels over these 12 months. For the LECS 2 survey it is the average CPI from March 1997 to February 1998, and so forth. Adjustment for spatial price differences varies somewhat between the LECS surveys. For example, LECS I and II use CPI data for cities and create their intra-survey deflators based on rice prices, while LECS IV and V create their deflators from village and diary price data to create spatial price indices separated between rural and urban areas.

[4] All inequality and poverty estimates are computed using household weights calculated as the inverse of the sampling fraction. Household level calculations are weighted by household weights X household size. Household weights are calculated from the two-stage sampling scheme. At the first stage, a sample of villages was selected by the proportion of the population, distributed according to province, district, rural area with access to road and rural area without access to road. In the second stage, a systematic sample of 15 households was selected in each sample village. The selection was based on an updated list of households in the village at the time of the survey.

Table 1. Mean, median and decile range of real household expenditures (1992-93 prices)

Year	Location	Mean	Median	Decile Range		Coefficient of Variation
				P10	P90	
1992-93	Rural	9,676	8,289	4,695	16,024	0.59
	Urban	16,014	13,060	7,474	28,396	0.65
	Total	11,170	9,202	5,029	19,331	0.68
2012-13	Rural	14,104	11,398	6,157	24,030	0.83
	Urban	22,889	16,911	8,587	41,493	0.94
	Total	16,549	12,675	6,557	29,564	0.94

Notes: Units of real household expenditure are kip per person per month, 1992-93 prices. The coefficient of variation is the standard deviation divided by the mean. 'Decile range' means, in the case of P10, the level of real expenditure below which the poorest 10 percent of the population is located and in the case of P90 the level below which the poorest 90 percent of the distribution is located.

Source: Authors' estimations, using LECS data and consumer price index data from Lao Statistics Bureau (LSB), Vientiane.

Table 2. Expenditure shares by population quintile (percent of total expenditures)

Quintile group	1992-93 (LECS 1)	1997-98 (LECS 2)	2002-03 (LECS 3)	2007-08 (LECS 4)	2012-13 (LECS 5)
Quintile 1 (poorest)	8.7	7.4	8.1	7.6	7.6
Quintile 2	12.8	11.4	11.9	11.5	11.5
Quintile 3	16.5	15.2	15.6	15.1	15.3
Quintile 4	21.8	20.7	21.1	20.9	20.8
Quintile 5 (richest)	40.2	45.3	43.3	44.9	44.8
Total	100	100	100	100	100

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

Table 3 shows that over the 20-year interval between 1992-93 and 2012-13 average real expenditure per person increased for every quintile group. That is, every quintile group benefited (on average) in real terms, but not at the same rates. Table 4 shows the percentage changes of real expenditures for each quintile group across each of the four five-year intervals between the LECS surveys, based on Table 3, above. By comparing each group with the mean, it is evident which group fared better or worse, in proportional terms, from any departures from distributional neutrality. Since we are most interested in long-term changes in inequality and poverty, Table 5 summarizes the proportional change of real expenditure for each quintile group over the full 20-year interval from 1992-93 and 2012-13. For quintile 1 (the poorest), real expenditure increased by 30.2 percent, clearly a positive outcome. But the real expenditure of quintile 5 (the richest) increased at more than twice this rate, at 65 percent. Indeed, the proportional increase for each successive quintile group exceeded that for the quintile group below it. Only the richest quintile experienced a proportional increase larger than the mean.

Table 3. Average levels of real expenditure, by population quintile group (CPI deflator, 1992-93 = 1)

Quintile group	1992-93 (LECS 1)	1997-98 (LECS 2)	2002-03 (LECS 3)	2007-08 (LECS 4)	2012-13 (LECS 5)
Quintile 1 (poorest)	4,848	5,244	4,834	5,867	6,312
Quintile 2	7,139	8,070	7,124	8,904	9,507
Quintile 3	9,229	10,725	9,363	11,681	12,675
Quintile 4	12,180	14,624	12,668	16,140	17,172
Quintile 5 (richest)	22,472	31,968	25,963	34,761	37,090
Mean	11,170	14,123	11,985	15,468	16,549

Note: Units are real household expenditures in kip per person per month, 1992-93 prices.
Source: Authors' calculations, using LECS and consumer price index data from Lao Statistics Bureau (LSB), Vientiane.

