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Socioeconomic Advance in the Republic of China (Taiwan):

An Intertemporal Analysis of Its Quality of Life Indicators

By CHARLES H. C. KAO and BEN-CHIEH LIU*

ABSTRACT. The significance of *economic development* in the *Republic of China* on *Taiwan* cannot be adequately recognized without a concomitant assessment of the *social changes* that have taken place over the last 30 years. The concept of *social indicators* as measures of such changes is explored and their applicability to the island determined. Levels of the *quality of life* from different periods are studied and their advances analyzed. Taiwan's levels are compared with those of *developed countries* and of the *People's Republic of China (Mainland China)*. Taiwan's show evidence of remarkable progress. The impacts of *energy* developments and of the *recession's* deterioration of *foreign trade* have threatened the rate as well as the absolute level of this *progress*.

I

Introduction

THE SIGNIFICANCE of the Republic of China (R.O.C.) or Taiwan's economic development cannot be fully appreciated without a concomitant evaluation of its social changes, since the latter are frequently considered as the potential trade-offs of the former. Empirical data on developing nations have shown that it is easier to improve economic indicators such as the growth rate of gross national product (GNP) per capita than to improve social conditions such as the distribution of family incomes, public health, housing services, etc. Having had an early awareness of those possible social trade-offs or conflicts between economic and social goals, the Chinese government in Taiwan has devoted special attention and effort to improving various social and environmental concerns affecting the country's overall quality of life. At

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the same time it was pressing a program for industrialization and accelerated economic growth.

The government has long recognized that economic development would mean little if the goods and services produced could not enhance the standard of living for the majority of the nation's population. In the view of the economic planners, the ultimate test of successful development should be measured not only by those aggregate economic efficiency indicators alone, but also by such social indicators as the distribution of income, health and educational services, and housing and environmental enrichment.

Economists and other social scientists worldwide have attempted in recent years to develop a host of such socioeconomic indicators and termed them "quality of life" (QOL) indicators. The effort is intended not just to compensate for the weaknesses and limitations of economic indicators, but more importantly, to measure the social and environmental progress and/or retrogression of a nation over time.

This paper will explore the concept of social indicators and analyze the quality of life indicators in Taiwan for a period of 20–30 years. It will make an international assessment of the quality of life indicators among developed nations and also for Mainland China. The impact of energy developments on Taiwan's economic growth will be discussed and future influences on Taiwan's QOL improvement suggested.

II

The Concept of and the Need for Social Indicators

A SOCIAL INDICATOR REPRESENTS and measures wherever possible certain aspects of the progress or retrogression of such processes or activities as industrialization, health, welfare, and educational services, areas of special concern to society. Interpreted in this broad sense, "social indicators" as a measurement of the social aspects of life become an integral part of "development indicators."¹

As pointed out by the U.N. Bureau of Social Affairs, "The separation between social and economic development is often an artifact of academic analysis and government departmentalization." Professor Benjamin Higgins suggested: "Perhaps instead of talking about 'social aspects of economic development,' we should talk about development."² To many social scientists, the ultimate goal of development is an improvement of the social welfare for all people, rather than merely raising the "standard of living" for any particular group or groups.

Jan Drewnowski noted that, in recent years, "Lists of social indicators have been compiled and various analytical procedures applied to them. Not only individual researchers but high-powered official bodies have been engaged in that exercise."³ At the same time, he cautioned that "The day when the traditional economic indicators will come to be replaced by social indicators in measuring the progress of development is still far off. It is not yet clear which of the many suggested social indicators are fit to serve the purpose."⁴

Regardless of the emphasis placed upon economic performance or social conditions, an indicator's major function is to measure a given phenomenon— income, education, health, pollution, etc. The purpose of this measurement is often to reflect progress or retrogression. An indicator must also be a serial measurement which can be used to discover a relative trend. When an economic and social variable is used as an indicator, it is not the indicator itself that is meaningful but, rather, what it points out. The infant mortality rate or school enrollment ratio by itself does not mean much, but it becomes enlightening when interpreted as an indicator of the changes in public health or educational progress over a particular period of time.

A "good" indicator should also reflect many more facets than what it directly measures. For example, the "expectation of life at birth" is considered a "good" indicator because it reflects the availability and accessibility of medical and housing services, and the level of nutrition, diet, literacy, family income, etc. But, most importantly, it indicates the direction and magnitude of the person's expected lifetime.

