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**A GLOBAL ANALYSIS OF SOCIOECONOMIC VARIABLES USING
GROUPINGS BASED ON GROWTH RATES FOR SECONDARY
EDUCATIONAL ENROLMENT**

by

BRIAN DAVID AARENAU, B.A.

**A thesis submitted to the Faculty of Graduate Studies
and Research in partial fulfillment of the requirements
for the degree of**

Master of Management Studies.

School of Business

**Carleton University
Ottawa, Ontario**

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**A GLOBAL ANALYSIS OF SOCIOECONOMIC VARIABLES USING
GROUPINGS BASED ON GROWTH RATES FOR SECONDARY
EDUCATIONAL ENROLMENT**

submitted by Brian David Aarenau B.A. in partial
fulfillment of the requirements for the degree
of Master of Management Studies.

for: David Gray
Thesis Supervisor

July 29/94
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June 22, 1994

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ABSTRACT

It has been suggested (Hobbs and Kiggundu, 1992) that secondary education is an important factor for countries which want to achieve socioeconomic growth and development. This study examines other socioeconomic variables which include: birth rates (BR), the number of televisions per 1000 households (NTV), energy consumption per capita (ECPC), gross domestic savings (GDS), gross domestic investment (GDI), life expectancy (LE), the percentage of females in the workforce (PFIW) and urbanization (URBZN), to determine if these variables are influential enough to discriminate among countries which have different levels of educational development. Specifically, 129 countries are grouped according to Growth Rates For Secondary Educational Enrolment (GRFSEE). Descriptive discriminant analysis (DDA) is used to determine if the selected variables do in fact discriminate between the groupings, and to show which variables discriminate most effectively.

The results show that based on GRFSEE three indicator variables ECPC, BR, and LE are effective discriminators and in general support the hypotheses. The results of this study indicate that the selected socioeconomic variables can be used to discriminate among the groupings and may be manipulated in coordination with secondary education to increase economic and human development.

1.0 INTRODUCTION:

One goal of less developed countries (LDCs) is to improve the quality of life (QOL) for their citizens. Each country must begin by identifying the socioeconomic variables which are necessary to improve their own QOL. These factors differ for countries at different stages of development. For example, developed countries want to improve their QOL by increasing employment levels and per capita income, while decreasing inflation and debt levels, while in LDC's, the people are still dealing with the basics such as availability of clean water and food. Studies on developing countries such as China, Taiwan, Thailand and Malaysia, show that increased industrialization is a key factor for achieving QOL. It is also known (Hobbs and Kiggundu, 1992; Thomas, 1992) that increased industrialization depends for its success on the provision of an educated workforce. In countries at all stages of development, education is an important socioeconomic factor that when used properly can aid people in their quest for QOL. It has been shown (Hobbs and Kiggundu, 1992) that when a country's level of enrolment in secondary education reaches approximately 62%, the distribution of a country's labour force moves from being predominately in agriculture, to being employed in industry and service. This signals a change in the country's economy from agriculture to one of industry and service. Since most LDCs wish to attain industrialization for the purpose of becoming more developed, the level of secondary education participation is of great importance.

Besides income and occupation, what other socioeconomic variables are important to a country's economic development? Can the variables be used to discriminate among countries? If they can, will they allow us to identify and explain the different rates of educational development for different countries? This study will try to answer some of these questions. This paper will analyze United Nations (U.N.) data from 129 countries and will generate groupings of approximately equal size, based solely on their GRFSEE. The statistical technique of descriptive discriminate analysis (DDA) will then be used to determine which socioeconomic variables best discriminate among the groups. This exploratory study will then analyze these socioeconomic variables in an effort to select variables whose dimensions, when understood, can be manipulated for the purpose of increasing industrialization and economic and human development.