Focusing on absolute changes in real consumption, rather than proportional changes, the disparity in the experiences of different quintile groups is amplified and the increase in measured

inequality becomes more graphic, because richer groups start from a larger base.[5] These calculations are summarized in the second column of Table 5, also based on Table 3, above, showing average real consumption per person in constant 1992-93 prices. Over these two decades, average real expenditure per person in quintile 1 (the poorest), measured in constant 1992-93 prices, increased by 1,464 kip. For quintile 5 (the richest) it was ten times this amount, at 14,618 kip. The absolute increase for quintile 5 far exceeded that for quintile 4, which exceeded quintile 3, and so forth. Overall, the poor gained in real terms, but the rich gained much more.

Table 4. Percent change in real expenditure by population quintile group (CPI deflator, percent change)

Quintile group	1992-93 to 1997-98	1997-98 to 2002-03	2002-03 to 2007-08	2007-08 to 2012-13
Quintile 1 (poorest)	8.2	-7.8	21.4	7.6
Quintile 2	13.0	-11.7	25.0	6.8
Quintile 3	16.2	-12.7	24.8	8.5
Quintile 4	20.1	-13.4	27.4	6.4
Quintile 5 (richest)	42.3	-18.8	33.9	6.7
Mean	26.4	-15.1	29.1	7.0

Note: Calculated from Table 3.
Source: Authors' calculations, using LECS and consumer price index data from Lao Statistics Bureau (LSB), Vientiane.

[5] The literature on inequality refers to this concept as absolute inequality, whereas standard measures, such as quintile shares or the Gini coefficient focus on relative inequality. An increase in relative inequality necessarily implies an increase in absolute inequality, but not *vice versa*.

Table 5. Change in real expenditure by population quintile group, 1992-93 to 2012-13 (CPI deflator)

Quintile group	Proportional change (percent)	Absolute change (kip, 1992-93 prices)
Quintile 1 (poorest)	30.2	1,464
Quintile 2	33.2	2,368
Quintile 3	37.3	3,446
Quintile 4	41.0	4,992
Quintile 5 (richest)	65.0	14,618
Mean	48.2	5,379

Note: Calculated from Table 3.
Source: Authors' calculations, using LECS and consumer price index data from Lao Statistics Bureau (LSB), Vientiane.

Standard measures of inequality and poverty incidence support the above story. Table 6 summarizes the LECS data on the level of the Gini coefficient of inequality over this 20-year period. With the partial exception of a high value of the coefficient in 1997-98 (LECS 2), the Gini coefficient increased continuously over the two decades covered by these surveys. This is true at the national level and within both rural and urban areas. The absolute level of the coefficient is consistently higher in urban than in rural areas, but its level increased steadily in both, again with the partial exception of an abnormally high level in 1997-98. Similar findings apply for each of the four major regions of the country. Over the 20-year period, the Gini coefficient increased in all regions, although in the most recent five-year period, 2007-08 to 2012-13, inequality increased only in the South.[6] Finally, Table 7 shows a long-term increase in inequality within every one of the 17 provinces, although in some provinces 1997-98 was an outlier to the pattern of steadily increasing inequality, as it is at the national level.[7]

[6] Mining exports dominate the Southern economy and the surge in these exports during the decade 2007-08 to 2012-13 may be a driver of the most recent increase in inequality observable there.

[7] The years 1997-98 were a period of economic turbulence in Laos. The contractionary impact of the Asian Financial Crisis, which began in neighbouring Thailand, was followed by a hyperinflation within Laos induced by monetary expansion (Menon and Warr, 2013), during which annual rates of inflation were well over 100 percent. The large and temporary increase in measured inequality in over the period ending in 1997-98 may be partly attributable to those events. The data on real expenditures in 1997-98 may be less reliable than those for other years because the rate of increase in the consumer price index may have been underestimated during the hyperinflation, resulting in overestimation of measured increases in real expenditures.

Table 6. Gini coefficient of household expenditure per person, by region and rural-urban location

	1992-93	1997-98	2002-03	2007-08	2012-13
Vientiane	0.30	0.37	0.36	0.38	0.38
North	0.27	0.35	0.31	0.35	0.32
Center	0.32	0.33	0.31	0.34	0.34
South	0.32	0.32	0.31	0.32	0.37
Rural	0.29	0.32	0.31	0.33	0.33
Urban	0.31	0.38	0.35	0.36	0.38
National	0.31	0.35	0.33	0.36	0.37

Note: The Gini coefficient varies from 0 to 1, higher values indicating greater inequality.
Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

The LECS surveys identify 50 ethnic groups in Laos. They can be summarized into the four major categories listed in Table 8.[8] The surveys make it possible to identify ethnic categories only for the years 2002-03, 2007-08 and 2012-13. Of these four categories, over the decade covered by these data, the dominant Lao-Tai group (64 percent of the population) consistently exhibited the highest levels of both average expenditure per person and within-group inequality. The increase in average expenditure per person among the Lao-Tai was equal to the population average. Inequality increased among all four ethnic groups, as measured by the Gini coefficient, but the increase *within* the majority Lao-Tai ethnic group was the smallest. The increase in expenditures per person was heavily concentrated in the top few centile groups within all categories, but the concentration of these gains at the top was even higher within the minority groups than for the majority Lao-Tai.

