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Energy and Development

Extended Analysis and Implications

J.G. Leigh
J. V. Strasser
R.K. Trehan

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The MITRE Corporation
Metrek Division
1820 Dolley Madison Boulevard
McLean, Virginia 22102

ABSTRACT

This report describes the results of further analyses of the relationships between energy and indicators of economic and social development in Less Developed Countries. Policy implications for energy development assistance are drawn. This work is a continuing part of a broader effort to provide analytical support for policy development in the energy assistance programs of USAID. This report is a companion volume to the preliminary analysis previously published.

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The authors would like to express their appreciation for the helpful guidance and direction provided by Dr. Jerome Bosken of USAID. We would also like to express our appreciation for the support and helpful suggestions offered by Mr. Edward G. Sharp and Dr. Rodney K. Lay. Last but not least we would like to thank Ms. Margie Purkerson for looking after the typing and compilation of this report.

TABLE OF CONTENTS

	Page
LIST OF ILLUSTRATIONS	vi
LIST OF TABLES	vii
EXECUTIVE SUMMARY	ix
1.0 INTRODUCTION	1
2.0 POLICY IMPLICATIONS	7
3.0 AGGREGATE ENERGY AND ECONOMIC DEVELOPMENT	19
3.1 Conclusions	19
3.2 Approach	19
3.3 Data	20
3.4 Models Tested	22
3.5 Results	25
3.6 Discussions	29
4.0 SECTORAL ENERGY AND ECONOMIC DEVELOPMENT	39
4.1 Conclusions	39
4.2 Approach	40
4.3 Data	41
4.4 Models Tested	43
4.5 Results	47
5.0 THE ROLE OF NONCOMMERCIAL ENERGY IN LDCs	55
5.1 Conclusions	55
5.2 Approach	56
5.3 Data	57
5.4 Models Tested	59
5.5 Results	61
6.0 QUALITY OF LIFE ANALYSES	71
6.1 Conclusions	71
6.2 Approach	73
6.3 Data Limitations	76
6.4 Results	77
6.4.1 Factor Analyses	77
6.4.2 Unstratified Regression Analyses	82
6.4.3 Stratified Regression Analyses	87
6.5 Discussion	89
APPENDIX A - TABLES OF RESULTS	A-1
APPENDIX B - LISTINGS OF DATA BASES	B-1
APPENDIX C - STATISTICAL METHODOLOGY	C-1
REFERENCES	D-1

LIST OF ILLUSTRATIONS

Figure Number		Page
2-1	1960 and 1975 Values of Physical Quality of Life Index vs. Natural Logarithm of Commercial Energy Consumption Per Capita	12
2-2	1960 and 1975 Values for Physical Quality of Life Index vs. Natural Logarithm of Gross Domestic Product Per Capita	13
2-3	Example of a Middle Income LDC with High Correlation Between Energy Consumption and GDP (Republic of Korea)	15
2-4	Example of Low Income LDC with Low Correlation Between Energy Consumption and GDP (Kenya)	16
3-1	Example of a Middle Income LDC with High Correlation Between Energy Consumption and GDP (Republic of Korea)	30
3-2	Example of Low Income LDC with Low Correlation Between Energy Consumption and GDP (Kenya)	31
3-3	Example of an Oil exporting LDC Iran	35
5-1	Total and Noncommercial Energy Time Series (Brazil)	63
5-2	Proportion of Noncommercial Energy Time Series Energy Consumed (Brazil)	64
5-3	Industrial Energy Time Series (Brazil)	66
5-4	Proportion of Noncommercial to Total Energy Consumed by Industry	67
6-1	1960 and 1975 Values for Physical Quality of Life Index vs. Natural Logarithm of Gross Domestic Product Per Capita	72
6-2	1960 and 1975 Values for Physical Quality of Life Index vs. Natural Logarithm of Commercial Energy Consumption Per Capita	83

LIST OF TABLES

Table Number		Page
1-I	86 LDCs Used in the Analysis	3
3-I	Aggregate Energy-Economic Models Tested	23
3-II	Analysis of Energy and Investment Intensities	27
3-III	Mean Slopes and Coefficients of Determination for Energy Intensity	28
3-IV	Countries with Low Correlation Between GDP and Energy Consumption	33
3-V	Low Income LDCs with High Potential Benefit from Energy Assistance	37
4-I	Stratification of Countries for Detailed Sectoral Analyses	42
4-II	Sectoral Energy Models Tested	44
4-III	Analysis of Sectoral GDP-Energy Consumption Intensities	48
4-IV	Agricultural Productivity Regressions	50
5-I	Noncommercial Energy Models Tested	60
5-II	Residential Fuel Use Regressions - India	68
6-I	Factor Analyses of development Indicators: Factor Patterns	79
6-II	Factor Analyses of Rates of Change of Development Indicators: Factor Patterns	80
A-1	Per Capita Energy Consumption - GDP Time Series Regressions	A-2
A-2	Per Capita GDI-GDP Time Series Regressions	A-13
A-3	Sectoral Time Series Regressions	A-20
A-4	Noncommercial Energy Regressions	A-24

LIST OF TABLES (Concluded)

Table Number		Page
A-5	PQLI Regression Analysis (Unstratified)	A-28
A-6	PQLI Regression Analysis (Stratified)	A-30
B-1	Energy-GDP-Time Series Data	B-2
B-2	Aggregate Regression Analysis Data	B-23
B-3	Energy-GDP Sectoral Time Series Data	B-27
B-4	Agricultural Time Series Data	B-34
B-5	Noncommercial Energy Time Series	B-38
B-6	Residential Fuel Use in India	B-44
B-7	Quality of Life Data Base	B-46

EXECUTIVE SUMMARY

This report describes the results of quantitative analyses of the relationships between energy and development indicators for Less Developed Countries (LDCs). The purpose of this analysis is to provide insight on energy-economic-social relationships that will be useful in the formulation of both energy-specific and overall development assistance policy. This work is a continuation of an analysis previously performed. That analysis had shown strong relationships between energy consumption and both economic outputs and quality of life indicators in a cross-sectional analysis.

The analyses in this study have centered upon:

(1) the use of time-series data to delineate energy-economic relationships, and

(2) an examination of social, economic, and energy-related indicators to investigate patterns of social and economic development and the quality of life.

The scope of the work covers all developing countries, and a data base on eighty-six of them was compiled for conducting this analysis. These countries were organized by type of economy (agricultural, industrial, balanced, etc.) and per capita income level, with a dividing point of $250 per year between high and low income LDCs. The data coverage and quality ranged from acceptable for the major economic and energy indicators to poor and partial for some other indicators. In particular, noncommercial energy consumption data is of very limited coverage and contains many discrepancies.

Accordingly, the analyses have concentrated on commercial energy consumption, for which good data is available. Detailed sectoral energy and economic data were available for 16 countries, and these were subjected to further analysis. Major data sources used included World Bank economic data and United Nations energy consumption and demographic data. Sectoral energy data were taken from International Energy Agency reports.

The statistical techniques of regression analysis and factor analysis were used to examine relationships between energy consumption and indicators of social and economic development. These techniques can accurately determine correlation between variables. Correlation is a measure of the degree to which variables vary together, but does not indicate causality of the relationships discovered. A significance level of 5 percent was used for all hypotheses tested. That means there is at most a 5 percent chance of wrongly stating two variables to be correlated when they really are not.

The major results and policy implications which we have drawn from the results obtained in this analysis and our previous analysis are:

- Energy consumption and economic and social development are closely related, and the oil price rises in the 1970's slowed the economic development of the LDCs. Therefore, it can be inferred that energy assistance is a legitimate and useful way of promoting economic development.
- The output of the agricultural sector of LDCs economies increases much more with increased energy inputs than of the

other sectors of the economy. Therefore, the agricultural sector may be an attractive option for energy assistance.

- Different LDCs respond differently to energy input, thus energy assistance programs must be tailored to each country's needs and abilities.

- Nearly all countries follow a common pattern of development, in which increases in energy consumption, economic output and social welfare go hand-in-hand. Therefore, a broad based assistance program that includes various sources of energy should be pursued.

- Consideration should be given to using the strength and stability of the energy/economy/development relationship in a country as a factor in determining the quantity and type of assistance to be rendered.

In detail, the study revealed that per capita energy consumption and Gross Domestic Product (GDP) increase together within the majority of LDCs. Those few LDCs where GDP and energy consumption showed little relationship almost all had very low incomes, below $250 per capita per year. LDCs with per capita incomes above $250 show increasing GDP as energy consumption increases.

The size of increase in GDP per capita as energy consumption increased varied among LDCs. However, none of the possible factors we examined (level of GNP, urbanization, economy type, energy and oil self-sufficiency in oil importers, geographic region, culture) could explain the differences.

Sectoral GDP and energy consumption also increased together in most nations studied for each of the three sectors examined: industry, transportation, and agriculture. Surprisingly, this growth is not related to the population growth of the LDC; normalizing sector

output and energy consumption by population actually masks the trends.

Perhaps the most interesting result is that a unit increase in energy consumption appears to have by far the greatest impact in agricultural output. The increase in agricultural productivity frequently exceeds that of both industry and transportation by a factor of 10 or more, for example, in Brazil, Egypt, India, Korea, and Mexico. This result has significant policy implications: in many countries energy assistance to agriculture may be a most attractive option.

The drive towards industrialization being followed by many LDCs may thus not represent the best use of available energy resources in terms of economic development. However, increasing agricultural productivity requires the increased availablity of machinery and skilled labor, and often results in a net decrease in agricultural employment. In fact, the proportion of the labor force engaged in agriculture is declining in every nation examined. The workers displaced from agriculture must be provided with alternative employment if distress and social unrest are to be avoided. Therefore sectoral energy assistance to agriculture must not only be closely coordinated with other agricultural programs, but must be accompanied by other programs to provide economic employment for displaced laborers. An integrated approach to development is essential.

Noncommercial energy (i.e., energy which is not commercially traded) is a traditional source of fuel in most LDCs. However, as total energy consumption and GDP increase over time, noncommercial energy consumption remains stagnant. Thus, noncommercial energy appears to have little role in economic growth. Most commercial energy is nonrenewable, and, therefore, energy assistance should be broad based to include other than renewable energy sources. Although noncommercial energy is used primarily in subsistance living, it is also used as an industrial fuel in several LDCs.

The analysis of quality of indicators showed that all indicators (health, cultural, economic) improved together, rather than some set increasing before the other change. Because of this fact, indices other than the Physical Quality of Life would be equally indicative of societal change. A few countries do show exceptional patterns of development; Sri Lanka, for example, has a high quality of life associated with low economic development, and Mauritania has a low quality of life but high economic development.

1.0 INTRODUCTION

This report describes the results of quantitative analyses of the relationships between energy and development indicators for Less Developed Countries (LDCs). The purpose of this analysis is to provide insight on energy-economic-social relationships that will be useful in the formulation of both energy-specific and overall development assistance policy. This work is part of a broader effort to provide analytical support for policy development in the energy assistance programs of USAID, and forms a continuation of analyses previously performed.[1] This document must be regarded as a companion to the earlier work, which found strong energy-economy and energy-quality of life relationships, in a cross-sectional analysis. It also indicated that these relationships are influenced by cultural factors.

The analyses in this study have centered upon:

(1) the use of time-series data to delineate energy-economic relationships, and

(2) the examination of social, economic, and energy-related indicators to investigate patterns of social and economic development and the quality of life.

Relative to detailed development planning, there is an important need to look at energy-economic relationships in developing countries in detail. The objective is to discover specific areas in the economy of a developing country where energy development can have a major

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[1] The MITRE Corporation, Energy and Development: A Preliminary Analysis of Less Developed Countries, MTR-79W00216, 1979.

impact on economic and social progress. This analysis is intended to form a foundation upon which energy development planning may take place. The scope of the work covers all LDCs, and a data base covering 86 was used in these analyses (Table 1-I).

The previous study used regression techniques to perform cross-sectional analyses based on published data. This work goes beyond the previous study in three respects:

- Unpublished data sources, including AID's computerized data bank, were used as well as published material.*
- This expanded data base made possible the use of time-series (rather than cross-sectional) analyses of economic questions.
- More sophisticated techniques (factor analysis) were used in the quality of life analyses.

The data base is felt to be more accurate and reliable than that used in our previous analysis. It should be noted that the data on noncommercial energy consumption is sparse and contains many discrepancies. Therefore, the analyses have concentrated on commercial energy consumption, for which good data is available, although noncommercial energy has been subjected to some analysis (Chapter 5). In particular, the use of within-country, time-series analysis reduces problems of inter-comparability of data collected in different

*As a part of this study, the structure of the AID Data Bank relating to energy has been examined, and recommendations have been made to AID for improvements and expansions of energy coverage (Mendis, M., An LDC Energy Data Base for USAID, The MITRE Corporation, WP-80W00128, 1980).

TABLE 1-I

86 LDCs USED IN THE ANALYSIS

Afghanistan
Algeria
Argentina
Bangladesh
Barbados
Benin
Bolivia
Brazil
Burma
Burundi
Cambodia
Cameroon
Central African Empire
Chad
Chile
China (Rep.)
Colombia
Congo, P.R.
Costa Rica
Dominican Republic
Ecuador
El Salvador
Ethiopia
Fiji
The Gambia
Ghana
Greece
Guatemala
Equatorial Guinea
Guyana
Honduras
Hong Kong
India
Indonesia
Iran
Iraq
Israel
Ivory Coast
Jamaica
Jordan
Kenya
Korea (Rep.)
Lebanon
Liberia
Libya
Madagascar
Malawi
Malaysia
Mali
Malta
Mauritania
Mexico
Morocco
Nepal
Nicaragua
Niger
Nigeria
Oman
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Qatar
Rhodesia
Rwanda
Saudi Arabia
Senegal
Sierra Leone
Singapore
Somalia
South Viet-Nam
Sri Lanka
Sudan
Syrian A.R.
Tanzania
Thailand
Togo
Tunisia
Trinidad & Tobago
Uganda
Upper Volta
Uruguay
Venezuela
Zaire
Zambia

countries. However, it must be noted that the level of aggregation and accuracy of the data may obscure details of importance to development policy formulation. Such potential hazards have been identified in the text. The value of the statistical analysis is, of course, dependent upon the quality of the data. We believe that the conclusions of the study are valid and represent a significant advance over our previous work.

The countries used were grouped on the basis of categories used by Brookhaven National Laboratory[2] and the World Bank.[3] These categories are the same as those used in MITRE's previous study. BNL uses six economy-type categories: Industrialized, Oil Exporter, Balanced Growth Economy, Primary Commodity Exporter, Agricultural Exporter, and Other Agricultural. The World Bank divides LDC's into low and high income groups, with $250 per year per person being the dividing line.

This report consists of six chapters. Chapter 2 describes the major results obtained, and the relevance of these to assistance policy formulation. The strengths and weaknesses of the analysis and describing areas where further investigations would be most fruitful are also discussed.

---

(2) Palmedo, P., Nathans, R., Beardsworth, E., Hale, S., Energy Needs, Uses and Resources in Developing Countries, Brookhaven National Laboratory, BNL 50784, 1978.

(3) World Bank, World Development Report, 1978.

Chapters 3, 4, and 5 cover the economic analyses. Chapter 3 describes the aggregated analyses conducted, i.e., those based upon data at the individual country level, while Chapter 4 discusses the sectoral analyses, where data for economic sectors within given countries is used. Both chapters discuss data sources, and describe the questions investigated and the results obtained. Chapter 5 discusses the role of noncommercial energy in development, and includes supporting statistical analyses.

Chapter 6 describes the quality of life analyses. The meaning of the term "quality of life" is discussed, and possible indicators are analyzed. Relationships of the quality of life to energy, economic and social development are investigated.

Appendix A contains selected tables of results which were felt to be too bulky for the main text. Appendix B contains listings of data bases and Appendix C briefly describes the statistical methods used.

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2.0 POLICY IMPLICATIONS

The major results and policy implications which we have drawn from the results obtained in this analysis and our previous analysis are:

- Energy consumption and economic and social development are closely related, and the oil price rises in the 1970's slowed the economic development of the LDCs. Therefore, it can be inferred that energy assistance is a legitimate and useful way of promoting economic development.

- The output of the agricultural sector of LDCs economies increases much more with increased energy inputs than of the other sectors of the economy. Therefore, the agricultural sector may be an attractive option for energy assistance.

- Different LDCs respond differently to energy input, thus energy assistance programs must be tailored to each country's needs and abilities.

- Nearly all countries follow a common pattern of development, in which increases in energy consumption, economic output and social welfare go hand-in-hand. Therefore, a broad based assistance program that includes various sources of energy should be pursued.

- Consideration should be given to using the strength and stability of the energy/economy/development relationship in a country as a factor in determining the quantity and type of assistance to be rendered.

The remainder of this chapter is devoted to a discussion of the reasoning behind these conclusions.

In order to discuss development, it is necessary to decide on a definition. At a very general level, development can be viewed as a process of increasing the variety of choices or options open to a society and to the individuals living in it. In practice, this increase in variety has been achieved by economic growth and improved

social welfare. Economic growth results in an increased level of commercialization within the society. Thus, subsistence agriculture is replaced by cash-crop agriculture, with the cash being used to buy (and hence stimulate production of) a variety of goods and services. Increased production of commercial goods and services results in increasing specialization of production and division of the labor force. Improved social welfare both results from economic development, because extra wealth is available for services such as health care and education, and contributes to further economic growth by, for example, reducing chronic illness and raising the education and skill level in the population.

Development, in the analyses described here, has been measured by indicators of economic growth (such as the Gross Domestic Product) and by quality of life indicators (relating to health, education, nutrition, housing, and ownership of consumer goods) such as cars and TVs. These indicators are open to the charge that they measure development according to a Western model. This is to some extent true, if only because development is, in itself, largely a Western concept. Insofar as wealth and health, etc., can be regarded as goods in themselves, this concept of development is sound. It must be noted that economic growth need not imply industrialization, and that most LDCs are too poor to have experienced the disbenefits of affluence such as industrial pollution.

There is a clear need for a definition of development in terms which are not culture-bound. Such a definition must necessarily precede the formulation of suitable measurement techniques.

With our choice of development indicators, our analyses have shown strong correlations between energy consumption and economic output, for both the rural economy and for individual economic sectors. The overall energy/economy correlation holds for about 80 percent of the LDCs examined, and the strength of the correlation is proportional to the level of economic output per capita. The causality of the relationship involved is indicated by the finding, in the previous study, that the economic growth rates of non-oil-exporting LDCs dropped by an average of over 50 percent after the oil price increases of 1973, while the growth rates of oil-exporting LDCs increased over 20 percent on the average.(1)

This indicates that increased energy supplies can foster economic development in LDCs, and that energy assistance is therefore a legitimate development assistance option.

The examination of the relationships between sectoral economic production (in agriculture, industry and transportation) and energy consumption have shown that there are generally strong correlations between sectoral economic output and sectoral energy consumption. In particular, energy consumption is more closely correlated to sectoral economic output than to population -- normalization by population

(1)The MITRE Corporation, Energy and Development: A Preliminary Analysis of Less Developed Countries, MTR-79W00216, 1979.

actually masks the trends observed. This is most likely due to changes in labor force.

The slope of agricultural output when regressed against energy consumption in agriculture is very steep, much steeper than the corresponding slopes for the industrial and transportation sectors in all countries analyzed. This indicates that the agricultural sector of LDCs may particularly benefit from increased energy inputs. Therefore, the agricultural sector may prove to be a good point for applying energy assistance initially. Clearly, energy assistance in this area must be carefully integrated with other agricultural and rural development projects.

In this context, the drive towards industrialization being pursued by many LDCs may be a misapplication of resources. In the face of possibly limited availability and certain high cost of commercial energy, the agricultural sector has an apparent advantage in terms of the economic benefits obtained from energy use.

It has been estimated that total LDC energy consumption will increase at about 3.5 percent annually until 2000.[2] Such a growth rate, although starting from a low initial level, would clearly have a negative impact on world energy availability. In contrast, U.S. energy consumption is likely to grow only at about half this rate.

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[2] Palmedo, P., Nathans, R., Beardsworth, E., Hale, S., Energy Needs, Uses and Resources in Developing Countries, Brookhaven National Laboratory, BNL 50784, 1978.

The relationships between the Physical Quality of Life Index (based on longevity, adult literacy and infant mortality) and energy consumption and economic output discovered in our previous analysis[1] were confirmed. These relationships seem to be stable over time, at least for the period 1960 to 1975, as shown in Figures 2.1 and 2.2, where the heads of the arrows represent the 1975 positions, and the tails represent the 1960 positions of the countries. From these figures, it appears that energy consumption is a more "reliable" indicator of development than is economic output.* This may be because energy consumption is a physical measure, while apparent economic output depends, for instance, upon fluctuating exchange and inflation rates, and international commodity prices. Consideration should therefore be given to using the commercial energy consumption per capita as well as (or perhaps instead of) the more usual GDP per capita as a quick measure of development.

Figures 2.1 and 2.2 provide some evidence for the existence of a "take-off" point in the development process, in that countries towards the upper right corner ("more developed") exhibited greater, more consistent growth than did those towards the bottom left ("less developed").

---

[1] The MITRE Corporation, Energy and Development: A Preliminary Analysis of Less Developed Countries, MTR79W00216, 1979.

*In the sense that the countries examined show a more consistent pattern in Figure 2.1 than in Figure 2.2.

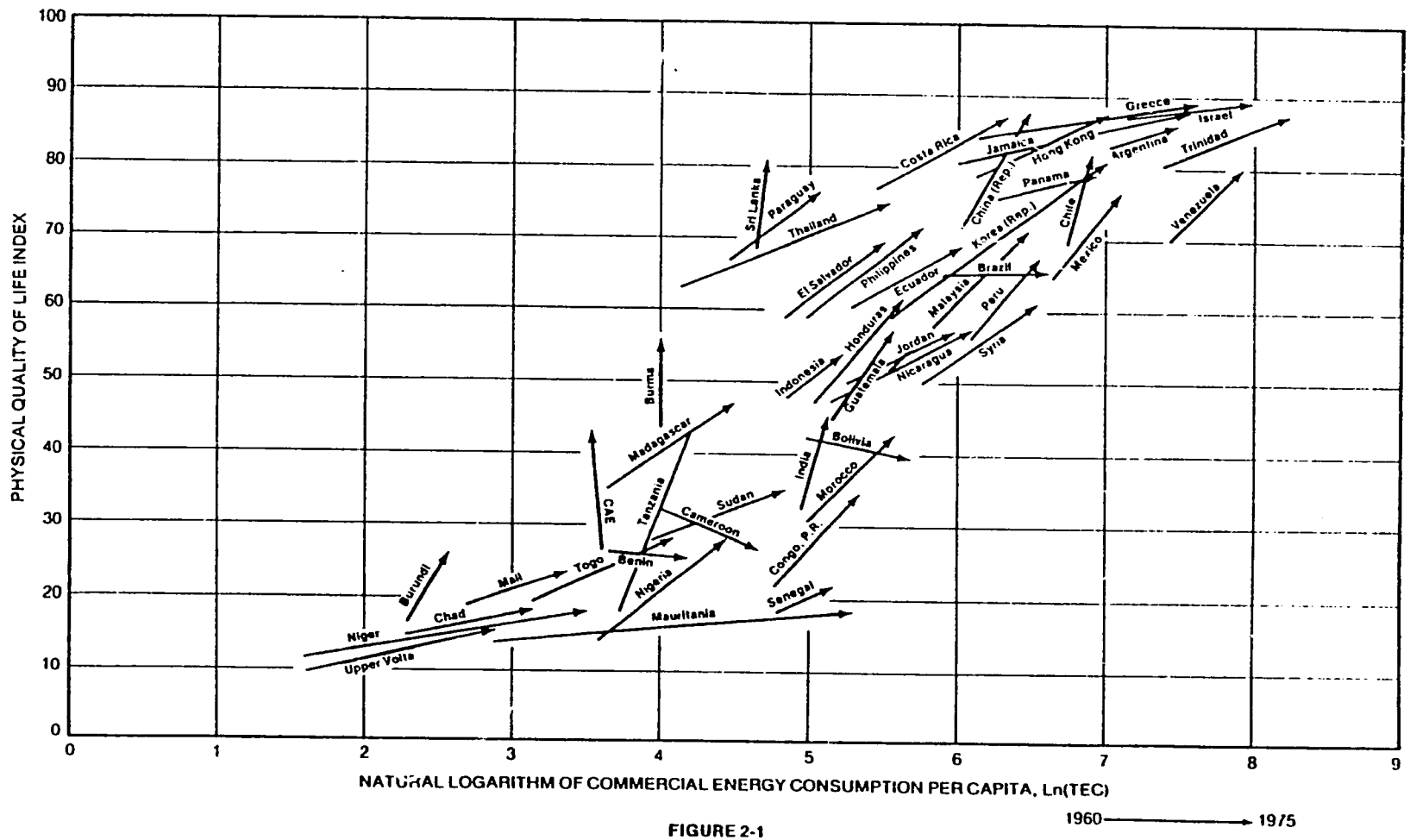

FIGURE 2-1
1960 AND 1975 VALUES OF PHYSICAL QUALITY OF LIFE INDEX VS. NATURAL LOGARITHM OF COMMERCIAL ENERGY CONSUMPTION PER CAPITA

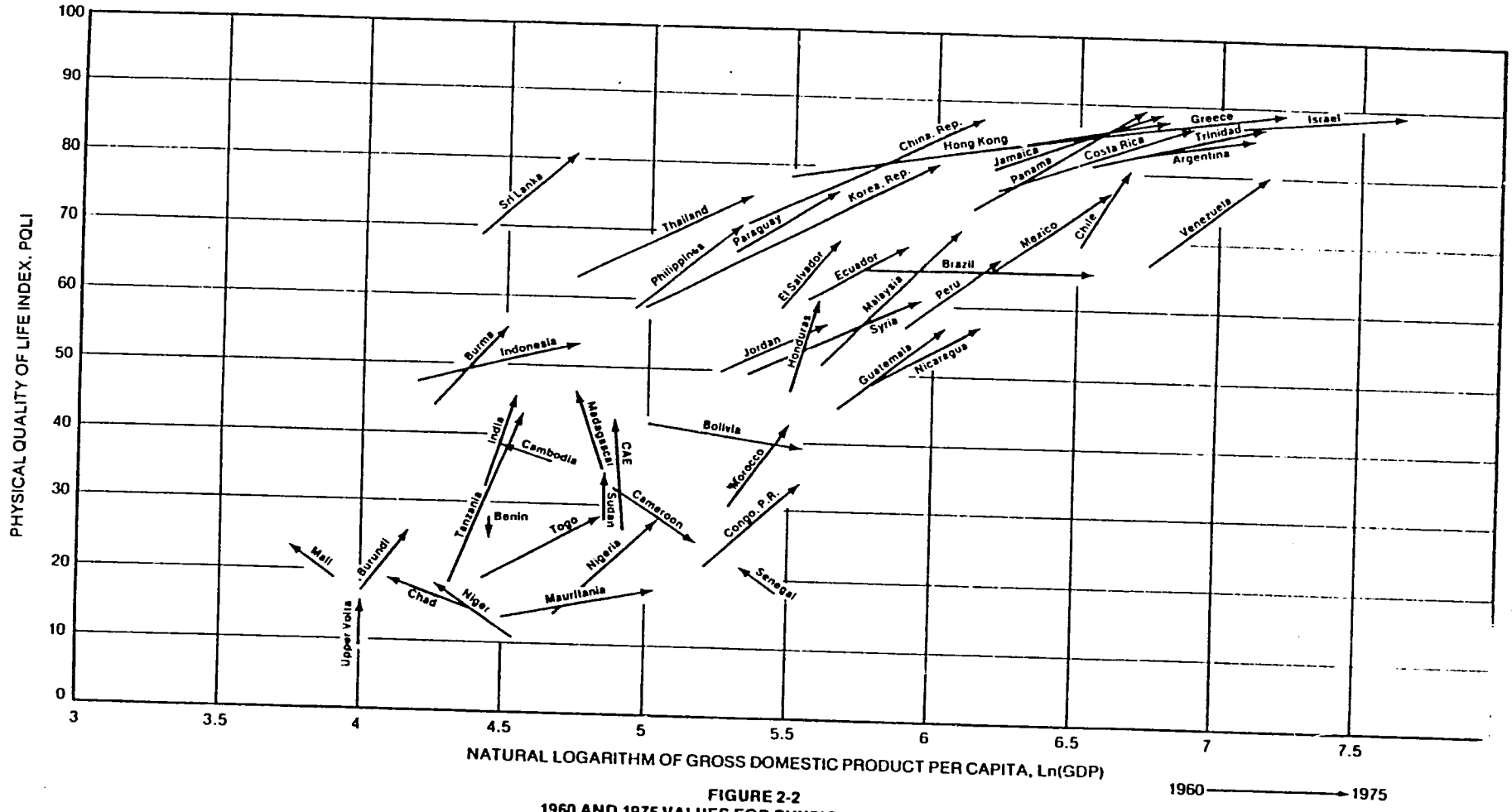

FIGURE 2-2
1960 AND 1975 VALUES FOR PHYSICAL QUALITY OF LIFE INDEX VS. NATURAL LOGARITHM OF GROSS DOMESTIC PRODUCT PER CAPITA

Some countries do not conform to the energy/economy/physical quality of life relationships which hold for the majority of countries. The countries which do not show a good energy/economy relationship are mostly (83 percent) low income (below $250 per capita annually). These countries may indeed be below the "take-off" point.

The reasons for the lack of correlation are not clear from our analyses. In many cases, neighboring nations with apparently similar objective conditions (climate, culture, state of development, type of economy, etc.) have experienced much more consistent progress. Figure 2.3 shows an example of an LDC with high correlation between energy consumption and economic output (the Republic of Korea); Figure 2.4 shows an example of a country with low correlation (Kenya).

It may be that the causes of stagnant or erratic energy/economy/development relationships can legitimately be addressed by energy assistance programs such as infrastructure development; on the other hand, the causes may lie deep within a country's social, political and economic structure, and may therefore be effectively beyond the reach of assistance efforts. Galbraith(4) theorizes that the cultural accommodation of the mass of the population to poverty, and the expectation of continuing poverty, is a major hinderance to the ability of LDCs to effectively utilize development assistance. We

(4) J.K. Galbraith, The Nature of Mass Poverty, Harvard University Press, 1979.

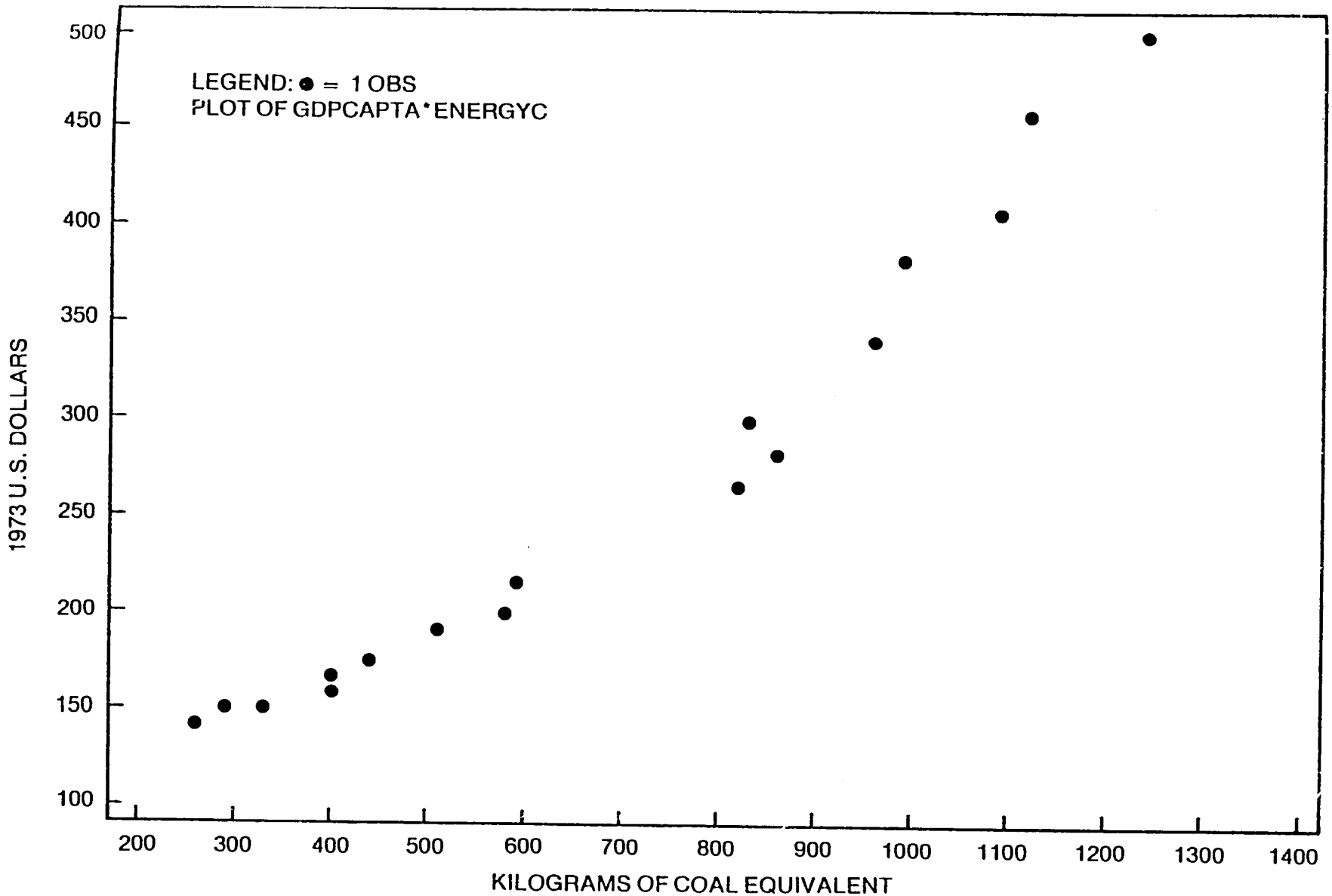

FIGURE 2-3
EXAMPLE OF A MIDDLE INCOME LDC WITH HIGH CORRELATION BETWEEN ENERGY CONSUMPTION AND GDP
REPUBLIC OF KOREA

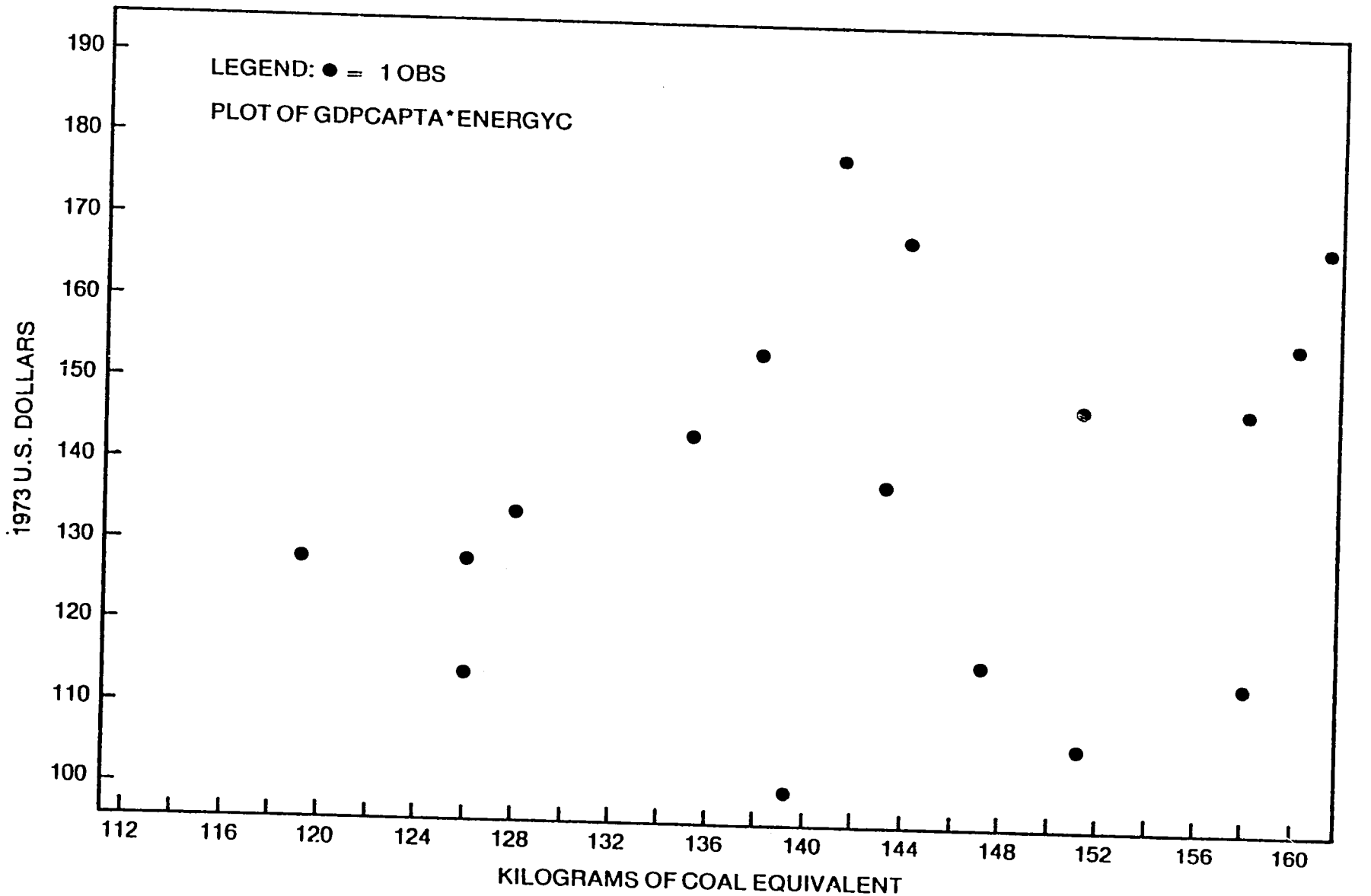

FIGURE 2-4
EXAMPLE OF LOW INCOME LDC WITH LOW CORRELATION BETWEEN ENERGY CONSUMPTION AND GDP
KENYA

feel that a detailed examination and comparison of several nations with differing energy/economy/development patterns would be likely to prove most instructive in elucidating the determinants of the dynamics of development, and in providing guidance for energy assistance policy formulation.

Clearly, the observed differences in the energy/economy/development relationships of different countries indicate the need for carefully tailoring energy assistance policies to the needs and abilities of individual countries.

It seems reasonable to infer that a country with poor correlations between energy consumption and economic production may require different types of assistance from a country which has good correlations. In the latter case, the energy-economy system would appear to be working smoothly, and therefore it is likely that increased energy supplies could be effectively utilized in economic production. In the former case, assistance in infrastructure development might be more appropriate, so that the country could more effectively use existing resources. As noted above, such differences between countries may be caused by factors which are deeply embedded in the countries' social and cultural structures. Such differences would be extremely hard to address with an outside assistance program. The resolution of this question is of importance for policy formulation.

It is also reasonable to infer that the overall effectiveness of energy assistance may vary with the strength and stability of the

energy/economy/development relationships of the recipient country. Put another way, it seems that a given amount of assistance would have greater overall benefits in a country with stable, positive growth patterns than in one where these patterns were erratic or confused.

Finally, we started the quality of life analysis with a hypothesis that a country could, so to speak, choose social development or economic development, and therefore that social indicators would be more correlated among themselves than they would be correlated with economic indicators. This hypothesis was not verified. All indicators of development seem to increase more-or-less together. While the causality is not clear, this result seems to indicate that development is essentially a unified process, in which all facets of a nation's life advance in concert. In this context, countries such as Sri Lanka and Mauritania can be viewed as performing variations on a common theme.

Therefore, energy assistance policy should attempt to follow a balanced program which does not single out particular sectors, energy resources, activities or classes for prolonged special attention (the importance of agricultural development notwithstanding), because it appears that one facet of life in an LDC cannot develop indefinitely without requiring or causing development in other areas.

3.0 AGGREGATE ENERGY AND ECONOMIC DEVELOPMENT

This chapter describes the analysis of the following questions:

- Is an increase in commercial energy consumption per capita accompanied by an increase in productivity per capita in LDCs?
- What factors affect the variations of energy consumption relative to productivity between nations?
- Is an increase in investment per capita accompanied by an increase in productivity per capita in LDCs?

3.1 Conclusions

The major conclusions of the analysis of aggregate energy and economic development are:

- Per capita commercial energy consumption and GDP per capita are significantly and positively correlated over time within countries for most LDCs.
- The correlation between commercial energy consumption and GDP per capita is significantly higher for countries with higher GDPs. High income LDCs (above $250 GNP per capita) have closely correlated energy consumption and GDP, while low income LDCs (below $250 GNP per capita) commonly show little relationships between commercial energy consumption and GDP.
- All oil exporters have highly correlated energy consumption and GDP.

3.2 Approach

Productivity in any country is a function of the level of inputs of capital, labor, and energy. This portion of the analysis examines how a country's total productivity, as measured by gross domestic product, is affected by energy consumption, and by increases in capital, as measured by gross domestic investment.

To investigate energy-economic relationships, a series of basic functional forms were hypothesized. These forms were then transformed to allow their estimation by regression analysis. Each nation for which sufficient data was available was individually examined. The relationship between GDP and GDI was also examined using regression analysis.

Subsequent portions of the analysis examined the coefficients obtained from the regression analysis to determine what factors affected across country differences. The two coefficients examined were the slope and the coefficient of determination. The coefficient of determination is the square of the correlation coefficient and indicates what portion of the variation (sum of squares) for GDP is attributable energy consumption. It thus provides a measure of how closely to energy consumption and GDP are linked. The slope of the regression line measures the change in GDP which accompanies a unit change in energy consumption. It should be noted, however, that regression analysis in no way implies causality.

3.3 Data

The quality and quantity of available time series data imposed some limitations on the number of nations which could be analyzed. Appendix B-1 contains the data used in this analysis, transformed to a standard format. Only Less Developed Countries (LDCs) are included. Western Europe, the United States, Canada, Australia, New Zealand, Japan and the Communist bloc are excluded.

Gross Domestic Product (GDP) was chosen as a measure of productivity since it represents the total final output of a country's economy. Gross National Product (GNP) in contrast includes foreign output as well as domestic. GDP data were taken from World Bank data.[5] GDP was normalized to 1973 U.S. dollars using the implicit GDP deflators and exchange rates presented in this document. Since the World Bank data included only the years from 1960 to 1973, International Monetary Fund data[6] was used to augment the time series. In those cases where the IMF statistics diverged significantly from the World Bank data, the years subsequent to 1973 were omitted from the analysis.

Gross Domestic Investment (GDI) measures the net increase or decrease in inventories of capital goods. This data was drawn from the World Bank and normalized in the same manner as GDP. The IMF statistics did not include GDI, so GDI has not been analyzed beyond 1973.

Per capita energy consumption data were taken from the United Nations.[7,8] Even though these documents were published by the same organization, in a number of cases, the time series showed large discrepancies. For example, the first document gave a 1973 per

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[5] The World Bank, World Tables, 1976.

[6] The International Monetary Fund, International Financial Statistics, April 1979.

[7] United Nations, World Energy Supplies 1950-1974, 1976.

[8] United Nations, World Energy Supplies 1973-1978, 1979.

capita commercial energy consumption of 10,313 kilograms of coal equivalent for Kuwait. The second gave only 5,460 for the same year. For this reason, Kuwait was omitted from the analysis. Similar discrepancies occurred for several other nations.

The GDP and GDI data were normalized by the country's population to make across country comparisons possible. Population statistics used were obtained from the United Nations. These data sometimes differed appreciably from World Bank population statistics.

Aggregate time series data were compiled for a total of 84 nations.

3.4 Models Tested

Table 3-I shows the energy-economic models tested. Four basic analyses were performed. The first tested three models for GDP energy consumption relationships, the second analyzed GDP-GDI relationships. The third and fourth analyses examine the results of the previous two to determine across country patterns.

GDP per capita was expressed as a function of energy consumed per capita using the following models:

Linear Model: $GDP/capita = a + b\ (energy/capita)$

Multiplicative Model: $GDP/capita = a\ (energy/capita)^b$ or $\log (GNP/capita) = a_2 + b_2 \log (energy/capita)$

Exponential Model: $GDP/capita = a\ b^{(energy/capita)}$ or $\log (GDP/capita) = a_3 + b_3\ (energy/capita)$

Since each of these models fit the data reasonably well and none appeared significantly better than the others, the linear model was

TABLE 3-I

AGGREGATE ENERGY-ECONOMIC MODELS TESTED

Analysis		Dependent Variable	Independent Variable	Number of Countries Tested
First Analysis	ADDITIVE (Dependent) = a+b (Independent)	GDPCAPTA	ENERGYC	83 Individually
	MULTIPLICATIVE (Dependent) = a (Independent)^b	log(GDPCAPTA)	log(ENERGY	
	EXPONENTIAL (Dependent) = ab$^{(Independent)}$	log(GDPCAPTA)	ENERGYC	
Second Analysis	ADDITIVE (Dependent) = a+b (Independent)	GDPCAPTA	GDICAPTA	81 Individually
Third Analysis	ADDITIVE	R2E	log(GNP)	
	MEANS	SLOPEE R2E		by BNL Type by Region by Culture
	ADDITIVE	SLOPEE	GNP	by BNL Type
	EXPONENTIAL	SLOPEE	LENSUF	by BNL Type
	EXPONENTIAL	SLOPEE	OILSUF	by BNL Type
	ADDITIVE	SLOPEE	LOILSUF	
		SLOPEE	URB	
Fourth Analysis	ADDITIVE	R2I	GNP	
	MEANS	SLOPEI R2I		by Region by BNL Type by Culture

Variable Symbols:

GDPCAPTA = Per capita GDP, 1973 U.S. dollars
ENERGYC = Per capita commercial energy consumption (kilograms of coal
GDICAPTA = Per capita Gross Domestic Investment, 1973 U.S. dollars
R2E = Coefficient of determination for energy-GDP regressions
SLOPEE = Slope of energy-GDP regressions
GNP = Gross National Product per capita, 1973 U.S. dollars
ENSUF = Percent self-sufficiency in energy, 1972
ENSUF = Percent self-sufficiency in energy, 1972
OILSUF = Percent self-sufficiency in oil, 1972
URB = Percent of population living in urban areas, 1975
R2I = Coefficient of determination for GDP-GDI regressions
SLOPEI = Slope of GDP-GDI regressions
BNL Type = Economy type, as categorized by Brookhaven National Laboratory
Region = Geographical region
Culture = Culture, as measured by religion

used for subsequent analyses. The linear model avoids the assumption of indefinite rapid growth implied by the multiplicative and exponential models.