Indicators are used in different combinations for different purposes. They can serve as warning signals of undesirable trends in a nation, or as a basis for assessing the performance of development programs and institutions. Specifically, they may be used (1) to describe trends and to diagnose a particular development situation; (2) to analyze interrelations and trade-offs between variable policies and activities; (3) to predict future trends or likely outcomes; and (4) to assess and evaluate a program's efficiency and effectiveness. These uses, like the indicators themselves, may overlap and are frequently inseparable. Sometimes the indicators may be misleading, misinterpreted, and malfunctioning if the built-in weaknesses and strengths of those indicators are not fully understood.

III

An Assessment of the Quality of Life in Taiwan

"QUALITY OF LIFE" (QOL) is a new name for the older terms "general welfare" or "social well-being." The QOL concept or the social indicator movement

has been a response to the need for information on social conditions related to a variety of dimensions of our welfare concerns and the dynamic process of development. As a result, there are as many QOL definitions as there are people. According to Liu, QOL may be defined as the output level of a certain social production function encompassing two different but often interdependent input categories—physical inputs which are objectively measurable and transferable, and the psychological inputs which are subjectively, ordinarily differentiable but usually not comparable between persons.⁵ Recently, Barker and Fox have introduced the basic units of ecobehavioral science, behavior settings, to the arena of QOL measures.⁶ The use of more than 30 and 100 variables respectively in the work of the Organisation for Economic Cooperation and Development (OECD) and Liu's empirical work has shown that the content of development is multi-faceted.⁷ It is no longer acceptable for a developed society to achieve a higher income per capita without commensurate improvement in its national health represented by the social and environmental quality of life. In a broader sense, quality of life embraces all human and physical aspects of individual life and group interaction—economic security, political integrity, social equality, cultural enrichment, and environmental improvement. In developed countries, people now believe that a "balanced society" where both economic and non-economic conditions are improving is preferable to an unbalanced one.

The growing public interest in social and environmental conditions in the world has led to the search for indicators designed to reflect the overall "health" of the nation and the well-being of its citizens. For the Chinese and their government, the implication is that economic growth should not be pursued without giving due consideration to social development. Both efficiency and equality measures have always been considered simultaneously as criteria vital to the improvement of national well-being in Taiwan.

The following is an assessment of QOL indicators for Taiwan in terms of its income distribution, educational attainment, individual equality, health and welfare measures, and the command over goods and services such as food, clothing, housing and transportation, as developed in Liu's QOL model for U.S. states and cities and OECD's model for its member countries.

Income Distribution

The relationship between growth and income distribution has aroused increased attention in recent years. The key issue involved is whether rapid growth in a developing country must coincide with a worsening distribution of income as Arthur Lewis claimed from the theoretical point of view, or as

S. S. Kuznets found on the basis of a cross-sectional comparison. In Taiwan, Kuo observed that, during the period 1964–72, the ratio of the income share of the top 10 percent to that of the bottom 10 percent of the population dropped from 8.63 to 6.83, and the ratio of the income share of the top 20 percent to that of the bottom 20 percent decreased from 5.33 to 4.57. The Gini coefficient also dropped from 0.328 to 0.301.⁸

In a more comprehensive study by Fei, Ranis and Kuo,⁹ Taiwan data were used to examine growth and family distribution of income by factor components. Their findings, based on sample survey data of Taiwan for selected years during 1964–72, show that worsening income distribution in the course of rapid development is not inevitable. They concluded that Taiwan's rural-oriented growth path not only enhanced the role of agricultural income as a family income distribution equalizer due to agricultural reform and productivity, but also permitted labor's relative share in non-agriculture to rise as a consequence of increasing labor absorption rather than raising real wages.

Based on his evaluation of empirical data, Little believed that, despite some sample data discrepancies, "Taiwan's income is exceptionally equally distributed for a developing country." He argued that factors contributing to Taiwan's high labor-intensive growth can also be taken as contributing to equality.¹⁰

The income equality achieved in Taiwan is more apparent when compared to 28 developed and developing countries whose data are available in the 1980 World Development Report. In comparing the household income share of the highest 20 percent to that of the lowest 20 percent, Taiwan has the lowest ratio (4.5 to 1.0) among all these countries. The data showed that the income gap in developed countries is generally much smaller than that of developing countries except for Taiwan, Sri Lanka, India, and South Korea.