[8] The mapping from the 50 LECS categories into these four is: LECS 1 to 8 = Lao-Tai; LECS 9-40 = Mon-Khmer, LECS 41-47 = Chinese-Tibetan; LECS 48-50 = Mon-Mien. Source: Lao Statistics Bureau, Survey Guide Book, 2002-03, 2007-08 and 2012-13.

Table 7. Gini coefficient of household expenditure per person, by province

Province	1992-93	1997-98	2002-03	2007-08	2012-13
Vientiane Capital	0.28	0.36	0.36	0.38	0.38
Phongsaly	0.19	0.29	0.22	0.30	0.27
Luangnamtha	0.23	0.32	0.25	0.30	0.36
Oudomxay	0.25	0.38	0.25	0.31	0.30
Bokeo	0.25	0.31	0.29	0.30	0.29
Luangprabang	0.29	0.35	0.32	0.31	0.31
Huaphanh	0.27	0.36	0.29	0.28	0.28
Xayabury	0.26	0.39	0.35	0.42	0.34
Xiengkhuang	0.28	0.35	0.32	0.38	0.35
Vientiane	0.29	0.37	0.32	0.32	0.31
Borikhamxay	0.25	0.32	0.28	0.34	0.36
Khammuane	0.27	0.36	0.29	0.31	0.30
Savannakhet	0.28	0.33	0.31	0.34	0.34
Saravane	0.23	0.32	0.27	0.30	0.34
Sekong	0.28	0.32	0.31	0.38	0.40
Champasack	0.28	0.36	0.30	0.29	0.34
Attapeu	0.26	0.30	0.29	0.32	0.33
National	0.31	0.35	0.33	0.36	0.37

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

In contrast to this overall picture of rising inequality, Table 9 shows that measured poverty incidence declined steadily over the two decades – at the national level, within both rural and urban areas and within every region – whether poverty is calculated from household expenditures per person or per 'adult equivalent'. [9] In summary, the poor became better off in absolute terms, but lost ground relative to all other income groups, especially the richest.

[9] The upper half of Table 9 measures poverty incidence using expenditures per household member, as is conventional in the literature on poverty in Laos. The lower half uses expenditures per adult equivalent, employing the World Bank's household member weights, but using the same poverty lines as in the upper half. Because the household member adult equivalent weights are all less than or equal to unity, their use raises per unit household expenditures and thereby lowers the measured level of poverty incidence for a given poverty line. Nevertheless, the proportional changes in poverty incidence over time are very similar.

Table 8. Inequality by ethnic group

Ethnic group	Population share (%)	Mean real consumption per person			Gini coefficient		
	2012-13 (LECS 5)	2002-03 (LECS 3)	2012-13 (LECS 5)	% change: LECS 3 to 5	2012-13 (LECS 5)	2002-03 (LECS 3)	% change: LECS 3 to 5
Lao-Tai	63.6	13,730	18,991	38	0.346	0.362	0.016
Mon-Khmer	23.6	8,176	11,651	42	0.272	0.302	0.030
Chinese-Tibetan	5.0	9,230	14,441	56	0.247	0.284	0.037
Mon-Mien	7.8	9,127	12,267	34	0.294	0.324	0.030
Total population	100	11,985	16,549	38	0.334	0.366	0.032

Notes: Units of real consumption are kip per person per month, 1992-93 prices.
'Ethnic group' means the ethnicity of the head of the household.
Data on ethnicity are not available for 1992-93 (LECS 1) or 1997-98 (LECS 2).