It must be stressed that regression analysis does not indicate causality. GDP/capita was expressed as a function of energy consumption per capita to allow the examination of what GDP would be associated with increased energy consumption. The linear relationship

GDP/capita = a + b (energy/capita) could also have been expressed as:

(energy/capita) = a' + b' (GDP/capita).

The two slopes are related as follows:

$b\ b' = r^2$

where r^2, the coefficient of determination, measures the proportion of the variation in the dependent variable attributable to the independent variable. This coefficient varies between 0 and 1, and is the same regardless of whether energy consumption or GDP is the independent variable.

The relationship of GDP and GDI was expressed solely as a linear model. Sufficient data was available to study 81 nations.

In the third analysis, the coefficient of determination of the energy regressions was compared with GNP across all countries. This tested whether energy use was more crucial to further development in the richer or the poorer LDCs. The slopes of the regression lines, which measure the intensity of productivity to a unit increase in

energy consumption, were compared with GNP, oil and energy independence, organization, economy type, region, and culture. Slopes were analyzed only for those nations where a statistically significant relationship between energy and GDP had been demonstrated. Both the slopes and coefficients of determination are actually sample estimates with associated variances. This analysis, and the subsequent analysis, has not included this additional source of error. The analysis should therefore be interpreted as indicating basic trends, rather than providing definitive statements.

Since GDI is not a major focus of this study, the fourth part of the analysis was abbreviated. The coefficient of determination was compared with GNP across countries. The slope, i.e., intensity of productivity relative to investment, was compared by region, economy type and culture.

3.5 Results

Table A-1 (in Appendix A) shows the results of the first analysis; testing three models for energy-GDP relationships by country. The results are summarized below:

- The additive model of GDP per capita versus energy consumption per capita is statistically significant for 64 out of 83 nations studied.
- The multiplicative model is statistically significant for 66 out of 83 nations studied.
- The exponential model is statistically significant for 64 out of the 83 nations examined.
- Although one particular model may be occasionally perferable for an individual nation, across countries all models appear equally suitable.

- Coefficients of determination for those nations where a statistically significant relationship exists are usually very high; .80 or more.

- In almost all cases (76 of 83) the relationship between energy consumption and GDP is positive; GDP per capita increases as energy consumption per capita increases.

Table A-2 (in Appendix A) shows the results of the second analysis, the per capita GDI/GDP time series regressions. The major results are:

- GDI per capita and GDP per capita show a statistically significant positive correlation in 56 out of 81 nations.

- In two nations, Mauritania and Liberia, GDI per capita and GDP per capita show a statistically significant negative correlation.

- In those nations where a significant positive correlation occurs, intensities are almost always greater than one (52 out of 56 nations); a unit increase in GDI per capita is accompanied by a larger increase in GDP per capita.

The results of the analyses of the coefficients of determination and slopes of the regression lines are shown on Tables 3-II and 3-III. These results are summarized below:

- Nations with a higher GNP show a closer fit with both energy consumption and investment to GDP. This relationship increases with the log of GNP.

- The slope, i.e., intensity of GDP to energy, is not significantly related to either GNP or degree of urbanization.

- Intensity of GDP to energy is significantly and positively correlated to both energy self-sufficiency and oil self-sufficiency in oil exporting LDCs. There is no significiant relationship for other economy types among LDCs.

- Energy consumption and GDP are most closely correlated in the industrialized LDCs and least correlated in the low income agricultural LDCs. Intensities of GDP to energy also vary by economy type, but not sufficiently to be statistically significant.

TABLE 3-II

ANALYSIS OF ENERGY AND INVESTMENT INTENSITIES

Dependent Variable	Independent Variable	Number of Countries	Intercept a	Slope b	r^2	P Significance Level of Regression
R2E	LGNP	83	-0.4659	0.1867	.3736	.0001
R2I	LGNP	80	-0.3648	0.1577	.2323	.0001
SLOPEE	GNP	65	0.5458	0.0000	.0064	.5276
SLOPEE	GNP	6 (BNL=1)	0.4778	0.0001	.0556	.6530 NS
SLOPEE	GNP	16 (BNL=2)	0.6591	0.0000	.0036	.8260 NS
SLOPEE	GNP	7 (BNL=3)	0.3546	0.0002	.4754	.0865 NS
SLOPEE	GNP	7 (BNL=4)	0.5137	-.0004	.1505	.3899 NS
SLOPEE	GNP	6 (BNL=5)	-.7345	0.0029	.3462	.2193 NS
SLOPEE	GNP	20 (BNL=6)	0.6577	-.0003	.0090	.6913 NS
SLOPEE	LENSUF	44	0.6486	0.0430	.0559	.1224 NS
SLOPEE	LENSUF	5 (BNL=1)	0.5172	-.1143	.0352	.7626 NS
SLOPEE	LENSUF	14 (BNL=2)	0.1202	0.3013	.5344	.0030
SLOPEE	LENSUF	6 (BNL=3)	0.4423	-.0202	.0660	.6231 NS
SLOPEE	LENSUF	5 (BNL=5)	1.0190	0.0618	.0130	.8550 NS
SLOPEE	LENSUF	11 (BNL=6)	0.4138	-0.725	.0430	.5406 NS
SLOPEE	LOILSUF	22	0.5011	0.1214	.2491	.0181
SLOPEE	LOILSUF	4 (BNL=1)	0.5477	-.1363	.1013	.6817 NS
SLOPEE	LOILSUF	14 (BNL=2)	0.1850	0.2409	.3969	.0157
Insufficient data for other BNL TYPES.						
SLOPEE	URB	59	0.6034	-.0428	.0003	.8911 NS

TABLE 3-III

MEAN SLOPES AND COEFFICIENTS OF DETERMINATION FOR ENERGY INTENSITY

BNL Type	Number of Countries	Mean	Standard Error of Mean
1 SLOPEE	6	0.5582	0.0970
R2E	6	0.9233	0.0185
2 SLOPEE	16	0.6876	0.1527
R2E	16	0.8362	0.0316
3 SLOPEE	7	0.4963	0.0612
R2E	7	0.8103	0.0759
4 SLOPEE	7	0.3779	0.1041
R2E	7	0.6987	0.0669
5 SLOPEE	6	0.5698	0.3177
R2E	6	0.8030	0.0708
6 SLOPEE	20	0.5829	0.1495
R2E	20	0.6410	0.0510

Region	Number of Countries	Mean	Standard Error of Mean
1 SLOPEE	17	0.6425	0.1820
R2E	17	0.6346	0.0532
2 SLOPEE	7	0.7143	0.3551
R2E	7	0.6923	0.0886
3 SLOPEE	5	0.3501	0.0971
R2E	5	0.8382	0.0273
5 SLOPEE	10	0.4865	0.0603
R2E	10	0.8463	0.0363
6 SLOPEE	11	0.5485	0.1332
R2E	11	0.7816	0.0568
7 SLOPEE	10	0.5576	0.0900
R2E	10	0.8671	0.0252

Culture	Number of Countries	Mean	Standard Error of Mean
1 SLOPEE	2	0.2873	0.0763
R2E	2	0.6393	0.2594
2 SLOPEE	25	0.6174	0.0767
R2E	25	0.8204	0.0302
3 SLOPEE	11	0.5194	0.2436
R2E	11	0.8050	0.0366
5 SLOPEE	5	0.6914	0.2282
R2E	5	0.6909	0.0746
9 SLOPEE	17	0.5233	0.1542
R2E	17	0.6631	0.0599

- Although intensities of GDP to energy and coefficients of determination vary by region, most of the variations are not statistically significant. The only exception is that the coefficient of determination for Region 1, Southern Africa is lower than that for Regions 5 and 7; East Asia and South America.

- Variations of intensities of GDP to energy and coefficients of determination by culture are not statistically significant. All culture types had very large standard errors in coefficients of determination so that no comparisons could be made.

3.6 Discussion

This analysis shows that in general an important relationship exists between energy consumption and development, and also between investment and development. These relationships hold over time within the majority of LDCs.

Although many of the results of the previous section appear confusing, several basic patterns do emerge. First, the more advanced LDCs almost invariably show a very strong relationship between per capita energy consumption and economic growth. Figure 3-1 shows the energy-GDP time series for the Republic of Korea from 1960 to 1977. The coefficient of determination is very high (0.9541). Productivity more than tripled over this time period, and energy consumption increased still more rapidly. The investment-GDP time series, although not shown, has a similar shape. Higher income LDCs, such as Korea, characteristically have a close fit between productivity, energy consumption and investment.

By contrast, low income LDCs usually show little relationship between energy consumption and GDP. Figure 3-2 illustrates the

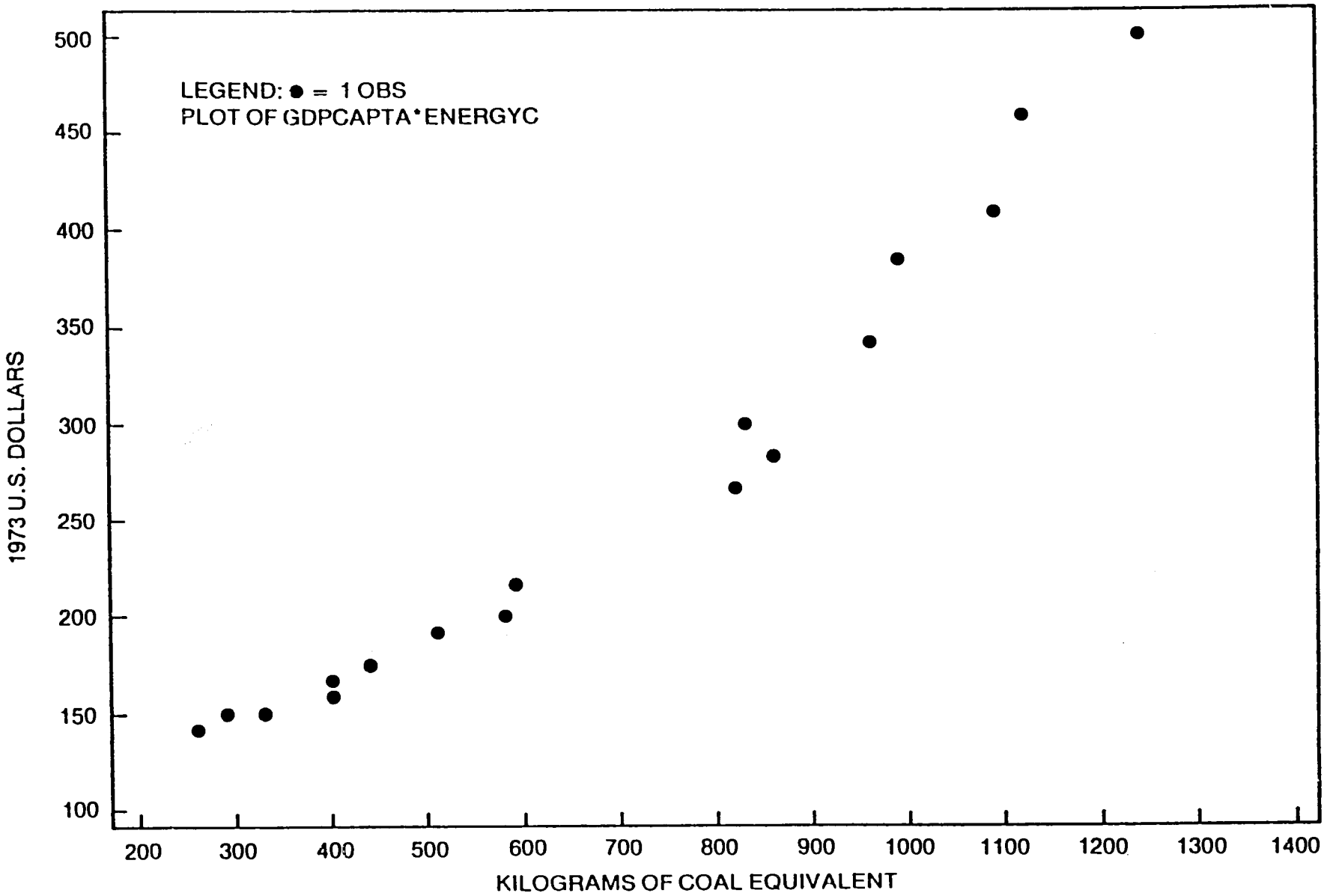

FIGURE 3-1
EXAMPLE OF A MIDDLE INCOME LDC WITH HIGH CORRELATION BETWEEN ENERGY CONSUMPTION AND GDP REPUBLIC OF KOREA

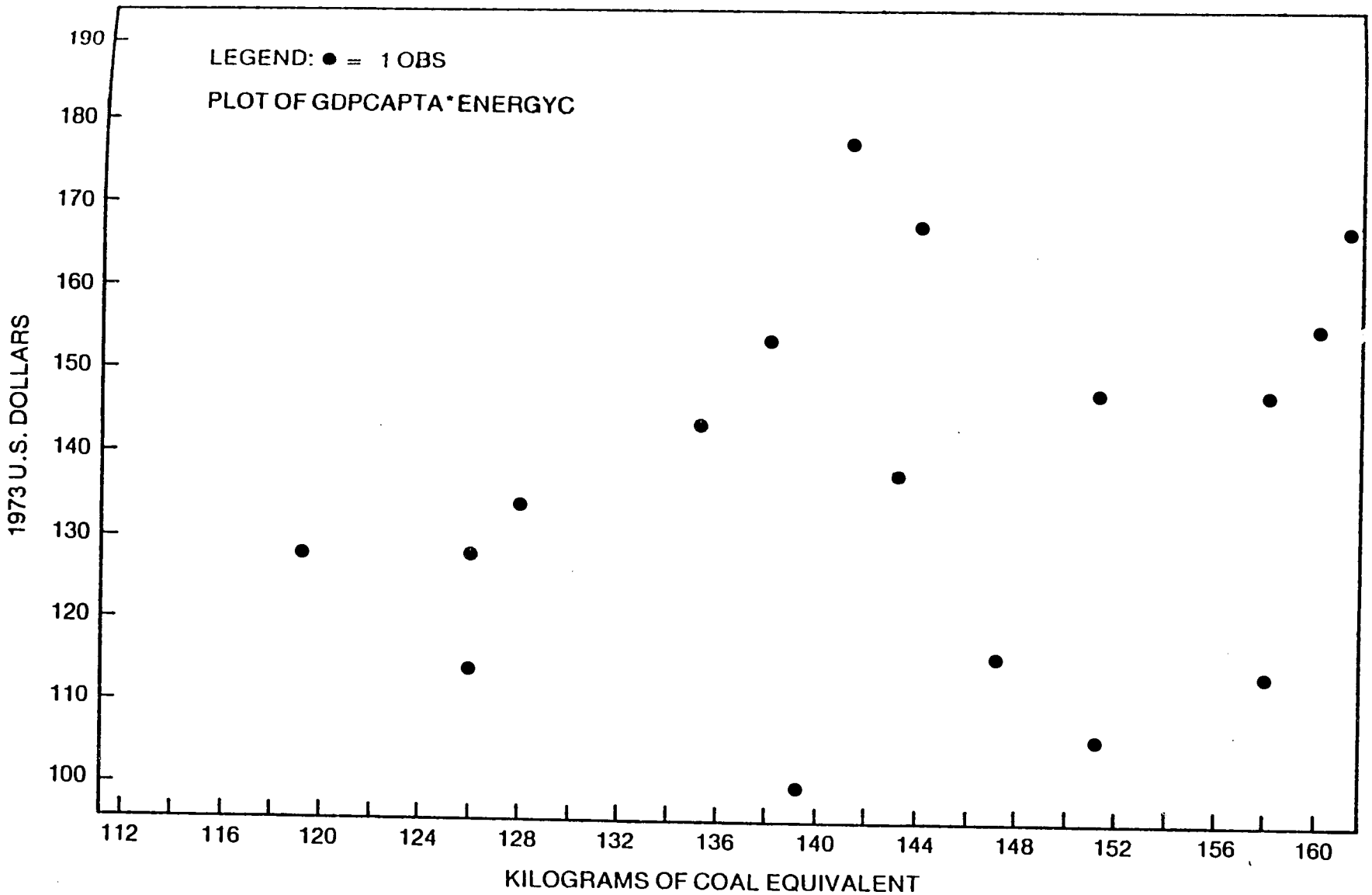

FIGURE 3-2
EXAMPLE OF LOW INCOME LDC WITH LOW CORRELATION
BETWEEN ENERGY CONSUMPTION AND GDP
KENYA

energy-GDP time series for a typical low income LDC, Kenya. The coefficient of determination is only .0609, far lower than Korea's .9541. Energy consumption and GDP show little relationship. Both remained relatively stagnant from 1960 to 1977 in comparison to the rapid growth of Korea. Kenya does show a close relationship between investment and GDP. However, the coefficient of determination, .6721, is still substantially lower than Korea's .9226.

In general there are few countries with no significant correlation between GDP and energy consumption; only 18 out of the 83 examined. Table 3-IV lists these 18 countries. Several features are immediately apparent. First, most follow the pattern set by Kenya. They are low income, with a GNP per capita below 250 U.S. dollars in 1973. The only exceptions are Jordan, Uruguay, and Zambia, with per capita GNPs of $340, $950, and $340 respectively. Most have primarily agricultural economies. Zambia is a primary exporter. A large group are African. With the exception of Jordan and Uruguay, all are predominantly rural. The majority of these nations also show no significant relationship between investment and GDP.

These results appear to indicate that development follows a general trend. Among very poor nations, productivity is relatively stagnant. Energy consumption and investment change erratically, with little relationship to productivity. A possible explanation for this is that energy and investment may be consumed in subsistence rather than production. A well known example is the use of petroleum

TABLE 3-IV

COUNTRIES WITH LOW CORRELATION BETWEEN GDP AND ENERGY CONSUMPTION

OBS	CNTRYNO	COUNTRY	SLOPEE	SIGNIFE	R2E	SLOPEI	SIGNIFI	R2I	REGION	BNLTYPE	CULTURE	GNP	URB	ENSUP	OILSUP
1	1	AFGHANISTAN	0.0270	N	0.0657	-0.2297	N	0.0318	3	6	3	90	0.12	5.14	0.00
2	10	BURMA	0.5961	N	0.0971	0.4921	N	0.1066	5	6	1	80	0.22	0.92	0.98
3	11	BURUNDI	0.7707	N	0.1925	0.2736	N	0.0018	1	6	5	80	0.04	0.00	0.00
4	12	CAMBODIA	3.2502	N	0.3326	3.4902	S	0.7376	5	.	1	70	0.23	.	.
5	14	CENT.AF.EMP.	0.1437	N	0.1728	-1.6338	N	0.2559	1	6	9	160	0.36	0.07	0.00
6	30	GAMBIA,THE	0.2507	N	0.1956	2.9092	S	0.6120	1	5	3	130	.	.	.
7	34	GUINEA,EQ	0.1121	N	0.0803	0.5883	N	0.1427	1	6	9	110	0.20	.	.
8	47	JORDAN	0.4045	N	0.2631	1.0772	N	0.2184	3	6	3	340	0.56	0.00	0.00
9	48	KENYA	0.4577	N	0.0609	2.3682	S	0.6721	1	6	5	170	0.11	0.03	0.00
10	56	MADAGASCAR	-0.0495	N	0.0172	0.8452	N	0.1831	1	6	4	150	0.18	0.03	0.00
11	65	NEPAL	0.2878	N	0.1325	.		.	4	6	1	90	0.05	0.06	0.00
12	84	SOMALIA	-0.0650	N	0.0173	0.5070	N	0.1453	1	6	3	80	0.28	0.00	0.00
13	85	SOUTHVIETNAM	0.0014	N	0.0017	0.2581	N	0.0709	.	.	.	160	.	.	.
14	87	SRILANKA	0.1253	N	0.0396	2.6884	S	0.6771	4	5	1	120	0.24	0.05	0.00
15	89	SUDAN	-0.1045	N	0.1799	0.4695	N	0.0478	2	6	3	130	0.13	0.01	0.00
16	100	URUGUAY	0.0838	N	0.1578	0.8720	S	0.4150	7	1	2	950	0.81	0.04	0.00
17	103	ZAIRE	-0.0975	N	0.0065	0.6853	S	0.3676	1	4	2	140	0.26	0.29	0.00
18	104	ZAMBIA	0.1260	N	0.2143	0.1177	N	0.0220	1	4	4	430	0.37	0.58	0.00

products in domestic cooking and lighting, as opposed to industrial uses. The middle income nations show a rapid growth in energy consumption, investment and GDP.

The oil-exporting nations form a distinct subgroup. All oil exporters have highly correlated energy consumption and GDP per capita. Figure 3-3 shows the energy consumption and GDP time series for Iran. The slope of the time series for oil exporters is closely and positively correlated with the logarithm of both energy self-sufficiency, and oil self-sufficiency. Since energy exports make a substantial contribution to the productivity of these nations, this trend should not be surprising. Energy intensity does not appear to be related to oil or energy independence in any other group of LDCs.

The relationship between energy and productivity following 1973 may in fact be changing. Unfortunately, the years from 1974 to the present for which energy and GDP data are available are too few for an adequate time series analysis. MITRE's previous analysis of cross-sectional data did show a large increase in inflation and a lowering in economic growth rates of non-oil exporting LDCs following 1973.(1)

Although this analysis points out major trends in development, a great deal of unexplained variance remains. The models used to examine energy intensities provided little insight, except in the case of

(1)The MITRE Corporation, Energy and Development: A Preliminary Analysis of Less Developed Countries, MTR-79W00216, 1979.

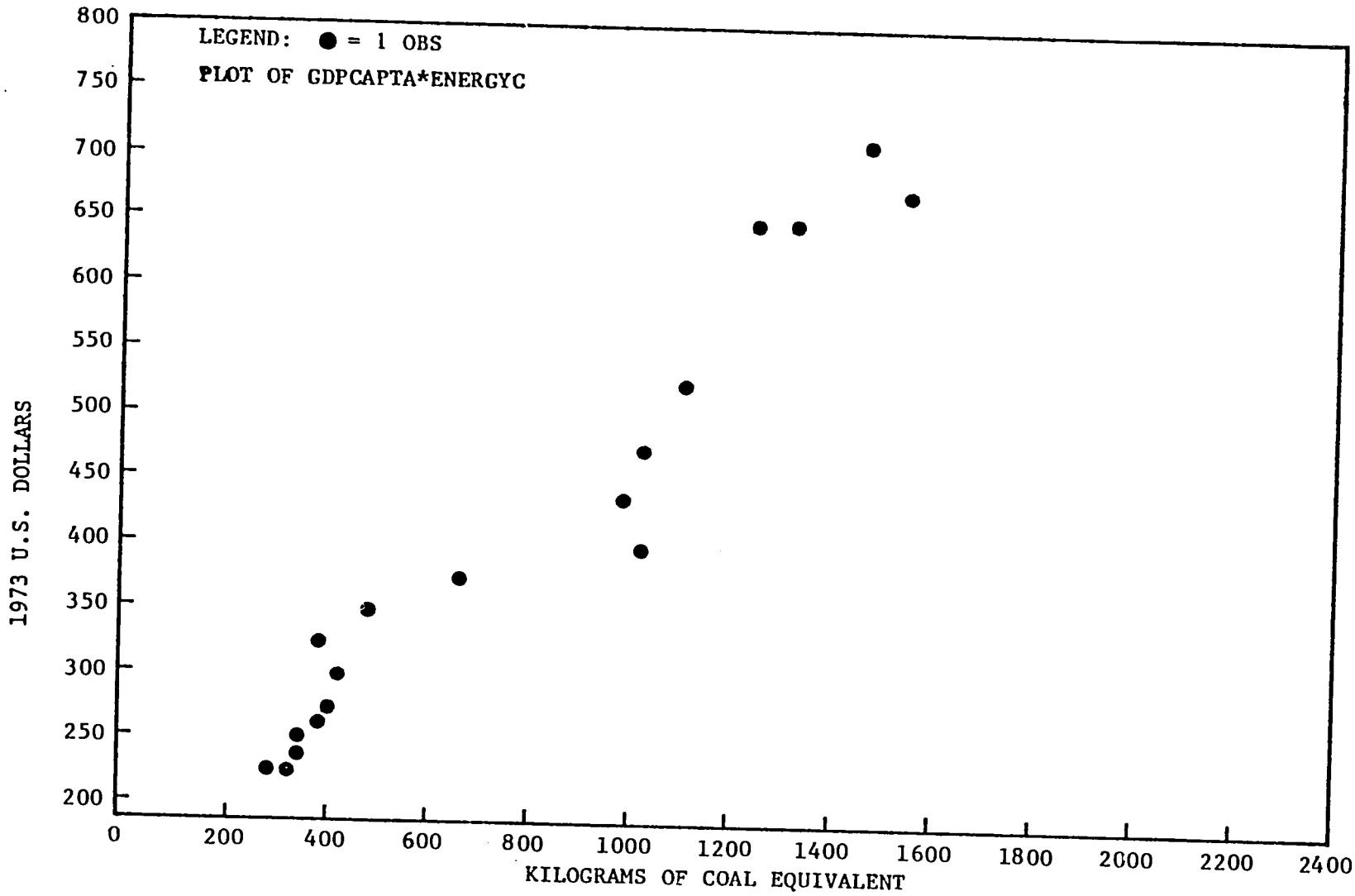

FIGURE 3-3
EXAMPLE OF AN OIL EXPORTING LDC
IRAN

oil exporters. Neither urbanization, GNP, energy independence, oil independence, economy type, culture, nor geographic region (as defined in Chapter 2.0) appear to have a statistically significant impact on the efficiency of energy use. A more detailed examination of a selected subgroup of LDCs emphasizing social factors could provide greater insight into variations in energy intensity.

Unlike most low income LDCs, ten low income nations (GNP below $250) do show a close positive correlation between GDP and energy consumption. They are listed in Table 3-V. Of these, three are oil exporters - Bolivia, Indonesia and Nigeria- and one, Mauritania, is a primary exporter. The majority, six, have low income agricultural economies. All but two are African. Almost all (8 out of 10) also show a significant correlation between GDI and GDP. In contrast, in those countries where energy consumption and GDP are not related, GDI and GDP are usually also not related. The ten nations of Table 3-V all stand at the beginning of the development process. With the responsiveness their economies appear to show to energy consumption, these nations may be especially suitable for energy assistance.

TABLE 3-V

LOW INCOME LDCS WITH HIGH POTENTIAL BENEFIT FROM ENERGY ASSISTANCE

OBS	CNTRYNO	COUNTRY	SLOPEE	SIGNIFE	R2E	SLOPEI	SIGNIFI	R2I	REGION	BELTYPE	CULTURE	GNP	URB	ENSUF	OILSUF
1	7	BOLIVIA	0.6842	S	0.9107	0.5301	N	0.0150	7	2	2	230	0.37	3.39	2.87
2	13	CAMEROON	1.1538	S	0.8095	3.4902	S	0.7376	1	6	9	250	0.24	.	.
3	26	ETHIOPIA	0.6591	S	0.8500	4.4776	S	0.9338	2	6	2	90	0.11	0.03	0.00
4	40	INDONESIA	0.3816	S	0.7497	2.7864	S	0.9475	5	2	3	130	0.19	4.26	5.70
5	57	MALAWI	1.4686	S	0.8022	4.8569	S	0.6917	1	6	5	110	0.06	0.08	0.00
6	61	MAURITANIA	0.4555	S	0.7924	-0.9892	S	0.2998	2	4	3	200	0.11	0.00	0.00
7	68	NIGERIA	1.3761	S	0.8585	3.4776	S	0.8732	1	2	9	210	0.29	29.71	37.82
8	79	RWANDA	1.5909	S	0.5695	2.1299	N	0.0706	1	6	2	70	0.04	.	.
9	92	TANZANIA	0.5428	S	0.7777	1.9976	S	0.8301	1	6	9	130	0.07	0.04	0.00
10	98	UGANDA	0.6456	S	0.8530	2.6166	S	0.6800	1	6	9	150	0.08	0.13	0.00

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4.0 SECTORAL ENERGY AND ECONOMIC DEVELOPMENT

This chapter describes the analyses of the following questions:

- Is an increase in sector energy consumption accompanied by an increase in sectoral GDP for the following sectors: industry, transportation, and agriculture?

- Do any of these sectors tend to have a higher productivity increase accompanying a unit energy consumption increase than the other sectors across countries?

- Does the intensity of energy consumption vary between nations for any of the sectors? If so, how? Are there any visible patterns?

- Is growth in agricultural productivity related to decreases in the percentage of the labor force in agriculture?

- Is growth in industrial productivity related to growth in the non-agricultural labor force?

4.1 Conclusions

The major conclusions of this chapter are:

- Sectoral GDI and sectoral energy consumption are closely correlated for all three sectors - industry, transportation, and agriculture - in most nations studied.

- Total sectoral GDP and energy consumption are more closely related than per capita GDP and energy consumption in almost all sectors in all nations studied.

- The increase in sector productivity per unit energy consumed is by far the highest for the agricultural sector, frequently exceeding both industry and transportation by a factor of 10 or more.

- Industrial GDP-energy consumption intensities are not significantly affected by level of GNP, importance of industry to the economy, growth in industry, or size of the labor force outside agriculture.

- Transportation GDP-energy consumption intensities are not significantly affected by level of GNP, degree of urbanization, population density, or percent self-sufficiency in petroleum.

- Agricultural GDP-energy consumption intensities are significantly and negatively related to the proportion of the labor force in agriculture. As the labor force shrinks, the agricultural productivity per unit of energy consumed increases. However, intensities are not significantly related to the percent contribution of agriculture to the GDP, or to population density.

- Agricultural GDP is strongly and positively correlated to the number of tractors owned in most nations. The number of tractors owned is also strongly and positively correlated to energy consumption.

4.2 Approach

The previous chapter demonstrated the close relationship between gross domestic product and commercial energy consumption within most LDCs. In fact, however, the level of economic activity in any nation is the sum of the production of a variety of products, each requiring energy as well as other inputs. This chapter examines three of the major sectoral components of GDP: industry, transportation, and agriculture.

Functional relationships between sectoral GDP and energy consumption have been determined through regression analysis. Total sectoral GDPs and per capita sectoral GDPs were separately examined for each nation. As in the previous chapter, the second step of the analysis was an examination of the coefficients generated to determine whether any across-country or across-sector patterns emerged. Since one sector, agriculture, showed a much higher increase in productivity per unit energy input than the remaining sectors, additional time series regressions were performed for it.

4.3 Data

Sectoral energy consumption data exist for 16 nations (International Energy Agency).[9] These nations are listed in Table 4-I. They have been stratified by three variables: geographic region, economy type, and religion.

Unfortunately, the distribution of these countries by strata makes patterns among nations difficult to discern. Eight of the sixteen countries are oil exporters, and another four are advanced non-agricultural. Each of the categories, primary exporter; advanced agricultural; low-income non-agricultural; and low-income agricultural contains only one country. The effects of economy, region and religion are therefore confounded and so cannot be assessed.

The quality of the data poses further limitations on the analysis. A major handicap is the lack of energy consumption data for the agricultural sectors of eight of the nations. A ninth nation, Argentina, has data for only three years, precluding any analysis.

Many of the energy consumption time series show very large perturbations which are unlikely to be due to annual fluctuations. For example, in Algeria, the industrial sector is stated to have consumed 162,000 metric tons of oil equivalent energy in 1969. The following year consumption more than tripled to 575,000 metric tons. In 1971, at 560,000 metric tons, little change occurred, but the next

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(9) International Energy Agency, Workshop on Energy Data of Developing Countries, Volume II, 1978.

TABLE 4-I

STRATIFICATION OF COUNTRIES FOR
DETAILED SECTORAL ANALYSES

Region \ Economy	Oil Exporters	Primary Exporter	Advanced Non-Agricultural	Advanced Agricultural	Low Income Non-Agricultural	Low Income Agricultural
South and Central America	Mexico (C) Venezuela (C)		Argentina (C) Brazil (C) Columbia (C)			
Caribbean		Jamaica (C)				
North Africa	Algeria (I) Egypt (I)					
South Africa	Nigeria (O)					Kenya (O)
Middle East	Iran (I) Saudi Arabia (I)					
South Asia					India (B)	
East Asia	Indonesia (I)		Korea (B)	Thailand (B)		

RELIGION CODE:

B - Buddhist or Hindu
C - Christian
I - Islamic
O - Other

year consumption was halved, to 276,000 metric tons. Aberrations of this magnitude make the quality of the data and therefore of the analysis questionable.

The economic sectoral data also had some problems. The total GDP time series data used in the previous chapter were taken from the World Bank.(5) To ensure compatibility with the previous analysis, the World Bank data were also used for the sectoral GDP time series. Since these data stopped at 1973, the time series were supplemented with data from the United Nations.(10) In most cases, the time series matched quite closely, but for several nations discrepancies appeared. In this case, the United Nations data were adjusted by a multiplicative factor so that the two time series matched.

4.4 Models Tested

Table 4-II shows the energy-economic models tested in this portion of the study. The first anslysis examines basic formulations of sectoral Gross Domestic Product and energy consumption relationships. The second analysis examines the parameters determined for these relationships. The third analysis expands the study of a critical sector - agriculture.

The first analysis examines the relationship between sectoral GDP and energy consumption for industry, transportation, and agriculture. All relationships are postulated to be linear. The exponential and multiplicative models also examined in the previous chapter

(5) The World Bank, World Tables, 1976.

(10) The United Nations, Yearbook of National Account Statistics, 1977.

TABLE 4-II

SECTORAL ENERGY MODELS TESTED

Analysis	Dependent Variable	Independent Variable	Number of Countries Analyzed
First Analysis Regressions	INDS 70	ENERGYI	16
	INDSCAP	ENICAP	16
	TRANS 70	ENERGYTR	16
	TRANSCAP	ENTRCAP	16
	AGRI 70	ENERGYA	8
	AGRICAP	ENACAP	8
Second Analysis Analysis of Intensities	LSLOPEI	GNP	16
	SLOPEI	PI 76	16
	SLOPEI	RATIOPI	15
	LSLOPEI	NAL 70	8
	LSLOPETR	GNP	12
	LSLOPETR	URB	12
	SLOPETR	DENSITY	11
	SLOPETR	OILSUF	12
	LSLOPEA	AL 70	7
	LSLOPEAA	RATIOAL	7
	SLOPEA	PA 76	7
	SLOPEA	DENSITY	7
Third Analysis Agriculture	AGRI 70	ENERGYA	8
	AGRI 70	TRACTORS	8
	ENERGYA	TRACTORS	8

TABLE 4-II (Continued)

SECTORAL ENERGY MODELS TESTED

Variable Symbols:

INDS 70	=	Gross Domestic Product for the Industrial Sector (millions of 1970 U.S. dollars)
INDSCAP	=	Per Capita Gross Domestic Product for the Industrial Sector (1970 U.S. dollars)
TRANS 70	=	Gross Domestic Product for the Transportation Sector (millions of 1970 U.S. dollars)
TRANSCAP	=	Per Capita Gross Domestic Product for the Transportation Sector (1970 U.S. dollars)
AGRI 70	=	Gross Domestic Product for the Agricultural Sector (millions of 1970 U.S. dollars)
AGRICAP	=	Per Capita Gross Domestic Product for Agriculture (1970 U.S. dollars)
ENERGYI	=	Energy Consumed by Industry (millions of metric tons of oil equivalent)
ENICAP	=	Per Capita Industrial Energy Consumption (metric tons of oil equivalent)
ENERGYTR	=	Energy Consumed by Transportation (millions of metric tons of oil equivalent)
ENTRCAP	=	Per Capita Transportation Energy Consumption (metric tons of oil equivalent)
ENERGYA	=	Energy Consumed by Agriculture (millions of metric tons of oil equivalent)
ENACAP	=	Per Capita Agricultural Energy Consumption (metric tons of oil equivalent)
SLOPEI	=	Slope of INDS 70 * ENERGYI regression
LSLOPEI	=	Log of Slope of INDS 70 * ENERGYI regression
SLOPETR	=	Slope of TRANS 70 * ENERGYTR regression
LSLOPETR	=	Log of Slope of TRANS 70 * ENERGYTR regression
SLOPEA	=	Slope of AGRI 70 * ENERGYA regression
LSLOPEA	=	Log of Slope of AGRI 70 * ENERGYA regression
GNP	=	Gross National Product (1973 U.S. dollars)
PI 76	=	Proportion of Gross Domestic Product Attributable to Industry, 1976
RATIOPI	=	PI 76 - PI 60
NAL 70	=	Proportion of Labor Force not in Agriculture, 1970
URB	=	Percent of Population Living in Urban Areas, 1975
DENSITY	=	Population Density
OILSUF	=	Percent Self-Sufficiency in Petroleum, 1972
AL 70	=	Proportion of Labor Force in Agriculture, 1970
RATIOAL	=	AL 70 - AL 60
PA 76	=	Proportion of Gross Domestic Product Attributable to Agriculture, 1976
TRACTORS	=	Number of Tractors in Country

are here omitted. In part this decision stems from our earlier discovery that any of the three models adequately explain GDP-energy consumption relationships. Since the remainder of Chapter 3.0 used the linear relationship, this chapter also uses it. The linear sectoral regressions show a high coefficient of determination, indicating that the model is indeed adequate.

Both per capita and total sectoral trends are examined. The optimum normalization factor would have been the size of the sectoral labor force. Unfortunately this data was not available year by year for any of the nations studied. The labor force may increase more rapidly than the total population in some sectors, and it invariably declines in one - agriculture.

The second analysis examines the slopes of the total sectoral GDP versus energy consumption regressions. The per capita sectoral regressions are not examined since their coefficients of determination are almost invariably appreciably lower than those of the corresponding total sectoral regressions. The slopes were compared with a variety of factors hypothesized to explain variations in each sector.

The third analysis examines the impact of a second variable, tractors owned, on agricultural GDP. This variable was selected since it serves as a replacement for human labor, which is known to be decreasing over time. Tractors also represent a form of capital investment. Along with other farm machinery, for example harvesters, tractors consume petroleum products, and so account for a portion of the increase in energy consumption seen in the sector.

4.5 Results

Table A-3 (in Appendix A) shows the results of the sectoral time series regressions applied to the sixteen nations for which data were available. The major results are:

- Industrial GDP and energy consumption show a strong linear relationship in all 16 nations studied. Coefficients of determination range from .65 to .97. Per capita industrial GDP and energy consumption also show a statistically significant linear relationship in 15 of 16 countries, but in all countries, the correlation is lower than for the corresponding total industrial GDP - energy regression.

- GDP attributable to transportation and energy consumption by transportation are significantly and linearly correlated in 11 of the 16 nations. In the remaining five -Algeria, Argentina, Egypt, Jamaica and Korea - there is no significant linear relationship. Again, the per capita regressions, significant for 7 countries, have in all cases a lower correlation than the corresponding total sector regression.

- Due to data limitations, agricultural sector regressions could only be performed for eight nations. The total sector regressions were significant in six of these nations. In both India and Venezuela there is no statistically significsnt relationship between energy consumption and agricultural GDP. Per capita sectoral regressions in all cases but one had lower correlations than the total sector regressions.

- In each of the six nations in which agricultural GDP and energy consumption were significantly related, the increment in agricultural GDP per unit energy consumed was far higher than the increment in transportation or industrial GDP for the same amount of energy consumed. In four of the six countries the increment was higher by a factor of 10 or more; in the remaining two it was more than double.

Table 4-III shows the results of the analysis of the sectoral GDP-energy consumption intensities. The results are summarized below:

TABLE 4-III

ANALYSIS OF SECTORAL GDP-ENERGY CONSUMPTION INTENSITIES

Sector	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Industry	LSLOPEI	GNP	16	6.539	-0.000577	.0790	.2916 NS
	LSLOPEI	PI 76	16	1332.897	-1400.665	.1081	.2137 NS
	SLOPEI	RATIOPI	15	932.961	-93.965	.0148	.6658 NS
	LSLOPEI	NAL 70	8	6.227	0.1361	.0008	.9476 NS
Transportation[a]	LSLOPETR	GNP	12	4.786	0.000269	.0435	.5155 NS
	LSLOPETR	URB	12	4.740	0.5382	.0316	.5804 NS
	SLOPETR	DENSITY	11	163.148	0.0826	.0369	.5713 NS
	SLOPETR	OILSUF	12	161.911	0.6102	.0372	.5479 NS
Agriculture[b]	LSLOPEA	AL 70	7	14.143	-8.267	.5986	.0412
	LSLOPEA	RATIOAL	7	23.875	-16.562	.4868	.0813 NS
	SLOPEA	PA 76	7	32852.518	-19743.441	.0035	.9002 NS
	SLOPEA	DENSITY	7	-913.146	118.572	.6435	.0300[c]

[a] Includes only those nations for which the relationship between transportation energy consumption and productivity was proven to be statistically significant.

[b] Includes only those nations for which the relationship between agriculture energy consumption and productivity was proven to be statistically significant.

[c] Statistical significance appears to be caused by one country; therefore, this result should probably be ignored.

- The size of increment in industrial GDP per unit energy consumption does not appear to be a function of the country's proportion of GNP attributable to industry, the growth in proportion of GNP attributable to industry, or the size of the non-agricultural labor force.

- The incremental transportation GDP per unit energy consumption is not significantly correlated to GNP, degree of urbanization, population density, or petroleum self-sufficiency.

- The incremental agricultural GDP per unit energy consumption is not significantly correlated to the rate of decline of the agricultural labor force, or the proportion of GNP attributable to agriculture. It is significantly correlated to population density, but this result appears to be spurious. The incremental GDP is significantly and negatively correlated to the proportion of the labor force in agriculture.

Table 4-IV provides the results of the additional analysis of agriculture. Basic results are:

- Agricultural GDP is significantly and positively correlated to the number of tractors owned in five of eight nations examined.

- Agricultural energy consumption and number of tractors owned are significantly and positively correlated for six of the eight nations studied.

The analysis of the previous chapter showed that there is an important relationship between economic output and energy consumption over time within LDCs. This chapter has shown that this result also holds with three major sectors of the economy -- industry, transportation, and agriculture.

Although all three sectors show a strong increment in GDP corresponding to a unit increase in energy consumption, this relationship is strongest by far within the agricultural sector. We feel this is a result which has important implications for the formulation of energy assistance policy (see below and Chapter 2). Although

TABLE 4-IV

AGRICULTURAL PRODUCTIVITY REGRESSIONS

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b		P Significance Level of Regression
Brazil	AGRI70	ENERGYA	9	-210.841	24606.545	.9768	.0001
	AGRI70	TRACTORS	9	-1761.368	0.0429	.9931	.0001
	ENERGYA	TRACTORS	9	-0.0573	0.00000171	.9840	.0001
Egypt	AGRI70	ENERGYA	9	428.574	31948.946	.8173	.0008
	AGRI70	TRACTORS	8	-715.320	0.1455	.9799	.0001
	ENERGYA	TRACTORS	8	-0.00590	0.00000297	.8554	.0010
India	AGRI70	ENERGYA	8	19986.558	3389.656	.1881	.2831 NS
	AGRI70	TRACTORS	8	20571.126	0.0106	.2145	.2478 NS
	ENERGYA	TRACTORS	8	0.2098	0.00000291	.9868	.0001
Kenya	AGRI70	ENERGYA	8	444.706	1595.123	.6675	.0133
	AGRI70	TRACTORS	8	691.187	-0.0280	.1165	.4080 NS
	ENERGYA	TRACTORS	8	0.0761	-0.00000475	.0128	.7897 NS
Korea	AGRI70	ENERGYA	6	1984.174	125108.627	.9642	.0005
	AGRI70	TRACTORS	7	2439.528	0.9419	.7625	.0103
	ENERGYA	TRACTORS	6	0.00346	0.00000790	.8298	.0115
Mexico	AGRI70	ENERGYA	10	1563.874	7176.487	.7809	.0007
	AGRI70	TRACTORS	9	2563.045	0.0102	.6006	.0142
	ENERGYA	TRACTORS	9	0.1776	0.00000153	.8285	.0007
Thailand	AGRI70	ENERGYA	10	1081.290	1405.543	.7621	.0010
	AGRI70	TRACTORS	9	1613.626	0.0403	.7667	.0020
	ENERGYA	TRACTORS	9	0.4491	0.0000233	.8404	.0005
Venezuela	AGRI70	ENERGYA	8	1190.268	-48307.739	.4117	.0863 NS
	AGRI70	TRACTORS	8	467.876	0.0181	.3366	.1317 NS
	ENERGYA	TRACTORS	7	0.0118	-0.00000019	.1771	.3471 NS

agriculture consumes relatively small amounts of energy compared to the two other sectors, growth in productivity is quite rapid. Incremental increases in economic output per unit energy consumed are therefore very high.