After examining the growth of and structural changes in Taiwan's economy from the early 1950s to the early 1970s, Kuznets concluded, with some qualification on data limitations, that "Despite the rapid shifts in the production and use structure, there is no evidence of widening inequality in the sharing of gains from growth among various groups of households in the population."¹¹

It is therefore fair to suggest that Taiwan's income distribution pattern was more equitable than that of any other country during the 1960s and 1970s. The economic progress made on the island had been, by and large, shared by people of all income strata.

Educational Attainment

Educational attainment is an important aspect of the quality of life, as well as an important means to achieve more equitable income distribution. Two

educational policies in Taiwan have been the important contributing factors: an easily accessible education and the low tuition for higher education. The effectiveness of these policies can be seen as the country saw a rapid increase in student enrollment at every level as well as growth in educational spending in the past two decades. The data for the period 1952–80 show:

The number of schools, teachers, and students at every level has increased significantly.

The number of students as a percentage of the total population has increased steadily, particularly at the secondary level.

The number of students in higher education has increased in every field, particularly in the social sciences and engineering. In engineering, there was almost a 44-fold increase in enrolled students from 1952 to 1980.

The percentage of graduates entered in the next higher level of school was high. In 1980, 99.7 per cent of all school-aged children were enrolled in primary schools and 79.9 per cent of all senior high graduates were admitted to higher education institutions.

The availability of educational opportunities through mass expansion of educational facilities has raised the aspirations of the people, particularly the children of low-income families, and has contributed to the improvement of their income earning potential and hence their quality of life.

Individual Equality

All Chinese residents of legal age are eligible to vote and those who meet the necessary qualifications can run for public office. Participation in political activities has long been recognized as one measure of individual equality—an equal opportunity to serve the public. In a study of the background of members of the Taiwan Provincial Assembly for the period 1951–70, it was concluded that there has been a real increase in political participation by the people of Taiwan at all levels. Opportunities for the attainment of positions of political influence have been expanded in the past decade. The election of a sizable number of Taiwanese people into the parliamentary bodies, the Executive Yuan, the top positions of the ruling party and the Vice Presidency of this country represents a significant improvement in political equality.

Unlike many Western nations, R.O.C./Taiwan has not adopted the application procedures in admitting students to senior high, colleges and universities. Similar to other Asian nations such as Japan and Korea, admission to higher education is based entirely on a written examination held in the summer. Despite its many obvious disadvantages, one significant advantage is that this examination process is open, fair, and objective. Individuals of any social status have equal opportunity to compete for admission.

To insure that those who have passed the examination would not be denied their educational opportunity for financial reasons, the government has deliberately pursued a low-tuition policy for public colleges and universities: (1)

The tuition in public higher institutions has remained unchanged from 1968 to 1975. Other fees were increased only moderately four times during this 11-year period. The tuition and fees have increased slightly since 1975, but the rate of increase has also been smaller than that of the consumer price index or of income per capita; (2) The total amount of tuition and fees as a percentage of national income per capita has been declining since 1969. It was only 12.7 percent in 1982 compared to 30 percent in 1969. In 1982, tuition and fees for a whole academic year in a public university amounted to less than US \$300.

Health and Welfare Measures

Professor T. S. Schultz has often emphasized that health is another important form of human investment, in addition to education, training, and migration. The availability and the accessibility of medical care, along with the welfare services provided to the needy, are key aspects of the quality of life. Many indices such as the number of physicians, dentists, nurses, hospital beds per 100,000 population, infant death rate, per capita public expenditure on public welfare, unemployment compensation, public assistance per recipient to the elderly, to low-income families and dependent children are used to measure the present state of health and welfare.