2.0 LITERATURE OVERVIEW:

After an extensive search of the literature, it appeared that only a few studies examined socioeconomic variables either nationally or globally, as they relate to secondary education. Those studies which were found included: Hobbs and Kiggundu's (1992) study on Secondary Education and the Workforce, Grant's (1978) study on Disparity Reduction Rates (DRRs) in Social Indicators, and the United Nations Research Institute for Social Development (UNRISD, 1972) study by McGranahan, Richard-Proust, Sovani and Subramanian. These studies will be discussed in more detail in the second part of this literature review. In addition, part

two of the literature review will also discuss some case studies on development by Thomas, Raby, Jalil, McGinn and Shafer (1992). This will be included to show what governments of different countries have done in the past to increase development, and to demonstrate what still needs to be done. Except for two studies: one by the UNRISD (1972), and the other by Grant (1978), almost all of the studies that were found discussed only the effects of governmental policies on education and their role in economic growth and development. Few national or global studies were found which dealt with socioeconomic variables in regards to secondary education and economic development.

Therefore, the first section of this literature review is an overview of the literature which led to the creation of this research question. The second part of the literature review concludes with a discussion of studies that tested or examined socioeconomic data either on a national or on a global scale.

2.1 LITERATURE REVIEW

2.11 Literature Review - Part 1 The Process.

The process begins with the intriguing question of how to improve a country's quality of life for its citizens. What steps should a country take to improve QOL? If a specific factor or set of variables is found, can they be used as a recipe for investigating improvement in all countries, or does it differ for countries at different stages of development?

The first step in the process is to define "Quality of Life". It should be pointed out that the definition might be different for countries at different stages of development. The Human Development Report (HDR, 1991), answered this question by stating that QOL is improved when there is increased human development. This definition is true for countries at all stages of development, since no matter what variables the specific country emphasizes, the main purpose is to increase human development. The only thing which would change is the emphasis placed on the different variables according to the different needs of countries which are at different stages of development. Human development is defined as the process of enlarging the range of peoples' choices, allowing them greater opportunities which include: education, health care, income and employment. Human development is concerned with developing human capabilities and with using them productively. The former requires investment in people, the latter, that people contribute to GNP, growth and employment. Both are essential components of development (HDR, 1992).

2.12 Literature Concerned with Classification:

The question then becomes: How can human development be improved? What socioeconomic factors (variables) will have the greatest influence on human development? Developmental literature focuses both on economic variables and on social variables, but it may be more appropriate today for the focus to be on socioeconomic variables, since they deal with both the social and economic needs of

countries. Perhaps the answer could be found by examining in more detail the types of U.N. data that are collected and how it is presented.

United Nations agency reports present the data for each country in columns, each of which represent a different variable. In an effort to provide order and structure and to help with the assessment of a country's social and economic well being, countries are ranked and presented in ascending order according to their gross national product (GNP). For example, in the World Bank Development Report and in the Human Development Index Report, the primary ranking system used to present and rank countries is according to GNP.

The GNP is a measure of all the goods and services produced by a country and acts as a measure of national income (Samuelson, 1976). It provides a measure of productivity, economic growth and income, and therefore serves as a measure of national economic success in the world today (Peterson, 1978).

Many countries and international agencies rely on these data to make policy decisions. The countries with the lowest ranking are generally considered the poorest of the poor and as a result of this ranking system, may be in line for larger amounts of foreign aid. However, it should be pointed out that GNP alone is not always used to make these decisions and would not by itself be an appropriate measure of the amount or type of needs. Sri Lanka is a good example of why GNP alone would not be an appropriate indicator. It has a very low GNP but very good social indicators, such as low infant mortality (IM) and high LE.

Another commonly used tool today is Gross Domestic Product (GDP). It offers a way to measure net national income through an output approach (Lipsey, Purvis and Steiner, 1988). Many governments and economic agencies have replaced GNP with GDP as a preferred measurement tool (World Economic Outlook, 1991).

However GNP and GDP are economic measures and do not take into consideration the many important social factors such as LE, IM and literacy which lead to quality of life.

2.13 Literature Concerned with Measuring Development:

What are the important factors which should be included when trying to find ways to improve human and economic development? Is productivity all-important? A number of leaders, from the pharaohs in Egypt to Stalin of Russia, have shown us that productivity can be achieved but with great expense to the people. Therefore, economic factors such as GNP or GDP should not be the sole consideration.