In addition to increased energy consumption, each sector is also experiencing shifts in labor force. The labor force may grow more rapidly or more slowly than population, or may even decline within a given sector. Normalizing sector output and energy consumption by population may actually mask trends. This effect was shown by the per capita sectoral regressions, which invariably had lower correlation coefficients than the total sectoral regressions.

The most striking example of the relationship of the labor force to economic output changes is agriculture. The World Bank[3] showed that the percentage of the labor force in agriculture decreased in every nation of the world between 1960 and 1970. In some nations the decline was quite large; from 55 to 45 percent in Mexico for example. At the same time, productivity and energy consumption grew. This observation is further reinforced by the analysis of the slopes of the agricultural regressions, which showed that in those nations where the agricultural labor force comprised a small portion of the total work force, incremental agricultural GDP tended to be higher than for other nations with a proportinately larger agricultural labor force.

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[3]World Bank, World Development Report, 1978.

The comparison of non-agricultural labor with industrial economic output showed no significant relationship. The growing non-agricultural labor force may be shifting to many sectors other than industry. Transportation, commerce, and government are possibilities. Time series data on sector labor forces could provide the answer if available.

In addition to energy and labor, capital investment is a major factor influencing economic output. Chapter 3.0 has already demonstrated the importance of this factor to a nation's total economic output. Sectoral investment data was not available, and so could not be compared with sectoral GDPs. However, the United Nations has published time series data on agricultural machinery --tractors and harvesters -- by country. Tractor ownership was found to be closely and positively correlated to both agricultural GDP and energy consumption.

The results of the analysis of agriculture point to a general trend in development. Increased economic output is accompanied by a growing reliance on machinery, which replaces human labor. The modernized agricultural techniques require increasing amounts of energy, in part to fuel machinery, but probably also for fertilizers, pesticides, and irrigation. In the meantime, part of the population migrates to urban areas, in search of non-agricultural jobs. This new labor pool can then contribute to other sectors of the economy.

Galbraith[4] points out that migration, either internal or external, of displaced agricultural labor has traditionally been a major (and little-recognized) engine of development, provided this labor can be employed usefully.

The very high values observed for the ratio of increases in agricultural output to increases in energy input clearly have significance for the formulation of energy assistance policy. With many LDCs moving into food deficits, this indicates an area where energy assistance could have significant impacts. Of course, the labor surplus, which apparently results from the displacement of agricultural workers by machines, must be provided with productive employment if the nation as a whole is to benefit.

Additionally, this result tends to call in question development strategies which are based on rapid industrialization; these may not be optimal in terms of obtaining the most economic growth for the use of scarce resources such as energy.

The present analysis does not explain much of the variation in sectoral GDP-energy intensities by country. The limited number of countries for which sectoral energy consumption data is available makes such an analysis infeasible at present.

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(4) J.K. Galbraith, The Nature of Mass Poverty, Harvard University Press, 1979.

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5.0 THE ROLE OF NONCOMMERCIAL ENERGY IN LDCs

This chapter describes the analysis of noncommercial energy consumption. For this study, noncommercial fuels considered are bagasse, fuelwood, and charcoal. They are gathered, but not commercially sold. The following questions are addressed:

- Does the importance of noncommercial energy change as commercial energy consumption increases?
- In which sectors is noncommercial energy consumed?
- Does sectoral consumption of noncommercial energy change as sectoral energy consumption increases?

5.1 Conclusions

Major conclusions of the analysis of noncommercial energy consumption are summarized below:

- Noncommercial energy is a major fuel in many LDCs, contributing substantially to the overall energy consumed.
- Overall energy consumption and productivity increase over time but noncommercial energy consumption remains stagnant. Thus the role of noncommercial energy generally declines as energy consumption increases.
- Noncommercial energy is the major industrial fuel source in two LDCs - Colombia and Kenya. It makes a substantial contribution (above 10%) in Argentina, Brazil, Egypt, Indonesia and Thailand.*
- The role of noncommercial energy in industry generally declines as industrial energy consumption increases. Again, this is because noncommercial energy remains stagnant while total (and therefore commercial) energy consumption increases.

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*Of course, noncommercial energy is of primary importance in non-industrial sectors in many LDCs.

5.2 Approach

The energy used to support economic activity can be derived from many different fuels. Conventional commercial fuels such as coal, coke, petroleum, gas, nuclear power and hydroelectricity are most familiar to the people of the more developed nations. In many countries, noncommercial fuels, such as fuelwood, bagasse, dung, and wood wastes also make a significant contribution to total energy consumption.

Chapter 3.0 above examined the relationship of commercial energy consumption and productivity. For those LDCs where noncommercial fuels are commonly used, energy consumption was therefore substantially underestimated. Chapter 4.0, the sectoral energy-GDP analysis, did include noncommercial energy as a component of total sectoral energy. However, noncommercial energy was not separately examined.

This chapter addresses the role of noncommercial energy, an issue which was omitted from the previous sections. Total and sectoral noncommercial energy use patterns over time are compared with total energy consumption. This comparison indicates changes in dependence on noncommercial energy as development proceeds.

To determine the role of noncommercial energy, basic functional relationships between noncommercial energy and total energy were postulated. These relationships were then tested using regression analysis. Each country for which data was available was separately tested. The coefficients derived and the measure of the fit of the

regression model indicated both the shape and the strength of the relationship.

Results of these analyses are shown in Section 5.5 below for each country. Since the data has many limitations, comparisons among countries are not feasible. However, general patterns of noncommercial energy use are similar for almost all countries and are discussed below.

5.3 Data

Data availability and quality imposed severe limitations on the analysis of noncommercial energy. Data are generally sparse; all data on noncommercial energy consumption in this study were taken from the International Energy Agency.[9]

This document defines noncommercial fuel as bagasse, fuelwood, and charcoal. Units used were thousands of metric tons of oil equivalent. For this analysis, units were transformed to millions of metric tons. The noncommercial fuels included in the study are by no means a comprehensive group; important fuels such as dung and wastes have been omitted. The study therefore underestimates the importance of noncommercial energy sources in LDCs. In addition, the IEA notes that the market structure of these fuels varies among countries; a fuel gathered in one country may be sold commercially in another. This limits across country comparisons of noncommercial energy consumption.

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[9] International Energy Agency, Workshop on Energy Data of Developing Countries, Vol. II, 1979.

Several other weaknesses of the data became apparent during the analysis. The source document covers 16 countries. No noncommercial energy is shown for one of them, Saudi Arabia. Although Saudi Arabia is an oil exporter, it is unusual that no noncommercial energy would be used. Oil-rich Iran and Algeria consume noncommercial energy, so also do oil-exporting Mexico and Indonesia.

Another major problem of the data base is the lack of sector energy consumption data. Industrial consumption of noncommercial fuels is usually separately indicated. Residential consumption, probably the primary use of noncommercial energy, is aggregated with agriculture, commercial, and public service as "other sectors." In only one country, India, is residential use separately indicated.

The amount of noncommercial energy ascribed to "other sectors" appears far too low for many countries. For example, 93% of the noncommercial energy consumed by Thailand in 1976 is attributed to industry, leaving a maximum of 7% for residential use. Thailand is an agricultural country with a GNP of only $270 in 1973. Only 17% of the population lives in urban areas. By contrast, Nigeria, with a GNP of 210 in 1973 and 29% urban population used only 0.08% of its noncommercial energy for industry; the remaining 99.92% was ascribed to "other sectors," presumably residential. The pattern for Nigeria appears fairly typical of noncommercial energy consumption in LDCs.

Finally, some of the time series data show what appear to be major internal errors. For example industrial consumption in India

was 0.778 million metric tons oil equivalent in 1967 and 0.784 in 1968. In 1969 consumption jumped to 1.383 million metric tons, followed by 1.529 in 1970. It is unlikely that noncommercial energy would almost double in just one year.

In view of the limitations of noncommercial energy data, comparisons between countries have not been made. However, it is felt that the quality of the data is adequate to support the results quoted in Section 5.5. The data used is presented in Appendix B-4. Appendix B-5 shows the residential noncommercial energy available for India.

5.4 Models Tested

Table 5-I shows the noncommercial energy consumption models tested in this analysis. Noncommercial energy was compared with total (i.e., commercial plus noncommercial) energy use. Since Sections 3.0 and 4.0 have already amply demonstrated the strong correlation between energy consumption and GDP, GDP has not been used as a variable in this portion of the analysis.

In the first part of the analysis, per capita noncommercial energy was regressed against time and against total per capita energy consumption. The proportion of total energy consumption contributed by noncommercial energy was also regressed against total energy consumption per capital. In the second portion of the analysis, the same regressions were performed for the industrial sector.

The third portion of the analysis deals with residential use of noncommercial energy. Since data was available only for India, the

NONCOMMERCIAL ENERGY MODELS TESTED

Analysis	Dependent Variable	Independent Variable	Number of Countries Tested
Total Noncommercial Energy Consumption	ENNCCAP	ENTOCAP	15
	ENNCCAP	YEAR	15
	FRNC	ENTOCAP	15
Industrial Noncommercial Energy Consumption	ENINC	ENERGYI	14
	ENINC	YEAR	14
	FRIN	ENERGYI	14
Residential Noncommercial Energy	RESCAPTA	YEAR	1
	NCCAPTA	YEAR	1
	PTRCAPTA	YEAR	1
	PTRCAPTA	RESCAPTA	1
	PTRCAPTA	NCCAPTA	1
	TOTALRES	YEAR	1
	NONCOM	YEAR	1
	PETROPRD	YEAR	1
	PETROPRD	TOTALRES	1
	PETROPRD	NONCOM	1

Variable Symbols:

ENNCCAP = Noncommercial Energy Consumption per Capita (metric tons oil equivalent)
ENTOCAP = Total Energy Consumption per Capita (metric tons oil equivalent)
YEAR = Year
FRNC = Fraction of Total Energy Consumption Attributable to Noncommercial Energy
ENINC = Total Noncommercial Energy Consumed by Industry (millions of metric tons oil equivalent)
ENERGYI = Total Energy Consumed by Industry (millions of metric tons oil equivalent)
FRIN = Fraction of Industrial Energy Consumption Attributable to Noncommercial Energy
RESCAPTA = Per Capita Residential Energy Consumption (metric tons oil equivalent)
NCCAPTA = Per Capita Residential Consumption of Noncommercial Energy (metric tons oil equivalent)
PTRCAPTA = Per Capita Residential Consumption of Petroleum Products (metric tons oil equivalent)
TOTALRES = Total Residential Energy Consumption (millions of metric tons oil equivalent)
NONCOM = Total Residential Noncommercial Energy Consumption (millions of metric tons oil equivalent)
PETROPRD = Total Residential Consumption of Petroleum Products (millions of metric tons oil equivalent)

analysis is limited in scope. Per capita and total use of all residential fuels, noncommercial fuels, and petroleum products have been regressed over time. In addition, petroleum product consumption was regressed against total and noncomercial residential fuel consumption to determine whether the mix of residential fuels is changing.

5.5 Results

Table A-4 (in Appendix A) shows the results of testing noncommercial energy time series data. The results for total noncommercial energy consumption are summarized below:

- Noncommercial energy comprises a substantial portion of the total energy consumed in many LDCs. The country most dependent on noncommercial energy is Nigeria; 79% of the total in 1973.

- Per capita consumption of noncommercial energy is usually stagnant compared to per capita total energy consumption. In 6 of the 15 countries examined, there is no statistically significant relationship between noncommercial and total energy consumption per capita. In another 7 countries, the slope of the regression line is either small or negative. In only two countries is there a strong, positive relationship -Kenya and Colombia. However, the data for Kenya appears suspect and Colombia has declining total and noncommercial energy consumption per capita over time.

- Per capita consumption of noncommercial energy shows minimal or even negative increases over time. Five nations show no statistically significant change over time. Of the remaining 10 nations, 5 show minor decreases in noncommercial energy use, 5 minor increases.

- The fraction of per capita consumption formed by noncommercial energy declines steadily as a country's total energy consumption increases. Of the 15 nations examined, 10 show a strong decline in fraction of noncommercial energy. The remaining 5 showed no statistically significant change. In no country was the fraction of per capita noncommercial energy consumption observed to increase significantly as total energy consumption increased.

Tests of noncommercial industrial time series data are also shown in Table A-4. The results are summarized below:

- Noncommercial energy comprises a substantial portion of the energy consumed by the industrial sector in several LDCs.

- Noncommercial energy consumption by industry increases as industrial energy consumption increases. However, noncommercial energy use increases more slowly than energy from other sources.

- The fraction of industrial energy attributable to noncommercial energy declines as industrial energy consumption increases. Of the 14 countries examined, 9 showed a declining proportion of noncommercial energy in industry. Only two showed increasing proportions The remaining three countries showed no significant correlation.

Figures 5-1 through 5-4 show these results plotted for Brazil. Brazil was selected as an example since it shows a typical pattern for noncommercial energy use in LDCs.

Figure 5-1 shows total and noncommercial energy time series from 1967 to 1976. Total energy consumption per capita shows a steady increase over this period, from 0.53 metric tons oil equivalent in 1967 to 0.77 metric tons oil equivalent in 1976, a 45 percent increase. In contrast, noncommercial energy shows no significant change; it is 0.27 metric tons oil equivalent in 1967 and 0.26 in 1976.

The implication of Figure 5-1 is that noncommercial energy makes little contribution to increased development. Since noncommercial energy consumption remains stagnant as total energy consumption increases, the proportion of noncommercial energy consumption declining. Figure 5-2 illustrates the trend. While noncommercial energy

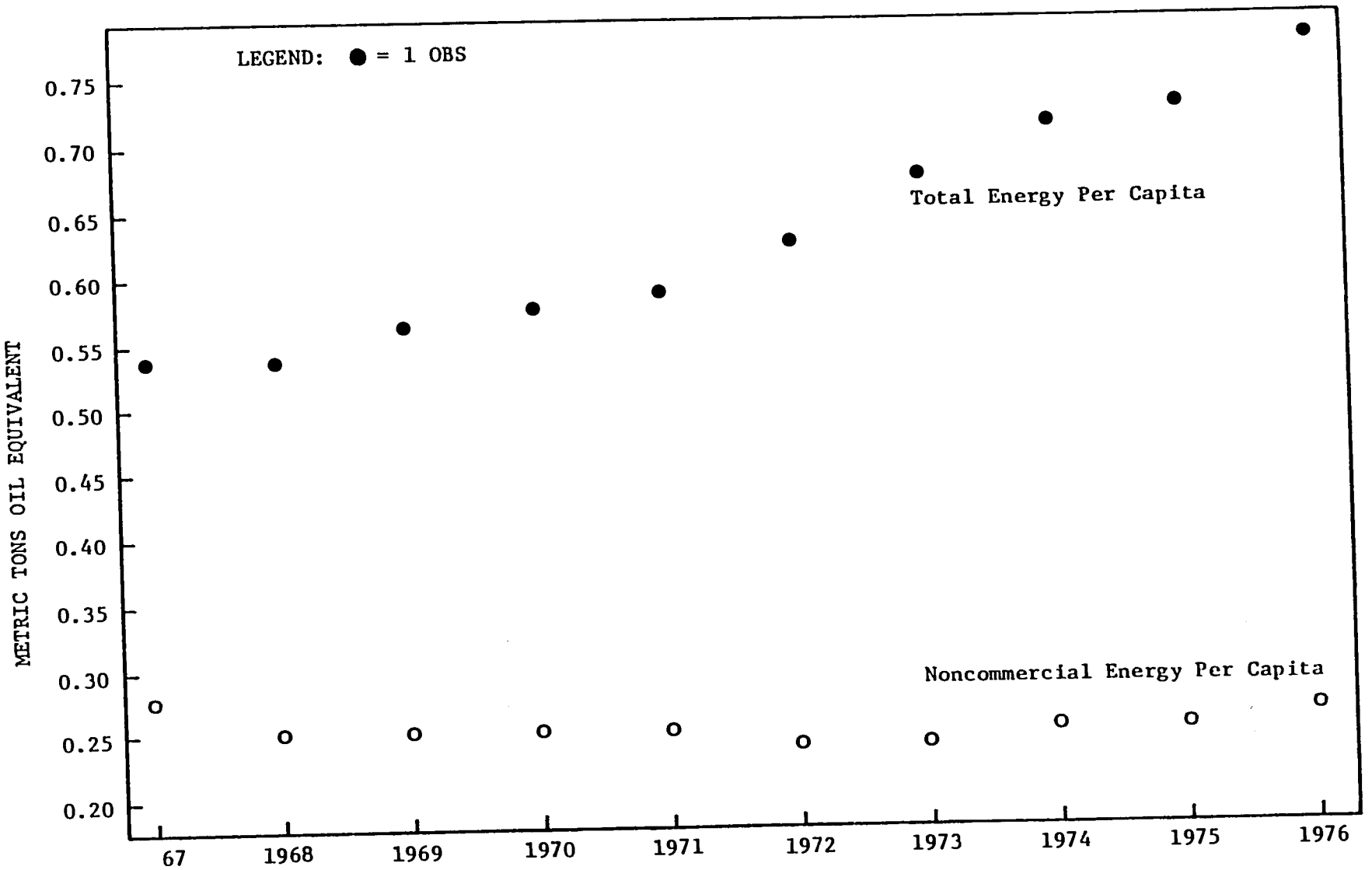

FIGURE 5-1
TOTAL AND NONCOMMERCIAL ENERGY TIME SERIES
BRAZIL

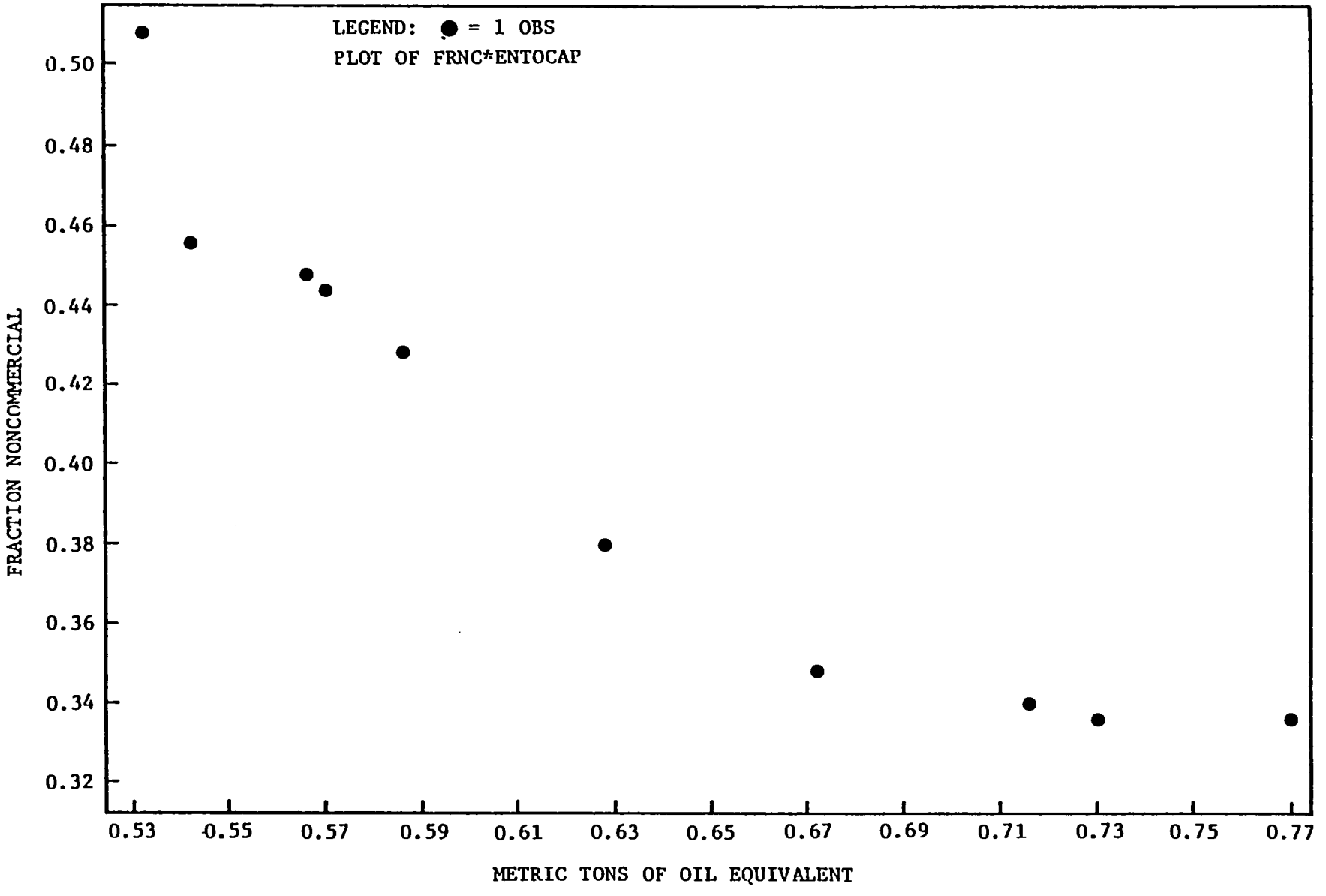

FIGURE 5-2
PROPORTION OF NONCOMMERCIAL ENERGY TO TOTAL ENERGY CONSUMED
BRAZIL

accounted for more than half the energy consumed in Brazil in 1967, it was only 34 percent in 1976. Of course, the noncommercial energy used, although diminishing in overall importance, may be critical to certain groups, such as the rural poor.

The trend in industrial energy consumption is similar. Figure 5-3 shows total industrial energy increasing rapidly while noncommercial energy used by the sector shows only a slow increase. As a result, the proportion of noncommercial energy used by the sector declines rapidly. Figure 5-4 plots this trend.

Table 5-II presents the results of the residential noncommercial energy use regressions for India. Total and noncommercial residential fuel consumption increased steadily from 1967 to 1976, but the consumption of petroleum products in the home showed no significant change over time. Petroleum products do show an increase when regressed against total residential fuels. Since petroleum is a part of total residential fuel use, this result probably has little meaning, especially since petroleum does not change significantly with respect to noncommercial fuel use.

On a per capita basis, the picture changes considerably. None of the fuels show any significant change in per capita consumption over time. The growth that was observed in the overall energy consumption regressions is therefore most likely attributable to population growth.

Although general trends of noncommercial energy use are clearly visible from this analysis, the quality of the data does not permit

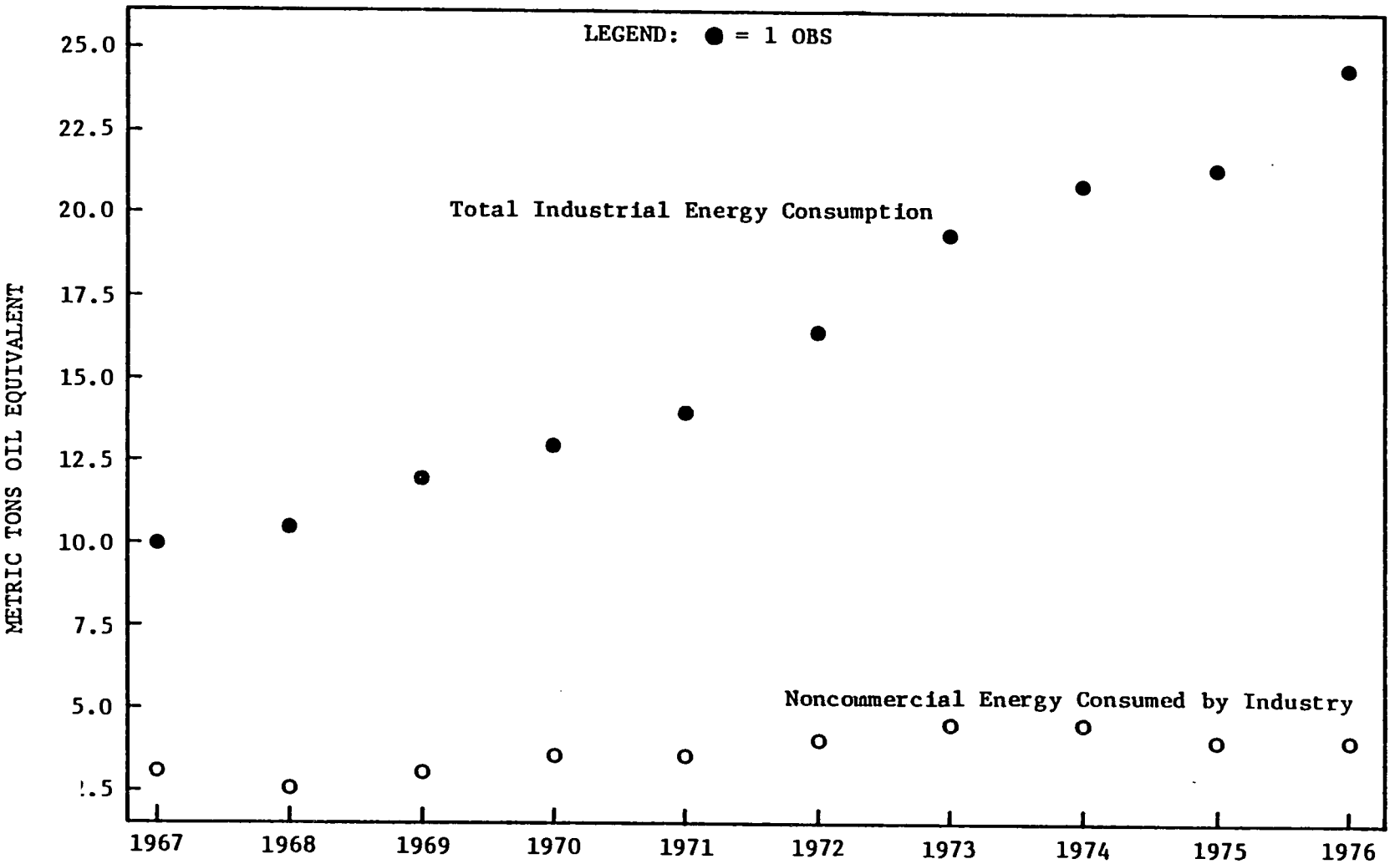

FIGURE 5-3
INDUSTRIAL ENERGY TIME SERIES
BRAZIL

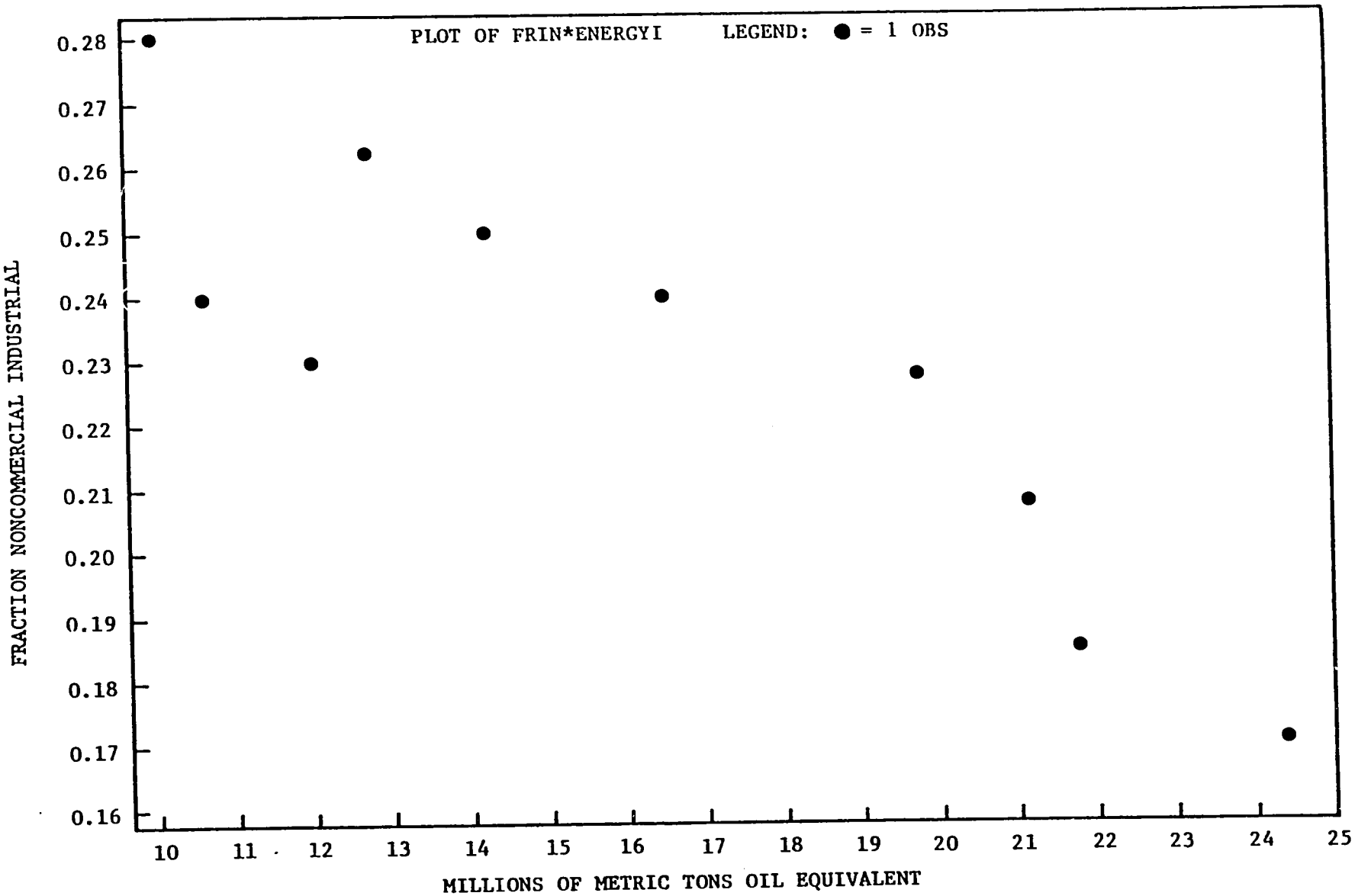

FIGURE 5-4
PROPORTION OF NONCOMMERCIAL TO TOTAL ENERGY CONSUMED BY INDUSTRY

TABLE 5-II

RESIDENTIAL FUEL USE REGRESSIONS - INDIA

	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Per Capita Regressions	RESCAPTA	YEAR	11	-0.7795	0.0004	.1542	.2322 NS
	NCCAPTA	YEAR	11	-0.0709	0.0001	.1288	.2785 NS
	PTRCAPTA	YEAR	11	-0.2566	0.0001	.0833	.3895 NS
	PTRCAPTA	RESCAPTA	11	-0.0154	0.3950	.8481	.0001
	PTRCAPTA	NCCAPTA	11	0.0544	-0.9903	.1274	.2812 NS
Overall Regressions	TOTALRES	YEAR	11	-1773.2601	0.8955	.7201	.0010
	NONCOM	YEAR	11	-1149.4161	0.5964	.9771	.0001
	PETROPRD	YEAR	11	-293.5899	0.1510	.2695	.1018
	PETROPRD	TOTALRES	11	-3.4569	0.2352	.7280	.0008
	PETROPRD	NONCOM	11	-1.5435	0.2159	.2005	.1672 NS

further analysis of patterns between countries. In general, noncommercial energy appears to assume a major role in LDCs. As productivity and total energy consumption increase, however, noncommercial energy becomes less important. Its role in development therefore appears to be small.

Improved data would make a more thorough and conclusive analysis feasible. Specifically, a larger number of nations should be included. All data should be screened for the obvious types of errors discussed in Section 5.3 above. Data should be more fully disaggregated by sector. Residential use is especially critical. Finally, all sources of noncommercial energy should be documented.

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6.0 QUALITY OF LIFE ANALYSES

6.1 Conclusions

Several different indicators of social and economic development in LDCs are examined. They include:

- Infant mortality rate
- Life expectancy
- Adult literacy
- Gross Domestic Product per capita (GDP)
- Commercial Energy Consumption per capita (TEC)
- Proportion of children receiving secondary education
- TV ownership per capita
- Automobile ownership per capita
- Percentage of urbanization

Factor analysis* indicates that these indicators are primarily expressions of one process of development. Thus, while it is true that individual countries may show very different patterns of development (for example, Sri Lanka and Mauritania in Figure 6-1), in a statistical sense there seems to be one pattern of development, since one component dominates the factor analysis results.

Analysis of the relationships between the Physical Quality of Life Index (PQLI) and both GDP and energy consumption (TEC) data for

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*Factor analysis is a statistical technique for explaining the variability of a set of observations of a number of variables in terms of a small number of hypothetical factors. See Appendix C for a brief explanation and reference.

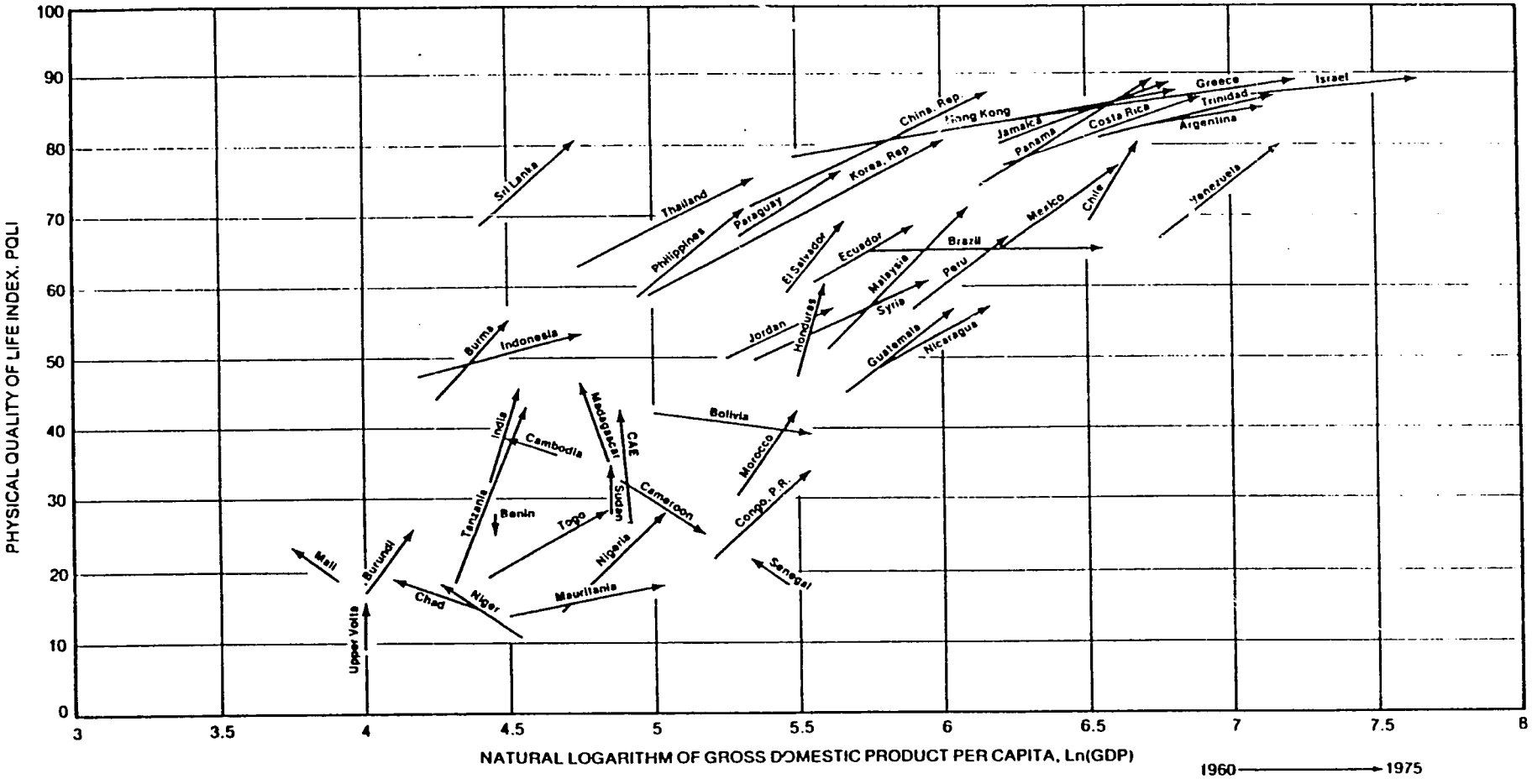

FIGURE 6-1
1960 AND 1975 VALUES FOR PHYSICAL QUALITY OF LIFE INDEX VS. NATURAL LOGARITHM OF GROSS DOMESTIC PRODUCT PER CAPITA

1960 and 1975 indicate that the relationships between these variables seem to be independent of time, so that the regression lines for 1975 are virtually identical with those for 1960. In this context, energy consumption seems to be a more consistent indicator than GDP, which may be subject to arbitrary exchange-rate fluctuations.

6.2 Approach

The "Quality of Life" is a rather vague concept. As noted in our previous work,[1] it is clear that this concept is quite distinct from economic activity. That study used the Physical Quality of Life Index (PQLI), formulated by the Overseas Development Council.[11] The PQLI is a linear function of: the infant mortality rate per 1000 live births, m; the life expectancy in years at age one, e; and the adult literacy rate, a. The original definition of PQLI scaled these factors on a 0-100 base, with 0 representing the worst observed performance, and 100 corresponding to ODC's judgement of the best performance possible by 2000 in advanced countries. These three values were then averaged to obtain the PQLI. For our purposes, the PQLI can be expressed as

$$PQLI = 0.15*m + 0.855*e + 0.333*a + 1.90$$

This measure has been heavily used in the present analysis, together with other non-economic and economic indicators, as discussed below.

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(1) The MITRE Corporation, Energy and Development: A Preliminary Analysis of Less-Developed Countries, MTR-79W00216, 1979.

(11) M.D. Morris, Measuring the Condition of the World's Poor, Overseas Development Council/Pergamon, Pergamon Policy Studies # 42, 1979.

The data base used in the quality of life analyses presented here is shown in full in Table B-7, Appendix B. The data base contains, for a sample of 87 LDCs, 23 parameters (for both 1960 and 1975, as far as possible). The GDP and TEC data are the same as those assembled for the energy-economic analyses described in the preceding chapters. The other data were assembled mainly fro AID's Economic and Social Data Bank, which in turn obtains data from the World Bank and other sources. These sources are indicated in parentheses. The list of parameters, with sources, follows:

- Gross Domestic Product per capita, GDP - see Chapter 3
- Total Commercial Energy Consumption per capita, TEC - see Chapter 3
- Infant Mortality rate, m - AID (World Bank), Overseas Development Council,(12), United Nationsl(13)
- Life Expectancy at Birth, e_o - AID (WB), ODC,(12), U.N.(13)
- Adult Literacy Rate, a - AID (WB), ODC,(12) UNESCO(14)
- Calorie Consumption per capita, CAL - AID
- Animal Protein Proportion of Protein Intake, AMLPROT - AID
- Percentage of Children in Secondary School, PCSSCH - AID (WB)
- Percentage of Female Children in Primary School, PCFSCH AID (WB)

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(12) Overseas Development Council, The United States and World Development Agenda 1979, 1979.

(13) United Nations, Statistical Yearbook, 1977, 1978.

(14) United Nations Educational, Cultural and Scientific Organization, UNESCO Statistical Yearbook, 1976, 1977.

- Number of TV Sets per 1000 Persons, TVS - AID (WB), UNESCO(13)
- Number of Persons per Room, PERSRM - AID (WB)
- Percentage of Population with Access to Sewage Disposal, PCACSEW - AID (WB)
- Percentage of Population with Access to Piped Water, PCACWAT
- Number of Cars per 1000 Persons, CARS
- Kuznets Index of Income Distribution, INCKUZ* - Jain(15)
- Average Household Size, HHSIZ - AID (WB), UN(13)
- Percentage of Dwellings with Electricity, PCELEC - AID (WB)
- Percentage of Population Living in Urban Areas, PCURB - AID (WB)
- Total Fertility Rate, TFR - World Bank(3)
- Central Government Expenditure as Percentage of Gross National Product, PCGOV - World Bank(3)

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(14)United Nations Educational, Cultural and Scientific Organization, UNESCO Statistical Yearbook, 1976, 1977.

(15)S. Jain, Size Distribution of Income - A Compilation of Data, World Bank, 1975.

(13)United Nations, Statistical Yearbook 1977, 1978.

(3)World Bank, World Development Report, 1978.

*The KUZNETS Index is a measure of inequality of income distribution. It is computed for twenty intervals; under perfect equality each 5% of the population would receive 5% of the income. The absolute mean deviation, d, of the income share of each 5% group from 5% of the income is therefore a measure of inequality. Then the index is defined as

$$INCKUZ = \frac{1}{9.5} * \frac{d}{20}$$

where 9.5 is a normalization factor. The value ranges from zero for perfect equality to unity for perfect inequality.

- Expenditure on Defense as Percentage of Central Government Expenditure, PCDEF - Europa Year Book[16]
- BNL Type of Economy[2]
- Dominant Religion - Europa Year Book[16]

Factor analyses have been used to search for significant groupings of development-related indicators, and linear regression analyses have been used to examine possible relationships between development indicators in detail. These analyses have been undertaken on three bases:

- cross-sectional analyses of all countries
- cross-sectional analyses of countries stratified by economy type or by culture
- cross-sectional analyses of growth rates of selected parameters between 1960 and 1975.

6.3 Data Limitations

As noted in MITRE's previous study,[1] there are severe limitations associated with the data available for non-economic indicators of development. Data is frequently not available, and in cases where it is available different sources frequently conflict. For instance, for Algeria, the World Bank[3] states the 1960 infant

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(16) Europa Year Book, Europa, London, 1978.

(2) Palmedo, P.F., Nathans, R., Beardsworth, E., Hale, S., Energy Needs, Use and Resources in Developing Countries, Brookhaven National Laboratory, BNL 50784, 1978 (See Chapter 1).

(1) The MITRE Corporation, Energy and Development: A Preliminary Analysis of Less Developed Countries, MTR-79W00216, 1979.

(3) World Bank, World Development Indicators, 1978.

mortality rate to be 36 per 1000, while the United Nations[13] gives 86. Similar examples abound.

The large gaps in the data were particularly deleterious to the factor analyses. All parameters examined in a factor analysis must be present for all observations, and elimination of observations with missing values rapidly reduces the sample size as the number of parameters examined increases.

6.4 Results

The results are presented in sections, dealing with the factor analyses, and with unstratified and stratified regression analyses, respectively.

6.4.1 Factor Analyses

Initially four factor analyses were made. Their descriptions are as follows:

Run 1.1: 1960 data, variables: GDP, energy consumption, secondary school, percentage of females in primary school, TV ownership, car ownership, urbanization (GDP, TEC, M, e_o, a, PCSSCH, PCFPSC, TVS, CARS, PCURB).

Run 1.2: 1960 data, variables as Run 1.1 plus income distribution (INCKUZ)

Run 1.3: 1975 data, variables as Run 1.1

Run 1.4: 1975 data, variables as Run 1.2

The purpose of these runs was to search for commonalities among economic and non-economic indicators of development. Due to the sparseness of the data, some variables present on the data file had to be

(13) United Nations, Statistical Yearbook 1977, 1978.

omitted from the factor analyses. (All variables must be present for an observation for it to be valid for factor analysis.) The results of these runs are shown in Table 6-I.

These results are quite interesting. They appear to indicate that two factors are involved, one of which is clearly dominant (from its eigenvalues) and accounts for 50 to 70% of the observed variance. The five indicators with the largest Factor 2 component are, in decreasing order, for 1960 data: TV ownership, car ownership, percent in secondary school, energy consumption, infant mortality (TVS, CARS, PCSSCH, TEC, m); and for 1975 data: GDP, literacy, infant mortality, energy consumption, percent females in primary school (GDP, a, m, TEC, PCFPSC). There is little comparability between these results, and it appears that Factor 2 is spurious. In all cases, Factor 2 accounts for less than 20% of the variance. Thus, there appears to be only one reliable development-related factor at work. When income distribution (INCKUZ) is included in the data set, it essentially gets a factor all of its own (factor 3 in Run 1.2, Factor 2 in Run 1.4).*

Two factor analyses were made to examine relationships between the rates of change of various indicators. These are summarized in Table 6-II, as numbers 1.5 and 1.6. The results obtained are confirming. Run 1.5, which compared growth rates of GDP, energy

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*INCKUZ is not, in itself, an indicator of economic development, being a measure of the distribution of income, not its quantity.