Comparing 1961 to 1979, we find a steady improvement in several major health areas: (1) the number of public hospitals and clinics increased from 1,089 to 1,230 and the number of private ones reached 9,618 in 1979; (2) total persons served by each health and medical facility dropped from 10,240 to 1,596; (3) the number of medical and para-medical personnel per 10,000 population increased from 12 to 23; (4) the number of beds per 10,000 population increased from 4 to 21; (5) the crude death rate and infant mortality rate dropped from 9.9 and 91.2 per thousand respectively in 1952 to 4.7 and 24.1 in 1979; and (6) the life expectancy at birth rose rapidly from 58.6 years to 70.7 while the maternity mortality rate dropped from 2 to 0.2 per thousand during the same period.

The "life expectancy at birth" indicator (71 years in 1979) in Taiwan is almost as high as that in the United States or the United Kingdom (both 73 years in 1978).

Despite steady progress in public health, the distribution of medical facilities and personnel and the delivery of medical care are uneven between rural and urban areas in Taiwan. Rural-area and remote village populations have not received adequate attention. Medical insurance has yet to be extended to cover dependents of civil service employees. Free medical care to the aged and the poor, though costly, should be given top priority.

The concept of "Western welfare"—a comprehensive package of programs consisting of a national health plan, social security, unemployment compensation, etc., has not been widely accepted. The Chinese tradition praises frugality and self-reliance. For most Chinese people, receiving welfare payments from the government is disgraceful. The government believes its responsibility is to create jobs, not to give direct payments. Traditionally strong Chinese family ties, though slowly weakening, minimize the need for such welfare programs.

In recent years, however, economic recessions and mounting medical costs have accelerated the local needs for more comprehensive welfare programs. The need for more social programs is, however, consistent with the federal government policy in improving the living conditions for the middle- and low-income families and the special attention which is given to civil service employees and military personnel. Periodic adjustments of basic wages and salaries, improvement of pension systems, expansion of labor insurance and medicare for government employees are major measures employed for the promotion of social welfare.

Food, Clothing, Housing, and Transportation Consumption

Finally, the improved quality of life still depends upon command over basic necessities—physical and biological needs—such as food, clothing, housing, and transportation. The following will summarize the changes in those indicators in Taiwan.¹²

The average daily per capita caloric intake in Taiwan rose from 2,078 calories in 1952 to 2,845 calories in 1979; protein intake, from 49 grams to 79 grams during the same period. As a result of continued improvement in nutrition, the incidence of illness caused by malnutrition has greatly diminished while that of diseases ascribable to excessive nutrition has been on the increase.

Annual per capita consumption of cotton textiles increased from 5 pounds in 1952 to 6.8 pounds in 1975. That of synthetic fiber and woolen fabrics, both of which were unobtainable in 1952, was respectively 13.3 lbs. and 0.4 lb. in 1975. The present emphases are on presentable and fashionable clothing.

Per capita housing space was 78 sq. ft. in 1965. By 1975, the figure grew to 137 sq. ft. and in 1979, 72 per cent of the population lived in houses they owned. The ratio of electricity users to the total population rose from 29 per cent in 1952 to 94 per cent in 1978; that of city water users, from 29 per cent to 64 per cent in the same period. In addition, most newly built apartment houses are equipped with modern built-in appliances.

Besides improvement in such means of mass public transportation as railroads and highways, there has also been a vast increase in the number of private conveyances—automobile ownership jumped from 1 per 1,000 people in 1952 to 32 in 1979; and motorcycles from less than 1 to 192 per thousand in that period. Telephones also increased significantly from 4 to 148 per 1,000 population during this period.

IV

International Comparison of the Quality of Life Indicators¹³

TWO RECENTLY COMPLETED STUDIES conducted respectively by the Overseas Development Council (ODC) of Washington, D.C., and Dr. Liu of Liu and Associates, Inc., placed Taiwan's quality of life in an international context. *Time Magazine* has also shed new light on Taiwan's quality of life by comparing it with that of Mainland China.

ODC's Physical Quality of Life Index

The ODC study developed a simple but operational index called Physical Quality of Life Index (PQLI) for international comparison. Its analysis shows where Taiwan stands economically and socially in good comparison with more than 150 countries.

Each country's PQLI rating is based on the average of its index ratings for life expectancy, infant mortality, and literacy in the mid-1970s. Taiwan's per capita GNP was ranked 68th, but its PQLI was as high as 32nd, reflecting the success of its efforts in achieving a better quality of life. From data compiled by the ODC, most of the 14 variables included in the study indicate that Taiwan is in the top 30th percentile. One exception to this overall favorable picture is per capita public educational expenditure. It was ranked 86th. Taiwan's death rate was ranked 154th out of 160 countries, meaning 153 countries have death rates higher than those in Taiwan.