There are many people who argue that social indicators are what is really important. The Human Development Report,(1991); Hobbs and Kiggundu (1991), are among many reports which state that LE and IM are two very important social indicators. However, it is also well known that social programs which attempt to increase LE and decrease IM cannot exist in the long term without proper funding, which is usually made available through increased productivity. Social indicators such as the Physical Quality of Life Index (PQLI) and/or its components, are important

indicators and should be used in a system which gathers data to assess development. However, they must be used in conjunction with economic indicators.

Grant (1978) showed that economic indicators such as GNP should be used in conjunction with social indicators when examining countries to determine their quality of life, as they provide a symbiotic effect. He created a socioeconomic model to demonstrate the types of inputs or socioeconomic factors which may be used to try to improve physical well-being and QOL.

However, The World Development Report and other United Nations reports, still present the countries and their data in groups which are based solely on the countries GNP or GDP levels. This is a clear demonstration of how difficult it is for the United Nations to get all the countries to comply with new data collection requests. It may also be one of the reasons that Grant did not test his socioeconomic model. One of the major problems faced by government and international agencies when trying to study and improve development, is that accurate economic indicators and sufficient measures of social well-being are difficult to develop and implement. This may also be one of the main reasons that a search of the literature did not uncover any significant global studies using socioeconomic indicators.

2.14 Literature Concerned with Social and Economic Indicators:

The literature review did uncover studies on how to measure development and the advantages and disadvantages of using the different indices. A few of them are now outlined.

Grant (1978), and Kiggundu and Hobbs (1989), discuss two social indicators which were developed to aid in the ranking of countries according to their ability to meet basic needs. These two scales were the PQLI and DRRs. The PQLI was proposed by the Overseas Development Council, and is composed of three social indicators which are equally weighted (Grant, 1978). The three indicators are: LE, IM, and literacy. However, Kiggundu and Hobbs (1989), showed that both LE and IM are highly dependant on education hence the PQLI calculation involves double counting. There is therefore some doubt as to the value of the PQLI as a measure of social well-being. Grant concluded, that to get a more comprehensive view, the PQLI must be used in conjunction with DRRs and some economic indicators. The DRRs proposed in 1978 at the Declaration of Amsterdam, are used to show the rate of change over time for each of the PQLI indicators. In fact in this declaration, target levels for the year 2000 were set for each of the PQLI indicators. The aim was to reduce by half the disparities of the three social indicators. Grant stated that the major advantage in using DRRs with the PQLI was that it provided an index which was equally applicable to both developing and industrialized countries. However, it should be pointed out that DRRs when taken by themselves were often misleading. Yet despite any shortcomings, the use of DRRs and the PQLI together with other economic indicators, still provides a good basis for evaluating countries and developing new policies for improvement (Hobbs and Kiggundu, 1989).

A third index called The Human Development Index (HDI) uses a similar measure of development. Its measure, like that of the PQLI, uses literacy and LE,

but instead of using IM it uses the log of real GDP per capita (Human Development Report, 1991). This index provides some interesting results, but like the other two, it yielded some exceptions to the rule. For example, in the case of the PQLI, Sri Lanka's results are different when comparing it with GNP. In 1985 Sri Lanka had a GNP which places the country among the poorest countries but a PQLI of 85.5 which places it in the upper third. The discrepancy is caused because the PQLI only looks at social indicators and Sri Lanka has good social indicators, a long LE and a low IM (Hobbs and Kiggundu, 1991). The HDI does not show this same discrepancy because it looks at both social and economic variables. However, it also yielded some peculiar results. Hobbs and Kiggundu (1991), point this out by examining The Iran Islamic Republic which had a HDI of .691 which placed it in the "medium human development" range, yet, it reported an IM of 108.1 which was far greater than Kenya whose HDI places it in the "low human development" category.

Hobbs and Kiggundu (1991), point out that none of these indices looked at IM by itself nor did they identify the variables upon which LE depends. Hobbs and Kiggundu looked at LE and IM because there has been increasing evidence that studying GDP and other macroeconomic indicators is insufficient as measures of peoples' social and physical well-being, and as a measure of peoples' QOL. Furthermore, Hobbs and Kiggundu argue that education should not be measured solely by literacy, but that it should be measured by primary and secondary educational levels. In fact, they found that primary and secondary education as well as the number of doctors and nurses per population, influence both LE and IM.