TABLE 6-I

FACTOR ANALYSES OF DEVELOPMENT INDICATORS: FACTOR PATTERNS

Run Number	1.1		1.2			1.3		1.4	
Factor	1	2	1	2	3	1	2	1	2
Variable									
GDP	.903	.192	.892	.304	-.081	.857	.435	.916	.285
TEC	.866	.379	.866	.396	-.174	.797	.404	784	.391
m	-.692	.323	-.532	.542	-.077	-.803	.413	-.711	.337
e_o	.903	-.244	.794	-.448	-.034	.929	-.208	.877	-.258
a	.867	-.323	.757	-.476	.322	.851	-.422	.768	-.362
PCSSCH	.776	-.441	.481	-.632	-.400	.820	-.125	.676	-.131
PCF?SC	.817	-.316	.589	-.370	.480	.847	-.394	.731	-.192
TVS	.616	.678	.840	.454	-.096	.862	.289	.917	-.031
CARS	.767	.493	.866	.405	.006	.826	.373	.782	.431
PCURB	.877	.031	.896	.168	-.133	.809	.085	.847	.188
INCKUZ	-	-	.083	.309	.849	-	-	-.078	.818
Eigen Value	6.62	1.45	5.88	2.01	1.29	7.07	1.15	6.48	1.49
Portion	.662	.807	.534	.717	.834	.707	.822	.590	.725

TABLE 6-II

FACTOR ANALYSES OF RATES OF CHANGE OF DEVELOPMENT INDICATORS:
FACTOR PATTERNS

Run No.	1.5				1.6			
Factor	1	2	3	4	1	2	3	4
GDPR	-0.198	-0.148	0.907	-0.141	0.782	0.316	-0.013	0.007
TECR	0.180	0.340	0.861	0.255	0.551	0.323	0.096	0.536
CALR	-0.140	-0.259	0.040	0.815	-	-	-	-
PCSSCHR	-0.751	0.227	0.083	-0.416	-0.468	-0.467	0.512	0.099
PFPSCR	-0.415	0.069	-0.476	-0.649	-	-	-	-
CARR	0.630	-0.275	0.546	0.205	0.624	0.590	0.133	-0.160
PCURBR	-0.666	0.278	-0.185	0.571	-0.394	0.450	0.639	-0.017
MR	0.864	-0.053	-0.036	-0.168	0.646	-0.434	0.331	-0.147
AR	0.026	0.805	0.013	-0.428	0.263	0.492	0.485	-0.254
ER	-0.080	0.930	0.003	0.019	-0.132	-0.376	0.135	0.849
DRR	0.870	0.228	0.192	-0.035	0.695	-0.439	0.428	-0.029
Eigen Value	3.68	2.32	1.98	1.28	2.66	1.72	1.24	1.13
Portion	0.33	0.55	0.73	0.84	0.30	0.49	0.63	0.75

consumption, calory consumption, percent in secondary school, percent females in primary school, car ownership, urbanization, infant mortality, literacy, and life expectancy (GDP, TEC, CAL, PCSSCH, PFPSC, CARS, PCURB, m, a and e), together with the Disparity Reduction Rate (DRR),[17] contained only 12 valid observations. Four factors were observed, and the primary constituents were as follows:

Factor 1: Disparity Reduction Rate, percent in secondary school, car ownership, urbanization and infant mortality (DRR, PCSSCH, CARS, PCURB, m)

Factor 2: literacy, life expectancy (a, e)

Factor 3: GDP, energy consumption (GDP, TEC)

Factor 4: calory consumption (CAL)

In run 1.6, the variables CAL and PFPSC were removed to increase the number of valid observations to 41. Again, four factors were observed, but the components were rather different:

Factor 1: GDP, energy consumption, car ownership, literacy (GDP, TEC, CAR, a)

Factor 2: Disparity Reduction Rate, infant mortality (DRR, m)

Factor 3: Percent in secondary school, urbanization (PCSSCH, PCURB)

Factor 4: Life expectancy (e)

These results do not exhibit a clear pattern, and the association of variables seems rather arbitrary, although GDP and energy consumption

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(17) The Disparity Reduction Rate is the rate at which the PQLI is approaching the assigned limiting value of 100. See: J.P. Grant, Disparity Reduction Rates, Overseas Development Council, Monograph No. 11, 1978. (Ref. 6-8)

seem to be associated. The rates of change of parameters are more susceptible to the effects of bad data than the parameters themselves; for instance, if a parameter has observed values of 50 in 1960, and 70 in 1975, with a margin of error of ± 5 in each observation, then the annual growth rate could lie between 1.1% and 3.5% so that $\pm 10\%$ error in the observed parameters can lead to $\pm 50\%$ errors in the imputed rate of change. Therefore it appears that rates of change are intrinsically unreliable in this context. This result also appears in Sections 6.3 and 6.4

6.4.2 Unstratified Regression Analyses

Runs 2.1 through 2.4 (Table A-5 in Appendix A) confirm the strong relationship between the Physical Quality of Life Index (PQLI) and Log(GDP) and Log(TEC) which was observed in the previous analysis. Comparison of Runs 2.1 and 2.2, and 2.3 and 2.4 indicate that the regression lines for the 1960 data and the 1975 data are little different from each other. This is significant because it indicates that movement of the points representing individual countries over the period 1960-1975 took place along the regression line; that is, the cross-sectional analysis yields results which are valid in a longitudinal sense. This is largely confirmed by Figures 6-1 and 6-2 which show the individual countries' movements.* Figure 6-1 indicates that while most higher income countries seem to be moving smoothly upward along the curve, many low-income countries are moving

*The tails of the arrows show the 1960 positions and the points show the 1975 positions.

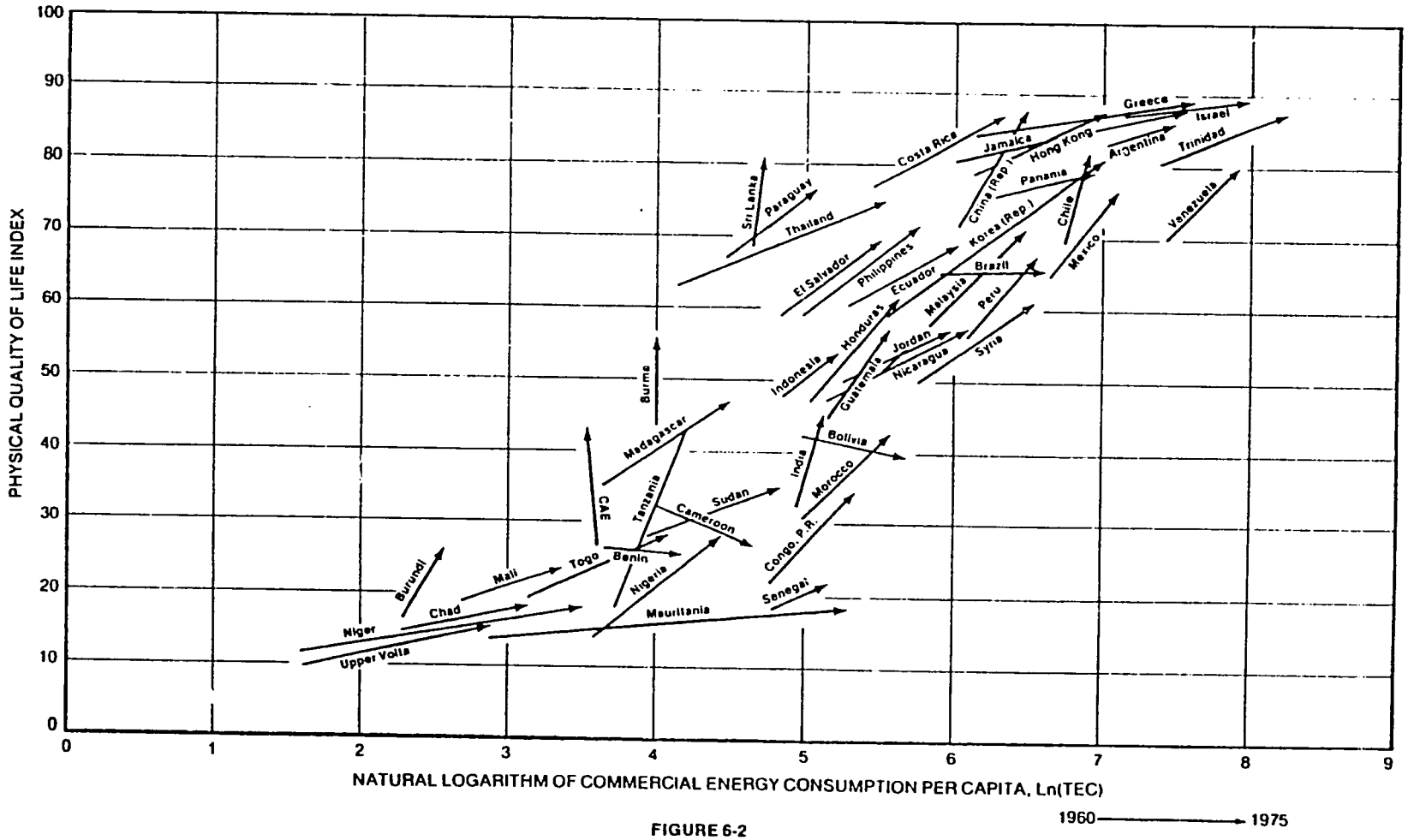

FIGURE 6-2
1960 AND 1975 VALUES OF PHYSICAL QUALITY OF LIFE INDEX VS. NATURAL LOGARITHM OF COMMERCIAL ENERGY CONSUMPTION PER CAPITA

erratically. Infant mortality data for Brazil and Bolivia are suspect, showing large increases which are intuitively surprising, given the progress of these countries in other areas during 1960-75. It is possible that exchange rate fluctuations, differing inflation rates, changing commodity prices, or other financial variations have distorted the GDP figures for some countries. Figure 6-2, which shows PQLI and Ln(TEC), presents a more uniform pattern. Energy consumption is a physical measure, and is thus unaffected by financial variations. The S-shape of the curve is clearly visible. Runs 2.1 through 2.4 are based on all LDCs including oil exporters.* Runs 2.5 and 2.6 investigate the relationship between the inverse energy intensity of the GDP (i.e., TEC/GDP) and the PQLI for 1960 and 1975. There is found to be a significant and positive relationship for both time periods. Runs 2.7 and 2.8 regress the inverse energy intensity of the GDP on the GDP itself for 1960 and 1975. There is, again, a significant and positive correlation for both time periods; but the relationship for 1975 is much weaker than that for 1960 ($F = 6.85$ against $F = 16.87$), and the B-coefficient is much lower (0.0004 against 0.0012).

Simply put, these results indicate that high GDP, high PQLI and high energy consumption per unit GDP output are correlated. The rate of change of TEC/GDP with GDP appears to be lower in 1975 than in 1960. The significance of these results is discussed in Section 5.5.

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*It is possible that the rapid expansion of the oil exporters' incomes and energy usages after 1973 may account for the slightly lower B-coefficient values in the 1975 data.

The Disparity Reduction Rate (DRR) was regressed against annual percentage growth rates in GDP and TEC (called GDPR and TECR, respectively) in Runs 2.9 through 2.10 (Table A-5). Run 2.11 compared GDPR and TECR. The results are extremely interesting; while there is a strong and positive correlation between DRR and GDPR, and a strong and positive correlation between GDPR and TECR, there is none between DRR and TECR. This has also been investigated in a stratified manner (see Section 5.43).

A search was made for relationships between the DRR and growth rates in GDP and TEC, and expenditures by the central government and defense expenditures. The results of these regression analyses are shown in Table A-5, Runs 2.12 through 2.20. In these runs, the independent variables are defined as follows:

PCGOV = average of 1960 and 1975 central government expenditures as % of GDP

PCDEF = 1975 defense expenditure as % of central government expenditure*

TPCDEF = PCGOV*PCDEF/100; this is a rough measure of defense expenditure as a % of GDP

Finally, as an example of the types of relationships which can be obtained using this data base, the behavior of the total fertility rate (TFR) was investigated. TFR measures the number of living children that a woman bears during her lifetime. In Table A-V runs 2.21 through 2.23 regress TFR on PQLI, GDP and TEC respectively.

*Defense expenditures for 1960 were not available.

Good correlations are obtained (F>20 for all cases). The pattern is quite non-linear, TFR being roughly constant for low PQLIs and dropping rapidly at high PQLIs (> 65). This suggests the use of the transformed variable:

$$PVAL = \frac{100}{100-PQLI}$$

This variable is analogous to the DRR suggested by Grant,[17] in that the rate of change of PVAL is the same as the DRR.

Runs 2.24 and 2.25 regress TFR against PVAL for 1975 data. It can seen that the correlation obtained is much better (F = 123.5 compared with F = 46.7, r^2 = 0.65 compared with r^2 = 0.41). Excluding the oil-exporting countries does not increase the correlation further (F = 96.4 and r^2 = 0.65).

In the next runs, 2.26 through 2.29, PVAL is regressed against GDP and TEC, first for all LDCs and then for non-oil-exporting LDCs. High correlations are obtained although the results are not as good as those obtained in MITRE's previous study when PQLI was regressed against Ln (GNP) and Ln (TEC).

Judging from the results of the factor and correlation analysis, similar results would be obtained for most of the development indicators in the data base; namely a high degree of correlation with PQLI (or some function thereof), TEC, and GDP.

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[17] Grant, J.P., Disparity Reduction Rates, Overseas Development Council, Monograph No. 11, 1978.

6.4.3 Stratified Regression Analyses

Following on from the results obtained in our preliminary analyses published earlier,[1] a number of regression analyses have been made with the sample of countries stratified by religion or economic type.*

Runs 3.1 through 3.12 (Table A-VI in Appendix A) continue the investigation of the relationship between the Physical Quality of Life Index (PQLI) and the inverse energy intensity of the GDP (TEC/GDP), stratified by religion. Results are shown in full only for significant runs.

The results indicate that PQLI is correlated with the inverse energy intensity of the GDP for Islamic countries (religion=3) and possibly for countries with mixed religions (religion=4) or traditional or tribal religions (religion=5). It is not clear if any of this effect is linked to oil exports, but it seems unlikely since oil exports in 1960 did not command the price they achieved in the 1970's, and hence would not dominate oil exporting LDCs economies in the same way.

A similar sequence of runs was undertaken with the sample of countries stratified by BNL economy type. (Runs 3.13 through 3.24). These results clearly indicate that a significant positive relationship exists between PQLI and TEC/GDP for economy type 2 (oil

[1] The MITRE Corporation, Energy and Development: A Preliminary Analysis of Less Develop Countries, MTR-79W00216, 1979.

*Economic types based on BNL classification (Palmedo, etc. op. cit.).

exporters), and strongly hint that a significant relationship exists for economy type 3 (balanced growth economies), (negative relationship) and for economy type 6 (other agricultural) (positive relationship).*

A series of stratified runs were made to investigate the anomalous DPR-GDPR-TECR relationships discovered in Section 5.4.2 (Runs 2.9-2.11). The results are shown in Table A-6, Runs 3.25-3.54. No systematic pattern emerged either for DPR-TECR or DPR-GDPR relationships. In fact, only two runs out of 30 are significant at the 5% level, a result which could easily be obtained by chance. The effects of inaccuracies in data on the rates of change in parameters have already been noted in Section 6.4.1, and may explain the apparent anomalies in these results.

Following on from the analyses of total fertility rate (TFR) presented in Section 5.4.2, analyses of TFR were performed for 1975 data stratified by culture (religion) and economic type. The results are shown in Table A-6, runs 3.55 through 3.73, using PQLI, PVAL and TEC as independent variables. The results are much the same for each independent variable; TFR declines with increasing development for Bhuddhist/Hindu, Christian, and mixed societies, but not for Islamic or Traditional Societies. The exclusion of oil-exporters (run 3.73)

*Run 3.18 had B=17.0, and Run 3.21 had B=-37.7. Both these runs, although not significant at the 5% level, had signs the same as the corresponding significant runs. Further, these runs were close to being significant (P=0.08 and P=0.06 respectively).

does not increase the significance level of the regression line for Islamic societies.

The results for TFR as a function of PVAL when stratified by economy type are shown in runs 3.74 through 3.79, Table A-6. Significant correlations are found for economy types 1, 2, 3, and 5; that is industralized, oil exporters, balanced growth economies and agricultural exporters. No correlations were found for primary exporters or for other agricultural economies.

6.5 Discussion

The analyses described in this chapt were designed to investigate the nature of the development process in LDCs, and upon some factors affecting it. However, the results obtained are rather puzzling, especially with respect to the nature of the development process.

Perhaps the most interesting area is raised by the initial factor analyses in Section 5.3. These strongly indicate that the main development indicators considered, whether social, economic or energy-related, are primarily reflections of a single dominant factor. It had been hypothesized that social and economic development might be unrelated processes; had this been the case, the factor analyses would have shown a pattern with two strong factors. Economic and energy indicators (e.g., GDP, TEC, TV and car ownership) would have been strongly related to one factor, and social indicators (e.g., school enrollments, PQLI components) would have been more

related to the other. This pattern was not observed, leading to the conclusion that development appears to be a unified "multi-fold" process.[18] However, this conclusion is contradicted by the factor analyses of rates of change and by the anomalous relationships observed between the Disparity Reduction Rate (DRR), and the growth rates of GDP and energy consumption (GDPR and TECR), where DRR and GDPR are significantly related, and GDPR and TECR are significantly related, but DRR and TECR are not related. This behavior is not clarified by stratified analyses on the bases of economy type, GDP per capita or social (religion) type. The relationship observed at the unstratified level for DRR and GDPR almost disappears at the stratified levels, where it is found only for Buddhist/Hindu countries and for countries with an economic basis of subsistence agriculture.

It is possible that the non-linearity of the DRR is masking any real relationships which are present. It seems more likely that data errors and inaccuracies are having a more significant impact on the growth rates of indicators than on the absolute values of the indicators (see Section 5.4.1) so that no firm conclusions can be drawn from these analyses.

On balance, it appears that development, as studied, is a relatively unified process, in which economic and social progress go

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[18] See Kahn, H., Towards the Year 2000, Macmillan, 1967.

together, although individual countries can vary quite significantly from the general norm of progress.

It seems clear that the cross-sectional analyses have yielded relationships which are valid in describing the development of PQLI, GDP and TEC through time. The regression lines of PQLI and LTEC and LGDP are almost identical for 1960 and 1975 data, and Figures 6-1 and 6-2 indicate that most countries have moved up along the line.

In this context, the behavior of the low-income countries is very interesting. These countries show, as a group, a much more erratic pattern of movement in Figures 6-1 and 6-2 than do the countries with higher GDP or TEC values. The behavior with respect to TEC is more uniform than for GDP perhaps because of the effects of fluctuating exchange rates on relative GDP values. The S-shape of the curve is clearly visible in the Figures. This indicates that initial gains in economic development are not matched by PQLI increases for low-income countries, whereas for higher-income countries, increases in GDP, TEC and PQLI largely go hand-in-hand.

In fact, examining Figure 6-2 indicates that there may be a take-off point somewhere around Ln (TEC)=4, i.e., an energy consumption of about 55 kg coal equivalent per capital per year, where rapid rises in PQLI and economic development become apparent. Certainly, of seven countries with energy consumptions of less than 33 kg coal equivalent in 1960, six showed very limited PQLI improvements, whereas of nine countries with energy consumption between 33

and 90,* seven showed moderate to good PQLI improvements. In this context, TEC seems a more valuable indicator than GDP, which shows a more confused pattern. This may well be because TEC is a physical measure, while GDP is affected by changes in exchange rates, international price fluctuations, and differing economic structures. Consideration should be given to using TEC as a major indicator of development, precisely because of its unambiguous physical nature and apparent superiority to GDP as an indicator.

The stratified analyses (by religion and economy type) of the relationship between PQLI and TEC/GDP (which is the inverse energy intensity of the GDP) are interesting. Significant positive relationships exist (in a cross-sectional sense) for Islamic societies and possibly for mixed societies and those with traditional or animistic religions. Significant positive relationships also exist for economy type 2 (oil exporters) and perhaps for economy type 6 (agricultural non-exporters), while a negative relationship may exist for economy type 3 (balanced growth).

These results indicate that, for certain groups of countries, higher values of TEC/GDP are associated with higher PQLI values, while for most groups no such relationship exists. The results for Islamic countries may be influenced by the high proportion of oil exporters, which naturally have a high TEC/GDP ratio.

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*Ln(TEC) lying between 3.5 and 4.5.

Finally, the TFR-PQLI analyses indicate that the fertility rate does not begin to drop appreciably until the PQLI reaches about 65. As a matter of interest, this is equivalent to a value of energy consumption of about 400 kg coal equivalent per capita per year. Of course, TFR is a lagging variable, in that the value reflects child-bearing by women several years ago as well as in the present.

In summary, the dynamics of changes in total fertility rate, energy consumption and the physical quality of life are thus not very clear, although some interesting relationships have emerged. This whole area seems to offer a rich potential for further analyses.

APPENDIX A

TABLES OF RESULTS

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Afghanistan	GDPCAPTA	ENERGYC	14	55.01	0.0270	.0657	.3765 NS
	log(GDPCAPTA)	log(ENERGYC)	14	3.995	0.0082	.0214	.6182 NS
	log(GDPCAPTA)	ENERGYC	14	4.008	0.0005	.0626	.3884 NS
Algeria	GDPCAPTA	ENERGYC	18	-63.50	1.249	.8095	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	0.348	0.948	.7823	.0001
	log(GDPCAPTA)	ENERGYC	18	4.947	0.0025	.8676	.0001
Argentina	GDPCAPTA	ENERGYC	17	128.30	0.568	.9143	.0001
	log(GDPCAPTA)	log(ENERGYC)	17	0.656	0.852	.9276	.0001
	log(GDPCAPTA)	ENERGYC	17	6.019	0.0006	.9352	.0001
Barbados	GDPCAPTA	ENERGYC	18	238.05	0.3745	.8296	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	3.260	0.4666	.8581	.0001
	log(GDPCAPTA)	ENERGYC	18	5.797	0.0007	.8453	.0001
Benin	GDPCAPTA	ENERGYC	14	48.68	1.99	.2475	.0703 NS
	log(GDPCAPTA)	log(ENERGYC)	14	4.275	0.0466	.2972	.0438
	log(GDPCAPTA)	ENERGYC	18	4.470	0.0034	.9294	.0001
Bolivia	GDPCAPTA	ENERGYC	15	-24.680	0.9564	.9092	.0001
	log(GDPCAPTA)	log(ENERGYC)	15	0.005	0.9817	.9235	.0001
	log(GDPCAPTA)	ENERGYC	15	5.028	0.0021	.9571	.0001
Brazil	GDPCAPTA	ENERGYC	15	-24.680	0.9564	.9092	.0001
	log(GDPCAPTA)	log(ENERGYC)	15	0.005	0.9817	.9235	.0001
	log(GDPCAPTA)	ENERGYC	15	5.028	0.0021	.9571	.0001
Burma	GDPCAPTA	ENERGYC	17	44.411	0.5961	.0971	.2235 NS
	log(GDPCAPTA)	log(ENERGYC)	17	2.672	0.4170	.1023	.2106 NS
	log(GDPCAPTA)	ENERGYC	17	3.921	0.0076	.1015	.2125 NS

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Burundi	GDPCAPTA	ENERGYC	12	47.171	0.7707	.1925	.1536 NS
	log(GDPCAPTA)	log(ENERGYC)	12	3.598	0.1748	.1969	.1484 NS
	log(GDPCAPTA)	ENERGYC	12	3.862	0.0140	.2049	.1395 NS
Cambodia	GDPCAPTA	ENERGYC	9	98.959	3.2502	.3326	.1040 NS
	log(GDPCAPTA)	log(ENERGYC)	9	4.585	0.1109	.5143	.0296
	log(GDPCAPTA)	ENERGYC	9	4.590	0.0316	.3361	.1018 NS
Cameroon	GDPCAPTA	ENERGYC	17	65.858	1.1538	.8895	.0001
	log(GDPCAPTA)	log(ENERGYC)	17	2.558	0.5729	.9088	.0001
	log(GDPCAPTA)	ENERGYC	17	4.454	0.0075	.8975	.0001
Central African Empire	GDPCAPTA	ENERGYC	14	127.120	0.1437	.1728	.1394 NS
	log(GDPCAPTA)	log(ENERGYC)	14	4.711	0.0488	.1857	.1239 NS
	log(GDPCAPTA)	ENERGYC	14	4.845	0.0011	.1172	.1339 NS
Chad	GDPCAPTA	ENERGYC	14	88.903	-0.6626	.2856	.0490
	log(GDPCAPTA)	log(ENERGYC)	14	4.763	-0.1489	.2760	.0537 NS
	log(GDPCAPTA)	ENERGYC	14	4.496	-0.0087	.2605	.0622 NS
Chile	GDPCAPTA	ENERGYC	14	450.476	0.2885	.8433	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	3.567	0.4396	.8538	.0001
	log(GDPCAPTA)	ENERGYC	14	6.232	0.0004	.8229	.0001
China Republic	GDPCAPTA	ENERGYC	16	-129.243	0.9587	.8130	.0001
	log(GDPCAPTA)	log(ENERGYC)	16	-2.294	1.3070	.7287	.0001
	log(GDPCAPTA)	ENERGYC	16	4.483	0.0027	.7655	.0001

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Colombia	GDPCAPTA	ENERGYC	16	7.320	0.5404	.8968	.0001
	log(GDPCAPTA)	log(ENERGYC)	16	-0.312	0.9560	.8843	.0001
	log(GDPCAPTA)	ENERGYC	16	4.810	0.0016	.8977	.0001
Congo, P.R.	GDPCAPTA	ENERGYC	13	136.502	0.445	.8503	.0001
	log(GDPCAPTA)	log(ENERGYC)	13	3.541	0.3550	.8641	.0001
	log(GDPCAPTA)	ENERGYC	13	4.992	0.0021	.8458	.0001
Costa Rica	GDPCAPTA	ENERGYC	14	409.129	0.9124	.9025	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	3.927	0.4563	.8173	.0001
	log(GDPCAPTA)	ENERGYC	14	6.149	0.0012	.8850	.0001
Dominican Republic	GDPCAPTA	ENERGYC	17	242.312	0.3934	.9080	.0001
	log(GDPCAPTA)	log(ENERGYC)	17	3.948	0.3448	.8930	.0001
	log(GDPCAPTA)	ENERGYC	17	5.571	0.0010	.9033	.0001
Ecuador	GDPCATPA	ENERGYC	18	157.090	0.5238	.9478	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	3.089	0.4682	.9231	.0001
	log(GDPCAPTA)	ENERGYC	18	5.248	0.0016	.9575	.0001
El Salvador	GDPCAPTA	ENERGYC	18	218.576	0.3218	.5637	.0003
	log(GDPCAPTA)	log(ENERGYC)	18	4.376	0.2404	.6484	.0001
	log(GDPCAPTA)	ENERGYC	18	5.405	0.0012	.5620	.0003
Ethiopia	GDPCAPTA	ENERGYC	17	52.218	0.6591	.8500	.0001
	log(GDPCAPTA)	log(ENERGYC)	17	3.607	0.1975	.8957	.0001
	log(GDPCAPTA)	ENERGYC	17	3.974	0.0101	.8507	.0001

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Fiji	GDPCAPTA	ENERGYC	14	223.756	0.4335	.5864	.0014
	log(GDPCAPTA)	log(ENERGYC)	14	3.814	0.3618	.5557	.0022
	log(GDPCAPTA)	ENERGYC	14	5.535	0.0011	.6041	.0011
The Gambia	GDPCAPTA	ENERGYC	18	88.723	0.2507	.1956	.0061 NS
	log(GDPCAPTA)	log(ENERGYC)	18	4.039	0.1490	.2518	.0339
	log(GDPCAPTA)	ENERGYC	18	4.483	0.0025	.2177	.0509 NS
Ghana	GDPCAPTA	ENERGYC	16	226.975	0.2168	.3907	.0096
	log(GDPCAPTA)	log(ENERGYC)	16	5.017	0.1083	.3604	.0139
	log(GDPCAPTA)	ENERGYC	16	5.432	0.0008	.3813	.0108
Greece	GDPCAPTA	ENERGYC	18	343.002	0.5664	.9877	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	2.454	0.6348	.9932	.0001
	log(DPCAPTA)	ENERGYC	18	6.181	0.0006	.9581	.0001
Guatemala	GDPCAPTA	ENERGYC	18	4.455	1.7022	.9611	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	0.649	0.9804	.9546	.0001
	log(GDPCAPTA)	ENERGYC	18	4.904	0.0047	.9574	.0001
Guinea, Eq.	GDPCAPTA	ENERGYC	14	85.858	0.1121	.0803	.3262 NS
	log(GDPCAPTA)	log(ENERGYC)	14	4.050	0.1140	.1116	.2430 NS
	log(GDPCAPTA)	ENERGYC	14	4.450	0.0013	.0932	.2884 NS
Guyana	GDPCAPTA	ENERGYC	14	263.052	0.0895	.6861	.0003
	log(GDPCAPTA)	log(ENERGYC)	14	4.416	0.2100	.7030	.0002
	log(GDPCAPTA)	ENERGYC	14	5.594	0.0003	.6815	.0003

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Honduras	GDPCAPTA	ENERGYC	17	211.588	0.2786	.5134	.0012
	log(GDPCAPTA)	log(ENERGYC)	17	4.358	0.2325	.5484	.0007
	log(GDPCAPTA)	ENERGYC	17	5.378	0.0010	.5095	.0013
HongKong	GDPCAPTA	ENERGYC	14	149.590	0.6230	.8682	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	1.340	0.7686	.8902	.0001
	log(GDPCAPTA)	ENERGYC	14	5.643	0.0010	.8663	.0001
India	GDPCAPTA	ENERGYC	17	55.639	0.2110	.3799	.0084
	log(GDPCAPTA)	log(ENERGYC)	17	2.507	0.3913	.3090	.0073
	log(GDPCAPTA)	ENERGYC	17	4.116	0.0023	.3882	.0075
Indonesia	GDPCAPTA	ENERGYC	18	29.226	0.3816	.7497	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	0.793	0.7333	.7664	.0001
	log(GDPCAPTA)	ENERGYC	18	3.815	0.0041	.7109	.0001
Iran	GDPCAPTA	ENERGYC	18	129.243	0.3713	.9442	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	1.778	0.6432	.9406	.0001
	log(GDPCAPTA)	ENERGYC	18	5.261	0.0009	.9401	.0001
Israel	GDPCAPTA	ENERGYC	15	314.347	0.6537	.9576	.0001
	log(GDPCAPTA)	log(ENERGYC)	15	1.379	0.7917	.9592	.0001
	log(GDPCAPTA)	ENERGYC	15	5.588	0.000<1	.9617	.0001
Ivory Coast	GDPCAPTA	ENERGYC	18	163.124	0.7750	.8810	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	3.531	0.4296	.8836	.0001
	log(GDPCAPTA)	ENERGYC	18	5.287	0.0023	.9108	.0001
Jamaica	GDPCAPTA	ENERGYC	15	372.565	0.2477	.8779	.0001
	log(GDPCAPTA)	log(ENERGYC)	15	3.782	0.3861	.8521	.0001
	log(GDPCAPTA)	ENERGYC	15	6.042	0.0004	.8818	.0001

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Jordan	GDPCAPTA	ENERGYC	15	139.686	0.4045	.2631	.0506 NS
	log(GDPCAPTA)	log(ENERGYC)	15	2.660	0.5088	.3531	.0195
	log(GDPCAPTA)	ENERGYC	15	5.037	0.0017	.3052	.0327
Kenya	GDPCAPTA	ENERGYC	18	71.106	0.4577	.0609	.3236 NS
	log(GDPCAPTA)	log(ENERGYC)	18	2.7613	0.4318	.0505	.3702 NS
	log(GDPCAPTA)	ENERGYC	18	4.459	0.0031	.0516	.3647 NS
Korea, Rep.	GDPCAPTA	ENERGYC	18	17.633	0.3571	.9541	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	0.257	0.8142	.9347	.0001
	log(GDPCAPTA)	ENERGYC	18	4.574	0.0013	.9877	.0001
Lebanon	GDPCAPTA	ENERGYC	14	296.188	0.3778	.8203	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	2.842	0.5327	.8404	.0001
	log(GDPCAPTA)	ENERGYC	14	5.880	0.0006	.7950	.0001
Liberia	GDPCAPTA	ENERGYC	17	181.003	0.2339	.7989	.0001
	log(GDPCAPTA)	log(ENERGYC)	17	4.359	0.2077	.7609	.0001
	log(GDPCAPTA)	ENERGYC	17	5.232	0.0009	.8262	.0001
Libya	GDPCAPTA	ENERGYC	14	256.442	2.4149	.8543	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	1.474	0.9344	.8893	.0001
	log(GDPCAPTA)	ENERGYC	14	6.377	0.0016	.7666	.0001
Madagascar	GDPCAPTA	ENERGYC	17	126.483	-0.0495	.0172	.6516 NS
	log(GDPCAPTA)	log(ENERGYC)	17	4.908	-0.0230	.0184	.6038 NS
	log(GDPCAPTA)	ENERGYC	17	4.842	-0.0005	.0217	.5725 NS
Malawi	GDPCAPTA	ENERGYC	14	11.498	1.4686	.8022	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	1.002	0.8795	.8059	.0001
	log(GDPCAPTA)	ENERGYC	14	3.492	0.0189	.7900	.0001

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Malaysia	GDPCAPTA	ENERGYC	16	196.466	0.3523	.9579	.0001
	log(GDPCAPTA)	log(ENERGYC)	16	3.278	0.4264	.9505	.0001
	log(GDPCAPTA)	ENERGYC	16	5.417	0.0010	.9532	.0001
Mali	GDPCAPTA	ENERGYC	14	41.725	0.4934	.4264	.0113
	log(GDPCAPTA)	log(ENERGYC)	14	3.396	0.1833	.4132	.0132
	log(GDPCAPTA)	ENERGYC	14	3.752	0.0095	.4278	.0112
Malta	GDPCAPTA	ENERGYC	17	-67.521	0.7499	.6723	.0001
	log(GDPCAPTA)	log(ENERGYC)	17	-3.563	1.4569	.4773	.0021
	log(GDPCAPTA)	ENERGYC	17	4.667	0.0018	.4575	.0029
Mauritania	GDPCAPTA	ENERGYC	14	96.004	0.4555	.7924	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	3.719	0.2748	.9213	.0001
	log(GDPCAPTA)	ENERGYC	14	4.577	0.0036	.7632	.0001
Mexico	GDPCAPTA	ENERGYC	18	230.724	0.4015	.8859	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	1.908	0.6579	.8843	.0001
	log(GDPCAPTA)	ENERGYC	18	5.790	0.0007	.8549	.0001
Morocco	GDPCAPTA	ENERGYC	17	142.410	0.3909	.8279	.0001
	log(GDPCAPTA)	log(ENERGYC)	17	3.5295	0.3533	.8074	.0001
	log(GDPCAPTA)	ENERGYC	17	5.0397	0.0018	.8097	.0001
Nepal	GDPCAPTA	ENERGYC	18	73.610	0.2878	.1325	.1376 NS
	log(GDPCAPTA)	log(ENERGYC)	18	4.246	0.0407	.1953	.0663 NS
	log(GDPCAPTA)	ENERGYC	18	4.299	0.0038	.1367	.1310 NS
Nicaragua	GDPCAPTA	ENERGYC	14	229.415	0.6072	.8383	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	3.411	0.4589	.8667	.0001
	log(GDPCAPTA)	ENERGYC	14	5.551	0.0015	.8134	.0001

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Niger	GDPCAPTA	ENERGYC	14	111.668	-0.9036	.4929	.0051
	log(GDPCAPTA)	log(ENERGYC)	14	4.878	-0.1177	.2648	.0597 NS
	log(GDPCAPTA)	ENERGYC	14	4.736	-0.0102	.5127	.0040
Nigeria	GDPCAPTA	ENERGYC	16	53.137	1.3761	.8585	.0001
	log(GDPCAPTA)	log(ENERGYC)	16	2.585	0.5700	.8384	.0001
	log(GDPCAPTA)	ENERGYC	16	4.278	0.0101	.8520	.0001
Oman	GDPCAPTA	ENERGYC	10	89.355	1.2997	.8807	.0001
	log(GDPCAPTA)	log(ENERGYC)	10	3.492	0.4404	.8875	.0001
	log(GDPCAPTA)	ENERGYC	10	4.648	0.0059	.9360	.0001
Panama	GDPCAPTA	ENERGYC	18	213.807	0.6703	.9180	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	1.984	0.6943	.9284	.0001
	log(GDPCAPTA)	ENERGYC	18	5.791	0.0010	.8999	.0001
Papua New G	GDPCAPTA	ENERGYC	18	151.107	0.5223	.8257	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	3.736	0.3474	.9218	.0001
	log(GDPCAPTA)	ENERGYC	18	5.069	0.0023	.8289	.0001
Paraguay	GDPCAPTA	ENERGYC	18	106.567	1.0334	.9035	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	2.825	0.5474	.8884	.0001
	log(GDPCAPTA)	ENERGYC	18	4.951	0.0040	.9109	.0001
Peru	GDPCAPTA	ENERGYC	18	146.177	0.5154	.7731	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	1.921	0.6567	.7947	.0001
	log(GDPCAPTA)	ENERGYC	18	5.404	0.0012	.7927	.0001
Philippines	GDPCAPTA	ENERGYC	18	82.714	0.3476	.8483	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	2.557	0.4681	.8431	.0001
	log(GDPCAPTA)	ENERGYC	18	4.620	0.0020	.8833	.0001

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Quatar	GDPCAPTA	ENERGYC	14	479.869	0.0179	.7966	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	4.617	0.2110	.7517	.0001
	log(GDPCAPTA)	ENERGYC	14	6.192	0.0000	.7748	.0001
Rhodesia	GDPCAPTA	ENERGYC	10	78.543	0.3024	.4764	.0272
	log(GDPCAPTA)	log(ENERGYC)	10	1.276	0.6701	.4555	.0323
	log(GDPCAPTA)	ENERGYC	10	4.914	0.0011	.4733	.0279
Rwanda	GDPCAPTA	ENERGYC	13	36.916	1.5909	.5695	.0029
	log(GDPCAPTA)	log(ENERGYC)	13	3.199	0.3339	.6285	.0012
	log(GDPCAPTA)	ENERGYC	13	3.663	0.0299	.5817	.0024
Saudi Arabia	GDPCAPTA	ENERGYC	14	59.065	0.6272	.8305	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	1.482	0.7194	.8478	.0001
	log(GDPCAPTA)	ENERGYC	14	5.180	0.0014	.9161	.0001
Senegal	GDPCAPTA	ENERGYC	14	308.394	-0.6426	.6694	.0003
	log(GDPCAPTA)	log(ENERGYC)	14	7.306	-0.3891	.6800	.0003
	log(GDPCAPTA)	ENERGYC	14	5.791	-0.0029	.6773	.0003
Sierra Leone	GDPCAPTA	ENERGYC	16	128.015	0.2847	.4611	.0038
	log(GDPCAPTA)	log(ENERGYC)	16	4.309	0.1632	.4824	.0028
	log(GDPCAPTA)	ENERGYC	16	4.863	0.0019	.4620	.0038
Singapore	GDPCAPTA	ENERGYC	18	199.467	0.5252	.9637	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	1.957	0.6759	.9297	.0001
	log(GDPCAPTA)	ENERGYC	18	5.931	0.0006	.9737	.0001
Somalia	GDPCAPTA	ENERGYC	14	71.224	-0.0650	.0173	.6541 NS
	log(GDPCAPTA)	log(ENERGYC)	14	4.362	-0.0371	.0313	.5450 NS
	log(GDPCAPTA)	ENERGYC	14	4.263	-0.0009	.0152	.6744 NS

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
South Vietnam	GDPCAPTA	ENERGYC	14	150.699	0.0014	.0017	.8883 NS
	log(GDPCAPTA)	log(ENERGYC)	14	4.976	0.0077	.0280	.5677 NS
	log(GDPCAPTA)	ENERGYC	14	5.014	0.0000	.0021	.8762 NS
Sri Lanka	GDPCAPTA	ENERGYC	17	80.045	0.1253	.0396	.4437 NS
	log(GDPCAPTA)	log(ENERGYC)	17	3.605	0.1985	.0550	.3648 NS
	log(GDPCAPTA)	ENERGYC	17	4.371	0.0015	.0555	.3626 NS
Sudan	GDPCAPTA	ENERGYC	15	129.8431	-0.1045	.1799	.1151 NS
	log(GDPCAPTA)	log(ENERGYC)	15	5.133	-0.0775	.1981	.0965 NS
	log(GDPCAPTA)	ENERGYC	15	4.870	-0.0009	.1923	.1020 NS
Syrian A.R.	GDPCAPTA	ENERGYC	15	88.482	0.3564	.7993	.0001
	log(GDPCAPTA)	log(ENERGYC)	15	1.361	0.6806	.7946	.0001
	log(GDPCAPTA)	ENERGYC	15	4.959	0.0012	.7923	.0001
Tanzania	GDPCAPTA	ENERGYC	18	57.283	0.5428	.7777	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	3.035	0.3594	.8297	.0001
	log(GDPCAPTA)	ENERGYC	18	4.116	0.0063	.7814	.0001
Thailand	GDPCAPTA	ENERGYC	18	95.565	0.3636	.8986	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	3.155	0.3773	.9289	.0001
	log(GDPCAPTA)	ENERGYC	18	4.654	0.0022	.9109	.0001
Togo	GDPCAPTA	ENERGYC	17	66.146	0.9434	.7446	.0001
	log(GDPCAPTA)	log(ENERGYC)	17	3.027	0.4386	.8337	.0001
	log(GDPCAPTA)	ENERGYC	17	4.288	0.0085	.7644	.0001
Trinidad & Tobagos	GDPCAPTA	ENERGYC	17	436.025	0.1240	.4171	.0051
	log(GDPCAPTA)	log(ENERGYC)	17	3.362	0.4170	.4684	.0024
	log(GDPCAPTA)	ENERGYC	17	6.252	0.0001	.4905	.0017

TABLE A-1

PER CAPITA ENERGY CONSUMPTION - GDP TIME SERIES REGRESSIONS (Concluded)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Uganda	GDPCAPTA	ENERGYC	14	88.957	0.6456	.8530	.0001
	log(GDPCAPTA)	log(ENERGYC)	14	3.773	0.2650	.8865	.0001
	log(GDPCAPTA)	ENERGYC	14	4.521	0.0054	.8363	.0001
Upper Volta	GDPCAPTA	ENERGYC	14	52.355	0.5003	.3223	.0342
	log(GDPCAPTA)	log(ENERGYC)	14	3.879	0.0755	.3033	.0413
	log(GDPCAPTA)	ENERGYC	14	3.963	0.0086	.3270	.0326
Uruguay	GDPCAPTA	ENERGYC	17	721.612	0.0838	.1578	.1144 NS
	log(GDPCAPTA)	log(ENERGYC)	17	6.025	0.0965	.1578	.1144 NS
	log(GDPCAPTA)	ENERGYC	17	6.586	0.0001	.1584	.1137 NS
Venezuela	GDPCAPTA	ENERGYC	18	225.314	0.3768	.8866	.0001
	log(GDPCAPTA)	log(ENERGYC)	18	0.974	0.7782	.8979	.0001
	log(GDPCAPTA)	ENERGYC	18	6.213	0.0003	.9018	.0001
Zaire	GDPCAPTA	ENERGYC	16	100.981	-0.0975	.0065	.7674 NS
	log(GDPCAPTA)	log(ENERGYC)	16	4.824	-0.0668	.0048	.7992 NS
	log(GDPCAPTA)	ENERGYC	16	4.618	-0.0011	.0071	.7562 NS
Zambia	GDPCAPTA	ENERGYC	14	127.908	0.1260	.2142	.0956 NS
	log(GDPCAPTA)	log(ENERGYC)	14	3.192	0.3313	.2027	.1063 NS
	log(GDPCAPTA)	ENERGYC	14	4.919	0.0007	.2067	.1024 NS

TABLE A-2

PER CAPITA GDI-GDP TIME SERIES REGRESSIONS

Country	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Afghanistan	13	56.470	-0.2297	.0318	.5599 NS
Algeria	14	230.361	0.6690	.5717	.0018
Argentina	14	384.510	2.878	.8540	.0001
Bangladesh	12	58.930	1.078	.5964	.0032
Barbados	14	63.205	3.688	.8089	.0001
Benin	14	73.161	0.4781	.3932	.0164
Bolivia	14	154.892	0.5301	.0150	.6763 NS
Brazil	14	163.806	3.1369	.9663	.0001
Burma	14	69.306	0.4921	.1066	.2546 NS
Burundi	14	55.378	0.2736	.0018	.8859 NS
Cambodia	11	103.187	0.4592	.0327	.5946 NS
Cameroon	14	78.757	3.4902	.7376	.0001
Central African Empire	14	171.655	-1.6338	.2559	.0650 NS

TABLE A-2

PER CAPITA GDI-GDP TIME SERIES REGRESSIONS (Continued)

Country	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Chad	14	89.466	-1.4166	.0303	.5518 NS
Chile	14	176.877	4.4550	.5960	.0012
China, Republic	14	117.876	2.5281	.9733	.0001
Colombia	14	101.206	3.5262	.6207	.0008
Congo, P. R.	14	171.252	0.7009	.2634	.0605 NS
Costa Rica	14	366.313	2.0737	.8090	.0001
Dominican Republic	14	240.280	1.9352	.9758	.0001
Ecuador	14	223.836	1.2864	.6778	.0003
El Salvador	14	208.620	1.7465	.3111	.0382
Ethiopia	14	27.061	4.4776	.9338	.0001
Fiji	14	189.985	2.3571	.8406	.0001
The Gambia	14	56.565	2.9092	.6120	.0009
Ghana	13	243.944	0.2181	.0760	.3615 NS

TABLE A-2.