Liu's Quality of Life Indicators

Liu's study was much more comprehensive. He developed a composite quality of life (QOL) indicator model which consists of five major components—social, economic, energy and environmental, health and education, and national vitality and security with a host of subcomponents. Using cross-national data for 1975, and with more than 50 standardized variables, 32 developed countries and the Republic of China (Taiwan) were ranked according to their standardized composite QOL indexes. Of the 33 countries evaluated, Taiwan ranked 20th in the social component; 32nd in economic component; 28th in health and education component; 28th in environment

component; 5th in national vitality and security component. It was rated the 30th in Liu's overall quality of life comparison.

Liu concluded that the Republic of China (Taiwan), although a developing nation based on GNP per capita, rated relatively favorably in his rather comprehensive QOL study. Three other countries, Uruguay, Argentina, and Chile, were ranked behind Taiwan in terms of their overall QOL index despite their higher GNP per capita.

Time Magazine's Comparison: Taiwan vs. Mainland China

Using PQLI along with per capita GNP and a political freedom index, *Time Magazine* examined the economic achievements and problems of five economic systems: the Marxist-Leninist, the Social Democratic, the Third World Socialist, the Mixed Economy, and the Capitalist. Taiwan was ranked next to Japan and Singapore, but ahead of other Asian nations.

To compare the actual performance of socialism vs. capitalism, *Time* cited

Table 1
SELECTED INDICATORS IN SELECTED COUNTRIES

Country	Per Capita GNP	Physical Quality of Life Index	Political Freedom Index
United States	7,890	94	100
Japan	4,910	96	92
R.O.C. (Taiwan)	1,070	86	42
Mainland China	410	57	17
Singapore	2,700	83	33
South Korea	670	82	33
North Korea	470	--	0
Philippines	410	71	33

Source: *Time Magazine*, March 13, 1978, pp. 26-27.

four pairs of countries: North Korea vs. South Korea; Mainland China vs. Republic of China; Tanzania vs. Kenya; USSR vs. USA. Tables 1 and 2 reproduce the comparison of Republic of China vs. Mainland China. Of the seven indicators selected, Taiwan is ahead of Mainland China in every category. The reality reveals that the socialist promise, however appealing, remains largely unfulfilled.

V

Income, Energy, and Quality of Life

IS ENERGY CONSUMPTION VITAL to maintaining a certain level of quality of life? Recognizing that both income per capita and energy consumption are critical determinants of QOL, how important is one versus the other? What impacts

will the skyrocketing price increases in imported oil have on Taiwan's QOL? This section is aimed at providing some useful information on these questions.

In an empirical study conducted by Liu and Anderson,¹⁴ it was found that among the 50 countries (Taiwan inclusive) with per capita incomes exceeding \$1,000 in 1975, there was a stronger correlation and a clearer pattern between QOL and energy consumption indexes than that between QOL and income per capita. Their regression results show that QOL is significantly and positively affected by energy consumption and production, with R^2 being equal to 0.68.

In contrast, although QOL is found to be positively affected by the real income per capita, the effect is increasing at a declining rate as income continues to grow, *i.e.*, the squared income variable was estimated with a statistically significant but negative sign. The R^2 in this model was 0.53, lower than that obtained from the model containing only the energy variables. When

Table 2
COMPARATIVE ECONOMIC DATA, R.O.C./TAIWAN AND MAINLAND CHINA

	R.O.C. Taiwan	Mainland China
Growth Rate in Real GNP per capita 1970-75	5.7	5.3
Per Capita Public Spending on Education	\$47	\$10
Per Capita Public Spending on Health	\$20	\$2
Hours of Work to Buy a Pair of Shoes	7	20
Radios per 1,000	240	16
Autos per 1,000	22.5	0.1
Calories per Capita per Day	2,791	2,330

Source: Time Magazine, March 13, 1978, p. 35.

other determinants of QOL such as life expectancy rate, arable land per capita, adult illiteracy rate, population per physician available, etc. were also included in the QOL determination model, the income variable became insignificant whereas the energy consumption variable was still significant. The explanatory power of this final model was extremely high, with R^2 equal to 0.93.