Specifically, they report that increasing the number of doctors or nurses and increasing nutrition will cause a decrease in IM and an increase in LE. This effect was also demonstrated by an increase in female primary and secondary education. Hobbs and Kiggundu concluded by questioning the wisdom of using an index to evaluate countries at different levels of development, since average scales tend to obscure the true situation in regards to a country's specific variables.

The literature review did not reveal studies which examine the relationships among all of the variables (indicators). However, a few studies did examine a few of the indicators. Hobbs and Kiggundu's (1991) study which was just discussed in the preceding paragraph, examined IM and LE and found a correlation to exist between female primary and secondary education and LE and IM. A second study by the United Nations Research Institute for Social Development (UNRISD, 1972), also looked at LE and IM but also examined the relationships among a much greater number of indicators. It is discussed below.

2.2 LITERATURE REVIEW PART 2:

2.21 Literature on Socioeconomic Studies:

The UNRISD study (1972), is the most similar to the proposed research since it was a global study which included approximately 115 countries using socioeconomic variables as indicators for development. It examined the nature of development and the inter-relations of its social and economic aspects. In the study, a method of successive approximations was used to select variables. It was based on a two pronged approach. The first step was to choose socioeconomic variables that logically seem to involve a progression towards various objectives or values which countries seek to achieve. Since it was a global study the logical objectives had to hold true for countries throughout the world. This way the results could be applied on a global scale. A good example of such variables are LE and IM since all countries want longer LE and decreased IM. On the other hand, the number of women working may not be as good since certain countries discourage women in the workplace due to religious, cultural or political reasons (McGranahan, et al, 1972).

In the second step, indicators are chosen which empirically demonstrate their ability to distinguish among countries at different stages of development. This process was necessary since at the time of the UNRISD study, there was no quantitative criterion of development against which the variables could be tested. However, in this proposed study GRFSEE was used to test and examine the effects of other socioeconomic variables. Specifically, GRFSEE was used to ascertain the

extent to which other socioeconomic variables can discriminate among countries at different levels of human development (McGranahan, et al, 1972).

The UNRISD (1972), study then employed a component indicator approach for measuring standards of living and development. It accomplished this by collecting an initial data base of 73 conceptually derived socioeconomic indicators in accordance with the methods described above. This group of variables was then further reduced by using the assumption that variables with high average inter-correlations with other logical, conceptually derived development variables, are better indicators than those with low inter-correlations. Through this process a set of indicators was established which could then be used to establish and test a further more refined set. Based on this method the initial group of 73 indicators was then reduced to 42 core indicators. This was then reduced to a highly correlated core of 18 indicators.

Through the successive approximations approach component indicators (variables) were chosen and others were eliminated. For example, health was viewed as a value component of development. Mortality rates were chosen as an indicator of health. However, it was found that mortality rates do not take the age structure of the population into account and have poor correlations with other development indicators. Therefore, mortality rates are poor indicators of development. Unlike mortality rates, LE was chosen since it has a high correlation with other development indicators used in the study (McGranahan, et al, 1972).

However, high correlations when used alone are not sufficient, logic is an important consideration for variable selection. For example, agricultural production and school enrolment levels are highly correlated but, one can not seriously propose measuring agricultural production by school enrolment (McGranahan, et al, 1972).

The selection procedure used in the 1972 UNRISD study implies that development can be defined quantitatively by a group of highly inter-correlated variables which undergo change together. These variables may change at different rates and may have low correlations with each other but high correlations with the objective criterion. Components of development are inter-correlated and therefore, higher scores among socioeconomic variables tend to be found together in highly developed countries.

Correspondence analysis (CA) was then used to examine the core variables and to create an index of socioeconomic development. CA is a descriptive analysis of the inter-relations of variables in terms of their correspondence. The technique measures the level of growth a particular indicator has on any other indicator and vice versa. For example, once the score of a particular country is known for an indicator's effect "x on y" and "y on z", this information can then be used to predict the score which measures the effect of indicator "x on z" of that country. A scatter diagram can be used to find the best fitting curve for all the indicators. The use of CA helped to eliminate duplicate variables and to create variables with a wider sectoral spread. The next step was to create a general socioeconomic index which could be used to distinguish among countries at different levels of development.