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

Table 9. Poverty incidence estimated from household expenditures per person and per adult equivalent, 1992-93 to 2012-13 (percent)

	1992-93	1997-98	2002-03	2007-08	2012-13
Calculated from household expenditures per person					
Rural	51.8	42.5	37.6	31.7	28.6
Urban	26.5	22.1	19.7	17.4	10.0
Vientiane	33.6	13.5	16.7	15.2	5.9
North	51.6	47.3	37.9	32.5	25.8
Central	45.0	39.4	35.4	29.8	23.3
South	45.7	39.8	32.6	22.8	29.2
National	46.0	39.1	33.5	27.6	23.2
Calculated from household expenditures per adult equivalent					
Rural	n.a.	17.1	13.3	11.0	9.7
Urban	n.a.	7.7	5.9	6.3	5.3
Vientiane	n.a.	5.6	6.5	7.8	2.9
North	n.a.	21.9	13.9	11.5	6.8
Central	n.a.	13.1	11.7	9.8	8.0
South	n.a.	15.6	10.4	7.7	13.3
National	n.a.	15.5	11.6	9.6	8.5

Note: Calculations of expenditures per adult equivalent use the World Bank's recommended household member weights, drawn from Houghton and Khandker (2009), p. 29): adult male = 1; adult female = 0.8; and child under 15 years = 0.5. They apply the official poverty lines to these data. Since the adult equivalent weights are below unity for all members other than adult males, they raise per unit household expenditures for most household and thus lower estimated poverty incidence. LECS data for 1992-93 do not contain sufficient household information to support this calculation. Regional poverty lines reflect the variation in the cost of living between different Lao regions (see footnote 3).

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

3. The Economic Literature on Poverty and Inequality in Laos

The economic literature dealing with the above issues is thin and is dominated by one type of study. With the completion of each round of the LECS survey, from the second onwards, researchers from one or more of the multilateral development institutions and their consultants, in conjunction with the Lao government's statistical staff, conduct an analysis of the findings of the latest survey. Their analysis estimates the levels of poverty incidence and inequality, both in aggregate and among various sub-groups, comparing them with the corresponding levels estimated from the preceding LECS survey, five years before. The main focus is on whether poverty has risen or fallen, in aggregate and among particular groups, in the five-year interval since the last LECS survey.

Thus, Kakwani *et al.* (2001) used data from LECS 1 (1992-1993) and LECS 2 (1997-1998) to construct a poverty line and used it to analyze poverty incidence, depth and severity. Inequality was measured by the Gini coefficient and consumption shares by quintile. Andersson *et al.* (2006) used data from LECS 3 (2002-2003) to examine poverty across regions and ethnic groups and to explore the determinants of income, consumption, and poverty. The results revealed that poor households were characterized by large household size, high dependency ratios, low levels of human capital, simple technology, limited access to agricultural inputs, and unfavorable locational characteristics.

Epprecht *et al.* (2008) used data from LECS 3 (2002-03) and the 2005 Population and Housing Census to estimate different measures of poverty and inequality, disaggregated by various population sub-groups. The study mapped inequality in terms of the Gini coefficient and Theil indices, and decomposed overall inequality in terms of differences in mean per capita expenditure between and within sub-groups. Using the same data set and a similar methodology, Messerli *et al.* (2008) subsequently developed a widely-used descriptive map of socio-economic conditions in Laos in 2005.

Engvall *et al.* (2010) used data from LECS 4 (2007-2008) to analyze poverty and alternative indicators of welfare, including expenditures, incomes, asset ownership, nutrition, access to social services and infrastructure, and education of household members. OECD (2013) used aggregate statistics and secondary data to describe trends in poverty and inequality. Nolintha *et al.* (2014) similarly employed secondary data to study the inclusiveness of growth along income and non-income dimensions and to calculate a growth inclusiveness index. Most recently, a report by the World Bank and the Lao Statistics Bureau (Pimhidzai *et al.,* 2014) used data from LECS 4 (2007-08) and 5 (2012-13) to analyze poverty and inequality trends. The report examined inequality in terms of the distributional patterns of consumption growth and trends in the Gini coefficient and Theil index, comparing the years 2007-08 and 2012-13.

While the above studies are potentially useful for policy-makers, their scope is almost always short-term, focusing on the most recent round of the LECS survey and looking back five years to the previous round. Now that five rounds of the LECS survey are available, covering two decades, it is important that a longer-term perspective be considered. This is particularly important in the case of inequality, where changes tend to be more gradual than changes in poverty incidence. As the previous discussion has shown, the cumulative effect of gradual changes in inequality can be large. The present paper attempts to provide that longer-term perspective.