PER CAPITA GDI-GDP TIME SERIES REGRESSIONS (Continued)

Country	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Greece	14	185.455	3.0207	.9649	.0001
Guatemala	14	186.379	3.9770	.5717	.0018
Guinea, Eq.	9	85.943	0.5883	.1427	.3162 NS
Guyana	14	286.401	0.9192	.2406	.0750 NS
Honduras	14	199.376	1.5877	.6467	.0005
Hong Kong	14	244.555	2.8094	.8759	.0001
India	14	58.8726	2.0106	.4136	.0131
Indonesia	14	51.910	2.7864	.9475	.0001
Iran	14	107.972	3.5806	.9767	.0001
Israel	14	394.603	2.7598	.8225	.0001
Ivory Coast	14	127.551	3.0840	.9320	.0001
Jamaica	14	279.809	2.4186	.7999	.0001

TABLE A-2

PER CAPITA GDI-GDP TIME SERIES REGRESSIONS (Continued)

Country	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Jordan	14	206.083	1.0772	.2184	.0920 NS
Kenya	14	72.331	2.3682	.6721	.0003
Korea, Rep.	14	109.924	2.3252	.9226	.0001
Lebanon	14	253.632	2.7886	.7286	.0001
Liberia	14	278.505	-0.7774	.5517	.0023
Libya	12	31.8864	3.7890	.7082	.0006
Madagascar	14	109.843	0.8452	.1831	.1269 NS
Malawi	14	32.957	4.8569	.6917	.0002
Malaysia	14	127.417	3.8652	.8871	.0001
Mali	14	50.018	0.2528	.0113	.7180 NS
Malta	14	118.252	2.7868	.8490	.0001
Mauritania	14	169.984	-0.9892	.2998	.0427

TABLE A-2

PER CAPITA GDI-GDP TIME SERIES REGRESSIONS (Continued)

Country	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Mexico	14	96.526	4.199	.9531	.0001
Morocco	14	153.461	2.1791	.6421	.0006
Nicaragua	14	179.237	2.9656	.8644	.0001
Niger	14	65.966	3.2491	.6048	.0011
Nigeria	14	54.6311	3.4776	.8732	.0001
Panama	14	344.950	1.9329	.9550	.0001
Papua New Guinea	14	123.894	1.2364	.6146	.0015
Paraguay	14	173.397	1.5210	.5496	.0024
Peru	14	347.335	1.2820	.1049	.2586 NS
Philippines	14	69.377	2.9151	.6611	.0004
Rhodesia	14	213.253	1.2182	.4306	.0108
Rwanda	14	45.871	2.1299	.0760	.3401 NS

TABLE A-2

PER CAPITA GDI-GDP TIME SERIES REGRESSIONS (Continued)

Country	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Saudi Arabia	14	91.038	5.4998	.6682	.0004
Senegal	14	235.493	-0.3156	.0924	.2906 NS
Sierra Leone	10	111.652	2.070	.8392	.0002
Singapore	14	410.416	2.3339	.9777	.0001
Somalia	14	62.939	0.5070	.1453	.1788 NS
South Vietnam	14	145.392	0.2581	.0709	.3574 NS
Sri Lanka	14	54.197	2.6884	.6771	.0003
Sudan	14	111.219	0.4695	.0468	.4577 NS
Syrian A. R.	11	147.162	2.6078	.7317	.0008
Tanzania	14	57.801	1.9976	.8301	.0001
Thailand	14	74.207	2.2323	.8289	.0001
Togo	14	72.699	2.3345	.5162	.0038

TABLE A-2

PER CAPITA GDI-GDP TIME SERIES REGRESSIONS (Concluded)

Country	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Trinidad and Tobago	13	672.120	0.4684	.0679	.3898
Uganda	14	77.750	2.6166	.6800	.0003
Upper Volta	14	56.001	0.3045	.0044	.8214 NS
Uruguay	14	718.225	0.8720	.4150	.0129
Venezuela	14	522.148	2.3204	.4041	.0145
Zaire	14	78.0060	0.6853	.3676	.0215
Zambia	14	182.284	0.1177	.0220	.6129 NS

TABLE A-3

SECTORAL TIME SERIES REGRESSIONS

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Algeria	INDS70	ENERGYI	10	451.535	486.797	.7246	.0018
	INDSCAP	ENICAP	10	35.230	287.835	.6101	.0076
	TRANS70	ENERGYTR	10	-18.593	300.745	.4364	.1062 NS
	TRANSCAP	ENTRCAP	10	10.423	10.794	.0003	.9696 NS
Argentina	INDS70	ENERGYI	9	-5667.807	2215.672	.8957	.0001
	INDSCAP	ENICAP	9	-279.759	2378.084	.8282	.0007
	TRANS70	ENERGYTR	9	1613.283	58.001	.1283	.3439 NS
	TRANSCAP	ENTRCAP	9	82.613	15.955	.0049	.8579 NS
Brazil	INDS70	ENERGYI	10	-2233.744	736.814	.9214	.0001
	INDSCAP	ENICAP	10	-26.764	759.547	.8850	.0001
	TRANS70	ENERGYTR	9	136.000	141.522	.9744	.0001
	TRANSCAP	ENTRCAP	9	2.111	136.783	.9456	.0001
	AGRI70	ENERGYA	9	-210.841	24606.54	.9768	.0001
	AGRICAP	ENACAP	9	-2.757	24805.262	.9543	.0001
Colombia	INDS70	ENERGYI	9	633.525	1173.567	.6484	.0088
	INDSCAP	ENICAP	9	38.104	816.307	.4650	.0430
	TRANS70	ENERGYTR	9	211.334	105.479	.5762	.0177
	TRANSCAP	ENTRCAP	9	19.563	14.851	.0072	.8278 NS
Egypt	INDS70	ENERGYI	9	256.722	1249.924	.7801	.0016
	INDSCAP	ENICAP	9	16.769	898.513	.5431	.0235
	TRANS70	ENERGYTR	9	283.387	57.096	.2636	.1575 NS
	TRANSCAP	ENTRCAP	9	9.686	5.759	.0022	.9051 NS
	AGRI70	ENERGYA	9	428.574	31948.946	.8173	.0008
	AGRICAP	ENACAP	9	23.863	23699.614	.6279	.0109

TABLE A-3

SECTORAL TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
India	INDS70	ENERGYI	10	2842.972	105.829	.9154	.0001
	INDSCAP	ENICAP	10	7.605	61.747	.7148	.0021
	TRANS70	ENERGYTR	10	-4225.048	409.982	.9044	.0001
	TRANSCAP	ENTRCAP	10	10.258	-212.306	.0486	.5405 NS
	AGRI70	ENERGYA	8	19986.558	3389.656	.1881	.2831 NS
	AGRICAP	ENACAP	8	44.997	-4518.732	.2544	.2545 NS
Indonesia	INDS70	ENERGYI	9	142.919	1449.263	.9103	.0001
	INDSCAP	ENICAP	9	1.457	1396.551	.8638	.0003
	TRANS70	ENERGYTR	10	-287.498	250.752	.8844	.0001
	TRANSCAP	ENTRCAP	10	-3.115	281.248	.7851	.0006
Iran	INDS70	ENERGYI	10	836.520	121.881	.6408	.0054
	INDSCAP	ENICAP	10	36.142	90.016	.5206	.0185
	TRANS70	ENERGYTR	10	406.697	86.624	.6682	.0038
	TRANSCAP	ENTRCAP	10	16.417	44.880	.2871	.1104 NS
Jamaica	INDS70	ENERGYI	5	95.228	77.883	.8533	.0250
	INDSCAP	ENICAP	5	57.975	62.466	.7855	.0452
	TRANS70	ENERGYTR	10	66.953	49.712	.1099	.3493 NS
	TRANSCAP	ENTRCAP	10	38.580	31.514	.1084	.3528 NS
Kenya	INDS70	ENERGYI	6	44.962	729.686	.8222	.0126
	INDSCAP	ENICAP	6	7.060	561.459	.6147	.0649 NS
	TRANS70	ENERGYTR	10	97.461	33.361	.6380	.0056
	TRANSCAP	ENTRCAP	10	10.640	-25.436	.3729	.0607 NS
	AGRI70	ENERGYA	8	444.706	1595.123	.6675	.0133
	AGRICAP	ENACAP	8	42.303	-11.119	.0001	.9779 NS

TABLE A-3

SECTORAL TIME SERIES REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Korea	INDS70	ENERGYI	10	-924.278	2138.327	.9665	.0001
	INDSCAP	ENICAP	10	-31.378	2191.589	.9586	.0001
	TRANS70	ENERGYTR	10	409.011	134.448	.0282	.6427 NS
	TRANSCAP	ENTRCAP	10	17.286	-15.091	.0005	.9531 NS
	AGRI70	ENERGYA	6	1984.174		.9642	.0005
	AGRICAP	ENACAP	6	65.703	95775.049	.9093	.0032
Mexico	INDS70	ENERGYI	10	2225.877	341.288	.9601	.0001
	INDSCAP	ENICAP	10	86.081	229.168	.8204	.0003
	TRANS70	ENERGYTR	10	-487.060	138.967	.8509	.0001
	TRANSCAP	ENTRCAP	10	-15.046	165.444	.6782	.0034
	AGRI70	ENERGYA	10	1563.874	6176.487	.7809	.0007
	AGRICAP	ENACAP	10	-19.403	13363.749	.7270	.0017
Nigeria	INDS70	ENERGYI	9	234.349	501.754	.7425	.0028
	INDSCAP	ENICAP	9	4.633	453.550	.6642	.0074
	TRANS70	ENERGYTR	9	107.125	236.334	.9139	.0001
	TRANSCAP	ENTRCAP	9	2.144	222.702	.8890	.0001
Saudi Arabia	INDS70	ENERGYI	10	85.651	81.627	.7193	.0019
	INDSCAP	ENICAP	10	17.179	66.635	.6091	.0077
	TRANS70	ENERGYTR	10	91.154	216.028	.9213	.0001
	TRANSCAP	ENTRCAP	10	14.255	194.018	.8630	.0001
Thailand	INDS70	ENERGYI	10	148.543	472.664	.9068	.0001
	INDSCAP	ENICAP	10	6.254	432.990	.8328	.0002
	TRANS70	ENERGYTR	10	262.934	62.180	.8522	.0001
	TRANSCAP	ENTRCAP	10	9.254	25.746	.4910	.0240
	AGRI70	ENERGYA	10	1081.290	1405.543	.7621	.0010
	AGRICAP	ENACAP	10	44.498	531.561	.2632	.1294 NS

TABLE A-3

SECTORAL TIME SERIES REGRESSIONS (Concluded)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Venezuela	INDS70	ENERGYI	10	369.220	280.790	.8653	.0001
	INDSCAP	ENICAP	10	69.640	291.375	.6181	.0070
	TRANS70	ENERGYTR	9	46.432	252.847	.9383	.0001
	TRANSCAP	ENTRCAP	9	7.484	254.756	.8621	.0003
	AGRI70	ENERGYA	8	1190.268	-48307.739	.4117	.0863 NS
	AGRICAP	ENACAP	8	94.079	-23504.860	.2380	.2201 NS

TABLE A-4

NONCOMMERCIAL ENERGY REGRESSIONS

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Algeria[1]	ENNCCAP	ENTOCAP	10	0.0183	0.0030	.4899	.0242
	ENNCCAP	YEAR	10	-0.1822	0.0001	.6460	.0051
	FRNC	ENTOCAP	10	0.1386	-0.2298	.9626	.0001
	ENINC	ENERGYI	10	0.0025	0.0063	.3648	.0644 NS
	ENINC	YEAR	10	-1.3929	0.0007	.7043	.0024
	FRIN	ENERGYI	10	0.0282	-0.0291	.7500	.0012
Argentina[2]	ENNCCAP	ENTOCAD	10	-0.0881	0.1902	.3514	.0709 NS
	ENNCCAD	YEAR	10	-14.1627	0.0072	.5192	.0187
	FRNC	ENTOCAD	10	0.0279	0.0739	.0901	.3993 NS
	ENINC	ENERGYI	10	-2.7482	0.6487	.9385	.0001
	ENINC	YEAR	10	-486.2698	0.2475	.7017	.0025
	FRIN	ENERGYI	10	-0.1038	0.0496	.8642	.0001
Brazil	ENNCCAP	ENTOCAP	10	0.2701	-0.0327	.0730	.4502 NS
	ENNCCAP	YEAR	10	2.6841	-0.0012	.1303	.3054 NS
	FRNC	ENTOCAP	10	0.8281	-0.6747	.8901	.0001
	ENINC	ENERGYI	10	1.6060	0.1227	.7999	.0005
	ENINC	YEAR	10	-403.5970	0.2065	.7976	.0005
	FRIN	ENERGYI	10	0.3247	-0.0058	.7776	.0007
Columbia[3]	ENNCCAP	ENTOCAP	9	-0.3170	0.8854	.6269	.0110
	ENNCCAP	YEAR	9	21.4464	-0.0108	.9627	.0001
	FRNC	ENTOCAP	9	-0.0964	0.7590	.3407	.0989 NS
	ENINC	ENERGYI	9	0.1643	0.1525	.7448	.0027
	ENINC	YEAR	9	-27.1772	0.0139	.9364	.0001
	FRIN	ENERGYI	9	0.7623	-0.4977	.7508	.0025

TABLE A-4

NONCOMMERCIAL ENERGY REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Egypt	ENNCCAP	ENTOCAP	9	0.0044	0.0064	.1712	.2682 NS
	ENNCCAP	YEAR	9	-0.1914	0.0001	.3035	.1242 NS
	FRNC	ENTOCAP	9	0.0567	-0.1385	.7328	.0032
	ENINC	ENERGYI	9	0.0691	0.1074	.4582	.0452
	ENINC	YEAR	9	-13.0069	0.0069	.6579	.0080
	FRIN	ENERGYI	9	0.2359	-0.0562	.1863	.2460 NS
India[4]	ENNCCAP	ENTOCAP	10	0.0368	0.0826	.6108	.0076
	ENNCCAP	YEAR	10	0.2853	0.0002	.5007	.0221
	FRNC	ENTOCAD	10	0.5517	-1.4924	.9517	.0001
	ENINC	ENERGYI	10	0.0328	0.0405	.6352	.0058
	ENINC	YEAR	10	-164.6398	0.0842	.6497	.0049
	FRIN	ENERGYI	10	0.04166	-0.0000	.0000	.9949 NS
Indonesia	ENNCCAP	ENTOCAP	10	0.2111	0.0079	.0098	.7858 NS
	ENNCCAP	YEAR	10	-0.4976	0.0004	.1169	.3335 NS
	FRNC	ENTOCAP	10	1.2711	-1.8617	.9965	.0001
	ENINC	ENERGYI	9	0.1151	0.2624	.8987	.0001
	ENINC	YEAR	10	-43.9623	0.0224	.8276	.0003
	FRIN	ENERGYI	9	0.6650	-0.2957	.8451	.0005
Iran	ENNCCAP	ENTOCAP	10	0.0173	0.0023	.0336	.6124 NS
	ENNCCAP	YEAR	10	-0.1612	0.0001	.0108	.7749 NS
	FRNC	ENTOCAP	10	0.0644	-0.0495	.7458	.0013
	ENINC	ENERGYI	10	0.1495	0.0054	.5021	.0218
	ENINC	YEAR	10	-11.6593	0.0060	.3581	.0676 NS
	FRIN	ENERGYI	10	0.0928	-0.0070	.8989	.0001

TABLE A-4

NONCOMMERCIAL ENERGY REGRESSIONS (Continued)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Jamaica	ENNCCAP	ENTOCAP	10	0.1097	-0.0389	.7745	.0008
	ENNCCAP	YEAR	10	5.6087	-0.0028	.8534	.0001
	FRNC	ENTOCAP	10	0.1768	-0.1023	.9080	.0001
	ENINC	ENERGYI	5	0.1924	-0.0685	.6415	.1034 NS
	ENINC	YEAR	10	6.7979	-0.0034	.7050	.0024
	FRIN	ENERGYI	5	0.4229	-0.3046	.8962	.0147
Kenya[5]	ENNCCAP	ENTOCAP	10	-0.0405	0.8537	.6999	.0025
	ENNCCAP	YEAR	10	8.7054	-0.0043	.5673	.0119
	FRNC	ENTOCAP	10	0.5995	0.3979	.0468	.5482 NS
	ENINC	ENERGYI	6	0.0115	0.1477	.8264	.0120
	ENINC	YEAR	9	-7.4144	0.0038	.7626	.0021
	FRIN	ENERGYI	6	0.2323	-0.1485	.1991	.3751
Korea	ENNCCAP	ENTOCAP	10	0.0979	-0.0608	.5698	.0016
	ENNCCAP	YEAR	10	4.8707	-0.0024	.7581	.0010
	FRNC	ENTOCAP	10	0.3116	-0.3421	.9236	.0001
Mexico	ENNCCAP	ENTOCAP	10	0.1654	-0.1258	.8576	.0001
	ENNCCAP	YEAR	10	5.1003	-0.0026	.9890	.0001
	FRNC	ENTOCAP	10	0.2609	-0.2250	.9218	.0001
	ENINC	ENERGYI	10	0.6270	0.0108	.7590	.0010
	ENINC	YEAR	10	-31.0248	0.0162	.6595	.0027
	FRIN	ENERGYI	10	0.0722	-0.0014	.9523	.0001
Nigeria	ENNCCAP	ENTOCAP	9	0.2398	0.0164	.2274	.1943 NS
	ENNCCAP	YEAR	9	-0.1671	0.0002	.4916	.0353
	FRNC	ENTOCAP	9	1.6140	-2.6432	.9961	.0001
	ENINC	ENERGYI	9	0.0066	0.0047	.6843	.0059
	ENINC	YEAR	9	-1.4357	0.0007	.8491	.0004
	FRIN	ENERGYI	9	0.0251	-0.0120	.6408	.0062

TABLE A-4

NONCOMMERICAL ENERGY REGRESSIONS (Concluded)

Country	Dependent Variable	Independent Variable	Number of Data Values	Intercept a	Slope b	r^2	P Significance Level of Regression
Thailand	ENNCCAP	ENTOCAD	10	-0.0003	0.0835	.6901	.0029
	ENNCCAP	YEAR	10	-2.2663	0.0012	.8191	.0003
	FRNC	ENTOCAP	10	0.0872	-0.0335	.0121	.7620 NS
	ENINC	ENERGYI	10	-0.1201	0.2859	.8779	.0001
	ENINC	YEAR	10	-136.9337	0.0697	.8874	.0001
	FRIN	ENERGYI	10	0.1625	0.0278	.2982	.1025 NS
Venezuela	ENNCCAP	ENTOCAD	10	0.1473	0.0196	.4258	.0408
	ENNCCAP	YEAR	10	-1.9241	0.0011	.3848	.0557 NS
	FRNC	ENTOCAP	10	0.2273	-0.0722	.9585	.0001
	ENINC	ENERGYI	10	-0.1833	0.0640	.8811	.0001
	ENINC	YEAR	10	-57.7556	0.0294	.8057	.0004
	FRIN	ENERGYI	10	0.0048	0.0046	.6760	.0035

Notes:

1. Total Industrial Energy Consumption data (ENERGYI) appears to contain major errors.
2. Noncommercial energy consumption increases rapidly 1973 to the present.
3. Total Industrial Energy Consumption data (ENERGYI) appears far too high for 1974 and 1975.
4. Noncommercial energy consumption in industry (ENINC) appears to be too low for 1967 and 1968.
5. Data from 1973 to present are inconsistent with 1967 to 1972.

TABLE A-5

PQLI REGRESSION ANALYSES (UNSTRATIFIED)

Run No.	Countries	Date	Dependent Variable	Independent Variable	Coef B	Standard Error of B	F	r^2	Degrees of Freedom	P Significance Level of Regression
2.1	All	1960	PQLI	Ln (GNP)	22.54	2.54	76.71	0.601	1/15	0.0001
2.2	All	1975	PQLI	Ln (GNP)	18.40	1.89	95.32	0.563	1/74	0.0001
2.3	All	1960	PQLI	Ln (TEC)	13.60	1.26	115.81	0.698	1/51	0.0001
2.4	All	1978	PQLI	Ln (TEC)	12.35	1.26	96.71	0.570	1/73	0.0001
2.5	All	1960	TEC/GDP	PQLI	0.015	0.003	26.46	0.346	1/51	0.0001
2.6	All	1975	TEC/GDP	PQLI	0.013	0.002	29.35	0.287	1/73	0.0001
2.7	All	1960	TEC/GDP	GDP	0.0012	0.0003	16.87	0.172	1/81	0.0001
2.8	All	1975	TEC/GDP	GDP	0.0004	0.0001	6.85	0.076	1/83	0.0105
2.9	All	1975	DRR	GDPR	0.346	0.079	18.98	0.283	1/48	0.0001
2.10	All	1975	DRR	TECR	-	-	0.00	-	1/47	0.994
2.11	All	1975	TECR	GDPR	0.511	0.159	10.27	0.114	1/80	0.0019
2.12	All	1975	DRR	PCGOV			1.06		1/38	0.309
2.13	All	1975	GDPR	PCGOV			0.14		1/54	0.705
2.14	All	1975	TECR	PCGOV			2.69		1/54	0.107
2.15	All	1975	DRR	PCDEF			0.16		1/27	0.692

TABLE A-5

PQLI REGRESSION ANALYSES (UNSTRATIFIED) (Concluded)

Run No.	Countries	Date	Dependent Variable	Independent Variable	Coef B	Standard Error of B	F	r^2	Degrees of Freedom	P Significance Level of Regression
2.16	All	1975	GDPR	PCDEF			0.25		1/50	0.618
2.17	All	1975	TECR	PCDEF			0.37		1/49	0.549
2.18	All	1975	DRR	TPCDEF			0.01		1/22	0.911
2.19	All	1975	GDPR	TPCDEF			1.88		1/32	0.180
2.20	All	1975	TECR	TPCDEF			0.22		1/32	0.640
2.21	All	1975	TFR	PQLI	-0.035	0.005	46.69	0.407	1/68	0.0001
2.22	All	1975	TFR	GDP	-0.0012	0.0003	20.62	0.213	1/76	0.0001
2.23	All	1975	TFR	TEC	-0.00099	0.00016	37.46	0.330	1/76	0.0001
2.24	All	1975	TFR	PVAL	-0.425	0.038	123.5	0.645	1/68	0.0001
2.25	Excl. econ=2	1975	TFR	PVAL	-0.418	0.043	96.43	0.645	1/53	0.0001
2.26	All	1975	PVAL	GDP	0.0046	0.0005	78.68	0.515	1/74	0.0001
2.27	All	1975	PVAL	TEC	0.0025	0.0003	67.68	0.481	1/74	0.0001
2.28	Excl. econ=2	1975	PVAL	GDP	0.0055	0.0005	106.40	0.647	1/58	0.0001
2.29	Excl. econ=2	1975	PVAL	TEC	0.0037	0.0004	97.89	0.628	1/58	0.0001

TABLE A-6

PQLI REGRESSION ANALYSES (STRATIFIED)

Run No.	Countries	Date	Dependent Variable	Independent Variable	Coef B	Standard Error of B	F	r^2	Degrees of Freedom	P Significance Level of Regression
3.1	Religion = 1	1960	PQLI	TEC/GDP	-	-	0.26	-	1/3	0.650
3.2	Religion = 2	1960	PQLI	TEC/GDP	-	-	3.73	-	1/19	0.069
3.3	Religion = 3	1960	PQLI	TEC/GDP	22.70	5.04	20.31	0.717	1/8	0.0020
3.4	Religion = 4	1960	PQLI	TEC/GDP	-	-	1.23	-	1/2	0.383
3.5	Religion = 5	1960	PQLI	TEC/GDP	12.14	2.98	16.62	0.704	1/7	0.0047
3.6	Religion = 8	1960	PQLI	TEC/GDP	-	-	1.52	-	1/1	0.434
3.7	Religion = 1	1975	PQLI	TEC/GDP	-	-	2.20	-	1/5	0.198
3.8	Religion = 2	1975	PQLI	TEC/GDP	-	-	1.08	-	1/25	0.309
3.9	Religion = 3	1975	PQLI	TEC/GDP	30.89	7.84	15.52	0.477	1/17	0.0011
3.10	Religion = 4	1975	PQLI	TEC/GDP	46.74	8.12	33.13	0.847	1/6	0.0012
3.11	Religion = 5	1975	PQLI	TEC/GDP	-	-	0.49	-	1/9	0.501
3.12	Religion = 8	1975	PQLI	TEC/GDP	-	-	26.69	-	1/1	0.122
3.13	Economy = 1	1960	PQLI	TEC/GDP	-	-	1.48	-	1/5	0.278
3.14	Economy = 2	1960	PQLI	TEC/GDP	22.62	6.15	13.54	0.629	1/8	0.006
3.15	Economy = 3	1960	PQLI	TEC/GDP	-56.30	15.20	13.72	0.774	1/4	0.021
3.16	Economy = 4	1960	PQLI	TEC/GDP	-	-	3.87	-	1/2	0.188
3.17	Economy = 5	1960	PQLI	TEC/GDP	-	-	1.13	-	1/5	0.336
3.18	Economy = 6	1960	PQLI	TEC/GDP	-	-	3.57	-	1/16	0.077
3.19	Economy = 1	1975	PQLI	TEC/GDP	-	-	0.12	-	1/6	0.738
3.20	Economy = 2	1975	PQLI	TEC/GDP	22.15	5.25	17.83	0.578	1/13	0.0010
3.21	Economy = 3	1975	PQLI	TEC/GDP	-	-	5.15	-	1/7	0.058
3.22	Economy = 4	1975	PQLI	TEC/GDP	-	-	2.62	-	1/6	0.157
3.23	Economy = 5	1975	PQLI	TEC/GDP	-	-	0.73	-	1/6	0.425
3.24	Economy = 6	1975	PQLI	TEC/GDP	31.03	10.26	9.14	0.268	1/25	0.006

TABLE A-6

PQLI REGRESSION ANALYSES (STRATIFIED) (Continued)

Run No.	Countries	Date	Dependent Variable	Independent Variable	Coef B	Standard Error of B	F	r^2	Degrees of Freedom	P Significance Level of Regression
3.25	Economy = 1	–	DRR	GDPR	–	–	1.31	–	1/5	0.304
3.26	Economy = 1	–	DRR	GDPR	–	–	0.23	–	1/8	0.644
3.27	Economy = 3	–	DRR	GDPR	–	–	1.28	–	1/4	0.321
3.28	Economy = 4	–	DRR	GDPR	–	–	0.09	–	1/2	0.793
3.29	Economy = 5	–	DRR	GDPR	–	–	4.78	–	1/5	0.080
3.30	Economy = 6	–	DRR	GDPR	0.277	0.113	6.02	0.301	1/14	0.028
3.31	Ln(GDP) < 5	–	DRR	GDPR	–	–	3.88	–	1/14	0.069
3.32	5≤Ln(GDP) < 6	–	DRR	GDPR	–	–	0.12	–	1/13	0.738
3.33	6≤Ln(GDP)	–	DRR	GDPR	–	–	2.54	–	1/17	0.129
3.34	Religion = 1	–	DRR	GDPR	0.487	0.100	23.80	0.856	1/4	0.0082
3.35	Religion = 2	–	DRR	GDPR	–	–	0.01	–	1/18	0.916
3.36	Religion = 3	–	DRR	GDPR	–	–	2.34	–	1/8	0.164
3.37	Religion = 4	–	DRR	GDPR	–	–	0.06	–	1/2	0.833
3.38	Religion = 5	–	DRR	GDPR	–	–	0.33	–	1/5	0.592
3.39	Religion = 8	–	DRR	GDPR	–	–	1.80	–	1/1	0.408
3.40	Economy = 1	–	DRR	TECR	–	–	0.48	–	1/5	0.519
3.41	Economy = 2	–	DRR	TECR	–	–	0.10	–	1/8	0.766
3.42	Economy = 3	–	DRR	TECR	–	–	0.31	–	1/4	0.606
3.43	Economy = 4	–	DRR	TECR	–	–	0.06	–	1/2	0.833
3.44	Economy = 5	–	DRR	TECR	–	–	0.05	–	1/4	0.832
3.45	Economy = 6	–	DRR	TECR	–	–	0.11	–	1/14	0.746
3.46	Ln(TEC7) < 4	–	DRR	TECR	–	–	4.82	–	1/5	0.0797
3.47	4≤Ln(TEC7)<6	–	DRR	TECR	–	–	0.53	–	1/20	0.474
3.48	6≤Ln(TEC7)	–	DRR	TECR	–	–	0.89	–	1/18	0.357

TABLE A-6

PQLI REGRESSION ANALYSES (STRATIFIED) (Continued)

Run No.	Countries	Date	Dependent Variable	Independent Variable	Coef B	Standard Error of B	F	r^2	Degrees of Freedom	P Significance Level of Regression
3.49	Religion = 1	–	DRR	TECR	–	–	0.91	–	1/3	0.410
3.50	Religion = 2	–	DRR	TECR	–	–	0.63	–	1/18	0.437
3.51	Religion = 3	–	DRR	TECR	–	–	0.17	–	1/8	0.693
3.52	Religion = 4	–	DRR	TECR	–	–	9.53	–	1/2	0.091
3.53	Religion = 5	–	DRR	TECR	–	–	0.83	–	1/5	0.403
3.54	Religion = 8	–	DRR	TECR	–	–	0.00	–	1/1	0.971
3.55	Religion = 1	1975	TFR	PQLI	-0.044	0.017	6.58	0.568	1/5	0.050
3.56	Religion = 2	1975	TFR	PQLI	-0.059	0.013	20.02	0.476	1/22	0.0002
3.57	Religion = 3	1975	TFR	PQLI	–	–	0.57	–	1/17	0.46
3.58	Religion = 4	1975	TFR	PQLI	–	–	3.49	–	1/4	0.14
3.59	Religion = 5	1975	TFR	PQLI	–	–	0.49	–	1/9	0.50
3.60	Religion = 8	1975	TFR	PQLI	–	–	0.40	–	1/1	0.64
3.61	Religion = 1	1975	TFR	PVAL	-0.464	0.109	18.13	0.784	1/5	0.008
3.62	Religion = 2	1975	TFR	PVAL	-0.444	0.072	38.31	0.635	1/22	0.0001
3.63	Religion = 3	1975	TFR	PVAL		–	1.47	–	1/17	0.24
3.64	Religion = 4	1975	TFR	PVAL	-0.611	0.175	12.13	0.752	1/4	0.025
3.65	Religion = 5	1975	TFR	PVAL	–	–	0.97	–	1/9	0.35
3.66	Religion = 8	1975	TFR	PVAL	–	–	0.22	–	1/1	0.72
3.67	Religion = 1	1975	TFR	TEC	-0.00024	0.00010	6.33	0.513	1/6	0.046
3.68	Religion = 2	1975	TFR	TEC	-0.00098	0.00024	17.31	0.409	1/18	0.0003
3.69	Religion = 3	1975	TFR	TEC	–	–	0.63	–	1/17	0.44
3.70	Religion = 4	1975	TFR	TEC	-0.0017	0.0004	18.59	0.788	1/5	0.0076
3.71	Religion = 5	1975	TFR	TEC	–	–	0.83	–	1/11	0.38

TABLE A-6

PQLI REGRESSION ANALYSES (STRATIFIED) (Concluded)

Run No.	Countries	Date	Dependent Variable	Independent Variable	Coef B	Standard Error of B	F	r^2	Degrees of Freedom	P Significance Level of Regression
3.72	Religion = 8	1975	TFR	TEC	-	-	0.25	-	1/1	0.70
3.73	Rel=3, Econ=2	1975	TFR	PVAL	-	-	0.03	-	1/1	0.87
3.74	Economy = 1	1975	TFR	PVAL	-0.29	0.11	7.07	0.541	1/6	0.038
3.75	Economy = 2	1975	TFR	PVAL	-0.44	0.09	22.83	0.637	1/13	0.0004
3.76	Economy = 3	1975	TFR	PVAL	-0.39	0.14	7.91	0.613	1/5	0.038
3.77	Economy = 4	1975	TFR	PVAL	-	-	1.75	-	1/5	0.24
3.78	Economy = 5	1975	TFR	PVAL	-0.41	0.13	9.78	0.620	1/6	0.020
3.79	Economy = 6	1975	TFR	PVAL	-	-	0.23	-	1/23	0.64

APPENDIX B

LISTINGS OF DATA BASES

TABLE B-1: Energy-GDP-Time Series Data

This table contains energy-GDP time series data for 86 nations. The years from 1960 to 1978 are included. The variables shown for each country and each year are, in order:

- GDPCAPTA - Per capita gross domestic product, 1970 U.S.$ (calculated from World Bank economic data to 1973, International Monetary Fund data 1974-1978, normalized with United Nations population statistics).
- GDICAPTA - Per capita gross domestic investment, 1970 U.S.$ (calculated from World Bank economic data, normalized with United Nations population statistics).
- ENERGYC - Per capita energy consumption, kilograms of coal equivalent (United Nations energy consumption statistics).

TABLE B-1

ENERGY-GDP TIME SERIES DATA

COUNTRY=ALGERIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
20	1960	305.174	106.231	252
21	1961	263.116	104.111	261
22	1962	216.814	62.083	237
23	1963	281.237	67.981	212
24	1964	285.998	51.837	219
25	1965	295.750	52.500	241
26	1966	250.790	39.545	286
27	1967	264.386	55.021	253
28	1968	292.983	76.487	259
29	1969	312.315	97.477	308
30	1970	314.749	123.733	342
31	1971	305.662	120.047	335
32	1972	338.131	136.608	351
33	1973	344.627	171.959	472
34	1974	410.663	.	495
35	1975	505.030	.	490
36	1976	810.202	.	660
37	1977	970.262	.	662
38	1978	.	.	687

COUNTRY=AFGHANISTAN

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1	1960	56.2208	3.88041	15
2	1961	56.7623	3.97065	17
3	1962	55.5148	4.25035	22
4	1963	55.3372	4.25017	23
5	1964	55.3708	4.33627	26
6	1965	55.4113	4.24983	30
7	1966	54.2624	4.19228	32
8	1967	54.5377	3.01698	41
9	1968	54.9847	3.01286	41
10	1969	55.9024	3.01976	28
11	1970	56.0661	3.02282	34
12	1971	56.2929	3.09611	50
13	1972	56.5470	3.16443	44
14	1973	59.1799	.	49
15	1974	.	.	46
16	1975	.	.	52
17	1976	.	.	47
18	1977	.	.	45
19	1978	.	.	47

COUNTRY=ARGENTINA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
39	1960	809.54	175.054	1129
40	1961	853.37	188.915	1225
41	1962	826.77	171.173	1271
42	1963	795.10	138.269	1198
43	1964	864.62	171.607	1319
44	1965	929.83	181.358	1400
45	1966	923.64	165.988	1420
46	1967	933.71	171.131	1455
47	1968	963.70	189.591	1484
48	1969	1030.80	217.851	1630
49	1970	1061.76	232.883	1703
50	1971	1086.54	250.127	1790
51	1972	1110.60	260.137	1809
52	1973	1154.72	252.048	1870
53	1974	1268.44	.	1830
54	1975	1218.87	.	1765
55	1976	1170.39	.	1789
56	1977	.	.	1837
57	1978	.	.	1873

COUNTRY=BANGLADESH

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
58	1960	62.6783	4.3212	.
59	1961	64.5840	4.9991	.
60	1962	66.4915	7.8781	.
61	1963	64.4977	5.8690	.
62	1964	69.6071	7.1659	.
63	1965	68.6657	7.7919	.
64	1966	68.8037	7.9311	.
65	1967	65.6281	8.7428	.
66	1968	70.4071	11.5196	.
67	1969	69.8523	10.3622	.
68	1970	72.0932	9.4025	.
69	1971	65.0831	7.9011	.
70	1972	56.6215	.	29
71	1973	59.0317	.	32
72	1974	58.2842	.	27
73	1975	81.7147	.	29
74	1976	75.9961	.	33
75	1977	65.7829	.	39
76	1978	63.6942	.	43

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=BARBADOS

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
77	1960	390.652	114.130	375
78	1961	414.348	101.739	404
79	1962	443.043	96.304	582
80	1963	433.696	108.261	399
81	1964	445.870	104.565	432
82	1965	468.958	104.167	406
83	1966	466.600	107.000	476
84	1967	513.800	115.600	524
85	1968	559.200	148.800	743
86	1969	606.000	150.600	1069
87	1970	693.750	188.125	1104
88	1971	717.917	171.875	987
89	1972	695.455	154.545	910
90	1973	709.877	143.827	953
91	1974	662.667	.	918
92	1975	641.189	.	1011
93	1976	559.263	.	975
94	1977	627.968	.	964
95	1978	.	.	1101

COUNTRY=BOLIVIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
115	1960	145.162	25.4591	147
116	1961	144.567	20.1057	148
117	1962	148.875	34.2708	164
118	1963	154.482	30.3506	162
119	1964	157.901	32.2828	173
120	1965	162.611	28.9846	181
121	1966	170.711	29.3835	199
122	1967	176.407	26.9022	208
123	1968	181.559	36.4598	218
124	1969	182.443	32.4886	231
125	1970	181.394	30.6891	229
126	1971	186.002	29.4344	233
127	1972	192.803	28.5948	266
128	1973	200.645	24.0497	239
129	1974	254.599	.	274
130	1975	261.025	.	294
131	1976	269.155	.	326
132	1977	274.012	.	359
133	1978	.	.	368

COUNTRY=BENIN

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
96	1960	85.8462	13.3269	39
97	1961	86.1308	12.7850	30
98	1962	81.0000	12.2727	31
99	1963	82.5133	13.2212	28
100	1964	82.6713	11.3227	31
101	1965	83.6928	10.4238	32
102	1966	83.7107	10.5926	24
103	1967	85.5233	14.1823	29
104	1968	84.8043	15.4824	30
105	1969	85.7208	16.1660	38
106	1970	87.5854	15.7442	42
107	1971	87.8426	15.9714	43
108	1972	86.0488	17.6864	52
109	1973	85.7550	18.6902	66
110	1974	.	.	69
111	1975	.	.	74
112	1976	.	.	57
113	1977	.	.	55
114	1978	.	.	56

COUNTRY=BRAZIL

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
134	1960	308.856	54.103	332
135	1961	330.996	57.738	336
136	1962	338.707	58.746	361
137	1963	333.557	51.497	368
138	1964	334.080	54.555	370
139	1965	333.847	57.494	368
140	1966	341.099	52.667	394
141	1967	347.358	54.859	396
142	1968	369.087	64.102	447
143	1969	391.002	69.549	472
144	1970	416.450	76.498	474
145	1971	450.616	87.231	507
146	1972	483.870	102.226	548
147	1973	524.470	118.502	622
148	1974	703.829	.	674
149	1975	.	.	704
150	1976	.	.	748
151	1977	.	.	770
152	1978	.	.	794

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=BURMA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
153	1960	69.7621	8.3681	55
154	1961	68.7893	8.1861	48
155	1962	70.1626	7.9845	55
156	1963	77.8875	8.2797	50
157	1964	71.8143	7.6702	51
158	1965	77.8860	14.3850	49
159	1966	72.5810	3.1271	53
160	1967	66.7997	8.1120	53
161	1968	73.2175	11.1406	49
162	1969	73.9670	9.5971	55
163	1970	75.9594	9.9822	58
164	1971	77.3574	9.0851	62
165	1972	77.4025	8.8961	59
166	1973	76.4340	6.5714	53
167	1974	88.1095	.	59
168	1975	90.3409	.	53
169	1976	93.7341	.	56
170	1977	.	.	60
171	1978	.	.	64

COUNTRY=CAMBODIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
191	1960	106.581	21.5074	.
192	1961	103.160	17.7435	.
193	1962	109.013	18.2488	.
194	1963	114.407	18.2476	.
195	1964	108.522	16.4994	2
196	1965	110.941	15.2515	5
197	1966	113.434	20.7064	6
198	1967	116.631	17.8169	2
199	1968	119.303	17.4378	5
200	1969	118.563	17.7933	2
201	1970	103.951	13.5520	2
202	1971	95.842	.	1
203	1972	87.947	.	1
204	1973	.	.	6
205	1974	.	.	3
206	1975	.	.	3
207	1976	.	.	3
208	1977	.	.	3
209	1978	.	.	4

COUNTRY=BURUNDI

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
172	1960	55.4354	3.46442	.
173	1961	46.6997	3.22156	.
174	1962	50.1022	3.69745	10
175	1963	51.1738	3.07726	10
176	1964	53.0382	2.84638	10
177	1965	54.0111	3.11138	15
178	1966	55.4594	2.33927	13
179	1967	59.2312	2.61551	11
180	1968	57.3768	3.24215	13
181	1969	55.6796	2.98568	15
182	1970	61.2251	4.43731	15
183	1971	60.9705	5.16212	16
184	1972	62.9322	2.36542	17
185	1973	64.3042	2.55297	10
186	1974	.	.	13
187	1975	.	.	13
188	1976	.	.	12
189	1977	.	.	12
190	1978	.	.	12

COUNTRY=CAMEROON

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
210	1960	131.557	13.6585	55
211	1961	133.780	14.3629	58
212	1962	137.120	14.7977	60
213	1963	131.161	13.9266	60
214	1964	134.235	16.4039	62
215	1965	134.212	18.8183	59
216	1966	131.857	20.6487	59
217	1967	140.836	22.9538	74
218	1968	150.864	23.5702	77
219	1969	164.135	23.5077	84
220	1970	172.610	24.3653	91
221	1971	175.962	26.1756	100
222	1972	180.525	28.0318	93
223	1973	182.748	25.0055	87
224	1974	172.229	.	87
225	1975	173.650	.	105
226	1976	173.982	.	91
227	1977	.	.	122
228	1978	.	.	119

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=CENT.AF.EMP.

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
229	1960	138.736	21.2152	37
230	1961	141.039	24.2795	35
231	1962	134.437	25.3404	29
232	1963	130.993	24.0067	29
233	1964	130.249	25.0282	29
234	1965	129.286	24.5068	34
235	1966	127.382	24.4966	31
236	1967	124.355	25.4471	33
237	1968	131.566	21.6531	35
238	1969	136.242	21.5601	57
239	1970	136.388	23.1814	63
240	1971	135.257	23.4943	61
241	1972	133.751	22.9349	54
242	1973	133.363	23.4484	53
243	1974	.	.	35
244	1975	.	.	34
245	1976	.	.	41
246	1977	.	.	41
247	1978	.	.	44

COUNTRY=CHILE

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
267	1960	670.365	114.485	845
268	1961	692.902	127.775	910
269	1962	709.405	121.267	1029
270	1963	724.105	133.553	1029
271	1964	736.665	124.250	1003
272	1965	754.935	136.810	995
273	1966	789.095	141.307	1021
274	1967	788.091	125.486	1060
275	1968	792.754	131.989	1131
276	1969	800.321	142.730	1153
277	1970	817.206	152.659	1299
278	1971	865.981	142.736	1478
279	1972	864.035	142.687	1476
280	1973	801.344	132.305	1173
281	1974	.	.	1149
282	1975	.	.	974
283	1976	.	.	946
284	1977	.	.	990
285	1978	.	.	997

COUNTRY=CHAD

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
248	1960	83.3978	8.32805	10
249	1961	81.4842	9.46417	9
250	1962	84.7830	7.97690	14
251	1963	82.7893	9.98408	16
252	1964	79.3104	9.83095	17
253	1965	78.4387	7.50662	18
254	1966	80.2478	7.58668	13
255	1967	76.6394	8.71379	17
256	1968	78.2960	8.23086	19
257	1969	79.0808	8.77555	25
258	1970	74.0975	9.49714	25
259	1971	73.7624	8.90570	27
260	1972	63.9439	9.78636	21
261	1973	62.0637	8.37442	20
262	1974	.	.	19
263	1975	.	.	23
264	1976	.	.	23
265	1977	.	.	23
266	1978	.	.	22

COUNTRY=CHINA.REPUBLIC

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
286	1960	205.837	36.225	.
287	1961	213.769	39.386	410
288	1962	222.251	41.031	401
289	1963	235.639	41.778	425
290	1964	256.275	49.379	448
291	1965	277.811	62.986	456
292	1966	292.859	67.690	493
293	1967	314.436	80.933	341
294	1968	336.152	91.839	443
295	1969	350.964	94.556	469
296	1970	376.583	111.968	548
297	1971	409.989	122.334	562
298	1972	447.492	125.660	572
299	1973	493.963	135.367	598
300	1974	478.510	.	631
301	1975	477.428	.	653
302	1976	537.821	.	675
303	1977	.	.	761
304	1978	.	.	837

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=COSTARICA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
344	1960	619.230	116.567	233
345	1961	607.019	117.559	236
346	1962	629.195	137.180	252
347	1963	642.012	154.902	262
348	1964	623.367	113.747	269
349	1965	659.045	195.528	307
350	1966	680.764	159.394	330
351	1967	710.238	162.718	296
352	1968	755.982	164.623	325
353	1969	793.877	199.231	356
354	1970	814.302	186.857	421
355	1971	825.573	208.880	453
356	1972	849.718	233.843	490
357	1973	880.400	241.966	552
358	1974	.	.	521
359	1975	.	.	520
360	1976	.	.	506
361	1977	.	.	606
362	1978	.	.	564

COUNTRY=COLOMBIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
305	1960	278.474	57.4713	491
306	1961	283.247	61.4746	525
307	1962	289.462	54.5005	549
308	1963	289.434	51.6584	553
309	1964	297.609	56.7273	507
310	1965	298.581	53.5189	525
311	1966	304.771	62.1069	528
312	1967	307.669	52.3105	585
313	1968	316.455	61.6627	600
314	1969	326.237	60.5139	586
315	1970	337.352	67.5308	606
316	1971	344.927	71.8195	634
317	1972	357.715	66.9125	623
318	1973	371.659	68.8004	669
319	1974	375.881	.	679
320	1975	382.157	.	674
321	1976	.	.	702
322	1976	.	.	702
323	1977	.	.	720
324	1978	.	.	700

COUNTRY=DOMINICANREP

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
363	1960	300.042	29.296	157
364	1961	285.955	21.196	149
365	1962	324.827	35.584	176
366	1963	335.554	49.007	173
367	1964	348.379	59.017	237
368	1965	296.991	26.987	170
369	1966	326.137	45.558	214
370	1967	328.265	46.877	194
371	1968	316.092	45.836	288
372	1969	339.548	57.069	314
373	1970	365.906	69.131	320
374	1971	392.789	77.624	360
375	1972	429.552	95.070	427
376	1973	459.396	109.365	646
377	1974	485.360	.	658
378	1975	497.469	.	609
379	1976	513.727	.	568
380	1977	.	.	422
381	1978	.	.	464

COUNTRY=CONGO,PR

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
325	1960	183.498	66.2737	119
326	1961	192.672	87.9832	139
327	1962	198.601	51.6507	122
328	1963	184.993	32.4796	118
329	1964	188.360	28.7387	132
330	1965	189.810	30.9619	118
331	1966	194.917	45.9210	144
332	1967	217.668	62.0529	147
333	1968	224.273	66.3342	201
334	1968	230.218	64.6333	219
335	1970	238.150	61.7314	194
336	1971	233.475	64.3457	234
337	1972	228.736	67.1226	207
338	1973	254.883	72.5827	.
339	1974	.	.	.
340	1975	.	.	.
341	1976	.	.	.
342	1977	.	.	.
343	1978	.	.	.