The energy consumption intensity measure in Taiwan in terms of per capita kilograms of coal equivalent to income per capita was 1.34, almost 49 per cent higher than the average of the 50 countries being studied. However, as far as the electric production intensity measure is concerned, Taiwan's 23 billion kilowatts production weighted by its per capita income of \$1,070 fell behind the international average by some 45.5 per cent. This indicates a disparity between energy consumption and electrical power production.

The dependence of Taiwan's QOL on power production and energy

consumption is comparable to its reliance for per capita GNP growth on foreign trade. As foreign trade expanded, Taiwan's economy expressed in real income per capita rose, and so did the consumption of energy and the net import of primary energy. For instance, the domestic consumption of final energy increased from 4.0 GW/yr in 1960 to 27.4 GW/yr in 1979. The net import of primary energy also jumped from 26 per cent of total supply to 82 per cent during this period. Of the primary energy imported, about 88 per cent was petroleum.

Actions taken by the Organisation of Petroleum Exporting Countries (OPEC) in the 1970s have increased sharply the relative price of energy in Taiwan. As Taiwan's power production is vitally dependent on imported oil, the price increases manipulated by OPEC not only have impeded Taiwan's energy production and consumption patterns domestically, but also have suppressed her potential for export internationally.

As a result, the QOL in Taiwan has recently been unduly impacted by the oil price increases because of Taiwan's extremely high dependence on both imported primary energy and foreign trade. In order to further enhance the overall social well-being of Taiwan, the existing energy pricing policy in general, and power production and consumption patterns in particular, must be reevaluated to develop a more efficient energy mix system. Consequently, a more equitable distribution of energy consumption by sector can be achieved and a favorable balance of trade condition can be restored.

VI

Concluding Remarks

AS PROFESSOR ARTHUR LEWIS STATED, "The advantage of economic growth is not that wealth increases happiness, but that it increases the range of human choice."¹⁵ An improved quality of life—decent standards of living coupled with economic growth, more equitable income distribution, increased job opportunities and security, increased availability of, accessibility to, and direct participation in educational services, medical facilities, and social and political activities—has indeed widened the range of human choice in Taiwan. This has resulted from the farsighted and popular recognition that raising living standards through industrialization is necessary, but it is not the sufficient or ultimate goal of any national development policy. This is not to deny any problems or potential dangers in Taiwan's quality of life strategic planning. The following is a list of QOL considerations deserving prompt public attention and policy to cope with:

Pollution is becoming an increasingly severe problem.

Consumers' rights are not adequately represented or protected.

Natural environment is deteriorating steadily and arable land, forestry, and wild life are not well preserved or efficiently utilized.

Conspicuous consumption patterns are highly prevalent and much resources are wasted consequently.

Traffic safety and public sanitation need drastic improvement and open green areas in cities are drastically declining.

Music, art, drama, and other cultural activities, though becoming more popular, are short of talent and support.

The quality of education and medical service are not evenly distributed throughout the island.

Crime rates are increasing alarmingly and the traditional family structure, social value concept and the ethic system are being weakened gradually.

Despite these problems, most of which cannot be easily eradicated, the majority of people in Taiwan remain optimistic about its future quality of life. The most encouraging sign in recent years is the public awareness of these problems and their confidence in the government to deal with those shortcomings concerning future QOL enrichment. Members of the academic, science, and business communities, members of the literary circles, and overseas Chinese have been quite effective in articulating the need for improvement. These "citizen pressure groups," privately organized, have contributed towards advancing the common interests and common causes of all people in Taiwan.¹⁶

Taiwan must live up to the expectations of being one of the newly industrializing nations. The government and the people must join together to make the living environment richer and better. The importance of power production and energy consumption to QOL must be recognized and the imbalance between energy consumption and production, especially those in different sectors subject to different subsidy policies, must be studied and mitigated.

The analysis presented in this paper will hopefully aid government planners and civic leaders with some policy guidance in setting their priorities and directions. Taiwan passed the per capita income mark of US\$2,000 in 1980. If the people in Taiwan have the desire, dedication, and devotion to avoid most of the mistakes and pitfalls that many industrialized countries have encountered in the process of industrialization, the R.O.C. in Taiwan has indeed another rare opportunity of becoming one of the most well respected, affluent, happier and harmonious countries in the world.