4. Statistical Significance of the Rise in Measured Inequality

Measures of inequality and poverty are based on sample surveys that cover only a small proportion of the population. They produce estimates of the population values of inequality and poverty indicators, but those estimates necessarily entail errors. First, there are measurement errors that occur during the collection of the raw, household-level data. Second, there may be sample bias if the sample is non-representative of the population. Both imply that the expected value of the sample-based estimate may differ from the true population value. Statisticians, including those designing the LECS surveys, go to great lengths to minimize these sources of error. But even if these two sources of error were eliminated, there remains an unavoidable third source of error: sampling error arising from the small samples used to estimate population values.[10]

Sample-based estimates of population parameters are necessarily associated with a standard error. When two sample-based estimates are compared over time, the standard error of the difference between the two estimates must be considered in assessing whether the observed difference might reasonably be attributed to chance. For example, a sample-based change in measured inequality could be observed purely because of random sample error, when true inequality among the full population did not change. This could happen even if the first two sources of error outlined above – measurement error and sample bias – were absent. What is the probability that random sampling error accounts for the estimated increases in inequality described above?

In the analysis that follows, we review the changes in inequality measures, first across the decade 1992-93 to 2002-03 (LECS 1 to LECS 3), then the decade 2002-03 to 2012-13 (LECS 3 to LECS 5) and finally the full two decades 1992-93 to 2012-13 (LECS 1 to LECS 5). The sample based estimates show increased inequality across each of these intervals. But are the estimated increases significantly different from zero? Inequality measures are compared at the national

[10] The LECS 1 (1992-93) survey covered 2,937 households out of a population of 702,000 households and 4.4 million individuals. Subsequent LECS surveys covered between 8,200 and 8,900 households. By 2013 the total population was 1.14 million households and 6.5 million individuals.

level, meaning that it covers all households in the sample, and within both rural and urban areas. For each of these three levels, we compare Gini coefficients and also a member of the class of Generalized Entropy (GE) measures, the GE(1) measure, also known as the Theil T index. The analytic importance of the GE class of measures is discussed below. This gives six sets of measures, summarized in Table 10.

Table 10. Levels of inequality of household expenditures per person, 1992-93 to 2012-13

	1992-93 (LECS 1)	2002-03 (LECS 3)	2012-13 (LECS 5)
Gini Coefficient (National)	0.311	0.347	0.364
	(0.009)	(0.007)	(0.008)
Gini Coefficient (Urban)	0.301	0.350	0.375
	(0.010)	(0.011)	(0.012)
Gini Coefficient (Rural)	0.280	0.307	0.329
	(0.010)	(0.006)	(0.009)
GE(1), Theil's T (National)	0.171	0.231	0.258
	(0.010)	(0.012)	(0.013)
GE(1), Theil's T (Urban)	0.158	0.233	0.268
	(0.014)	(0.022)	(0.019)
GE(1), Theil's T (Rural)	0.137	0.178	0.209
	(0.009)	(0.009)	(0.013)

Note: Numbers in parentheses are standard errors. Linearized standard errors of point estimates are in round parentheses. Standard errors for Gini coefficients are based on the STATA code of Jenkins (2008), which uses the method of Kovacevic and Binder (1997). Standard errors for Theil's T index are based on the STATA command of Biewen and Jenkins (2006), which uses the method of Woodruff (1971).

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

Analysis of these data supports the hypothesis that the true population levels of inequality did increase. From Table 11, the measured increase in inequality observed over the decade 1992-93

to 2002-03 (LECS 1 to LECS 3) was, in all cases, statistically significant at the 95 percent confidence level and all cases but one (the Gini coefficient in rural areas), significant at the 99 percent confidence level.[11] The measured increases in inequality over the decade 2002-03 to 2012-13 (LECS 3 to LECS 5) were somewhat smaller than those seen over the previous decade and only one of the six measures (Gini coefficient in rural areas) increased significantly at the 95 percent confidence level. Over the two decades 1992-93 (LECS 1) to 2012-13 (LECS 5), all six measures increased significantly at confidence levels of 99 percent or better. This methodology can be applied to the estimated province-level values of the Gini coefficient (Table 7 above), calculated from expenditures per person, over the full two-decade period 1992-93 to 2012-13. Sample sizes are relatively small in some of these provinces, raising the standard errors of the estimates. The Gini coefficient increased in all 17 provinces and the increase was statistically significant at the 95 percent confidence level or above in about half of these provinces.