The UNRISD study (1972), concluded that the problems of using an index could be compensated for by the methods used to select and test the socioeconomic variables which formed the index. While it was not perfect, their consensus was that it offered better results than using Net National Income (NNI). This conclusion was reached because the general index gave a better reflection of the structure and distribution of a country's income. It also gave a more substantial picture of what was happening in general to a country over time. Furthermore, NNI had a tendency to demonstrate more erratic fluctuations over time, making predictions or estimates of missing or future data more difficult and less accurate. Finally, their findings showed that the index provided a better basis for distinguishing between developed and developing countries and for distinguishing in terms of the overall level of socioeconomic development (McGranahan, et al, 1972). An example which demonstrates the problems of relying on NNI is demonstrated in the 1972 UNRISD study, which found that Japan was ranked lower on the development scale than Venezuela because Japan's NNI (income per capita) was lower than Venezuela, despite the fact that Japan had a higher distribution and structure of income, not to mention higher literacy rates, longer LE and lower IM (McGranahan, et al, 1972).

In contrast to the above findings, (Hobbs and Kiggundu, 1989) stated that composite indicators such as the PQLI (and those similar to the one created by the UNRISD), are no longer the best way to proceed since they obscure specific information which leads to poor conclusions. In addition, since that time new types of data have been collected and are available.

It is hoped that the proposed research will uncover some socioeconomic variables which can be used to enhance current indicators and improve QOL through economic development. By finding proper methods for measuring development and for improving QOL, governments and international agencies will be better equipped to create policies which can efficiently aid countries in their task of economic development.

2.22 Literature on International Aid for Development:

Numerous studies (e.g. Brodhead, 1978; Saint-Germain, 1985) on foreign aid and developmental assistance were reviewed in an effort to discover how aid leads to development. This was important because if foreign aid was found to be an important factor in development, then the aid programs can be structured to include socioeconomic variables that will help to improve QOL and human development. The case study strategies of developmental assistance which were found dealt with the important requirements for development and some of the attempted solutions. The studies addressed why certain procedures should be followed in order to make foreign aid programs more successful. The section concludes by pointing out some of the newest ideas and concerns in regards to development.

There are many different factors which affect a country's development. Developed countries which offer foreign aid toward developmental systems must be aware that the developmental requirements of third world countries are many and diverse. Therefore, they must be aware of, and able to adapt their developmental

assistance programs to the many complex and changing needs of developing countries. This resource management is necessary if the developed countries are going to allocate their scarce resources toward making effective strides in development. This section will now review some of the many areas of development, and programs on which governments and international agencies have concentrated in their efforts to promote greater development in the developing and LDCs.

Foreign aid was to be used as a tool toward effecting a more equitable distribution of the world's wealth. In the 1970's, goals were set by the United Nations. The target was for industrialized countries to give 0.7 percent of their GNP. Unfortunately, as of 1976, near the time of Brodhead's paper, even the wealthier countries had not reached the goal. Canada was only giving 0.48 percent of its GNP. Other countries were adopting "trade not aid" policies, while many others were realizing that voluntary measures were not going to be enough and were therefore calling for a global tax (Brodhead, 1978). A global tax has not been imposed to date, perhaps thanks to a widening sense of social responsibility. Even so, there is still a great need for more foreign aid and even today not all industrialized countries are giving their allocated percentages of their GNP's.

The problem of funds for foreign aid are not the only ones. Countries have long been grappling with the questions: What criteria should be used to establish who gets the aid?; While others are asking what type of aid should be given? (Marshall, 1985; CIDA, 1986). Between 1975 and 1980, in its Strategy for International Development Cooperation, the Canadian International Development

Agency (CIDA) formed its policy to help the poorest countries by meeting the basic needs of the poorest people. CIDA pursued its policy with bilateral programs, giving special emphasis to women (CIDA, 1986). Education was included in all of CIDA's policies and programs. Several studies (Teigeler, 1985; CIDA, 1986) have shown that better education for women combined with employment programs, lead countries to greater development. Evidence of this fact is seen by declining population growth, lower child mortality rates, better nutritional habits and a general improvement in the quality of life for families and their communities. In addition, development programs which address women's needs have a greater chance for lasting success (Teigeler, 1985).