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=ECUADOR

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
382	1960	262.216	36.8646	201
383	1961	257.374	36.5045	183
384	1962	260.448	33.4010	172
385	1963	261.546	33.9422	200
386	1964	272.964	35.0891	204
387	1965	272.269	33.7577	214
388	1966	270.429	32.5349	218
389	1967	277.601	38.2574	228
390	1968	283.615	41.4695	266
391	1969	287.869	47.2114	272
392	1970	300.421	65.7678	297
393	1971	296.691	73.3833	313
394	1972	311.214	67.4183	306
395	1973	340.379	62.8700	325
396	1974	370.664	.	378
397	1975	370.369	.	417
398	1976	392.806	.	455
399	1977	403.791	.	439
400	1978	.	.	505

COUNTRY=ETHIOPIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
420	1960	55.0167	6.4854	8
421	1961	56.1431	6.8057	9
422	1962	57.8690	7.4242	10
423	1963	59.0745	7.0872	10
424	1964	61.4136	7.4119	14
425	1965	64.4869	7.8467	18
426	1966	66.1246	8.5748	21
427	1967	70.7632	10.3127	18
428	1968	71.7031	10.6198	30
429	1969	72.7124	9.1891	33
430	1970	73.3942	10.4218	33
431	1971	74.4562	10.5737	35
432	1972	75.8841	10.7760	35
433	1973	77.3282	10.9805	30
434	1974	67.6706	.	32
435	1975	66.0469	.	21
436	1976	66.1243	.	20
437	1977	.	.	19
438	1978	.	.	20

COUNTRY=ELSALVADOR

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
401	1960	236.250	36.4907	127
402	1961	242.843	31.5392	122
403	1962	260.556	31.2205	132
404	1963	258.792	33.2125	157
405	1964	272.614	47.0468	183
406	1965	276.817	43.4800	170
407	1966	285.575	49.7493	185
408	1967	291.448	43.6151	168
409	1968	289.551	32.7829	198
410	1969	290.952	37.3777	173
411	1970	295.714	38.5920	192
412	1971	297.023	46.0872	207
413	1972	298.244	38.6718	210
414	1973	305.359	51.8559	243
415	1974	280.633	.	241
416	1975	287.575	.	244
417	1976	291.131	.	264
418	1977	295.850	.	272
419	1978	.	.	265

COUNTRY=FIJI

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
439	1960	342.121	64.482	244
440	1961	336.873	64.832	208
441	1962	340.641	53.051	271
442	1963	353.931	61.211	276
443	1964	354.706	69.493	452
444	1965	337.647	70.532	352
445	1966	323.578	68.136	313
446	1967	366.740	71.394	336
447	1968	379.955	98.507	365
448	1969	382.213	92.743	398
449	1970	422.473	91.210	473
450	1971	443.020	101.044	478
451	1972	467.391	111.479	491
452	1973	487.559	118.455	432
453	1974	.	.	556
454	1975	.	.	505
455	1976	.	.	404
456	1977	.	.	507
457	1978	.	.	466

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=GAMBIA,THE

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
458	1960	81.137	9.6020	24
459	1961	91.374	12.0799	28
460	1962	90.290	12.0799	31
461	1963	90.909	15.3322	34
462	1964	93.920	12.3026	34
463	1965	101.112	14.2575	33
464	1966	114.659	16.0975	40
465	1967	126.662	19.9100	39
466	1968	101.912	16.1488	43
467	1969	100.608	14.5097	52
468	1970	88.714	8.0365	51
469	1971	94.320	16.3034	56
470	1972	97.980	15.8727	67
471	1973	94.942	15.6767	60
472	1974	127.798	.	58
473	1975	109.608	.	92
474	1976	108.901	.	90
475	1977	116.340	.	102
476	1978	.	.	107

COUNTRY=GREECE

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
496	1960	545.93	142.298	460
497	1961	600.40	160.964	505
498	1962	617.65	143.477	474
499	1963	663.83	142.436	583
500	1964	721.86	186.424	648
501	1965	782.27	213.489	783
502	1966	828.64	208.338	837
503	1967	867.80	204.159	902
504	1968	928.73	230.507	1020
505	1969	1011.38	263.122	1141
506	1970	1094.70	286.110	1222
507	1971	1167.33	313.397	1485
508	1972	1278.08	360.459	1566
509	1973	1380.87	419.913	1750
510	1974	1308.42	.	1691
511	1975	1374.11	.	1961
512	1976	1436.22	.	1981
513	1977	1471.03	.	2010
514	1978	.	.	1925

COUNTRY=GHANA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
477	1960	249.279	52.8634	106
478	1961	251.215	42.6685	94
479	1962	254.950	39.7978	99
480	1963	259.694	47.0518	120
481	1964	258.384	54.4263	103
482	1965	255.494	51.8400	105
483	1966	239.357	36.3222	95
484	1967	241.507	25.0788	110
485	1968	237.122	26.3314	130
486	1969	245.674	29.6599	135
487	1970	256.524	36.7892	173
488	1971	269.290	39.2148	145
489	1972	261.171	14.9418	159
490	1973	266.428	.	163
491	1974	272.955	.	183
492	1975	265.765	.	170
493	1976	.	.	157
494	1977	.	.	167
495	1978	.	.	165

COUNTRY=GUATEMALA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
515	1960	290.169	31.3069	174
516	1961	293.471	26.9523	177
517	1962	294.192	26.6668	169
518	1963	313.076	34.6600	170
519	1964	318.502	40.4933	165
520	1965	324.149	39.9685	201
521	1966	333.016	34.4684	184
522	1967	336.360	44.0391	192
523	1968	355.287	51.0155	208
524	1969	362.383	37.9927	214
525	1970	373.324	44.7498	212
526	1971	383.617	50.3234	223
527	1972	400.289	41.1796	238
528	1973	418.934	46.2181	241
529	1974	425.983	.	241
530	1975	421.743	.	251
531	1976	440.113	.	257
532	1977	463.819	.	263
533	1978	.	.	260

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=GUINEA,EQ

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
534	1960	89.121	.	65
535	1961	91.104	.	97
536	1962	95.583	.	101
537	1963	100.655	.	104
538	1964	93.333	.	103
539	1965	95.271	20.5698	100
540	1966	94.737	17.8947	100
541	1967	95.514	18.4865	98
542	1968	97.280	20.2667	101
543	1969	97.969	20.7812	98
544	1970	98.878	23.2653	98
545	1971	99.254	23.6318	102
546	1972	99.854	22.1898	98
547	1973	104.703	19.8575	84
548	1974	.	.	87
549	1975	.	.	96
550	1976	.	.	94
551	1977	.	.	92
552	1978	.	.	105

COUNTRY=HONDURAS

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
572	1960	245.070	31.3200	155
573	1961	242.166	27.3723	187
574	1962	247.102	35.0185	171
575	1963	247.002	38.9044	167
576	1964	252.433	37.6927	166
577	1965	265.636	39.6138	167
578	1966	270.108	43.3195	174
579	1967	276.190	54.6663	183
580	1968	283.787	52.7826	204
581	1969	276.943	51.6440	207
582	1970	284.863	61.0058	247
583	1971	287.938	47.9862	222
584	1972	292.956	42.4313	247
585	1973	293.491	49.9899	269
586	1974	281.294	.	262
587	1975	269.446	.	273
588	1976	281.817	.	293
589	1977	.	.	295
590	1978	.	.	284

COUNTRY=GUYANA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
553	1960	322.984	96.2115	579
554	1961	331.938	86.0220	632
555	1962	329.444	59.3557	565
556	1963	280.337	50.6057	493
557	1964	307.851	54.0675	502
558	1965	332.247	74.8882	830
559	1966	341.058	82.1197	889
560	1967	343.394	90.7431	973
561	1968	332.370	78.5700	963
562	1969	346.833	75.4614	966
563	1970	375.384	87.2062	1093
564	1971	375.552	69.9707	1016
565	1972	361.742	73.8851	1037
566	1973	348.385	78.2716	1153
567	1974	.	.	973
568	1975	.	.	1132
569	1976	.	.	1058
570	1977	.	.	1050
571	1978	.	.	1070

COUNTRY=HONGKONG

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
591	1960	395.546	73.570	468
592	1961	440.251	74.128	516
593	1962	484.625	87.045	539
594	1963	522.199	111.098	602
595	1964	569.461	131.255	585
596	1965	622.200	146.332	645
597	1966	598.260	154.379	690
598	1967	612.165	124.273	792
599	1968	617.288	100.207	784
600	1969	670.665	122.291	969
601	1970	745.174	153.665	1017
602	1971	773.730	187.531	1077
603	1972	844.087	206.993	1041
604	1973	894.064	237.264	1023
605	1974	.	.	1191
606	1975	.	.	1120
607	1976	.	.	1295
608	1977	.	.	1565
609	1978	.	.	1657

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=INDIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
610	1960	83.7740	14.1668	142
611	1961	85.4113	13.9536	151
612	1962	86.1835	14.7454	162
613	1963	89.2633	16.8637	170
614	1964	93.6889	15.0635	162
615	1965	88.3712	17.1169	174
616	1966	86.9444	16.1134	174
617	1967	91.9615	16.1445	170
618	1968	92.9822	15.4194	181
619	1969	95.9963	15.3539	160
620	1970	97.7099	17.2875	181
621	1971	97.2047	17.5230	186
622	1972	93.8681	17.8857	191
623	1973	97.0067	19.2341	156
624	1974	87.3870	.	158
625	1975	92.9750	.	168
626	1976	92.3481	.	172
627	1977	.	.	178
628	1978	.	.	178

COUNTRY=IRAN

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
648	1960	226.128	39.121	270
649	1961	228.145	37.603	329
650	1962	235.477	32.759	339
651	1963	244.642	35.555	342
652	1964	256.733	39.401	386
653	1965	279.625	51.149	395
654	1966	298.590	51.684	412
655	1967	323.612	64.506	386
656	1968	351.514	69.959	486
657	1969	373.682	70.886	666
658	1970	405.827	73.116	1020
659	1971	434.486	90.312	980
660	1972	474.403	103.944	1010
661	1973	529.313	119.904	1098
662	1974	649.768	.	1245
663	1975	650.825	.	1317
664	1976	707.946	.	1453
665	1977	679.472	.	1542
666	1978	.	.	1808

COUNTRY=INDONESIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
629	1960	66.281	5.2148	129
630	1961	68.946	7.3692	144
631	1962	68.600	6.5465	111
632	1963	65.805	4.9017	108
633	1964	66.845	5.4696	118
634	1965	66.301	5.5829	112
635	1966	66.871	6.1590	103
636	1967	66.526	4.9300	106
637	1968	72.399	5.9155	118
638	1969	75.889	7.4631	110
639	1970	80.094	9.7364	120
640	1971	82.795	11.0139	138
641	1972	85.771	12.7839	158
642	1973	93.144	14.4090	136
643	1974	113.266	.	151
644	1975	115.858	.	184
645	1976	120.661	.	223
646	1977	126.421	.	290
647	1978	.	.	278

COUNTRY=ISRAEL

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
667	1960	1128.85	319.009	1270
668	1961	1216.32	368.396	1403
669	1962	1266.52	384.825	1433
670	1963	1349.27	385.215	1508
671	1964	1421.93	446.752	1630
672	1965	1501.93	435.023	1721
673	1966	1477.06	355.007	1754
674	1967	1483.93	271.361	2110
675	1968	1672.28	391.638	2101
676	1969	1847.83	476.471	2347
677	1970	1932.16	524.078	2561
678	1971	2080.67	614.872	2702
679	1972	2264.82	653.029	2798
680	1973	2352.62	705.083	2952
681	1974	2115.60	.	2914
682	1975	2149.04	.	.
683	1976	2137.87	.	.
684	1977	2107.23	.	.
685	1978	.	.	.

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=IVORYCOAST

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
686	1960	222.180	32.2848	76
687	1961	235.499	40.4537	89
688	1962	230.809	27.7225	92
689	1963	255.397	39.4525	90
690	1964	289.854	54.9111	106
691	1965	271.333	51.4479	153
692	1966	279.674	54.3003	157
693	1967	282.935	49.4726	165
694	1968	318.277	54.4915	203
695	1969	325.036	63.6485	189
696	1970	347.304	76.6682	228
697	1971	358.968	77.5475	314
698	1972	371.620	74.7903	331
699	1973	387.484	77.9699	293
700	1974	415.203	.	301
701	1975	409.571	.	321
702	1976	477.621	.	370
703	1977	518.810	.	356
704	1978	.	.	357

COUNTRY=JORDAN

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
724	1960	192.611	33.5908	197
725	1961	232.863	36.5978	251
726	1962	230.848	39.3117	283
727	1963	236.819	36.6926	276
728	1964	269.152	45.5913	273
729	1965	289.090	47.9987	310
730	1966	288.042	44.5598	323
731	1967	307.384	40.8278	288
732	1968	287.473	57.9227	287
733	1969	300.558	88.3752	321
734	1970	255.702	49.4991	306
735	1971	252.646	56.3953	327
736	1972	252.346	51.7602	340
737	1973	234.254	62.1611	341
738	1974	275.239	.	351
739	1975	.	.	389
740	1976	.	.	477
741	1977	.	.	503
742	1978	.	.	535

COUNTRY=JAMAICA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
705	1960	505.031	116.319	426
706	1961	521.481	108.148	621
707	1962	521.707	99.512	619
708	1963	525.714	95.000	676
709	1964	555.789	110.877	1107
710	1965	582.955	117.273	871
711	1966	600.000	124.719	939
712	1967	615.249	137.238	1094
713	1968	626.885	167.869	985
714	1969	663.913	177.391	1038
715	1970	711.658	207.914	1325
716	1971	757.696	185.340	1506
717	1972	806.598	194.227	1452
718	1973	802.424	175.758	2011
719	1974	877.027	.	1824
720	1975	.	.	1939
721	1976	.	.	1677
722	1977	.	.	1763
723	1978	.	.	1823

COUNTRY=KENYA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
743	1960	112.181	28.1250	143
744	1961	100.523	17.7117	139
745	1962	106.992	15.9358	151
746	1963	113.009	18.4878	158
747	1964	115.260	15.1299	147
748	1965	113.924	15.7712	126
749	1966	127.883	22.9141	126
750	1967	128.330	23.1522	119
751	1968	133.597	22.8721	128
752	1969	137.068	24.2096	143
753	1970	143.348	28.8513	135
754	1971	148.072	33.2134	158
755	1972	148.796	27.9979	151
756	1973	154.946	31.3125	138
757	1974	168.598	.	161
758	1975	156.781	.	160
759	1976	167.158	.	144
760	1977	178.925	.	141
761	1978	.	.	139

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=FORFA,REP

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
762	1960	143.788	12.3896	258
763	1961	147.790	15.2345	286
764	1962	148.032	14.6275	332
765	1963	156.550	26.6884	396
766	1964	165.827	21.7572	399
767	1965	171.781	22.2859	435
768	1966	188.276	35.0829	513
769	1967	198.001	39.8971	582
770	1968	218.612	53.9980	593
771	1969	247.079	74.3370	655
772	1970	263.504	72.0460	815
773	1971	284.391	75.2799	858
774	1972	300.193	66.0470	830
775	1973	345.125	89.6214	956
776	1974	380.626	.	992
777	1975	407.252	.	1090
778	1976	460.646	.	1115
779	1977	497.710	.	1240
780	1978	.	.	1359

COUNTRY=LIBERIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
800	1960	212.014	65.003	86
801	1961	207.092	88.062	72
802	1962	201.030	120.715	107
803	1963	200.669	79.312	146
804	1964	223.947	52.778	191
805	1965	213.491	44.499	202
806	1966	232.300	45.666	221
807	1967	237.385	50.571	226
808	1968	244.060	35.488	233
809	1969	256.838	38.570	379
810	1970	265.723	42.792	454
811	1971	264.787	41.880	447
812	1972	273.081	45.291	394
813	1973	255.970	34.947	405
814	1974	316.279	.	460
815	1975	298.161	.	402
816	1976	304.918	.	409
817	1977	.	.	402
818	1978	.	.	395

COUNTRY=LEBANON

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
781	1960	484.581	77.536	548
782	1961	503.165	85.538	565
783	1962	509.436	91.631	611
784	1963	498.556	99.681	643
785	1964	516.120	113.613	657
786	1965	555.070	124.848	646
787	1966	576.692	139.126	696
788	1967	534.893	107.936	675
789	1968	584.277	105.962	701
790	1969	582.037	112.455	774
791	1970	602.832	112.117	665
792	1971	640.311	126.737	880
793	1972	696.208	141.858	924
794	1973	707.427	153.442	1193
795	1974	.	.	1180
796	1975	.	.	1014
797	1976	.	.	927
798	1977	.	.	834
799	1978	.	.	936

COUNTRY=LIBYA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
819	1960	.	.	251
820	1961	.	.	219
821	1962	492.80	188.855	210
822	1963	653.15	195.813	250
823	1964	895.82	257.564	279
824	1965	1102.72	323.383	298
825	1966	1253.37	367.811	401
826	1967	1328.57	372.432	470
827	1968	1707.24	454.087	469
828	1969	1866.32	476.733	581
829	1970	1869.95	347.538	537
830	1971	1644.06	302.885	575
831	1972	1685.44	379.426	647
832	1973	1849.00	547.182	892
833	1974	3127.68	.	988
834	1975	2703.94	.	1101
835	1976	.	.	1733
836	1977	.	.	1936
837	1978	.	.	1889

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=MADAGASCAR

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
838	1960	127.123	18.4004	38
839	1961	126.348	15.5517	35
840	1962	126.199	13.1578	36
841	1963	121.796	17.0656	40
842	1964	123.691	18.1147	41
843	1965	120.033	16.0493	46
844	1966	120.090	16.1355	45
845	1967	124.101	17.6825	59
846	1968	129.918	21.1981	67
847	1969	131.821	22.3636	63
848	1970	134.237	19.7407	71
849	1971	132.313	22.2571	76
850	1972	121.940	19.9143	74
851	1973	116.013	20.0938	69
852	1974	119.673	.	75
853	1975	114.226	.	89
854	1976	111.729	.	65
855	1977	.	.	76
856	1978	.	.	78

COUNTRY=MALAYSIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
876	1960	275.892	38.6990	248
877	1961	287.453	41.1006	268
878	1962	296.099	47.8192	262
879	1963	307.694	48.9611	288
880	1964	314.113	48.6778	363
881	1965	328.723	52.3686	361
882	1966	337.541	54.0499	421
883	1967	341.629	56.2134	453
884	1968	344.905	56.9390	444
885	1969	365.067	52.0577	479
886	1970	370.020	66.2993	494
887	1971	383.748	66.8994	458
888	1972	393.916	71.9885	538
889	1973	415.417	68.4928	663
890	1974	443.838	.	698
891	1975	439.227	.	663
892	1976	.	.	746
893	1977	.	.	733
894	1978	.	.	716

COUNTRY=MALAWI

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
857	1960	59.9862	6.7747	.
858	1961	62.9278	8.8584	.
859	1962	61.7707	5.7452	.
860	1963	59.4373	6.6395	.
861	1964	59.3871	4.6457	37
862	1965	68.1669	7.3184	38
863	1966	72.6520	6.6247	46
864	1967	79.3708	9.8095	41
865	1968	72.8412	7.3750	42
866	1969	73.3412	8.5502	41
867	1970	73.9825	10.1988	46
868	1971	85.6797	9.3363	49
869	1972	89.6686	10.4545	53
870	1973	94.3815	11.3627	52
871	1974	89.1247	.	49
872	1975	89.6153	.	56
873	1976	90.2473	.	56
874	1977	87.4105	.	51
875	1978	.	.	52

COUNTRY=MALI

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
895	1960	49.8867	5.9901	15
896	1961	48.6875	6.6683	15
897	1962	47.5000	8.1174	17
898	1963	49.0797	9.3052	22
899	1964	50.0178	6.3051	21
900	1965	50.9432	10.2052	23
901	1966	52.2194	8.4581	22
902	1967	52.8713	8.4979	26
903	1968	53.7350	8.4182	22
904	1969	52.2211	9.2880	16
905	1970	54.2158	7.3743	21
906	1971	55.4105	7.7996	23
907	1972	57.0361	7.7300	25
908	1973	54.8810	8.4052	25
909	1974	.	.	26
910	1975	.	.	29
911	1976	.	.	28
912	1977	.	.	30
913	1978	.	.	30

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=MALTA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
914	1960	45.18	10.203	508
915	1961	408.48	83.739	445
916	1962	391.12	84.761	500
917	1963	390.10	88.845	627
918	1964	410.72	116.897	767
919	1965	439.15	114.791	739
920	1966	486.54	129.534	656
921	1967	520.24	154.809	815
922	1968	572.90	189.562	993
923	1969	651.88	223.262	1008
924	1970	689.32	228.752	978
925	1971	698.51	203.221	1002
926	1972	727.71	189.562	1289
927	1973	762.46	169.553	1229
928	1974	786.26	.	1130
929	1975	911.40	.	993
930	1976	1066.41	.	1132
931	1977	.	.	1119
932	1978	.	.	1082

COUNTRY=MEXICO

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
952	1960	487.887	97.924	770
953	1961	495.178	98.571	789
954	1962	501.208	99.226	746
955	1963	523.276	99.956	760
956	1964	564.830	112.178	796
957	1965	581.205	110.044	795
958	1966	600.965	119.644	836
959	1967	617.385	119.755	898
960	1968	645.257	126.719	935
961	1969	663.131	137.402	1003
962	1970	661.192	139.100	1047
963	1971	667.228	129.014	1109
964	1972	686.495	140.435	1131
965	1973	711.079	150.228	1179
966	1974	735.237	.	1245
967	1975	739.377	.	1224
968	1976	725.429	.	1279
969	1977	722.411	.	1330
970	1978	.	.	1384

COUNTRY=MAURITANIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
933	1960	89.896	31.6948	18
934	1961	102.797	56.9541	23
935	1962	102.498	70.0576	32
936	1963	99.460	42.4560	39
937	1964	125.745	24.4604	55
938	1965	143.202	23.1859	75
939	1966	144.242	23.3929	80
940	1967	147.840	33.9736	80
941	1968	151.016	43.1122	99
942	1969	153.526	36.2761	113
943	1970	158.390	31.7884	144
944	1971	155.627	26.2966	125
945	1972	154.200	35.4000	123
946	1973	157.148	20.5512	163
947	1974	.	.	188
948	1975	.	.	188
949	1976	.	.	167
950	1977	.	.	198
951	1978	.	.	203

COUNTRY=MOROCCO

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
971	1960	197.198	20.8261	148
972	1961	186.236	17.8267	149
973	1962	202.697	23.2704	132
974	1963	208.855	26.1069	157
975	1964	206.551	22.9718	165
976	1965	204.757	23.1086	158
977	1966	195.886	21.3160	175
978	1967	202.696	28.1919	179
979	1968	220.806	37.7239	175
980	1969	216.041	27.3619	182
981	1970	220.275	33.1631	180
982	1971	233.763	34.9414	202
983	1972	237.815	30.6819	234
984	1973	234.356	28.5713	244
985	1974	238.316	.	254
986	1975	240.191	.	266
987	1976	256.590	.	280
988	1977	.	.	293
989	1978	.	.	285

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=NEPAL

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
990	1960	73.3429	.	5
991	1961	73.3909	.	4
992	1962	73.4656	.	5
993	1963	73.5516	.	5
994	1964	77.6556	.	7
995	1965	79.3513	.	9
996	1966	77.3533	.	9
997	1967	75.9832	.	10
998	1968	75.8918	.	12
999	1969	77.8146	.	18
1000	1970	77.3371	.	15
1001	1971	75.0824	.	9
1002	1972	74.9785	.	15
1003	1973	74.8902	.	12
1004	1974	71.9977	.	11
1005	1975	80.0252	.	11
1006	1976	81.7916	.	11
1007	1977	82.6075	.	11
1008	1978	.	.	11

COUNTRY=NIGER

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1028	1960	92.288	6.6667	5
1029	1961	93.333	6.9841	9
1030	1962	100.247	10.6173	11
1031	1963	107.267	14.4144	14
1032	1964	104.795	12.0468	14
1033	1965	109.744	9.6866	13
1034	1966	102.161	9.0859	18
1035	1967	100.162	9.2722	16
1036	1968	100.262	10.0787	20
1037	1969	89.412	5.9335	23
1038	1970	89.529	8.9330	25
1039	1971	89.007	9.0073	27
1040	1972	81.235	8.1710	29
1041	1973	70.791	4.2791	34
1042	1974	.	.	31
1043	1975	.	.	35
1044	1976	.	.	33
1045	1977	.	.	37
1046	1978	.	.	38

COUNTRY=NICARAGUA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1009	1960	307.572	44.9460	174
1010	1961	320.104	47.0312	192
1011	1962	345.389	58.5304	199
1012	1963	364.984	63.7092	278
1013	1964	405.955	82.7070	265
1014	1965	425.401	90.8488	244
1015	1966	425.060	97.6205	277
1016	1967	450.368	97.4853	313
1017	1968	443.132	81.0632	366
1018	1969	455.098	91.8017	358
1019	1970	465.806	90.6557	418
1020	1971	477.000	90.6389	412
1021	1972	481.510	89.5103	405
1022	1973	479.047	98.7052	438
1023	1974	.	.	450
1024	1975	.	.	443
1025	1976	.	.	467
1026	1977	.	.	540
1027	1978	.	.	517

COUNTRY=NIGERIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1047	1960	108.442	13.0000	34
1048	1961	106.081	14.6147	39
1049	1962	107.458	13.5516	37
1050	1963	113.776	14.5861	37
1051	1964	117.281	18.3531	47
1052	1965	121.480	20.8980	53
1053	1966	113.668	19.1712	62
1054	1967	93.806	15.7194	38
1055	1968	91.429	13.3228	34
1056	1969	112.279	14.3444	39
1057	1970	135.220	23.1025	52
1058	1971	151.144	29.6933	65
1059	1972	156.151	27.1852	72
1060	1973	162.987	28.8366	81
1061	1974	199.398	.	93
1062	1975	155.398	.	86
1063	1976	.	.	107
1064	1977	.	.	107
1065	1978	.	.	106

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=OMAN

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1066	1960	93.472	.	.
1067	1961	92.750	.	.
1068	1962	111.904	.	.
1069	1963	114.819	.	.
1070	1964	113.741	.	9
1071	1965	112.223	.	22
1072	1966	115.920	.	27
1073	1967	190.994	.	106
1074	1968	324.006	.	179
1075	1969	427.439	.	202
1076	1970	419.848	.	200
1077	1971	360.665	.	237
1078	1972	335.195	.	236
1079	1973	339.116	.	202
1080	1974	.	.	309
1081	1975	.	.	474
1082	1976	.	.	696
1083	1977	.	.	1992
1084	1978	.	.	2006

COUNTRY=PAPUANEWG

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1104	1960	161.874	.	51
1105	1961	163.100	42.046	55
1106	1962	168.118	40.198	52
1107	1963	175.881	44.621	67
1108	1964	180.298	49.707	68
1109	1965	188.947	59.009	76
1110	1966	195.190	70.747	85
1111	1967	206.697	78.184	103
1112	1968	215.046	79.230	119
1113	1969	226.040	76.367	124
1114	1970	239.878	109.295	138
1115	1971	286.165	152.560	167
1116	1972	276.349	119.977	194
1117	1973	339.761	89.741	267
1118	1974	291.049	.	300
1119	1975	281.920	.	278
1120	1976	270.648	.	291
1121	1977	277.775	.	293
1122	1978	.	.	292

COUNTRY=PANAMA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1085	1960	458.557	74.772	448
1086	1961	494.305	92.340	484
1087	1962	516.119	100.348	464
1088	1963	545.701	109.846	464
1089	1964	550.891	96.832	460
1090	1965	586.686	107.206	580
1091	1966	611.286	138.255	614
1092	1967	643.307	141.440	615
1093	1968	667.802	155.434	687
1094	1969	703.334	172.827	682
1095	1970	731.238	197.994	683
1096	1971	768.223	218.003	814
1097	1972	795.074	256.334	859
1098	1973	819.715	240.352	908
1099	1974	844.309	.	848
1100	1975	829.274	.	911
1101	1976	802.628	.	892
1102	1977	787.236	.	981
1103	1978	.	.	991

COUNTRY=PARAGUAY

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1123	1960	202.496	34.4502	87
1124	1961	209.337	35.5291	100
1125	1962	215.698	27.2532	105
1126	1963	214.133	24.0050	106
1127	1964	217.616	26.3503	108
1128	1965	226.562	35.1807	132
1129	1966	222.899	35.6318	126
1130	1967	229.916	38.0185	118
1131	1968	233.225	37.2169	116
1132	1969	234.827	38.0852	114
1133	1970	240.861	36.9747	140
1134	1971	243.726	37.5096	135
1135	1972	245.783	41.4264	123
1136	1973	254.580	54.7446	164
1137	1974	282.210	.	171
1138	1975	287.457	.	158
1139	1976	294.604	.	181
1140	1977	325.879	.	200
1141	1978	.	.	200

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=PERU

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1142	1960	361.403	58.7976	445
1143	1961	383.151	65.5553	450
1144	1962	407.152	70.7147	484
1145	1963	410.455	65.2036	517
1146	1964	425.518	66.3233	548
1147	1965	433.396	72.8601	536
1148	1966	447.902	86.5729	646
1149	1967	445.826	81.4189	634
1150	1968	433.367	56.1660	625
1151	1969	437.836	56.0273	611
1152	1970	456.958	58.8521	619
1153	1971	464.621	69.7944	625
1154	1972	477.996	67.6224	603
1155	1973	494.716	73.8873	616
1156	1974	503.438	.	647
1157	1975	505.729	.	681
1158	1976	506.788	.	645
1159	1977	486.915	.	646
1160	1978	.	.	649

COUNTRY=QATAR

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1180	1960	531.280	.	1569
1181	1961	448.147	.	1742
1182	1962	469.800	.	1551
1183	1963	484.493	.	3460
1184	1964	464.000	.	2878
1185	1965	500.126	.	2504
1186	1966	633.691	.	2468
1187	1967	705.280	.	3423
1188	1968	659.170	.	10861
1189	1969	708.470	.	16685
1190	1970	722.680	.	18739
1191	1971	786.190	.	18307
1192	1972	940.760	.	19450
1193	1973	988.578	.	26307
1194	1974	.	.	22459
1195	1975	.	.	35346
1196	1976	.	.	25307
1197	1977	.	.	27109

COUNTRY=PHILIPPINES

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1161	1960	140.736	23.9203	147
1162	1961	144.122	26.4712	164
1163	1962	147.087	25.0500	175
1164	1963	152.926	28.8982	197
1165	1964	152.365	32.0919	208
1166	1965	155.743	32.5856	218
1167	1966	158.570	32.1790	235
1168	1967	163.818	37.0846	246
1169	1968	167.856	37.2720	280
1170	1969	171.674	36.3223	290
1171	1970	177.085	34.6291	301
1172	1971	181.689	35.1108	307
1173	1972	184.124	34.8861	329
1174	1973	195.167	36.8864	314
1175	1974	197.083	.	300
1176	1975	202.659	.	316
1177	1976	210.760	.	327
1178	1977	217.688	.	342
1179	1978	.	.	339

COUNTRY=RHODESIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1198	1960	281.725	59.2052	.
1199	1961	281.867	58.0965	.
1200	1962	276.948	40.1434	.
1201	1963	264.616	31.6767	.
1202	1964	257.532	33.3638	558
1203	1965	262.152	40.3607	581
1204	1966	245.991	43.9523	657
1205	1967	252.350	58.6655	582
1206	1968	254.045	55.6742	675
1207	1969	281.778	54.5021	666
1208	1970	280.647	52.7137	692
1209	1971	298.852	60.2781	721
1210	1972	308.395	64.7454	685
1211	1973	319.119	69.4083	716
1212	1974	.	.	676
1213	1975	.	.	606
1214	1976	.	.	671
1215	1977	.	.	598
1216	1978	.	.	579

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=RWANDA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1217	1960	62.1925	3.76302	.
1218	1961	57.7747	3.78608	.
1219	1962	62.2677	4.98050	15
1220	1963	54.4141	4.25292	15
1221	1964	46.2000	3.83800	7
1222	1965	47.3834	4.64601	9
1223	1966	48.6785	4.70184	9
1224	1967	50.3858	3.68071	8
1225	1968	52.5104	4.29855	11
1226	1969	56.4905	3.74090	11
1227	1970	60.8302	4.28478	11
1228	1971	59.4781	5.45435	11
1229	1972	58.2051	5.56410	13
1230	1973	58.8728	5.68204	13
1231	1974	56.4757	.	13
1232	1975	.	.	15
1233	1976	.	.	17
1234	1977	.	.	18
1235	1978	.	.	17

COUNTRY=SENEGAL

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1255	1960	236.804	21.9304	121
1256	1961	239.348	25.0000	114
1257	1962	233.936	20.0000	112
1258	1963	233.333	26.7708	114
1259	1964	238.143	28.5526	119
1260	1965	236.476	28.2808	134
1261	1966	224.902	18.7255	126
1262	1967	230.014	31.9061	121
1263	1968	222.900	22.6694	121
1264	1969	218.519	48.7963	130
1265	1970	207.328	27.8753	139
1266	1971	224.540	53.7189	130
1267	1972	208.981	22.3422	159
1268	1973	208.836	43.8955	155
1269	1974	.	.	164
1270	1975	.	.	171
1271	1976	.	.	176
1272	1977	.	.	175
1273	1978	.	.	181

COUNTRY=SAUDIARABIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1236	1960	245.052	30.384	267
1237	1961	269.811	33.456	315
1238	1962	296.807	36.805	296
1239	1963	317.181	39.370	313
1240	1964	339.304	39.815	538
1241	1965	374.284	53.968	622
1242	1966	416.980	68.142	609
1243	1967	441.552	80.713	624
1244	1968	456.372	91.667	715
1245	1969	474.429	96.151	791
1246	1970	499.542	80.563	845
1247	1971	633.179	75.330	866
1248	1972	684.063	84.683	924
1249	1973	837.450	100.168	979
1250	1974	.	.	976
1251	1975	.	.	988
1252	1976	.	.	1147
1253	1977	.	.	1169
1254	1978	.	.	1306

COUNTRY=SIERRALEONE

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1274	1960	134.231	.	31
1275	1961	133.511	.	66
1276	1962	136.430	.	73
1277	1963	135.693	.	81
1278	1964	141.644	14.4849	67
1279	1965	148.611	17.2565	64
1280	1966	155.572	22.6417	65
1281	1967	150.384	19.3402	53
1282	1968	145.652	19.6625	76
1283	1969	160.832	22.7888	175
1284	1970	173.619	27.5906	134
1285	1971	172.373	31.9680	115
1286	1972	169.153	23.6521	83
1287	1973	154.033	20.5663	114
1288	1974	179.664	.	124
1289	1975	164.490	.	111
1290	1976	.	.	103
1291	1977	.	.	103
1292	1978	.	.	100

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=SINGAPORE

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1293	1960	482.65	31.800	372
1294	1961	526.73	49.889	480
1295	1962	511.47	53.664	586
1296	1963	544.58	63.242	620
1297	1964	532.75	78.735	718
1298	1965	579.32	85.896	749
1299	1966	622.19	82.419	922
1300	1967	648.40	86.220	1001
1301	1968	730.90	119.703	1135
1302	1969	822.03	153.273	1252
1303	1970	946.58	216.993	1402
1304	1971	1040.76	283.609	1670
1305	1972	1149.22	342.329	2065
1306	1973	1252.39	342.060	2006
1307	1974	1313.74	.	1842
1308	1975	1349.19	.	2025
1309	1976	1428.51	.	2358
1310	1977	1522.67	.	2433
1311	1978	.	.	2461

COUNTRY=SOUTHVIETNAM

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1331	1960	146.454	18.2624	54
1332	1961	142.167	12.5949	62
1333	1962	150.368	14.7354	59
1334	1963	147.520	12.5653	66
1335	1964	157.066	17.5048	127
1336	1965	164.547	20.9367	149
1337	1966	151.753	29.4740	318
1338	1967	153.064	30.7896	452
1339	1968	139.288	20.5342	443
1340	1969	146.614	31.3374	526
1341	1970	154.119	28.7780	530
1342	1971	155.901	28.1765	433
1343	1972	152.814	21.6830	425
1344	1973	153.759	22.4311	407
1345	1974	.	.	.
1346	1975	.	.	.
1347	1976	.	.	.
1348	1977	.	.	.
1349	1978	.	.	.

COUNTRY=SOMALIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1312	1960	73.7446	11.0301	19
1313	1961	69.7753	10.4072	20
1314	1962	73.1063	10.9425	23
1315	1963	73.2704	10.8871	21
1316	1964	67.3793	10.3939	28
1317	1965	61.8494	10.7017	26
1318	1966	65.8944	11.6680	27
1319	1967	68.4718	12.7301	43
1320	1968	68.2908	12.8536	28
1321	1969	65.6541	12.5492	29
1322	1970	67.1845	12.1934	39
1323	1971	69.4632	13.3039	32
1324	1972	72.9027	16.7888	34
1325	1973	73.6956	20.1558	38
1326	1974	.	.	41
1327	1975	.	.	66
1328	1976	.	.	68
1329	1977	.	.	96
1330	1978	.	.	99

COUNTRY=SRILANKA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1350	1960	82.416	11.8610	107
1351	1961	81.767	12.9143	113
1352	1962	84.559	12.2527	120
1353	1963	85.065	13.5511	118
1354	1964	86.974	12.4390	102
1355	1965	88.384	11.3307	118
1356	1966	89.607	12.5160	119
1357	1967	94.937	13.5067	123
1358	1968	95.589	14.8571	135
1359	1969	99.575	18.1232	166
1360	1970	102.847	18.5344	153
1361	1971	100.116	17.4460	129
1362	1972	100.265	14.5199	149
1363	1973	102.048	15.2949	131
1364	1974	112.865	.	117
1365	1975	112.931	.	112
1366	1976	116.620	.	107
1367	1977	.	.	114
1368	1978	.	.	109

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Continued)

COUNTRY=SUDAN

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1369	1960	127.549	13.3345	52
1370	1961	124.152	20.6456	52
1371	1962	129.062	22.5055	53
1372	1963	122.009	18.2449	59
1373	1964	117.389	18.8784	61
1374	1965	121.875	15.3215	81
1375	1966	116.719	20.7028	82
1376	1967	110.175	15.2851	105
1377	1968	129.445	17.6465	99
1378	1969	112.599	16.4839	127
1379	1970	110.237	18.3148	130
1380	1971	111.831	15.9395	121
1381	1972	123.118	11.8251	122
1382	1973	112.230	12.0030	125
1383	1974	133.542	.	125
1384	1975	127.686	.	.
1385	1976	144.026	.	.
1386	1977	137.871	.	.
1387	1978	.	.	.

COUNTRY=TANZANIA,UR

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1407	1960	74.879	10.0315	41
1408	1961	71.811	10.7456	34
1409	1962	75.992	9.9445	35
1410	1963	78.322	9.9867	36
1411	1964	80.117	10.6792	47
1412	1965	80.259	12.0020	52
1413	1966	88.202	13.6774	55
1414	1967	90.262	15.2977	73
1415	1968	92.944	16.0865	57
1416	1969	93.213	14.0879	76
1417	1970	96.776	20.5566	63
1418	1971	97.443	23.7394	71
1419	1972	100.434	19.6345	73
1420	1973	102.286	20.6449	95
1421	1974	95.101	.	72
1422	1975	97.104	.	67
1423	1976	99.646	.	68
1424	1977	102.526	.	65
1425	1978	.	.	65

COUNTRY=SYRIANAR

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1388	1960	.	.	321
1389	1961	.	.	295
1390	1962	.	.	303
1391	1963	211.736	27.9300	317
1392	1964	224.193	27.2702	386
1393	1965	222.033	22.8071	307
1394	1966	209.028	26.8902	415
1395	1967	213.128	26.9278	390
1396	1968	215.202	32.4003	427
1397	1969	240.849	40.9096	512
1398	1970	238.635	33.4837	502
1399	1971	254.718	38.3765	539
1400	1972	270.221	40.2982	511
1401	1973	261.637	44.1660	435
1402	1974	352.277	.	581
1403	1975	385.404	.	701
1404	1976	403.901	.	761
1405	1977	391.925	.	982
1406	1978	.	.	968

COUNTRY=THAILAND

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1426	1960	113.759	17.6418	64
1427	1961	116.066	17.9016	67
1428	1962	121.739	22.3251	80
1429	1963	127.875	27.3886	85
1430	1964	132.263	27.4576	102
1431	1965	138.350	29.7583	130
1432	1966	150.572	38.3182	126
1433	1967	157.255	40.5818	173
1434	1968	165.458	43.9424	200
1435	1969	173.028	50.9086	167
1436	1970	179.950	49.6466	247
1437	1971	184.478	45.2167	309
1438	1972	184.199	36.9518	310
1439	1973	195.562	45.4637	290
1440	1974	201.661	.	275
1441	1975	210.982	.	284
1442	1976	223.036	.	306
1443	1977	231.863	.	327
1444	1978	.	.	327

TABLE B-1

ENERGY-GDP TIME SEIRES DATA (Continued)

COUNTRY=TOGO

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1445	1960	84.081	10.1477	23
1446	1961	87.294	7.7647	31
1447	1962	88.280	9.6306	30
1448	1963	90.335	12.0745	35
1449	1964	100.193	21.4699	42
1450	1965	111.176	26.0471	39
1451	1966	119.726	20.9829	51
1452	1967	128.000	17.0000	56
1453	1968	128.043	15.1784	53
1454	1969	136.232	19.3263	64
1455	1970	134.816	19.2857	67
1456	1971	136.836	24.1791	79
1457	1972	132.459	27.7321	81
1458	1973	134.660	23.7736	78
1459	1974	159.138	.	72
1460	1975	128.054	.	67
1461	1976	123.264	.	84
1462	1977	.	.	95
1463	1978	.	.	96

COUNTRY=UGANDA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1483	1960	104.383	11.5297	30
1484	1961	100.604	10.8968	28
1485	1962	101.979	11.1950	30
1486	1963	110.751	13.7412	30
1487	1964	115.996	18.2854	33
1488	1965	116.753	16.9811	39
1489	1966	122.265	16.5862	45
1490	1967	125.899	19.4390	48
1491	1968	127.290	19.0945	56
1492	1969	137.533	23.4443	65
1493	1970	134.794	17.9882	74
1494	1971	133.204	20.9687	75
1495	1972	130.485	15.7211	69
1496	1973	124.394	12.6072	61
1497	1974	.	.	59
1498	1975	.	.	55
1499	1976	.	.	48
1500	1977	.	.	56
1501	1978	.	.	48

COUNTRY=TRINIDADTOBAGO

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1464	1960	691.36	249.703	1775
1465	1961	703.65	194.686	2065
1466	1962	708.97	225.767	2077
1467	1963	720.06	194.865	2068
1468	1964	722.49	192.770	2381
1469	1965	727.20	215.920	2840
1470	1966	741.14	179.245	3330
1471	1967	759.01	166.204	3610
1472	1968	812.30	159.109	3674
1473	1969	799.05	149.218	3587
1474	1970	833.90	218.365	4496
1475	1971	880.69	255.442	4188
1476	1972	887.68	267.447	4357
1477	1973	883.87	.	4297
1478	1974	1119.81	.	4453
1479	1975	1235.19	.	3778
1480	1976	1283.94	.	4255
1481	1977	.	.	4469
1482	1978	.	.	4965

COUNTRY=UPPERVOLTA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1502	1960	55.2650	5.84101	5
1503	1961	55.8508	6.08018	11
1504	1962	57.1376	6.21616	10
1505	1963	56.3704	6.43041	10
1506	1964	56.2878	6.80042	12
1507	1965	56.8148	7.38272	12
1508	1966	56.6915	6.91935	10
1509	1967	58.8475	6.25545	11
1510	1968	58.6506	5.64672	10
1511	1969	59.2386	6.20455	12
1512	1970	61.9796	6.52416	13
1513	1971	61.8033	6.67760	14
1514	1972	59.1604	6.74332	12
1515	1973	57.4167	6.56771	15
1516	1974	.	.	18
1517	1975	.	.	20
1518	1976	.	.	21
1519	1977	.	.	23
1520	1978	.	.	25

TABLE B-1

ENERGY-GDP TIME SERIES DATA (Concluded)

COUNTRY=URUGUAY

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1521	1960	807.937	106.690	825
1522	1961	821.104	114.661	799
1523	1962	789.924	100.688	795
1524	1963	781.890	89.063	819
1525	1964	788.832	75.534	840
1526	1965	789.383	70.515	897
1527	1966	803.966	72.769	865
1528	1967	762.663	77.781	834
1529	1968	763.846	68.004	784
1530	1969	801.694	85.667	916
1531	1970	827.825	93.510	930
1532	1971	811.377	99.647	936
1533	1972	789.735	86.503	986
1534	1973	781.811	82.393	991
1535	1974	788.178	.	997
1536	1975	820.471	.	1026
1537	1976	821.739	.	1096
1538	1977	.	.	1019
1539	1978	.	.	1054

COUNTRY=ZAIRE

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1559	1960	90.071	14.8350	87
1560	1961	78.271	12.0126	85
1561	1962	92.415	7.6829	78
1562	1963	94.787	21.9533	77
1563	1964	90.152	23.0491	64
1564	1965	88.719	22.5726	75
1565	1966	90.703	19.6185	73
1566	1967	86.057	16.7728	66
1567	1968	85.970	16.7700	75
1568	1969	90.029	22.7011	76
1569	1970	95.786	22.2960	81
1570	1971	98.179	25.5695	84
1571	1972	97.521	24.7927	84
1572	1973	102.029	24.5925	74
1573	1974	112.311	.	75
1574	1975	103.437	.	69
1575	1976	.	.	71
1576	1977	.	.	71
1577	1978	.	.	69

COUNTRY=VENEZUELA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1540	1960	869.00	186.027	1694
1541	1961	880.24	177.467	1840
1542	1962	927.42	192.689	1625
1543	1963	956.04	192.512	1897
1544	1964	1012.26	244.955	1960
1545	1965	1034.54	236.237	2091
1546	1966	1022.59	208.144	2107
1547	1967	1029.66	216.227	2172
1548	1968	1048.94	248.248	2196
1549	1969	1051.41	224.593	2199
1550	1970	1092.78	202.741	2319
1551	1971	1081.97	203.391	2361
1552	1972	1096.35	223.149	2427
1553	1973	1126.80	225.798	2852
1554	1974	1293.46	.	2802
1555	1975	1319.73	.	2740
1556	1976	1379.70	.	2927
1557	1977	1429.71	.	2979
1558	1978	.	.	2989

COUNTRY=ZAMBIA

OBS	YEAR	GDPCAPTA	GDICAPTA	ENERGYC
1578	1960	176.703	50.1544	.
1579	1961	173.675	46.9782	.
1580	1962	164.844	87.2765	.
1581	1963	165.386	32.3574	.
1582	1964	180.411	20.0204	432
1583	1965	204.279	49.0032	493
1584	1966	193.731	64.3323	445
1585	1967	198.575	65.6648	586
1586	1968	204.729	71.0561	563
1587	1969	203.926	45.1737	533
1588	1970	195.317	58.3448	495
1589	1971	191.408	67.3999	476
1590	1972	198.868	57.1501	509
1591	1973	188.236	33.3861	532
1592	1974	190.976	.	494
1593	1975	181.705	.	505
1594	1976	179.869	.	496
1595	1977	165.888	.	483
1596	1978	.	.	474

Table B-2: Aggregate Regression Analysis Data

This table contains records for 84 countries. The results of the energy-economic regressions are summarized. Other cross-sectional data are included to allow analysis of the regression results. The variables shown for each country are, in order:

- Slope of GDP-commercial energy consumption regression
- Statistical significance of GDP-energy regression (.05):
  N = not statistically significant
  S = statistically significant
- Coefficient of determination for GDP-energy regression
- Slope of GDP-GDI regression
- Statistical significance of GDP-GDI regression (.05):
  N = not statistically significant
  S = statistically significant
- Coefficient of determination for GDP-GDI regression
- Geographic region: 1 = S. Africa, 2 = N. Africa 3 = M. East, 4 = S. Asia, 5 = E. Asia, 6 = Central America and Caribbean, 7 = S. America, 8 = Europe*
- BNL economy type
- Culture: 1 = Hindu and Bhuddist, 2 = Christian, 3 = Islamic, 4 = Mixtures, 5 = Traditional or Tribal, 9 = Unknown
- GNP per capita, 1973 U.S.$ (World Bank)
- Fraction of population living in urban areas, 1975 (World Bank)
- Fraction self-sufficiency in energy, 1972
- Fraction self-sufficiency in oil, 1972

*Israel is counted as a European country.