The above inequality estimates all rest on the analysis of household expenditures per person. But what if the unit of observation is household expenditures per adult equivalent? The LECS data support the required calculations for 2002-03 and 2012-13 but not for the previous decade. The results are shown in Table 12 and can be compared with those for the same years shown in Tables 10 and 11. Because the 'adult equivalent' weights are lower for children than adults, the more children in a household, the larger will be its expenditure per adult equivalent relative to its expenditure per person. On average, poor households contain more children than richer ones (Andersson *et al.,* 2006). Consequently, data on expenditure per person are more widely spread. Comparing Table 12 with Table 10, the estimated levels of inequality are lower in all cases using expenditures per-adult-equivalent data than per-person. Nevertheless, the percentage change in estimated inequality is very similar and these changes are more highly significant using expenditures per-adult-equivalent than per-person.

The evidence supports the view that inequality has indeed increased within Laos, and that the sample-based increases in estimated inequality cannot reasonably be attributed to sampling error.

[11]The null hypothesis is that the true population value did not change. A *p*-value of 0.05 means that this hypothesis can be rejected with 95 percent confidence, because if the null hypothesis was true the observed sample-based difference could have occurred randomly only with a probability of 0.05.

Table 11. Changes in measured inequality of household expenditures per person, 1992-93 to 2012-13

	1992-93 to 2002-03			2002-03 to 2012-13			1992-93 to 2012-13		
	Change	*p*-value of change	Percent change	Change	*p*-value of change	Percent change	Change	*p*-value of change	Percent change
	Measured as expenditure per person								
Gini Coefficient (National)	0.036*** [0.011]	0.001	12	0.017* [0.010]	0.085	5	0.053*** [0.012]	0.000	17
Gini Coefficient (Urban)	0.049*** [0.015]	0.001	16	0.025 [0.016]	0.119	7	0.074*** [0.015]	0.000	25
Gini Coefficient (Rural)	0.027** [0.012]	0.021	10	0.022** [0.011]	0.040	7	0.049*** [0.013]	0.000	17
GE(1), Theil's T (National)	0.060*** [0.016]	0.000	35	0.027 [0.018]	0.124	12	0.087*** [0.016]	0.000	51
GE(1), Theil's T (Urban)	0.075*** [0.026]	0.004	48	0.035 [0.022]	0.107	15	0.110*** [0.021]	0.000	70
GE(1), Theil's T (Rural)	0.041*** [0.013]	0.002	30	0.031* [0.016]	0.055	17	0.072*** [0.0016]	0.000	52

Note: ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent levels respectively. Numbers in square parentheses are z-statistics. *p*-values are calculated using the methods of Barrett and Pendakur (1995) and Davidson and Duclos (2000).
Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

Table 12. Levels of changes in inequality of household expenditures per adult equivalent, 2002-03 to 2012-13

	Level: 2002-03 (LECS 3)	Level: 2012-13 (LECS 5)	Change: 2002-03 to 2012-13		
			Change	*p*-value of change	Percentage change
Gini Coefficient (National)	0.332 (0.004)	0.350 (0.008)	0.018** [0.009]	0.044	5
Gini Coefficient (Urban)	0.344 (0.011)	0.365 (0.010)	0.021 [0.015]	0.157	6
Gini Coefficient (Rural)	0.294 (0.005)	0.317 (0.006)	0.023*** [0.008]	0.003	8
GE(1), Theil's T (National)	0.213 (0.009)	0.240 (0.010)	0.027** [0.013]	0.044	13
GE(1), Theil's T (Urban)	0.226 (0.023)	0.256 (0.019)	0.030 [0.030]	0.314	13
GE(1), Theil's T (Rural)	0.165 (0.008)	0.195 (0.011)	0.030** [0.014]	0.027	18

Note: Numbers in round parentheses are standard errors and numbers in square brackets are z-statistics. See notes to Tables 10 and 11. Regarding calculations per adult equivalent, see notes to Table 9.

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

5. Inequality Within and Between Groups

Do the increases in measured inequality documented above arise from increased inequality between major socio-economic groups or within them? For example, suppose between-province differentials, or rural-urban differentials were responsible for the rise in overall inequality? If so, then if the policy objective was to address the rising inequality, this finding would have potentially important policy implications. If differentials between ethnic groups was a major source of rising inequality, the implications could potentially be even more serious.

Our analysis uses data on household expenditures per person to compute the GE(1) index, also known as the Theil T index, a member of the Generalized Entropy (GE) class of inequality measures.[12] The GE class has the unique feature that both levels and changes in measured inequality can be decomposed exactly into within-group and between-group components.[13] Our central interest in this paper is the long-term increases in measured inequality documented above. Accordingly, our focus is the extent to which within or between group factors are associated with increased inequality and we consider the longest period of analysis that the data can support.