When examining the basic needs of the poorest people one example that comes to mind is water. While it may not be a great concern to Canadians who have 110,000 cubic meters per person, one of the highest per capita measures of fresh drinking water, it is of great concern to developing countries such as India which only has two percent of the Canadian allotment, and of even greater concern to LDCs such as Egypt and Sri Lanka which have approximately 0.1 percent. It was therefore no surprise when a peasant from Sri Lanka pointed out his most important concern by saying "If there's no water there's no development" (Taylor, 1985, P.1). Therefore, in 1980 the United Nations General Assembly (UNGA), proclaimed this decade The International Drinking Water Supply and Sanitation Decade. The goal was clean water and adequate sanitation for all.

In accordance with the UNGA, Canada helps developing countries harness their water resources. It does this by building physical structures such as maintenance facilities and dams which can be used for hydroelectric power. However, most countries lose 70 percent of their water withdrawals through irrigation, with industry and domestic water usage only accounting for 23 and 7 percent, respectively. Therefore, developmental assistance programs must also include training and education in such areas as resource planning and management, irrigation, water supply and sanitation (Grover, 1985).

A 1965 study by Mihaly on Nepal concluded that the reason most national and agency aid programs failed to accomplish their goals was because Nepal was not ready for social, economic nor political change. More specifically, Mihaly cited two main reasons for the failure. The first was because the people of Nepal were not willing to learn the new technologies. Some were unable to imagine change, while others were against change for social, religious or economic reasons. Advances can not be made without an increase in education, which requires a willingness to learn. Second, the government was neither capable nor willing to administer the developmental projects (Mihaly, 1965).

CIDA's primary task in providing developmental assistance is to ensure that in the third world people have the required skills and knowledge to handle their development problems. A formal education was long considered to be the solution. However, they did not want to repeat the problems which were encountered earlier in Nepal. Toward that end, the concept of combining literacy instruction and other

formal education with work related projects, and other less formal teaching techniques was employed (Carr-Harris, 1979).

By the mid 1980's, to reach the goals of the General Assembly's Water Decade, the overall emphasis was changed from capital-intensive projects, such as urban type water distribution and sewer systems, to low cost, locally maintained alternative technology, which included hand pumps and gravity fed water systems. The main technological point was to design and adapt systems that could be locally maintained by their users (Taylor, 1985). In addition, to further create a willingness to learn and participate, imaginative educational techniques were used. These included creating a carnival-like atmosphere with music, dancing, community newsletters, posters and audiovisual stimuli. Another lesson learned was that community education and participation is vital to the success of any development assistance projects (Taylor, 1985). In time Nepal's need for these types of programs began to change. Canadian developmental assistance programs changed from one of teaching basics to the tackling of operational projects, which included developing policies and strategies for water and energy sectors (Marshall, 1985).

Between the years 1966 and 1986, developing countries have made significant advances. Per capita incomes have doubled, IM has been cut in half, and LE has increased by over ten years. In addition, there have been great strides in literacy and female enrolment in primary schools has almost tripled. Countries such as India and Bangladesh have improved agricultural productivity and are making strides toward

self sufficiency. Developmental assistance has played a great role. Without it, technological and material assistance would have been much slower (CIDA, 1986).

However, many problems still remain and new ones are developing each day. In the past, education had been the main focus of developmental assistance. Saint-Germain (1985), stated that most decision makers agreed that formal education was a major factor in development. Today, education is still very important, but it must be changed from its formal inflexible state to a non-formal and more flexible one.

The Human Capital Theory (HCT) and Modernization Theory (MT) have both made strong impacts on educational planning. The HCT assumes that development is best achieved by training humans and thereby transforming them into a productive labour force. An educated workforce provides for industrial development and economic growth. To be successful the education must provide for increased technological efficiency and an upgrading of human resources to use the new technology. However, by the late 1970's the labour market began to realize that better education was not enough. It does not necessarily lead to a better job or higher income. Many also began to feel that the HCT overestimates the link between education and standard of living, while underestimating the importance of individual qualities (Saint-Germain, 1985).