The first six variables listed were obtained from time series regression. Variables seven, eight, nine, twelve and thirteen are taken from MITRE's previous cross-sectional study of energy-economic relationships in LDCs.

TABLE B-2

AGGREGATE REGRESSION ANALYSIS DATA

001	AFGHANISTAN	0.0270N.0657	-.2297N.0318	3	6	3	90	.12	5.14	0
002	ALGERIA	1.249 S.8095	0.6690S.5717	2	2	3	570	.50	14.62	18.35
003	ARGENTINA	0.568 S.9143	2.878 S.8540	7	1	2	1640	.80	.96	1.00
005	BARBADOS	0.3745S.8296	3.688 S.8089	6		2	1000			
006	BENIN	1.99 S.2475	0.4781S.3932	1	6	9	110	.18		
007	BOLIVIA	0.6842S.9107	0.5301N.0150	7	2	2	230	.37	3.39	2.87
009	BRAZIL	0.9564S.9092	3.1369S.9663	7	1	2	760	.60	.40	.28
010	BURMA	0.5961N.0971	0.4921N.1066	5	6	1	80	.22	.92	.98
011	BURUNDI	0.7707N.1925	0.2736N.0018	1	6	5	80	.04	0	0
012	CAMBODIA	3.2502N.3326	3.4902S.7376	5		1	70	.23		
013	CAMEROON	1.1538S.8895	3.4902S.7376	1	6	9	250	.24		
014	CENT.AF.EMP.	0.1437N.1728	-1.6338N.2559	1	6	9	160	.36	.07	0
015	CHAD	-.6626S.2856	-1.4166N.0303	2	6	9	80	.14	0	0
016	CHILE	0.2885S.8433	4.4550S.5960	7	1	2	720	.83	.69	.45
017	CHINA.REPUBLC	0.9587S.8130	2.5281S.9733	5		8	660	.64		
018	COLOMBIA	0.5404S.8968	3.5262S.6207	7	3	2	440	.62	1.60	2.06
019	CONGO,PR	0.4445S.8503	0.7009N.2634	1	2	9	340	.40	2.02	2.14
020	COSTARICA	0.9124S.8850	2.0737S.8090	6	5	2	710	.40	.15	0
022	DOMINICANREP	0.3934S.9080	1.9352S.9758	6	5	2	520	.44	.01	0
023	ECUADOR	0.5238S.9478	1.2864S.6778	7	2	2	380	.42	3.08	3.16
025	ELSALVADOR	0.3218S.5637	1.7465S.3111	6	6	2	350	.40	.07	0
026	ETHIOPIA	0.6591S.8500	4.4776S.9338	2	6	2	90	.11	.03	0
027	FIJI	0.4335S.5864	2.3571S.8406	5	6	5	650		0	0
030	GAMBIA,THE	0.2507N.1956	2.9092S.6120	1	5	3	130			
031	GHANA	0.2168S.3907	0.2181N.0760	1	6	9	300	.32	.28	0
032	GREECE	0.5664S.9877	3.0207S.9649	8	3	2	1870	.65	.29	0
033	GUATEMALA	1.7022S.9611	3.9770S.5717	6	5	2	500	.35	.03	0
034	GUINEA,EQ	0.1121N.0803	0.5883N.1427	1	6	9	110	.20		
035	GUYANA	0.0895S.6861	0.9192N.2406	7	4	9	410			
036	HONDURAS	0.2786S.5134	1.5877S.6467	6	5	2	320	.28	.06	0
037	HONGKONG	0.6230S.8682	2.8094S.8759	5	3	9	1430	.95	0	0
039	INDIA	0.2110S.3799	2.0106S.4136	4	3	1	120	.22	.85	.40
040	INDONESIA	0.3816S.7497	2.7864S.9475	5	2	3	130	.19	4.26	5.70
041	IRAN	0.3713S.9442	3.5806S.9767	3	2	3	870	.44	15.22	22.77
042	IRAQ			3	2	3	850	.62	13.99	16.56
044	ISRAEL	0.6537S.9576	2.7598S.8225	8	1	8	3010	.84	1.05	1.05
045	IVORYCOAST	0.7750S.8810	3.0841S.9320	1	5	9	380	.20	.02	0
046	JAMAICA	0.2477S.8779	2.4186S.8000	6	4	2	990	.45	.01	0
047	JORDAN	0.4045N.2631	1.0772N.2184	3	6	3	340	.56	0	0
048	KENYA	0.4577N.0609	2.3682S.6721	1	6	5	170	.11	.03	0

TABLE B-2

AGGREGATE REGRESSION ANALYSIS DATA (Concluded)

049	KOREA,REP	0.3571S.9514	2.3252S.9226	5	1	8	400	.47	.45	0
052	LEBANON	0.3778S.8203	2.7886S.7286	3	6	5	940	.60		
054	LIBERIA	0.2339S.7989	-.7774S.5517	1	4	5	310	.28	.05	0
055	LIBYA	2.4149S.8543	3.7890S.7082	2	2	3	3530	.31	121.62	113.75
056	MADAGASCAR	-.0495N.0172	0.8452N.1831	1	6	4	150	.18	.03	0
057	MALAWI	1.4686S.8022	4.8569S.6917	1	6	5	110	.06	.08	0
058	MALAYSIA	0.3523S.9579	3.8652S.8871	5	2	3	570	.30	1.15	1.19
059	MALI	0.4934S.4264	0.2528N.0113	2	6	9	70	.14	.04	0
060	MALTA	0.7499S.6723	2.7868S.8490	8		2	1060			
061	MAURITANIA	0.4555S.7924	-.9892S.2998	2	4	3	200	.11	0	0
063	MEXICO	0.4015S.8859	4.1989S.9531	6	2	2	890	.63	.94	.93
064	MOROCCO	0.3909S.8279	2.1791S.6421	2	4	3	320	.38	.23	.02
065	NEPAL	0.2878N.1325		4	6	1	90	.05	.06	0
066	NICARAGUA	0.6072S.8383	2.9656S.8644	6	6	2	540	.48		
067	NIGER	-.9036S.4929	3.2491S.6048	1	6	3	100	.09	0	0
068	NIGERIA	1.3761S.8585	3.4776S.8732	1	2	9	210	.29	29.71	37.82
069	OMAN	1.2997S.8807			2		840			
070	PAKISTAN			4	3	3	120	.27	.61	.13
071	PANAMA	0.6703S.9180	1.9329S.9552	6	3	2	920	.51	.01	0
072	PAPUANEWG	0.5223S.8257	1.2364S.6146	5	6	9	410	.13	.04	0
073	PARAGUAY	1.0334S.9035	1.5210S.5496	7	6	2	410	.37	.08	0
074	PERU	0.5154S.7731	1.2820N.1049	7	3	2	620	.57	.71	.68
075	PHILIPPINES	0.3476S.8483	2.9151S.6611	5	3	2	280	.36	.02	0
077	QUATAR	0.0179S.7966		3	2	3	6040			
078	RHODESIA	0.3024S.4764	1.2182S.4306	1	6	9	430	.20	.88	0
079	RWANDA	1.5909S.5695	2.1299N.0706	1	6	2	70	.04		
080	SAUDIARABIA	0.6272S.8305	5.4998S.6682	3	2	3	1610	.21	58.99	115.49
081	SENEGAL	-.6426S.6694	2.0702N.0924	1	5	9	280	.28	0	0
082	SIERRALEONE	0.2847S.4611	2.0702S.8392	1	4	4	160	.15	0	0
083	SINGAPORE	0.5252S.9637	2.3339S.9777	5	1	9	1830	.90	0	0
084	SOMALIA	-.0650N.0173	0.5070N.1453	1	6	3	80	.28	0	0
085	SOUTHVIETNAM	0.0014N.0017	0.2581N.0709				160			
087	SRILANKA	0.1253N.0396	2.6884S.6771	4	5	1	120	.24	.05	0
089	SUDAN	-.1045N.1799	0.4695N.0478	2	6	3	130	.13	.01	0
091	SYRIANAR	0.3564S.7993	2.6078S.7317	3	2	3	400	.46	2.62	2.78
092	TANZANIA	0.5428S.7777	1.9976S.8301	1	6	9	130	.07	.04	0
093	THAILAND	0.3636S.8986	2.2323S.8289	5	6	1	270	.17	.03	0
094	TOGO	0.9434S.4467	2.3345S.5162	1	4	5	180	.14	0	0
095	TRINIDADTOBAGO	0.1240S.4171	0.4684N.0680	6	2	2	970	.25	2.82	4.45
096	TUNISIA			2	2	3	460	.47	3.40	3.76
097	TURKEY			3	3	3	600	.43	.55	.35
098	UGANDA	0.6456S.8530	2.6166S.6800	1	6	9	150	.08	.13	0
100	URUGUAY	0.0838N.1578	0.8720S.4150	7	1	2	950	.81	.04	0
101	VENEZUELA	0.3768S.8866	2.3204S.4041	7	2	2	1630	.82	9.99	19.51
103	ZAIRE	-.0975N.0065	0.6853S.3676	1	4	2	140	.26	.29	0
104	ZAMBIA	0.1260N.2143	0.1177N.0220	1	4	4	430	.37	.58	0
099	UPPERVOLTA	0.5003S.3223	0.3045N.0044	1	6	9	70	.08		

Table B-3: Energy-GDP Sectoral Time Series Data

This table contains sectoral energy consumption and GDP data for 16 nations. The industrial, transportation and agricultural sectors are covered for the years 1967 to 1976. The variables shown for each country and each year are, in order:

- TOTAL70 - Total GDP in 1970 U.S. dollars (from data of Table A-1)
- ENERGYTO - Total energy consumption in millions of metric tons of oil equivalent (International Energy Agency)
- INDS70 - Total industrial GDP in 1970 U.S. dollars (World Bank economic data to 1973, United Nations economic data 1974 and beyond, normalized by World Bank implicit GDP deflator, time series adjusted as necessary)
- ENERGYI - Total industrial energy consumption in millions of metric tons of oil equivalent (International Energy Agency)
- TRANS70 - Total GDP attributable to the transportation sector in 1970 U.S. dollars (World Bank economic data to 1973, United Nations economic data 1974 and beyond, normalized by World Bank implicit GDP deflator, time series adjusted as necessary)
- ENERGYTR -Total energy consumption in transportation, millions of metric tons of oil equivalent (International Energy Agency)
- AGRI70 - Total agricultural GDP in 1970 U.S. dollars (World Bank economic data to 1973, United Nations economic data 1974 and beyond, normalized by World Bank implicit GDP deflator, time series adjusted as necessary)
- ENERGYA - Total agricultural energy consumption in millions of metric tons of oil equivalent (International Energy Agency)

TABLE B-3

ENERGY-GDP SECTORAL TIME SERIES DATA

COUNTRY=ALGERIA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
1	1967	3458.2	2.394	440.0	0.067	110.0	0.547	462.0	.
2	1968	3955.3	2.473	499.1	0.084	130.2	0.535	564.2	.
3	1969	4344.3	3.263	583.2	0.162	151.2	0.551	561.6	.
4	1970	4510.3	3.312	588.7	0.575	182.7	0.538	507.5	.
5	1971	4514.6	3.433	650.1	0.560	157.6	0.569	453.1	.
6	1972	5163.3	5.657	646.0	0.276	171.0	0.639	532.0	.
7	1973	5434.8	5.190	680.2	0.513	196.9	0.710	447.5	.
8	1974	6685.6	5.741	752.4	0.513	.	0.809	513.0	.
9	1975	8474.4	5.993	758.4	0.629	.	0.906	742.6	.
10	1976	14016.5	7.694	936.0	0.768	.	0.961	633.6	.

COUNTRY=ARGENTINA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
11	1967	21287.0	19.397	6514.1	5.342	1854.73	7.278	2788.08	0.005
12	1968	22271.1	20.826	6620.4	5.457	2030.64	7.458	2713.89	0.004
13	1969	24151.7	22.432	7143.2	6.125	2213.60	8.377	2947.54	0.004
14	1970	25216.9	24.049	7264.1	6.400	2444.73	8.664	3208.06	.
15	1971	26153.0	25.234	8129.7	6.395	2169.30	9.264	3257.73	.
16	1972	27087.6	25.137	8731.2	6.243	2152.58	9.655	3555.22	.
17	1973	28544.7	26.881	10495.7	6.972	2085.36	9.986	3370.64	.
18	1974	31774.5	27.457	11310.0	7.249	2210.00	10.002	3185.00	.
19	1975	30935.0	28.310	12788.0	8.493	2001.00	9.356	3174.28	.
20	1976	30102.4	29.265	.	9.620	.	9.465	.	.

COUNTRY=BRAZIL

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
21	1967	29786.0	45.657	5361.4	10.061	1520.38	9.057	4650.80	.
22	1968	32560.9	47.769	6183.9	10.645	1500.90	10.599	4522.60	0.206
23	1969	35491.3	51.435	6955.3	12.013	1654.33	11.414	4744.86	0.212
24	1970	38863.1	53.176	7533.8	12.779	1956.82	12.554	5385.90	0.217
25	1971	43254.7	56.340	8171.1	14.246	2119.91	13.496	6236.90	0.247
26	1972	47753.1	61.889	9235.3	16.539	2309.80	14.959	6781.36	0.282
27	1973	53197.0	68.161	10461.4	19.693	2498.05	16.769	7412.95	0.309
28	1974	73367.1	74.735	12377.2	21.081	2774.20	19.346	8642.70	0.354
29	1975	77538.4	78.097	13496.4	21.690	3063.60	20.224	8942.40	0.391
30	1976		84.717	18073.0	24.369		21.266	9852.70	0.400

TABLE B-3

ENERGY-GDP SECTORAL TIME SERIES DATA (Continued)

COUNTRY=COLOMBIA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
31	1967	5913.39	12.987	944.99	0.269	359.539	1.936	1656.78	.
32	1968	6275.30	13.734	971.10	0.502	391.466	1.932	1749.58	.
33	1969	6674.82	13.527	1034.21	0.536	439.373	2.093	1815.54	.
34	1970	7124.87	13.406	1143.23	0.497	484.020	2.145	1900.99	.
35	1971	7515.97	14.140	1251.33	0.565	505.445	2.404	1964.34	.
36	1972	8045.00	14.596	1377.82	0.472	506.348	2.462	2148.39	.
37	1973	8626.22	14.813	1557.22	0.487	495.135	2.679	2375.40	.
38	1974	9002.35	15.440	1798.28	0.901	477.801	2.838	2175.80	.
39	1975	9412.52	14.714	1740.18	0.983	511.428	3.018	2319.79	.

COUNTRY=EGYPT

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
40	1967	5310.80	4.392	1131.68	0.688	386.723	0.484	1516.72	0.029
41	1968	5355.68	5.687	1140.65	0.767	274.456	0.508	1576.47	0.037
42	1969	5711.64	4.437	1220.97	0.874	288.606	0.559	1704.78	0.043
43	1970	6041.41	5.777	1326.18	0.895	315.790	0.603	1777.90	0.047
44	1971	6310.60	6.719	1409.79	0.939	329.282	0.799	1840.54	0.051
45	1972	6610.18	7.475	1410.60	0.908	332.503	0.964	2054.25	0.051
46	1973	6874.40	6.754	1483.95	0.888	334.536	1.168	2142.71	0.052
47	1974	7105.54	7.654	1632.47	0.957	327.025	1.473	2328.66	0.056
48	1975	7487.93	8.623	1722.34	1.219	425.015	1.559	2429.54	0.057

COUNTRY=INDIA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
49	1967	46363.3	74.164	5036.50	22.729	1626.07	14.767	21786.5	.
50	1968	47924.0	77.749	5415.00	25.083	1891.64	14.750	20938.0	.
51	1969	50589.1	79.971	5772.58	24.597	1974.83	15.181	21557.4	0.465
52	1970	52653.9	82.408	5878.53	30.193	2146.13	15.214	22554.4	0.499
53	1971	53542.3	83.678	6193.70	30.217	2274.45	16.122	22127.7	0.634
54	1972	52798.0	89.102	6251.77	32.509	2426.06	16.323	20674.8	0.681
55	1973	55703.2	91.527	6531.70	33.922	2519.37	16.135	22261.1	0.761
56	1974	51214.0	94.252	6598.35	36.252	2595.35	16.501	21781.2	0.837
57	1975	55587.9	98.678	6798.30	39.886	2839.29	17.681	25167.0	0.852
58	1976		102.814	7371.49	40.387	3012.58	17.236	22954.3	0.931

TABLE B-3

ENERGY-GDP SECTORAL TIME SERIES DATA (Continued)

COUNTRY=INDONESIA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
59	1967	7181.4	29.865	525.14	0.348	156.695	2.167	3873.33	.
60	1968	7965.3	31.389	678.68	0.349	218.120	2.141	263.34	.
61	1969	8508.7	32.095	784.69	0.433	240.697	1.992	1062.01	.
62	1970	9151.5	36.394	854.33	0.434	262.492	2.268	1575.50	.
63	1971	9760.7	36.621	868.40	.	416.083	2.294	1682.32	.
64	1972	10432.3	38.555	842.19	0.661	374.463	2.860	1719.35	.
65	1973	11605.7	40.481	1222.08	0.627	528.630	3.041	1481.37	.
66	1974	14451.6	44.570	1419.06	0.794	592.950	3.432	1686.39	.

CCUNTRY=INDCNESIA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
67	1975	15171.6	47.269	1593.93	1.011	623.10	3.847	1686.39	.
68	1976	16215.6	54.893	1748.70	1.127	705.51	3.849	1955.73	.

CCUNTRY=IRAN

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
69	1967	8511.0	11.572	1079.20	1.630	472.86	1.064	1823.28	.
70	1968	9519.0	9.671	1225.98	1.733	503.18	1.037	1940.44	.
71	1969	10422.0	13.780	1356.75	4.552	522.45	1.144	1995.30	.
72	1970	11631.0	19.599	1500.84	10.335	568.92	1.333	2119.92	.
73	1971	12939.0	19.652	1643.39	9.222	546.21	1.463	2050.37	.
74	1972	14493.0	20.576	1806.20	8.986	635.80	2.191	2195.60	.
75	1973	16567.5	23.995	1894.62	10.221	506.54	2.343	1919.95	.
76	1974	20766.6	27.834	2216.50	11.739	564.85	2.889	2173.60	.
77	1975	21366.6	30.642	2574.00	10.981	722.15	3.518	2323.75	.
78	1976	23645.4	32.989	2960.10	11.765	793.65	3.447	2473.90	.

COUNTRY=JAMAICA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
79	1967	1113.60	1.561	141.968	0.664	72.9063	0.339	107.094	.
80	1968	1142.40	1.415	152.427	0.640	76.5438	0.344	102.455	.
81	1969	1221.60	1.637	153.085	0.784	79.8213	0.463	97.223	.
82	1970	1330.80	1.683	159.000	0.838	84.3600	0.471	94.560	.
83	1971	1447.20	1.985	176.832	1.018	91.8144	0.523	116.813	.
84	1972	1564.80	2.059	191.072	.	96.9920	0.418	121.968	.
85	1973	1588.80	2.675	189.325	.	96.3235	0.414	119.194	.
86	1974	1754.05	2.508	196.091	.	90.7970	0.401	121.317	.
87	1975	1713.76	2.603	209.062	.	94.6120	0.387	123.606	.
88	1976	1595.86	2.609	195.328	.	91.5600	0.388	126.658	.

TABLE B-3

ENERGY-GDP SECTORAL TIME SERIES DATA (Continued)

COUNTRY=KENYA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
89	1967	1298.70	3.370	133.206	.	97.446	0.252	436.570	
90	1968	1400.10	3.535	146.000	.	105.704	0.304	438.292	.
91	1969	1491.30	3.457	162.448	.	108.108	0.254	458.744	0.002
92	1970	1609.80	3.437	174.160	0.203	114.240	0.435	484.680	0.040
93	1971	1728.00	3.634	192.156	0.242	116.580	0.490	482.132	0.049
94	1972	1795.96	3.617	212.562	0.185	118.516	0.485	530.561	0.050
95	1973	1933.72	4.290	251.472	.	120.072	0.606	550.824	0.054
96	1974	3051.30	4.114	265.104	0.295	119.700	0.777	545.076	0.065
97	1975	3501.45	4.127	271.908	0.302	116.172	0.743	546.840	0.060
98	1976	4287.30	4.034	306.054	0.352	123.102	0.601	558.558	0.056

COUNTRY=KOREA,REP

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
99	1967	5849.0	11.957	966.79	0.875	304.56	0.565	1871.07	.
100	1968	6595.5	12.182	1122.24	0.333	378.42	0.837	1907.22	.
101	1969	7595.2	14.932	1280.94	0.847	404.41	1.035	2204.09	.
102	1970	8247.7	17.069	1421.44	1.267	412.80	1.175	2316.48	0.003
103	1971	9052.2	18.828	1569.48	1.339	452.40	1.349	2638.71	.
104	1972	9714.2	16.475	1852.75	1.327	497.75	1.254	2732.75	0.006
105	1973	11358.1	19.908	2542.19	1.662	612.95	1.198	2938.25	0.007
106	1974	12735.7	20.589	3718.40	2.189	704.00	0.811	2716.80	0.006
107	1975	13858.8	23.432	4198.40	2.464	787.20	0.848	2908.80	0.007
108	1976	15933.7	24.334	5292.80	2.727	915.20	1.189	3171.20	0.010

COUNTRY=MEXICO

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
109	1967	27263.7	34.788	6782.9	14.851	742.31	7.997	3518.93	0.310
110	1968	29481.8	36.329	7495.7	15.877	806.52	8.713	3543.78	0.327
111	1969	31346.2	38.483	8038.2	17.613	845.70	9.464	3608.34	0.350
112	1970	33515.8	40.993	8635.9	17.770	885.76	10.328	3794.80	0.362
113	1971	34996.1	42.310	9285.6	18.865	938.01	11.190	3727.51	0.352
114	1972	37256.1	46.002	9705.6	21.164	1057.70	11.932	3843.51	0.354
115	1973	39934.2	49.329	10130.2	23.201	1081.66	13.455	4147.13	0.389
116	1974	42732.0	53.740	10927.1	25.673	1565.50	14.293	3966.30	0.396
117	1975	44473.5	55.556	11311.3	27.436	1705.06	14.193	4000.20	0.387
118	1976	45216.0	57.818	11616.4	27.549	1793.20	15.672	3853.30	0.394

TABLE B-3

ENERGY-GDP SECTORAL TIME SERIES DATA (Continued)

COUNTRY=NIGERIA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
119	1967	4794.4	13.982	315.575	0.489	200.850	0.505	2462.67	.
120	1968	4792.7	14.178	330.868	0.322	226.243	0.519	2357.72	.
121	1969	6032.8	14.676	448.626	0.341	222.562	0.545	2726.14	.
122	1970	7446.6	15.354	508.200	0.383	294.000	0.727	3302.60	.
123	1971	8551.7	15.954	492.660	0.580	321.300	0.677	3556.98	.
124	1972	9070.8	16.775	547.524	0.584	364.212	0.920	3643.33	.
125	1973	9723.8	18.295	547.210	0.708	382.609	1.617	3249.94	.
126	1974	12217.1	19.416	921.670	0.899	539.090	1.927	3373.66	.
127	1975	9779.2	21.336	939.060	1.558	747.770	2.441	3286.71	.

COUNTRY=SAUDIARABIA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
128	1967	3148.26	5.037	231.574	2.152	232.268	0.773	205.156	.
129	1968	3345.21	6.392	259.008	2.612	241.680	0.868	204.288	.
130	1969	3572.45	7.373	305.510	2.773	261.579	0.913	213.411	.
131	1970	3866.45	7.835	371.184	3.943	275.724	0.751	218.448	.
132	1971	5046.43	8.080	430.760	3.505	325.380	0.774	223.300	.
133	1972	5616.16	8.863	395.015	4.055	311.833	0.928	210.741	.
134	1973	7076.45	12.180	460.247	5.228	301.763	1.082	206.050	.

TABLE B-3

ENERGY-GDP SECTORAL TIME SERIES DATA (Concluded)

COUNTRY=SAUDIARABIA

OBS	YEAR	TOTAL70	ENERGYTC	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
135	1974	.	14.152	483.96	4.997	388.50	1.391	250.860	.
136	1975	.	14.580	472.86	4.458	475.08	1.830	260.628	.
137	1976	.	16.191	506.16	3.762	588.30	2.219	271.062	.

COUNTRY=THAILAND

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
138	1967	5189.40	3.129	628.80	0.759	326.40	1.266	1656.00	0.378
139	1968	5632.20	4.179	671.37	1.077	347.76	1.583	1762.95	0.542
140	1969	6075.00	4.395	739.44	1.225	355.50	1.614	1900.74	0.559
141	1970	6517.80	5.063	798.46	1.579	404.04	1.690	1851.85	0.668
142	1971	6895.80	5.953	861.56	1.625	437.92	2.426	1961.12	0.693
143	1972	7106.40	6.930	903.35	2.121	422.75	2.905	2149.35	0.681
144	1973	7781.40	7.804	1258.32	2.344	435.12	3.294	2442.16	0.811
145	1974	8272.13	7.664	1348.35	2.300	453.90	2.944	2155.98	0.927
146	1975	8886.58	8.046	1450.70	2.581	462.80	3.187	2349.87	0.848
147	1976	9637.37	9.163	1655.40	3.071	507.30	3.603	2448.39	0.912

COUNTRY=VENEZUELA

OBS	YEAR	TOTAL70	ENERGYTO	INDS70	ENERGYI	TRANS70	ENERGYTR	AGRI70	ENERGYA
148	1967	9586.1	11.224	1869.25	4.478	.	3.361	704.32	0.007
149	1968	10090.8	12.102	1605.37	4.925	927.45	3.581	778.95	0.007
150	1969	10451.0	12.760	1635.70	5.121	972.95	3.773	869.48	0.008
151	1970	11233.8	13.345	1857.25	5.438	1195.03	4.045	898.21	.
152	1971	11479.7	13.587	1902.03	5.233	1135.90	4.089	746.63	0.010
153	1972	11994.1	15.053	2067.74	5.912	1218.96	4.794	746.47	0.009
154	1973	12710.2	17.521	2363.58	7.816	1192.00	5.236	783.27	0.008
155	1974	15043.0	18.516	2497.50	7.827	1566.00	5.852	940.50	0.006
156	1975	15823.6	19.179	2610.00	7.929	1723.50	6.600	1005.75	0.006
157	1976	17053.0	20.681	2902.50	8.068	1910.25	7.212	967.95	

TABLE B-4: Agricultural Time Series Data

This table contains agricultural data for 16 nations for the years from 1967 to 1976. Tractors owned are shown only for those nations for which sufficient energy consumption data is available to make a meaningful analysis. The variables shown for each country and each year are:

- AGRI70 - Total agricultural GDP in 1970 U.S. dollars (World Bank economic data to 1973, United Nations economic data 1974 and beyond, normalized by World Bank implicit GDP deflator, time series was adjusted as necessary)
- ENERGYA - Total agricultural energy consumption in millions of metric tons of oil equivalent (International Energy Agency)
- TRACTORS - Total number of tractors owned in country (United Nations)

TABLE B-4

AGRICULTURAL TIME SERIES DATA

COUNTRY=ALGERIA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
1	1967	462.0	.	.
2	1968	564.2	.	.
3	1969	561.6	.	.
4	1970	507.5	.	.
5	1971	453.1	.	.
6	1972	532.0	.	.
7	1973	447.5	.	.
8	1974	513.0	.	.
9	1975	742.6	.	.
10	1976	633.6	.	.

COUNTRY=ARGENTINA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
11	1967	2788.08	0.005	.
12	1968	2713.89	0.004	.
13	1969	2947.54	0.004	.
14	1970	3208.06	.	.
15	1971	3257.73	.	.
16	1972	3555.22	.	.
17	1973	3370.64	.	.
18	1974	3185.00	.	.
19	1975	3174.28	.	.
20	1976	.	.	.

COUNTRY=BRAZIL

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
21	1967	4650.80	.	.
22	1968	4522.60	0.206	145000
23	1969	4744.86	0.212	155400
24	1970	5385.90	0.217	165870
25	1971	6236.90	0.247	183500
26	1972	6781.36	0.282	201000
27	1973	7412.95	0.309	218000
28	1974	8642.70	0.354	236000
29	1975	8942.40	0.391	254000
30	1976	9852.70	0.400	270000

COUNTRY=COLUMBIA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
31	1967	1656.78	.	.
32	1968	1749.58	.	.
33	1969	1815.54	.	.
34	1970	1900.99	.	.
35	1971	1964.34	.	.
36	1972	2148.39	.	.
37	1973	2375.40	.	.
38	1974	2175.80	.	.
39	1975	2319.79	.	.

COUNTRY=EGYPT

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
40	1967	1516.72	0.029	.
41	1968	1576.47	0.037	15572
42	1969	1704.78	0.043	16962
43	1970	1777.90	0.047	17300
44	1971	1840.54	0.051	17566
45	1972	2054.25	0.051	18500
46	1973	2142.71	0.052	20036
47	1974	2328.66	0.056	20889
48	1975	2429.54	0.057	21500

COUNTRY=INDIA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
49	1967	21786.5	.	.
50	1968	20938.0	.	.
51	1969	21557.4	0.465	90000
52	1970	22554.4	0.499	100000
53	1971	22127.7	0.634	143000
54	1972	20674.8	0.681	170000
55	1973	22261.1	0.761	184293
56	1974	21781.2	0.837	203351
57	1975	25167.0	0.852	227668
58	1976	22954.3	0.931	250884

TABLE B-4

AGRICULTURAL TIME SERIES DATA (Continued)

COUNTRY=INDONESIA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
59	1967	3873.33	.	.
60	1968	263.34	.	.
61	1969	1062.01	.	.
62	1970	1575.50	.	.
63	1971	1682.32	.	.
64	1972	1719.35	.	.
65	1973	1481.37	.	.
66	1974	1686.39	.	.
67	1975	1686.39	.	.
68	1976	1955.73	.	.

COUNTRY=IRAN

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
69	1967	1823.28	.	.
70	1968	1940.44	.	.
71	1969	1995.30	.	.
72	1970	2119.92	.	.
73	1971	2050.37	.	.
74	1972	2195.60	.	.
75	1973	1919.95	.	.
76	1974	2173.60	.	.
77	1975	2323.75	.	.
78	1976	2473.90	.	.

COUNTRY=JAMAICA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
79	1967	107.094	.	.
80	1968	102.455	.	.
81	1969	97.223	.	.
82	1970	94.560	.	.
83	1971	116.813	.	.
84	1972	121.968	.	.
85	1973	119.194	.	.
86	1974	121.317	.	.
87	1975	123.606	.	.
88	1976	126.658	.	.

COUNTRY=KENYA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
89	1967	436.570	.	.
90	1968	438.292	.	.
91	1969	458.744	0.002	5998
92	1970	484.680	0.040	7247
93	1971	482.132	0.049	5891
94	1972	530.561	0.050	6028
95	1973	550.824	0.054	5721
96	1974	545.076	0.065	6195
97	1975	546.840	0.060	5993
98	1976	558.558	0.056	6000

COUNTRY=KOREA,REP

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
99	1967	1871.07	.	.
100	1968	1907.22	.	.
101	1969	2204.09	.	.
102	1970	2316.48	0.003	61
103	1971	2638.71	.	183
104	1972	2732.[illegible]	0.006	212
105	1973	2938.25	0.007	293
106	1974	2716.80	0.006	388
107	1975	2908.80	0.007	564
108	1976	3171.20	0.010	790

COUNTRY=MEXICO

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
109	1967	3518.93	0.310	..
110	1968	3543.78	0.327	102000
111	1969	3608.34	0.350	108000
112	1970	3794.80	0.362	115230
113	1971	3727.51	0.352	120000
114	1972	3843.51	0.354	125000
115	1973	4147.13	0.389	130000
116	1974	3966.30	0.396	135000
117	1975	4000.20	0.387	140000
118	1976	3853.30	0.394	145000

TABLE B-4

AGRICULTURAL TIME SERIES DATA (Concluded)

COUNTRY=NIGERIA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
119	1967	2482.67	.	.
120	1968	2357.72	.	.
121	1969	2726.14	.	.
122	1970	3302.60	.	.
123	1971	3556.98	.	.
124	1972	3643.33	.	.
125	1973	3249.94	.	.
126	1974	3373.66	.	.
127	1975	3286.71	.	.

COUNTRY=SAUDIARABIA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
128	1967	205.156	.	.
129	1968	204.288	.	.
130	1969	213.411	.	.
131	1970	218.448	.	.
132	1971	223.300	.	.
133	1972	210.741	.	.
134	1973	206.050	.	.

COUNTRY=SAUDIARABIA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
135	1974	250.860	.	.
136	1975	260.628	.	.
137	1976	271.062	.	.

COUNTRY=THAILAND

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
138	1967	1656.00	0.378	.
139	1968	1762.95	0.542	6000
140	1969	1900.74	0.559	7000
141	1970	1851.85	0.668	8000
142	1971	1961.12	0.693	9146
143	1972	2149.35	0.681	10946
144	1973	2442.16	0.811	13273
145	1974	2155.98	0.927	15993
146	1975	2349.87	0.848	19173
147	1976	2448.39	0.912	22000

COUNTRY=VENEZUELA

OBS	YEAR	AGRI70	ENERGYA	TRACTORS
148	1967	704.32	0.007	.
149	1968	778.95	0.007	17000
150	1969	869.48	0.008	17700
151	1970	898.21	.	19200
152	1971	746.63	0.010	20700
153	1972	746.47	0.009	21100
154	1973	783.27	0.008	21300
155	1974	940.50	0.006	23460
156	1975	1005.75	0.006	26600
157	1976	967.95	.	.

Noncommercial Energy Time Series

This table contains records for 16 countries from 1967 to 1976. All data shown are based on the International Energy Agency's Workshop on Energy Data of Developing Countries. The variables shown by country for each year are, in order:

- ENERGYTO - Total energy consumed, millions of metric tons of oil equivalent
- ENERGYNC - Total noncommercial energy consumed, millions of metric tons of oil equivalent
- ENERGYI - Total energy consumed by the industrial sector, millions of metric tons of oil equivalent
- ENINC - Total noncommercial energy consumed by the industrial sector, millions of metric tons of oil equivalent
- ENTOCAP - Per capita total energy consumption, metric tons of oil equivalent
- ENNCCAP - Per capita noncommercial energy consumption, metric tons of oil equivalent.
- FRNC - Fraction of total energy consumption attributable to noncommercial energy
- FRIN - Fraction of industrial energy consumption attributable to noncommercial energy

TABLE B-5

NONCOMMERCIAL ENERGY TIME SERIES

COUNTRY=ALGERIA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
1	1967	2.394	0.243	0.067	0.002	0.183028	0.0185780	0.101504	0.0298507
2	1968	2.473	0.252	0.084	0.002	0.183185	0.0186667	0.101901	0.0238095
3	1969	3.263	0.263	0.162	0.003	0.234579	0.0189073	0.080601	0.0185185
4	1970	3.312	0.272	0.575	0.002	0.231124	0.0189812	0.082126	0.0034783
5	1971	3.433	0.286	0.560	0.006	0.232431	0.0193636	0.083309	0.0107143
6	1972	5.657	0.297	0.276	0.007	0.370465	0.0194499	0.052501	0.0253623
7	1973	5.190	0.306	0.513	0.008	0.329106	0.0195308	0.059345	0.0155945
8	1974	5.741	0.318	0.513	0.008	0.352641	0.0195332	0.055391	0.0155945
9	1975	5.993	0.330	0.629	0.006	0.357151	0.0196663	0.055064	0.0095390
10	1976	7.694	0.331	0.768	0.007	0.444740	0.0191329	0.043021	0.0091146

COUNTRY=ARGENTINA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
11	1967	19.397	2.110	5.342	1.070	0.85075	0.092544	0.108780	0.200300
12	1968	20.826	2.127	5.457	1.076	0.90117	0.092038	0.102132	0.197178
13	1969	22.432	2.182	6.125	1.137	0.95741	0.093126	0.097272	0.185633
14	1970	24.049	2.236	6.400	1.213	1.01259	0.094147	0.092977	0.180531
15	1971	25.234	2.148	6.395	1.184	1.04836	0.089240	0.085123	0.185145
16	1972	25.137	2.019	6.243	1.112	1.03063	0.082780	0.080320	0.178119
17	1973	26.881	2.225	6.972	1.532	1.08742	0.090008	0.082772	0.219736
18	1974	27.457	2.800	7.249	2.050	1.09609	0.111776	0.101978	0.282798
19	1975	28.310	3.580	8.493	2.750	1.11545	0.141056	0.126457	0.323796
20	1976	29.265	4.600	9.620	3.700	1.13783	0.178849	0.157184	0.384615

COUNTRY=BRAZIL

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
21	1967	45.657	23.119	10.061	2.825	0.532443	0.269609	0.506363	0.280787
22	1968	47.769	21.706	10.645	2.564	0.541476	0.246044	0.454395	0.240864
23	1969	51.435	22.952	12.013	2.762	0.566652	0.252859	0.446233	0.229918
24	1970	53.176	23.649	12.779	3.356	0.569824	0.253418	0.444731	0.262618
25	1971	56.340	24.076	14.246	3.559	0.586936	0.250818	0.427334	0.249825
26	1972	61.889	23.473	16.539	3.990	0.627105	0.237846	0.379276	0.241248
27	1973	68.161	23.785	19.693	4.459	0.672000	0.234497	0.348953	0.226426
28	1974	74.735	25.438	21.081	4.361	0.716951	0.244033	0.340376	0.206869
29	1975	78.097	26.257	21.690	4.032	0.729879	0.245393	0.336210	0.185892
30	1976	84.717	28.614	24.369	4.166	0.770155	0.260127	0.337760	0.170955

TABLE B-5

NONCOMMERCIAL ENERGY TIME SERIES (Continued)

COUNTRY=COLOMBIA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
31	1967	12.987	5.697	0.269	0.197	0.675702	0.296410	0.438669	0.732342
32	1968	13.734	5.719	0.502	0.219	0.692587	0.288401	0.416412	0.436255
33	1969	13.527	5.734	0.536	0.234	0.661144	0.280254	0.423893	0.436567
34	1970	13.406	5.723	0.497	0.223	0.634754	0.270975	0.426898	0.448692
35	1971	14.140	5.746	0.565	0.246	0.648922	0.263699	0.406365	0.435398
36	1972	14.596	5.772	0.472	0.272	0.649000	0.256647	0.395451	0.576271
37	1973	14.813	5.262	0.487	0.267	0.638216	0.226713	0.355229	0.548255
38	1974	15.440	5.295	0.901	0.295	0.644676	0.221086	0.342940	0.327414
39	1975	14.714	5.320	0.983	0.320	0.597402	0.215997	0.361560	0.325534

COUNTRY=EGYPT

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
40	1967	4.392	0.143	0.688	0.120	0.142090	0.00462633	0.0325592	0.174419
41	1968	5.687	0.161	0.767	0.137	0.179457	0.00508047	0.0283102	0.178618
42	1969	4.437	0.185	0.874	0.161	0.136523	0.00569231	0.0416948	0.184211
43	1970	5.777	0.197	0.895	0.172	0.173327	0.00591059	0.0341007	0.192179
44	1971	6.719	0.207	0.939	0.182	0.197154	0.00607394	0.0308082	0.193823
45	1972	7.475	0.210	0.908	0.182	0.214552	0.00602755	0.0280936	0.200441
46	1973	6.754	0.217	0.888	0.189	0.189613	0.00609208	0.0321491	0.212838
47	1974	7.654	0.204	0.957	0.176	0.210159	0.00560132	0.0266527	0.183908
48	1975	8.623	0.205	1.219	0.177	0.231614	0.00550631	0.0237736	0.145201

COUNTRY=INDIA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
49	1967	74.164	24.801	22.729	0.778	0.147104	0.0491927	0.334408	0.0342294
50	1968	77.749	25.406	25.083	0.784	0.150849	0.0492928	0.326769	0.0312562
51	1969	79.971	26.133	24.597	1.383	0.151751	0.0495892	0.326781	0.0562264
52	1970	82.408	26.779	30.193	1.529	0.152925	0.0496938	0.324956	0.0506409
53	1971	83.678	27.181	30.217	1.306	0.151915	0.0493464	0.324829	0.0432207
54	1972	89.102	27.723	32.509	1.223	0.158412	0.0492880	0.311138	0.0376204
55	1973	91.527	28.294	33.922	1.316	0.159394	0.0492738	0.309133	0.0387949
56	1974	94.252	29.024	36.252	1.481	0.160823	0.0495239	0.307940	0.0408529
57	1975	98.678	30.487	39.886	1.666	0.165046	0.0509918	0.308954	0.0417690
58	1976	102.814	31.206	40.387	1.661	0.168586	0.0511691	0.303519	0.0411271

TABLE B-5

NONCOMMERCIAL ENERGY TIME SERIES (Continued)

COUNTRY=INDONESIA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
59	1967	29.865	22.403	0.348	0.203	0.276656	0.207531	0.750142	0.583333
60	1968	31.389	23.199	0.349	0.199	0.285303	0.210862	0.739081	0.570201
61	1969	32.095	23.992	0.433	0.242	0.286256	0.213985	0.747531	0.558891
62	1970	36.394	24.734	0.434	0.234	0.318519	0.216471	0.679618	0.539171
63	1971	36.621	25.275	.	0.275	0.310637	0.214395	0.690178	.
64	1972	38.555	26.293	0.661	0.293	0.316986	0.216172	0.681961	0.443268
65	1973	40.481	27.039	0.627	0.289	0.324888	0.217006	0.667943	0.460925
66	1974	44.570	27.559	0.794	0.309	0.349322	0.215997	0.618331	0.389169

COUNTRY=INDONESIA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
67	1975	47.269	28.080	1.011	0.330	0.36097	0.214433	0.594047	0.326409
68	1976	54.893	28.205	1.127	0.455	0.40846	0.209874	0.513618	0.403727

COUNTRY=IRAN

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
69	1967	11.572	0.526	1.630	0.151	0.440000	0.0200000	0.0454545	0.0926380
70	1968	9.671	0.526	1.733	0.151	0.357127	0.0154239	0.0543894	0.0871321
71	1969	13.780	0.559	4.552	0.184	0.494084	0.0200430	0.0405660	0.0404218
72	1970	19.599	0.578	10.335	0.204	0.683845	0.0201675	0.0294913	0.0197388
73	1971	19.652	0.460	9.222	0.210	0.659906	0.0154466	0.0234073	0.0227716
74	1972	20.576	0.447	8.986	0.197	0.673519	0.0146318	0.0217243	0.0219230
75	1973	23.995	0.480	10.221	0.251	0.766613	0.0153355	0.0200042	0.0245573
76	1974	27.834	0.672	11.739	0.173	0.870901	0.0210263	0.0241431	0.0147372
77	1975	30.642	0.699	10.981	0.200	0.933354	0.0212915	0.0228118	0.0182133
78	1976	32.989	0.714	11.765	0.215	0.987695	0.0213772	0.0216436	0.0182745

COUNTRY=JAMAICA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
79	1967	1.561	0.153	0.664	0.153	0.86243	0.0845304	0.098014	0.230422
80	1968	1.415	0.152	0.640	0.152	0.77322	0.0830601	0.107420	0.237500
81	1969	1.637	0.131	0.784	0.131	0.88967	0.0711957	0.080024	0.167092
82	1970	1.683	0.126	0.838	0.126	0.90000	0.0673797	0.074866	0.150358
83	1971	1.985	0.130	1.018	0.130	1.03927	0.0680628	0.065491	0.127701
84	1972	2.059	0.128	.	0.128	1.06134	0.0659794	0.062166	.
85	1973	2.675	0.119	.	0.119	1.35101	0.0601010	0.044486	.
86	1974	2.508	0.125	.	0.125	1.25400	0.0625000	0.049841	.
87	1975	2.603	0.121	.	0.121	1.28227	0.0596059	0.046485	.
88	1976	2.609	0.121	.	0.121	1.26650	0.0587379	0.046378	.