We shall decompose changes in inequality within and between groups, using the methods described by Cowell (1995) and Litchfield (1999), according to five household groupings: (i) provincial location; (ii) rural vs. urban residence; (iii) educational attainment of the household head; (iv) ethnicity of the household head; and (v) sector of employment of the household head.[14] For groupings (i), (ii) and (iii) the LECS data support the decomposition over the full two decades of the data, enabling comparison of 1992-93 with 2012-13. For groupings (iv) and (v) the LECS data do not support these calculations for 1992-93 and we present comparisons only for the decade 2002-03 to 2012-13.

Tables 15 and 16 now decompose the changes in measured GE(1) inequality according to these five groupings. The percentage share of the total increase in inequality contributed by rising *within*-group inequality (final column) was 94 (provincial location), 100 (rural-urban location),

[12] The analysis was also performed using GE(0), the Theil L measure, also known as mean log deviation, which is more sensitive to changes at the lower end of the distribution, and the less commonly used GE(2) measure, more sensitive to changes at the upper end of the distribution (Cowell, 1995). The findings were qualitatively similar to GE(1) and for brevity we present only the GE(1) results.

[13] This decomposability feature is not possessed by the Gini coefficient. Neither the level nor the change in the Gini coefficient can be decomposed into within-group and between-group components, except with a residual that lacks a simple intuitive interpretation (Aronson and Lambert, 1993; Cowell, 1995).

[14] Provincial location means location of the household among the 17 provinces listed in Table 7. Rural / urban means whether the residence of the household is classified as rural or urban. Educational attainment means the highest level of education attained by the household head among the five categories listed in Table 13. Ethnicity means the ethnicity of the household head among the four categories listed in Table 8. Sector of employment means the sector in which the household head is primarily employed among the five categories: farming and livestock, manufacturing, construction, trade, and other services.

84 (educational attainment), 104 (ethnic group) and 96 (sector of employment). In every case, within-group increases in inequality heavily dominated between-group changes. Between-group increases were either minor (provincial location, educational attainment and sector of employment) or non-existent (rural-urban residence and ethnicity).[15]

Table 13. Level and change of inequality of expenditure per person, classified by formal education, level of household head, 1992-93 to 2012-13

Classification	1992-93 (LECS 1)	2012-13 (LECS 5)	Change: 1992-93 to 2012-13		
			Absolute change	*p*-value of change	Percentage change
Classified by education of household head					
None	0.151	0.200	0.049***	0.005	33
	(0.009)	(0.015)	[41.29]		
Primary	0.164	0.216	0.052***	0.003	32
	(0.018)	(0.013)	[33.32]		
Lower secondary	0.142	0.217	0.075***	0.258	25
	(0.014)	(0.017)	[13.28]		
Upper secondary	0.148	0.259	0.111***	0.014	85
	(0.026)	(0.043)	[7.88]		
Tertiary	0.149	0.267	0.118	0.000	88
	(0.017)	(0.025)	[11.82]		
Memo item:	0.171	0.258	0.087***	0.000	51
Total population	(0.010)	(0.012)	[0.016]		

Notes: The measure of inequality is the Theil T (GE(1)) measure, based on expenditure per person. Numbers in round parentheses are standard errors and numbers in square brackets are z-statistics. See notes to Tables 10 and 11.

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

[15] This conclusion on the role of ethnicity must be qualified by the fact that LECS data on ethnicity are unavailable for 1992-93.

Table 14. Level and change of expenditure inequality per person, classified by formal education and sector of employment, 2002-03 to 2012-13

Classification	1992-93 (LECS 1)	2012-13 (LECS 5)	Change: 1992-93 to 2012-13		
			Absolute change	*p*-value of change	Percentage change
Classified by ethnicity of household head					
Lao Tai	0.229	0.252	0.022	0.270	10
	(0.015)	(0.015)	[0.020]		
Mon Khmer	0.137	0.184	0.047	0.080	34
	(0.010)	(0.024)	[0.027]*		
Chinese Tibetan	0.114	0.165	0.051	0.193	45
	(0.015)	(0.035)	[0.039]		
Mon Mien	0.161	0.218	0.057	0.181	35
	(0.015)	(0.036)	[0.043]		
Classified by sectoral employment of household head					
Farming	0.177	0.206	0.029**	0.020	16
	(0.006)	(0.011)	[0.012]		
Manufacturing	0.340	0.257	-0.083	0.724	-24
	(0.076)	(0.028)	[0.081]		
Construction	0.202	0.224	0.029	0.445	11
	(0.024)	(0.016)	[0.028]		
Trade	0.265	0.174	-0.091	0.263	-34
	(0.037)	(0.029)	[0.047]		
Other services	0.201	0.274	0.073**	0.031	36
	(0.016)	(0.030)	[0.034]		
Memo item:	0.231	0.258	0.027	0.124	12
Total population	(0.012)	(0.013)	[0.018]		

Notes: See notes to Table 11. The measure of inequality is the Theil T (GE(1)) measure, based on household expenditures per person.