Notes

1. Let us quote two more definitions of social indicators. One defines the term as "measures of aspects of social behavior and the quality of life." See Social Science Research Council, *The*

Behavioral and Social Sciences—Outlook and Needs (Englewood N.J.: Prentice-Hall, 1970), p. 101. The other defines it as a "measurement of social phenomena, which are transeconomic. It is normative (or finalized), and is integrated in a self-consistent information system." See Andrew Shornfield and Stella Shaw, eds., *Social Indicators and Social Policy*, SSRC (London: Heinemann Educational Books, 1972), p. 14. A brief review of literature is also found in Charles Kao, "Development Indicators and Their Implications to Taiwan's Economic Development," *Industry of Free Choice* (May, 1974), pp. 10–27.

2. UNESCO, *Approaches to the Science of Socioeconomic Development* (Paris: 1971), p. 24.

3. Jan Drewnowski, "Social Indicators and Welfare Measurements: Remarks on Methodology," *Journal of Development Studies* (April, 1972), p. 78.

4. *Ibid.*

5. See Ben-chieh Liu, *Quality of Life Indicators in U.S. Metropolitan Areas* (New York: Praeger Publishers, Inc., 1976) and "Quality of Life: Concept, Measure and Results," *American Journal of Economics and Sociology*, Vol. 34, No. 1 (January, 1975).

6. See Roger Barker, "Wanted: An Eco-Behavioral Science," in E. P. Williams and H. L. Raush, eds., *Naturalistic Viewpoints in Psychological Research* (New York: Holt, Rinehart and Winston, 1969); and Karl Fox, *Social Indicators and Social Theory* (New York: Wiley, 1974); and "An Eco-Behavioral View of Human Societies and Its Implications for Systems Science," *International Journal of Systems Science*, Vol. 14, No. 8 (1983).

7. Ben-chieh Liu, *op. cit.*, and Organisation for Economic Cooperation and Development, *The OECD List of Social Indicators* (Paris: OECD, 1982), p. 13.

8. Shirley Kuo, *Income Distribution by Size in Taiwan Area: Changes and Causes* (Tokyo: The Japan Economic Research Center), Vol. 1 (July 1975). In 1977, the ratio of the income share of top 20 per cent to that of bottom 20 per cent was further reduced to 4.21. See Kuo's paper, "Economic Growth and Structural Change in the Republic of China," March 1979 (mimeo). According to the latest data, the ratio was further reduced to 4.17 in 1980; *Central Daily News*, Overseas Edition, September 20, 1981.

9. John Fei, G. Ranis, S. Kuo, "Growth and the Family Distribution of Income by Factor Components," *Quarterly Journal of Economics* (February, 1978), pp. 17–53.

10. Ira Little, "An Economic Reconnaissance," in Walter Galenson, ed., *Economic Growth and Structural Change in Taiwan* (Ithaca, N.Y.: Cornell Univ. Press, 1979), pp. 498–500.

11. Simon Kuznets, "Growth and Structural Shifts," in Galenson, *op. cit.*, p. 127.

12. Figures cited in this section were from *Social Indicators of the ROC—1979 and Taiwan Statistical Data Book—1981* (Taiwan: The Executive Yuan, 1982).

13. Ben-chieh Liu, "Economic Growth and Quality of Life: A Comparative Indicator Analysis between China (Taiwan), U.S.A. and Other Developed Countries," *American Journal of Economics and Sociology* (January, 1980), pp. 1–21; Overseas Development Council, *The U.S. and World Development—Agenda 1977* (Washington, D.C., 1977); and *Time Magazine* (March 13, 1978), pp. 26–27 and p. 35.

14. Ben-chieh Liu and Claude Anderson, "Industrialization, Energy Requirement and the Quality of Life: An International Assessment," *Proceedings of the International Society for General Systems Research* (London, 1979), pp. 771–79.

15. Arthur Lewis, *The Theory of Economic Growth* (Evanston, Ill.: Irwin, 1955), p. 420.

16. For instance, the Center for Quality of Life Studies was established in August, 1980, and financed by the non-profit and private Ming Teh Foundation. The Center has been studying various aspects of Taiwan's QOL.