TABLE B-5

NONCOMMERCIAL ENERGY TIME SERIES (Continued)

COUNTRY=KENYA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
89	1967	3.370	2.522	.	0.022	0.333004	0.249209	0.748368	.
90	1968	3.535	2.560	.	0.029	0.337309	0.244275	0.724187	.
91	1969	3.457	2.564	.	0.041	0.317739	0.235662	0.741684	.
92	1970	3.437	2.641	0.203	0.047	0.306055	0.235174	0.768403	0.231527
93	1971	3.634	2.671	0.242	0.046	0.311397	0.228877	0.735003	0.190083
94	1972	3.617	2.689	0.185	0.033	0.255669	0.222784	0.743434	0.178378
95	1973	4.290	3.183	.	.	0.343750	0.255048	0.741958	.
96	1974	4.114	2.778	0.295	0.059	0.318668	0.215182	0.675255	0.200000
97	1975	4.127	2.807	0.302	0.057	0.307985	0.209478	0.680155	0.188742
98	1976	4.034	2.810	0.352	0.060	0.291264	0.202888	0.696579	0.170455

COUNTRY=KOREA,REP

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
99	1967	11.957	2.125	0.875	0	0.404773	0.0719364	0.177720	0
100	1968	12.182	2.165	0.833	0	0.403779	0.0717600	0.177721	0
101	1969	14.932	2.265	0.847	0	0.485751	0.0736825	0.151608	0
102	1970	17.069	2.191	1.267	0	0.545335	0.0700000	0.128361	0
103	1971	18.828	2.083	1.339	0	0.591517	0.0654414	0.110633	0
104	1972	16.475	1.880	1.327	0	0.509116	0.0580964	0.114112	0
105	1973	19.908	2.291	1.662	0	0.604923	0.0696141	0.115079	0
106	1974	20.589	1.794	2.189	0	0.615332	0.0536163	0.087134	0
107	1975	23.432	1.838	2.464	0	0.688569	0.0540112	0.078440	0
108	1976	24.334	1.838	2.727	0	0.703498	0.0531367	0.075532	0

COUNTRY=MEXICO

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FRNC	FRIN
109	1967	34.788	3.091	14.851	0.796	0.787772	0.0699955	0.0888525	0.0535991
110	1968	36.329	3.064	15.877	0.771	0.795119	0.0670606	0.0843403	0.0485608
111	1969	38.483	3.134	17.613	0.846	0.814110	0.0663000	0.0814386	0.0480327
112	1970	40.993	3.073	17.770	0.793	0.808700	0.0606234	0.0749640	0.0446258
113	1971	42.310	3.091	18.865	0.821	0.806673	0.0589323	0.0730560	0.0435197
114	1972	46.002	3.109	21.164	0.854	0.847651	0.0572876	0.0675840	0.0403515
115	1973	49.329	3.067	23.201	0.927	0.878365	0.0546118	0.0621744	0.0399552
116	1974	53.740	3.047	25.673	0.937	0.924639	0.0524260	0.0566989	0.0364975
117	1975	55.556	2.942	27.436	0.899	0.923624	0.0489111	0.0529556	0.0327672
118	1976	57.818	2.937	27.549	0.894	0.927611	0.0471202	0.0507973	0.0324513

TABLE B-5

NONCOMMERCIAL ENERGY TIME SERIES (Concluded)

COUNTRY=NIGERIA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FENC	FEIN
119	1967	13.982	12.407	0.485	0.007	0.273367	0.242751	0.887355	0.0143149
120	1968	14.178	12.782	0.322	0.007	0.270469	0.243838	0.901538	0.0217391
121	1969	14.676	13.159	0.341	0.009	0.273143	0.244910	0.896634	0.0263930
122	1970	15.354	13.509	0.383	0.009	0.278809	0.245306	0.879836	0.0234987
123	1971	15.954	13.860	0.580	0.010	0.281972	0.244963	0.868748	0.0172414
124	1972	16.775	14.209	0.584	0.009	0.288776	0.244603	0.847034	0.0154110
125	1973	18.295	14.610	0.708	0.010	0.306654	0.244888	0.798579	0.0141243
126	1974	19.446	15.013	0.899	0.013	0.316892	0.245030	0.773228	0.0144605
127	1975	21.336	15.429	1.558	0.013	0.339043	0.245177	0.723144	0.0083440

COUNTRY=SAUDIARABIA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FENC	FEIN
128	1967	5.037	.	2.152	.	0.70645	.	.	.
129	1968	6.392	.	2.612	.	0.87203	.	.	.
130	1969	7.373	.	2.773	.	0.97915	.	.	.
131	1970	7.835	.	3.943	.	1.01227	.	.	.
132	1971	8.080	.	3.505	.	1.01380	.	.	.
133	1972	8.863	.	4.055	.	1.07954	.	.	.
134	1973	12.180	.	5.228	.	1.44142	.	.	.
135	1974	14.152	.	4.997	.	1.62667	.	.	.
136	1975	14.580	.	4.458	.	1.62542	.	.	.
137	1976	16.191	.	3.762	.	1.75227	.	.	.

COUNTRY=THAILAND

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FENC	FEIN
138	1967	3.129	0.294	0.759	0.153	0.094818	0.0089091	0.093960	0.201581
139	1968	4.179	0.357	1.077	0.228	0.122767	0.0104877	0.085427	0.211699
140	1969	4.395	0.355	1.225	0.257	0.125178	0.0101111	0.080774	0.209796
141	1970	5.063	0.417	1.579	0.307	0.139785	0.0115130	0.082362	0.194427
142	1971	5.953	0.419	1.625	0.299	0.159256	0.0112092	0.070385	0.184000
143	1972	6.930	0.440	2.121	0.341	0.179627	0.0114049	0.063492	0.160773
144	1973	7.804	0.540	2.344	0.456	0.196130	0.0135712	0.069195	0.194539
145	1974	7.664	0.653	2.300	0.593	0.186836	0.0159922	0.085595	0.257826
146	1975	8.046	0.680	2.581	0.632	0.191026	0.0161443	0.084514	0.244866
147	1976	9.163	0.939	3.071	0.875	0.212057	0.0217311	0.102477	0.284923

COUNTRY=VENEZUELA

OBS	YEAR	ENERGYTO	ENERGYNC	ENERGYI	ENINC	ENTOCAP	ENNCCAP	FENC	FEIN
148	1967	11.224	1.619	4.478	0.131	1.20559	0.173899	0.144244	0.0292541
149	1968	12.102	1.635	4.925	0.122	1.25800	0.169958	0.135102	0.0247716
150	1969	12.760	1.692	5.121	0.129	1.28370	0.170221	0.132602	0.0251904
151	1970	13.345	1.763	5.438	0.150	1.29815	0.171498	0.132109	0.0275837
152	1971	13.587	1.833	5.233	0.170	1.28058	0.172762	0.134908	0.0324861
153	1972	15.053	1.903	5.912	0.178	1.37596	0.173949	0.126420	0.0301083
154	1973	17.521	2.006	7.816	0.277	1.55328	0.177837	0.114491	0.0354401
155	1974	18.516	2.104	7.827	0.325	1.59209	0.180911	0.113631	0.0415229
156	1975	19.179	2.233	7.929	0.401	1.59958	0.186239	0.116429	0.0505738
157	1976	20.681	2.133	8.068	0.301	1.67322	0.172573	0.103138	0.0373079

TABLE B-6: Residential Fuel Use in India

This table contains records for residential fuel use in India from 1967 to 1977. All data shown are based on the International Energy Agency's Workshop on Energy Data of Developing Countries. The variables shown for each year are, in order:

- TOTALRES - Total residential fuel use, millions of metric tons oil equivalent
- NONCOM - Noncommercial residential fuel use, millions of metric tons oil equivalent
- PETROPRD - Residential use of petroleum products, millions of metric tons oil equivalent

TABLE B-6

RESIDENTIAL FUEL USE IN INDIA

OBS	YEAR	TOTALRES	NONCOM	PETRCPRD
1	1967	26.809	24.023	2.677
2	1968	27.792	24.622	3.064
3	1969	28.185	24.750	3.336
4	1970	33.011	25.250	4.747
5	1971	32.293	25.875	3.876
6	1972	34.454	26.500	5.448
7	1973	35.499	26.978	5.597
8	1974	34.803	27.543	4.775
9	1975	35.653	28.821	4.644
10	1976	37.033	29.545	4.618
11	1977	33.298	29.625	3.616

TABLE B-7: Quality of Life Data Base

This table contains the data base used in the quality of life analyses. Data sources have been described in Chapter 6.

TABLE B-7

QUALITY OF LIFE DATA BASE

Country	GDP 1960	GDP 1975	Commercial Energy Consumption 1960	Commercial Energy Consumption 1975	Infant Mortality 1960	Infant Mortality 1975	Life Expectancy at Birth 1960	Life Expectancy at Birth 1975	Adult Literacy, % 1960	Adult Literacy, % 1975
1 AFGHNSTN	56	59	15	49	-	228	33	39	9	11
2 ALGERIA	305	505	252	490	-	144	40	53	7	24
3 ARGENTINA	810	1219	1129	1765	62	59	66	68	91	93
4 BANGLADESH	63	66	-	39	-	147	39	39	22	23
5 BARBADOS	391	641	375	1011	-	30	64	69	96	98
6 BENIN	86	86	39	66	110	149	38	41	14	15
7 BOLIVIA	145	261	147	294	77	157	42	47	39	40
8 BOTSWANA	-	-	-	-	-	97	36	44	27	33
9 BRAZIL	309	703	332	704	70	110	58	61	61	65
10 BURMA	70	90	55	53	150	112	45	51	58	64
11 BURUNDI	55	64	10	13	150	144	34	42	12	11
12 CAMBODIA	107	88	-	3	127	150	41	45	41	42
13 CAMEROON	132	174	55	105	72	137	38	41	19	14
14 CENTAFEMP	139	133	37	34	195	190	40	39	35	84
15 CHAD	83	62	10	23	160	160	34	37	6	11
16 CHILE	670	801	845	974	125	62	60	64	84	89
17 CHINA,REP	206	477	410	653	31	19	64	70	54	83
18 COLOMBIA	278	382	491	674	100	85	58	62	-	78
19 CONGO PR	183	255	119	207	190	180	41	44	16	40
20 COSTA RICA	619	880	233	552	71	38	63	69	84	89
21 DOMNCAN R	300	497	157	609	101	61	53	59	-	59
22 ECUADOR	262	370	201	417	100	68	54	59	67	69
23 EL SLVDOR	236	288	127	244	76	57	56	62	51	60
24 ETHIOPIA	55	66	8	21	-	-	34	40	6	7
25 FIJI	342	488	244	432	-	41	63	70	-	75
26 GAMBIA	81	110	24	92	-	165	36	40	6	10
27 GHANA	249	266	106	170	135	98	40	46	-	30
28 GREECE	546	1374	460	1961	40	24	69	72	80	83
29 GUATEMALA	290	422	174	251	92	77	47	55	38	47
30 GUINEA EQ	89	105	65	94	-	-	37	41	8	-
31 GUYANA	323	332	579	632	-	51	60	68	87	86
32 HONDURAS	245	269	155	273	52	69	42	55	47	56
33 HONG KONG	396	894	468	1120	38	15	66	71	71	80

TABLE B-7

QUALITY OF LIFE DATA BASE (Continued)

	Country	GDP 1960	GDP 1975	Commercial Energy Consumption 1960	Commercial Energy Consumption 1975	Infant Mortality 1960	Infant Mortality 1975	Life Expectancy at Birth 1960	Life Expectancy at Birth 1975	Adult Literacy, % 1960	Adult Literacy, % 1975
34	INDIA	84	93	142	168	139	124	44	52	24	35
35	INDONESIA	66	116	129	184	104	91	47	48	50	61
36	IRAN	226	651	270	1317	.	109	44	54	15	44
37	IRAQ	298	978	487	704	.	86	.	55	18	26
38	ISRAEL	1129	2149	1270	2914	27	22	70	72	84	84
39	IVORY CST	222	410	76	321	138	.	36	44	8	20
40	JAMAICA	505	877	426	1939	54	21	65	70	84	85
41	JORDAN	193	275	197	389	45	72	49	53	33	52
42	KENYA	112	157	143	160	.	74	43	50	19	34
43	KOREA REP	144	407	258	1090	70	49	48	63	71	89
44	LEBANON	485	707	548	1014	105	71	57	63	.	74
45	LIBERIA	212	298	86	402	.	159	37	45	9	13
46	LIBYA	493	2704	210	1101	.	.	45	53	22	27
47	MADAGASCAR	127	114	38	89	69	53	36	44	33	40
48	MALAWI	60	90	37	56	.	144	35	42	22	23
49	MALAYSIA	276	439	248	663	69	38	52	63	36	57
50	MALI	50	33	15	28	120	120	35	38	4	8
51	MALTA	408	911	508	993	.	16	67	70	66	85
52	MAURITANIA	90	157	18	187	187	187	36	39	7	10
53	MEXICO	488	740	770	1224	74	60	58	65	62	75
54	MOROCCO	197	240	148	266	149	128	45	53	17	23
55	NEPAL	73	80	5	11	.	152	36	44	10	15
56	NICARAGUA	308	479	174	438	76	81	46	53	44	56

TABLE B-7

QUALITY OF LIFE DATA BASE (Continued)

	Country	GDP 1960	GDP 1975	Commercial Energy Consumption 1960	Commercial Energy Consumption 1975	Infant Mortality 1960	Infant Mortality 1975	Life Expectancy at Birth 1960	Life Expectancy at Birth 1975	Adult Literacy, % 1960	Adult Literacy, % 1975
57	NIGER	92	71	5	35	200	181	36	40	4	5
58	NIGERIA	108	155	34	86	207	159	34	41	22	25
59	OMAN	93	339	-	474	-	-	40	47	-	30
60	PANAMA	459	829	448	911	57	42	61	75	78	80
61	PAPUA NG	162	278	51	293	-	-	-	-	-	-
62	PARAGUAY	202	287	87	158	90	61	54	62	84	81
63	PERU	361	506	445	681	92	71	51	56	61	72
64	PHILIPPINE	141	203	147	316	85	73	49	58	72	81
65	QATAR	531	989	1569	-	-	138	-	47	-	13
66	RHODESIA	282	319	558	606	122	-	44	52	39	-
67	RWANDA	62	56	15	15	-	131	36	41	12	21
68	SAUDI	245	837	267	988	-	150	37	44	12	15
69	SENEGAL	237	209	121	171	143	159	36	40	6	9
70	SIERRALEON	134	164	31	111	-	136	36	44	7	13
71	SINGAPORE	483	1349	372	2025	35	13	63	70	-	74
72	SOMALIA	74	74	19	66	-	177	35	41	-	35
73	VIETNAM S	146	154	54	407	-	-	-	-	-	-
74	SRI LANKA	82	113	107	112	57	46	61	66	61	79
75	SUDAN	128	128	52	125	127	137	41	49	15	15
76	SYRIA	212	385	321	701	22	31	46	56	33	43
77	TANZANIA	75	97	41	67	190	146	37	45	17	56
78	THAILAND	114	211	64	284	49	40	51	59	68	81
79	TOGO	84	128	23	67	127	121	34	41	10	14
80	TRINIDAD&T	691	1235	1775	3778	45	32	63	68	88	91
81	TUNISIA	390	421	190	448	-	108	46	54	24	47
82	UGANDA	104	124	30	61	160	-	43	50	30	28
83	UPPERVOLTA	5[illegible]	57	5	20	182	182	32	37	5	8
84	URUGUAY	808	820	825	1026	47	49	68	70	90	91
85	VENEZUELA	869	1320	1694	2740	54	46	57	65	65	81
86	ZAIRE	90	103	87	69	124	-	40	44	-	20
87	ZAMBIA	177	182	432	505		159	42	45	41	45

TABLE B-7

QUALITY OF LIFE DATA BASE (Continued)

Country	Calorie Intake 1960	Calorie Intake 1975	Animal Protein, % 1960	Animal Protein, % 1975	Children in Secondary School, % 1960	Children in Secondary School, % 1975	Females in Primary School, % 1960	Females in Primary School, % 1975	TV Ownership Per 1000 1960	TV Ownership Per 1000 1975
1 AFGHNSTN	211	202	-	-	1	6	2	7	-	-
2 ALGERIA	-	214	-	-	8	16	37	72	5	30
3 ARGENTINA	325	341	-	61	31	47	99	109	21	180
4 BANGLADESH	-	-	-	-	8	15	26	51	-	-
5 BARBADOS	-	325	-	-	39	51	-	-	25	203
6 BENIN	-	-	-	-	2	11	15	28	-	-
7 BOLIVIA	164	185	-	12	11	31	50	65	-	-
8 BOTSWANA	-	-	-	-	1	15	-	-	-	-
9 BRAZIL	242	252	-	22	26	68	-	100	18	83
10 BURMA	195	222	-	-	10	22	52	81	-	-
11 BURUNDI	-	-	-	-	1	2	9	17	-	-
12 CAMBODIA	217	189	-	-	-	-	41	32	1	3
13 CAMEROON	-	237	-	13	3	11	43	97	-	-
14 CENTAFEMP	-	-	-	-	1	7	12	53	-	-
15 CHAD	-	-	-	-	0	2	4	20	-	-
16 CHILE	258	283	26	-	25	48	107	118	1	72
17 CHINA,REP	-	233	-	-	29	47	47	-	5	-
18 COLOMBIA	214	218	-	-	12	28	77	108	11	51
19 CONGO PR	-	-	-	-	4	46	53	140	-	3
20 COSTA RICA	220	254	28	-	21	33	95	109	3	79
21 DOMNCAN R	-	221	19	-	13	20	98	104	6	34
22 ECUADOR	-	212	14	-	12	25	79	100	1	37
23 EL SLVDOR	-	191	15	-	11	13	77	69	8	34
24 ETHIOPIA	-	-	-	-	1	6	3	14	0	1
25 FIJI	-	-	-	-	16	25	-	-	-	-
26 GAMBIA	-	232	-	-	3	9	-	-	-	-
27 GHANA	-	-	14	-	3	10	39	53	0	6
28 GREECE	-	329	50	-	39	69	103	104	0	126

TABLE B-7

QUALITY OF LIFE DATA BASE (Continued)

Country	Calorie Intake 1960	Calorie Intake 1975	Animal Protein, % 1960	Animal Protein, % 1975	Children in Secondary School, % 1960	Children in Secondary School, % 1975	Females in Primary School, % 1960	Females in Primary School, % 1975	TV Ownership Per 1000 1960	TV Ownership Per 1000 1975
29 GUATEMALA	-	199	14	-	8	8	40	56	8	19
30 GUINEA EQ	-	-	-	-	2	13	16	18	-	-
31 GUYANA	238	235	-	-	-	57	-	-	-	-
32 HONDURAS	-	204	-	14	6	18	67	88	1	16
33 HONG KONG	247	253	-	-	24	60	85	119	2	185
34 INDIA	206	198	-	6	9	28	27	52	0	1
35 INDONESIA	193	213	-	5	6	19	55	75	0	2
36 IRAN	189	237	-	11	12	37	27	67	2	51
37 IRAQ	-	243	-	16	17	26	36	63	17	178
38 ISRAEL	-	314	-	45	48	34	97	129	6	180
39 IVORY CST	-	-	-	-	2	16	24	64	2	15
40 JAMAICA	-	266	-	29	10	32	83	112	14	54
41 JORDAN	-	231	-	10	25	35	59	77	0	32
42 KENYA	-	212	-	15	2	12	30	101	1	3
43 KOREA REP	-	243	-	10	27	51	88	109	0	48
44 LEBANON	-	252	-	18	14	40	104	125	5	143
45 LIBERIA	-	-	-	-	2	5	18	44	3	5
46 LIBYA	-	-	-	-	14	47	24	135	0	4
47 MADAGASCAR	-	-	-	-	4	11	45	85	0	1
48 MALAWI	-	240	-	5	1	2	45	48	1	-
49 MALAYSIA	244	257	-	-	19	37	83	91	6	33
50 MALI	-	-	-	-	2	3	4	16	-	-
51 MALTA	-	308	-	-	16	70	-	-	43	232
52 MAURITANIA	-	-	-	-	0	3	3	9	-	-
53 MEXICO	-	273	-	16	11	24	77	109	19	84
54 MOROCCO	-	261	-	11	5	15	27	44	0	27
55 NEPAL	204	209	-	9	6	7	3	10	-	-
56 NICARAGUA		239	-	25	7	24	66	87	3	36

TABLE B-7

QUALITY OF LIFE DATA BASE (Continued)

	Country	Calorie Intake 1960	Calorie Intake 1975	Animal Protein, % 1960	Animal Protein, % 1975	Children in Secondary School, % 1960	Children in Secondary School, % 1975	Females in Primary School, % 1960	Females in Primary School, % 1975	TV Ownership Per 1000 1960	TV Ownership Per 1000 1975
57	NIGER	-	-	-	-	0	2	3	12	-	-
58	NIGERIA	-	209	-	6	3	9	27	39	0	2
59	OMAN	-	-	-	-	-	2	-	-	-	-
60	PANAMA	-	228	-	25	29	48	94	120	10	112
61	PAPUA NG	-	-	-	-	-	-	60	44	-	-
62	PARAGUAY	-	272	-	32	10	17	90	102	-	21
63	PERU	-	236	-	21	18	46	71	106	3	32
64	PHILIPPINE	185	197	-	17	26	48	93	103	1	17
65	QATAR	-	-	-	-	5	37	-	-	-	-
66	RHODESIA	-	-	-	16	-	-	-	-	10	11
67	RWANDA	-	-	-	-	2	2	30	54	-	-
68	SAUDI	-	248	-	11	2	9	2	32	1	14
69	SENEGAL	-	-	-	-	-	10	17	42	0	8
70	SIERRALEON	-	222	-	9	3	9	15	28	0	2
71	SINGAPORE	-	282	-	-	32	71	102	108	34	120
72	SOMALIA	-	182	-	-	1	3	5	41	-	-
73	VIETNAM S	-	-	-	-	-	-	-	-	-	-
74	SRI LANKA	-	202	-	-	27	52	90	77	-	-
75	SUDAN	-	-	-	-	3	11	14	27	0	6
76	SYRIA	242	260	-	-	16	45	39	81	12	31
77	TANZANIA	-	200	-	13	2	3	16	46	-	-
78	THAILAND	214	238	-	12	7	16	128	75	2	17
79	TOGO	-	-	-	-	2	15	24	68	-	-
80	TRINIDADET	-	253	-	-	22	40	109	111	-	94
81	TUNISIA	-	-	-	-	13	18	45	75	0	27
82	UGANDA	-	210	-	13	2	4	32	43	1	6
83	UPPERVOLTA	-	-	-	-	1	2	5	11	0	0
84	URUGUAY	-	308	-	66	37	62	112	103	9	116
85	VENEZUELA	-	243	-	-	12	47	100	96	37	107
86	ZAIRE	-	-	-	-	3	11	38	66	0	0
87	ZAMBIA	-	205	-	8	1	13	38	86	2	5

TABLE B-7

QUALITY OF LIFE BASE (Continued)

Country	Persons/Room 1960	Persons/Room 1975	Access to Water, % 1960	Access to Water, % 1975	Access to Sewage Disposal, % 1960	Access to Sewage Disposal, % 1975	Car Ownership Per 1000 1960	Car Ownership Per 1000 1975	KUZNETS Index of Income Distribution 1960	KUZNETS Index of Income Distribution 1975
1 AFGHNSTN	-	-	-	6	-	21	1	2	-	-
2 ALGERIA	-	-	-	77	-	67	17	12	-	-
3 ARGENTINA	1.4	1.4	-	66	-	97	24	88	332	-
4 BANGLADESH	-	-	-	56	-	5	-	1	283	-
5 BARBADOS	1.2	1.0	-	100	-	100	35	92	-	272
6 BENIN	-	-	-	34	-	14	1	5	337	-
7 BOLIVIA	-	-	-	34	-	12	3	4	-	-
8 BOTSWANA	-	-	-	45	-	-	2	5	-	445
9 BRAZIL	-	1.1	-	55	-	58	7	35	449	454
10 BURMA	-	-	-	17	-	33	1	1	-	-
11 BURUNDI	-	-	-	-	-	-	1	1	-	-
12 CAMBODIA	-	-	-	-	-	-	-	-	-	-
13 CAMEROON	-	-	-	32	-	-	3	6	-	-
14 CENTAFEMP	-	-	-	-	72	100	2	5	-	-
15 CHAD	-	-	-	-	-	1	1	2	275	-
16 CHILE	-	-	-	70	-	32	7	19	-	-
17 CHINA,REP	-	-	-	-	-	-	1	8	312	205
18 COLOMBIA	-	-	-	64	-	48	7	14	446	427
19 CONGO PR	-	-	-	38	-	9	-	-	-	-
20 COSTA RICA	-	-	-	72	-	93	14	28	412	339
21 DOMNCAN R	2.0	-	-	55	-	42	4	15	-	-
22 ECUADOR	-	-	-	36	-	-	2	5	-	548
23 EL SLVDOR	-	-	-	53	-	39	8	10	434	357
24 ETHIOPIA	-	-	-	8	-	14	1	2	-	-
25 FIJI	-	-	-	69	-	96	10	35	-	-
26 GAMBIA	-	-	-	12	-	-	3	6	-	-
27 GHANA	-	-	-	35	-	56	3	4	-	-
28 GREECE	-	-	-	-	-	-	5	42	-	-

TABLE B-7

QUALITY OF LIFE BASE (Continued)

Country	Persons/Room 1960	Persons/Room 1975	Access to Water, % 1960	Access to Water, % 1975	Access to Sewage Disposal, % 1960	Access to Sewage Disposal, % 1975	Car Ownership Per 1000 1960	Car Ownership Per 1000 1975	KUZNETS Index of Income Distribution 1960	KUZNETS Index of Income Distribution 1975
29 GUATEMALA	-	2.2	-	39	-	-	7	11	-	-
30 GUINEA EQ	-	-	-	14	-	13	2	2	-	-
31 GUYANA	-	2.1	-	84	-	96	19	31	-	-
32 HONDURAS	-	-	-	41	-	26	3	6	-	-
33 HONG KONG	-	-	-	-	-	-	11	29	-	323
34 INDIA	2.6	-	-	31	-	20	1	1	-	348
35 INDONESIA	-	-	-	11	-	15	1	2	-	337
36 IRAN	-	-	-	51	-	78	4	13	-	-
37 IRAQ	-	-	-	66	-	47	6	7	502	-
38 ISRAEL	-	-	-	-	-	-	13	81	-	-
39 IVORY CST	-	-	-	44	-	5	3	15	338	420
40 JAMAICA	1.9	-	-	86	-	94	20	45	450	-
41 JORDAN	-	-	-	77	-	-	4	8	-	-
42 KENYA	-	-	-	17	-	55	8	10	-	494
43 KOREA REP	2.5	2.3	-	66	-	64	0	2	-	271
44 LEBANON	-	-	-	92	-	-	30	72	418	-
45 LIBERIA	-	-	-	15	-	19	1	8	-	-
46 LIBYA	-	-	-	87	-	79	13	97	-	-
47 MADAGASCAR	-	-	-	25	-	-	4	6	422	-
48 MALAWI	-	-	-	-	-	-	-	2	-	352
49 MALAYSIA	3.0	2.6	-	34	-	60	13	34	349	394
50 MALI	-	-	-	17	-	8	2	1	-	-
51 MALTA	-	-	-	-	-	98	48	161	-	-
52 MAURITANIA	-	-	-	-	-	7	0	4	-	-
53 MEXICO	2.9	2.5	-	62	-	-	14	31	433	458
54 MOROCCO	2.2	-	-	51	-	29	11	17	-	-
55 NEPAL	-	-	-	8	-	1	0	-	-	-
56 NICARAGUA	-	2.9	-	46	-	-	5	16	-	-

TABLE B-7

QUALITY OF LIFE BASE (Continued)

	Country	Persons/Room 1960	Persons/Room 1975	Access to Water, % 1960	Access to Water, % 1975	Access to Sewage Disposal, % 1960	Access to Sewage Disposal, % 1975	Car Ownership Per 1000 1960	Car Ownership Per 1000 1975	KUZNETS Index of Income Distribution 1960	KUZNETS Index of Income Distribution 1975
57	NIGER	-	-	-	27	-	3	1	2	-	-
58	NIGERIA	-	-	-	-	-	-	1	2	-	-
59	OMAN	-	-	-	52	-	12	-	12	-	-
60	PANAMA	2.4	2.2	-	77	-	77	15	39	378	323
61	PAPUA NG	-	-	-	-	-	-	-	-	-	-
62	PARAGUAY	-	-	-	13	-	10	2	7	-	-
63	PERU	-	2.3	-	47	-	36	8	17	527	463
64	PHILIPPINE	-	2.3	-	50	-	56	3	9	388	379
65	QATAR	-	-	-	97	-	100	-	-	-	-
66	RHODESIA	-	-	-	-	-	-	-	-	-	518
67	RWANDA	-	-	-	68	-	57	-	1	-	-
68	SAUDI	-	-	-	64	-	47	6	9	-	-
69	SENEGAL	-	-	-	-	-	-	6	9	453	-
70	SIERRALEON	-	-	-	12	-	-	2	8	459	-
71	SINGAPORE	-	-	-	100	-	99	41	82	-	-
72	SOMALIA	-	-	-	38	-	47	2	3	-	-
73	VIETNAM S	-	-	-	-	-	-	-	-	-	-
74	SRI LANKA	-	-	-	19	-	59	8	7	371	288
75	SUDAN	-	-	-	50	-	22	1	2	-	-
76	SYRIA	2.9	-	-	71	-	-	4	5	-	-
77	TANZANIA	-	-	-	39	-	17	3	3	-	466
78	THAILAND	-	-	-	25	-	40	2	7	401	-
79	TOGO	-	-	-	16	-	15	0	6	-	-
80	TRINIDADET	1.8	1.7	-	93	-	92	44	83	-	-
81	TUNISIA	-	-	-	49	-	62	11	18	396	397
82	UGANDA	-	-	-	35	-	94	3	3	-	-
83	UPPERVOLTA	-	-	-	25	-	4	0	1	-	-
84	URUGUAY	-	-	-	98	-	83	39	55	-	-
85	VENEZUELA	-	-	-	75	-	-	37	57	430	480
86	ZAIRE	-	-	-	19	-	22	3	4	-	-
87	ZAMBIA	-	-	-	42	-	42	11	18	406	-

TABLE B-7

QUALITY OF LIFE DATA BASE (Continued)

	Country	Household Size 1960	Household Size 1975	Dwellings Electrified, % 1960	Dwellings Electrified, % 1975	Urban Population, % 1960	Urban Population, % 1975	Total Fertility Rate 1960	Total Fertility Rate 1975	Central Govt. % of GDP 1960	Central Govt. % of GDP 1975	Defense, % of Cent. Govt. 1960	Defense, % of Cent. Govt. 1975	Religion*	Economy Type**
29	GUATEMALA	.	5.2	.	29	32	35	.	6.1	8	7	.	11	2	5
30	GUINEA EQ	.	.	.	.	10	20	.	6.2	14	18	.	.	2	6
31	GUYANA	5.0	5.4	.	.	.	.	.	.	.	.	.	.	4	4
32	HONDURAS	.	.	.	.	23	28	.	7.3	11	14	.	.	2	5
33	HONG KO	.	4.5	.	.	88	95	.	3.0	7	7	.	3	1	3
34	INDIA	5.2	5.6	.	.	18	22	.	5.7	7	11	.	31	1	3
35	INDONESIA	.	.	.	.	15	19	.	5.5	11	9	.	.	3	2
36	IRAN	5.0	.	.	.	33	34	.	6.9	10	19	.	27	3	2
37	IRAQ	.	.	.	.	43	62	.	7.1	18	.	.	.	3	2
38	ISRAEL	.	3.8	.	.	78	84	.	3.7	18	42	.	40	8	1
39	IVORY CST	.	.	.	.	11	20	.	6.2	4	7	.	20	5	5
40	JAMAICA	3.9	4.3	.	.	30	45	.	5.4	7	21	.	.	2	4
41	JORDAN	.	6.1	.	.	43	56	.	7.1	28	33	.	25	3	6
42	KENYA	.	5.6	.	.	7	11	.	7.6	11	17	.	6	5	6
43	KOREA REP	5.6	5.1	28	50	28	47	.	4.0	15	13	.	23	8	1
44	LEBANON	.	.	.	.	35	60	.	6.3	10	.	.	19	3	6
45	LIBERIA	.	.	.	.	9	28	.	5.7	7	12	.	.	5	4
46	LIBYA	.	.	.	.	23	31	.	6.8	.	32	.	4	3	2
47	MADAGASCAR	.	4.7	.	.	12	18	.	6.7	20	.	.	16	4	6
48	MALAWI	.	.	.	.	4	6	.	6.1	16	11	.	2	5	6
49	MALAYSIA	5.9	5.6	.	.	26	30	.	5.7	11	15	.	14	3	2
50	MALI	.	4.8	.	.	10	14	.	6.7	12	18	.	.	3	6
51	MALTA	4.0	.	.	.	.	.	.	.	.	.	.	.	2	3
52	MAURITANIA	.	.	.	.	7	11	.	5.9	23	35	.	.	3	4
53	MEXICO	5.4	4.9	.	59	50	63	.	6.5	6	11	.	1	2	2
54	MOROCCO	4.8	5.4	76	.	30	38	.	7.1	13	17	.	.	3	4
55	NEPAL	.	5.5	.	.	3	5	.	6.2	3	.	.	4	1	6
56	NICARAGUA	.	.	.	.	40	48	.	6.9	9	9	.	.	2	5

*1 = Budhist, Hindu
2 = Christian
3 = Islamic
4 = Mixed
5 = Traditional (Animistic, etc.)
6 = Other

**1 = Industrialized
2 = Oil Exporter
3 = Balanced Growth
4 = Primary Exporter
5 = Agricultural Exporter
6 = Other Agricultural

TABLE B-7

QUALITY OF LIFE DATA BASE (Continued)

	Country	Household Size 1960	Household Size 1975	Dwellings Electrified, % 1960	Dwellings Electrified, % 1975	Urban Population, % 1960	Urban Population, % 1975	Total Fertility Rate 1960	Total Fertility Rate 1975	Central Govt. % of GDP 1960	Central Govt. % of GDP 1975	Defense, % of Cent. Govt. 1960	Defense, % of Cent. Govt. 1975	Religion*	Economy Type**
1	AFGHNSTN	-	-	-	-	8	12	-	6.9	-	6	-	17	5	6
2	ALGERIA	-	-	-	-	31	50	-	7.2	20	14	-	5	3	2
3	ARGENTINA	3.7	3.8	69	-	71	80	-	3.0	9	-	-	13	2	1
4	BANGLADESH	-	-	-	-	5	9	-	6.6	6	-	-	8	3	6
5	BARBADOS	4.0	3.9	-	-	-	-	-	-	-	-	-	0	2	3
6	BENIN	-	-	-	-	10	18	-	6.7	16	10	-	-	5	6
7	BOLIVIA	-	-	-	-	29	37	-	6.2	9	17	-	19	2	2
8	BOTSWANA	-	-	-	-	-	-	-	-	-	-	-	-	2	6
9	BRAZIL	5.1	5.1	39	56	45	60	-	5.2	12	-	-	12	2	1
10	BURMA	-	-	-	-	17	22	-	5.5	-	-	-	6	1	6
11	BURUNDI	-	-	-	-	2	4	-	6.3	3	13	-	-	5	6
12	CAMBODIA	-	-	-	-	10	23	-	6.7	19	-	-	-	1	5
13	CAMEROON	-	-	-	-	13	24	-	5.5	14	15	-	-	4	6
14	CENTAFEMP	-	-	-	-	19	36	-	5.5	19	-	-	10	5	6
15	CHAD	-	-	-	-	7	14	-	5.3	13	-	-	-	4	6
16	CHILE	5.4	5.1	-	-	69	83	-	3.7	11	14	-	15	2	1
17	CHINA, REP	-	-	-	-	35	64	-	2.8	19	17	-	41	8	1
18	COLOMBIA	-	5.9	-	-	47	62	-	5.9	6	-	-	9	2	3
19	CONGO PR	-	-	-	-	27	40	-	5.8	16	28	-	-	5	2
20	COSTA RICA	-	5.5	-	-	34	40	-	4.6	10	17	-	-	2	5
21	DOMNCAN R	5.0	5.3	20	-	30	44	-	6.9	13	7	-	9	2	5
22	ECUADOR	-	5.2	-	-	34	42	-	6.3	10	10	-	17	2	2
23	EL SLVDOR	-	5.2	-	-	38	40	-	6.2	10	11	-	13	2	6
24	ETHIOPIA	-	4.5	-	-	7	11	-	6.7	8	14	-	13	2	6
25	FIJI	6.3	-	-	-	-	-	-	-	-	-	-	-	2	6
26	GAMBIA	-	8.3	-	-	-	-	-	-	-	-	-	-	4	6
27	GHANA	-	4.7	-	-	23	32	-	6.7	10	12	-	8	4	6
28	GREECE	-	-	-	-	43	65	-	2.3	12	15	-	-	2	3

*1 = Budhist, Hindu
2 = Christian
3 = Islamic
4 = Mixed
5 = Traditional (Animistic, etc.)
6 = Other

**1 = Industrialized
2 = Oil Exporter
3 = Balanced Growth
4 = Primary Exportor
5 = Agricultural Exporter
6 = Other Agricultural

TABLE B-7

QUALITY OF LIFE DATA BASE (Concluded)

	Country	Household Size 1960	Household Size 1975	Dwellings Electrified, % 1960	Dwellings Electrified, % 1975	Urban Population, % 1960	Urban Population, % 1975	Total Fertility Rate 1960	Total Fertility Rate 1975	Central Govt. % of GDP 1960	Central Govt. % of GDP 1975	Defense, % of Cent. Govt. 1960	Defense, % of Cent. Govt. 1975	Religion*	Economy Type**
57	NIGER	-	-	-	-	6	9	-	7.1	13	20	-	-	3	6
58	NIGERIA	-	-	-	-	18	29	-	6.7	6	17	-	16	4	2
59	OMAN	-	-	-	-	-	-	-	-	-	-	-	-	3	2
60	PANAMA	4.7	4.9	44	52	41	51	-	5.1	11	13	-	-	2	3
61	PAPUA NG	-	-	-	-	3	13	-	6.0	28	32	-	-	5	6
62	PARAGUAY	-	-	-	-	35	37	-	6.2	8	6	-	20	2	6
63	PERU	-	4.8	-	32	47	57	-	5.8	8	13	-	-	2	3
64	PHILIPPINE	5.8	5.9	17	23	30	36	-	6.4	8	10	-	12	2	3
65	QATAR	-	-	-	-	-	-	-	-	-	-	-	-	3	2
66	RHODESIA	-	-	-	-	-	-	-	-	-	-	-	15	5	6
67	RWANDA	-	-	-	-	2	4	-	6.9	10	-	-	20	2	6
68	SAUDI	-	-	-	-	12	21	-	7.2	-	12	-	2	3	2
69	SENEGAL	-	-	-	-	22	28	-	6.3	13	14	-	13	3	5
70	SIERRALEON	-	-	-	-	12	15	-	5.9	-	15	-	11	5	4
71	SINGAPORE	-	5.3	-	-	69	70	-	2.8	8	11	-	19	4	1
72	SOMALIA	-	-	-	-	18	28	-	6.1	20	43	-	-	3	6
73	VIETNAM S	-	-	-	-	13	17	-	6.2	-	-	-	-	1	6
74	SRI LANKA	-	5.8	-	-	18	24	-	4.2	14	12	-	4	1	5
75	SUDAN	-	5.1	-	-	9	13	-	7.0	6	14	-	-	3	6
76	SYRIA	-	5.9	-	42	37	46	-	7.1	-	25	-	27	3	2
77	TANZANIA	4.4	-	-	-	5	7	-	6.7	9	-	-	-	5	6
78	THAILAND	-	5.8	-	-	13	17	-	6.3	10	11	-	14	1	6
79	TOGO	-	5.8	-	-	10	14	-	6.7	8	15	-	6	5	4
80	TRINIDAD&T	-	4.8	38	-	21	25	-	3.4	11	-	-	-	2	2
81	TUNISIA	5.1	-	-	-	32	47	-	6.2	17	14	-	7	3	2
82	UGANDA	-	4.8	-	-	5	8	-	6.1	9	-	-	13	2	6
83	UPPERVOLTA	-	-	-	-	5	8	-	6.5	17	23	-	20	5	6
84	URUGUAY	-	-	-	-	73	81	-	2.9	9	12	-	10	2	1
85	VENEZUELA	-	-	-	-	68	82	-	5.3	14	15	-	6	2	2
86	ZAIRE	-	-	-	-	20	26	-	5.9	18	25	-	14	4	4
87	ZAMBIA	-	4.6	-	-	18	37	-	6.9	11	23	-	-	2	4

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APPENDIX C

STATISTICAL METHODOLOGY

The basic technique which has been used to search for significant relationships between energy and economic and social development is multiple linear regression. This is a well-known technique for estimating the coefficients, B_i, of an equation of the type:

$$y = B_o + B_1x_1 + B_2x_2 + \ldots + B_nx_n$$

where y is the dependent variable and x_1 through x_n are the independent or explanatory variables. For instance, y may represent the PQLI, and x_1 the energy consumption per capita (variables x_2 through x_n not being present in this instance).

It is not the purpose of this appendix to describe the mathematical methods which are used in estimating the coefficients. The interested reader can find a good description in Plackett.[19] However, the main parameters which describe the significance and importance of the relationship obtained will be briefly described. These are called the coefficient of determination (r^2), the F statistic, and the standard error of the coefficient.

The coefficient of determination, r^2, shows how much of the variability of the dependent variable is explained by the relationship. More precisely, r^2 is the fraction of the total variance of

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[19] Plackett, R.L., Principles of Regression Analysis, Oxford University Press, 1960.

the dependent variable which is explained by the regression. It is an indicator of the closeness of fit of the data to the regression surface. If r^2 is near 0, the fit is poor; if r^2 is near 1, the fit is good.

The F statistic for an independent variable is an indicator of the significance of that variable in the relationship. For 1/10 degrees of freedom,* any value of F greater than 4.96 shows significance at the 5% level. For 1/30 degrees of freedom, the value decreases to 4.17. For specific cases, the reader should refer to a standard F statistic table.

The F statistic for the regression is an indicator for the strength of the linear relationship as a whole. Again, the meaning of the value of the statistic is dependent on the degrees of freedom given. As an example, for 2/40 degrees of freedom, any value of F greater than 3.23 shows there is a significant linear relationship at the 5% level. Again, for specific cases, the reader should refer to an F statistic table.

The Standard Error (S.E.) of a coefficient B represents the accuracy with which the coefficient is estimated. It is the standard deviation of the sampling variability of B.

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*The numerator of the degrees of freedom is the number of independent variables in the regression equation. The denominator is the difference between the number of data points and the number of independent variables, minus 1. Thus 1/10 degrees of freedom refers to an equation with 1 independent variable and 12 data points.

Factor Analysis is a method derived from regression analysis. The major difference is that the technique seeks the resolution of a number of observations of a set of variables linearly in terms of a small number of explanatory "factors." These factors are not predetermined, but are hypothetical constructs developed by the mathematical process. The resolution is accomplished by the analysis of the correlations among the variables. A satisfactory solution yields factors which convey all the essential information of the original set of variables.

The basic equation then becomes:

$$y_j = B_{j1}F_1 + B_{j2}\ F_2 \cdots + B_{jn}\ F_n + e$$

where y_j is the variable,* F_1 through F_n are the (hypothetical) factors, B_{j1} through B_{jn} are constants, and e is an error and residual variance term.

The factors are uncorrelated, and their explanatory power is measured in terms of their abilities to reduce the residual variance. This is measured by their eiger values.

A detailed discussion of factor analysis is given in Hannan.[20]

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*Not the jth observation.

[20] Hannan, H.H., Modern Factor Analysis, University of Chicago Press, 1967 (2nd edition).

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