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

Table 15. Decomposition of changes in inequality within and between provinces, rural/urban areas and educational groups, 1992-93 to 2012-13

GE (1) measure of inequality	1992-93 (LECS 1)	2012-13 (LECS 5)	Change: 1992-93 to 2012-13 Absolute change	*p*-value of change	Percentage change	Percentage of change due to
Decomposition within and between provinces						
Within provinces	0.138	0.220	0.082***	0.000	60	94
Between provinces	0.033	0.038		0.004	15	6
Decomposition within and between rural / urban areas						
Within rural/urban	0.144	0.232	0.088***	0.000	61	100
Between rural/urban	0.027	0.027	0.000	0.941	0	0
Decomposition within and between educational attainment categories						
Within educational categories	0.157	0.227	0.070***	0.000	45	84
Between educational categories	0.014	0.031	0.017***	0.000	21	16
Memo item:						
Total Inequality	0.171	0.258	0.087***	0.000	51	100

Notes: See notes to Table 11. The measure of inequality is the GE(1), Theil T index, based on household expenditures per person.

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

Table 16. Decomposition of changes in inequality within and between ethnic groups, farm/nonfarm location and sector of employment, 2002-03 to 2012-13

			Change: 1992-93 to 2012-13			
GE (1) measure of inequality	1992-93 (LECS 1)	2012-13 (LECS 5)	Absolute change	*p*-value of change	Percentage change	Percentage of change due to
Decomposition within and between ethnic groups						
Within ethnic groups	0.208	0.236	0.028	0.126	13	104
Between ethnic groups	0.023	0.022	-0.001	0.181	-4	-4
Decomposition within and between sector of employment						
Within sectors	0.198	0.229	0.031	0.126	13	96
Between sectors	0.024	0.029	0.005	0.617	4	4
Memo item:						
Total Inequality	0.231	0.258	0.027	0.124	12	100

Notes: See notes to Table 11. The measure of inequality is the GE(1), Theil T index, based on household expenditures per person.

Source: Authors' calculations, using LECS data from Lao Statistics Bureau (LSB), Vientiane.

6. Conclusions and Policy Implications

Over the past three decades Laos has moved from a highly regulated and closed socialist economy to one far more market-oriented internally and more open to world markets. Some increases in inequality may be inevitable and even necessary in a poor country undertaking such a wide-reaching program of economic reform, starting from the repressed economic conditions of the mid-1980s. The available evidence shows that over the past two decades, for which household survey data are available, the distribution of private household expenditures has indeed become more unequal, with the Gini coefficient rising from 0.311 to 0.364, even though the incidence of absolute poverty has halved, from 46 to 23 percent.

The sample-based data on which these statements are based indicate that the measured increase in inequality and decline in poverty are both statistically significant. Inequality has increased throughout the country, within all major socio-economic categories. When the data are decomposed according to provincial location, rural and urban areas of residence, educational attainment, ethnicity and sector of employment, the increase in inequality *within* groups dominates any changes between groups. But the underlying reasons for this increase in within-group inequality remain largely unexplored.

The above findings are relevant for policy formulation. As noted above, the Lao government's 8th Five Year Development Plan emphasizes increased disparities between rural and urban areas and between regions, and the relative stagnation of remote rural areas. The policy initiatives mentioned in response to these disparities focus on finding ways to reduce between-group inequality – between rural and urban areas and between regions – through 'more balanced regional and local development' (pp. 106-116).

Reducing between-group inequalities of the kind identified in the Plan is surely important. Nevertheless, the findings of the present study show that this approach overlooks the main sources of persistently increasing inequality over the past two decades, residing overwhelmingly *within* and not between the groups mentioned. Two important research questions are suggested by these findings. First, what economic or other forces have driven the increase in within-group expenditure inequality? Second, how might public policy mitigate these drivers of increasing inequality without at the same time jeopardizing continued reduction in poverty incidence?

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