Modernization Theory was then developed. It holds that society develops because people have individual values that enable society to be open to economic and technological innovation (Gailbraith, 1979). School, through the transmission of

knowledge and the acquisition of skills, plays a fundamental role in achieving these values, thus changing an individual's values, beliefs and behaviours. This change requires more than formal education. It requires community involvement and local participation even beyond the extended family. It requires going beyond traditions and a quest for knowledge (Saint-Germain, 1985).

Today, a new theory has evolved, that of non-formal education. Non-formal education is a systematic, organized activity whose aim is to gain knowledge, skills and attitudes which are closely related to the expressed needs of a local community or individual. In this way, education becomes an essential activity that is no longer "academic", removed from daily life exclusively to provide a diploma, but rather a way to gain the skills, knowledge and attitudes that are meaningful for individuals, and that pave the way for economic growth and development. This can best be accomplished through the theory of Educational Disconnection. According to this theory it is possible to detach certain activities, moving from a formal education which relies too heavily on the transmission of knowledge, to one which promotes acquisition of knowledge (Saint- Germain, 1985).

In 1989, Canada provided 2.5 billion dollars to more than 30 third world countries. The orientation and developmental assistance program headed by CIDA is continually evolving with the imperative for rapid economic growth being even greater today. This is evident by today's issues which now include a major expansion in the world's projected population, as well as other environmental concerns such as thinning of the ozone layer and global warming. In addition to these new issues,

many of the older fundamental concerns still remain. These include: hunger, lack of potable water, poverty, and unemployment. In an effort to solve these problems, government agencies such as CIDA, must develop proper socioeconomic indicators which can be used to distinguish among countries at different levels of development. This will help them to develop more effective foreign aid policies, which can be structured toward the socioeconomic variables, which when improved, will lead to greater QOL and increased human development.

In 1987, at the World Commission on Environment and Development CIDA announced its strategy to promote sustainable development. As a result of all the basic requirements still facing third world countries, sustainable forms of development are a precondition for economic growth and development. For human survival this growth and development must be sustainable not only economically but ecologically. Programs toward this end include: bilateral assistance, environmental cooperation in coordination with economic projects, foreign trade and better economic relations among industrialized and developing countries (MacNeill, Cox & Runallis, 1989).

In a more recent study, Kiggundu and Hobbs (1989), examined the deployment of Canadian experts and teachers in international development. They discussed the Canadian foreign aid policy, which states that foreign aid should be directed toward the poorest of the poor. The study showed that in many cases the needs of the developing countries were not always met and that they did not always adhere to the Canadian policy of helping the poorest of the poor. There are two

main reasons for this discrepancy. 1) That the Canadian policy is burdened by many conflicting goals and objectives such as differences in human rights issues, as well as political and financial issues. 2) Many times the problems may be with the developing country which may not have the resources to fully benefit from the type of aid being offered.

Another lesson which can be learned from the study, is that without the use of proper socioeconomic indicators, countries and government agencies such as the CIDA, may have problems developing proper foreign aid policies, and therefore, may neglect the real needs of many developing countries (Kiggundu and Hobbs, 1989). If influential socioeconomic variables can be discovered, then proper indices or more reliable measures of development can be established. These measures of development will then aid governments and international agencies with their development of proper foreign aid policies.

The question remains: What should governments be doing to increase sustainable economic growth and development? Governments should be searching for socioeconomic factors which are related to social and economic goals. If they can identify which socioeconomic variables discriminate between countries at different levels of development, then they may be able to influence these variables through government policies, and prepare a country's workforce for industrialization, which in turn will lead to economic growth and development.

2.23 Literature on Education Studies:

Which socioeconomic variable is the most important? Many studies such as Caruana, 1992, Jiang, 1992 and Thomas, 1992, have suggested that education is the most important socioeconomic variable for promoting economic development. The socioeconomic variable, education, was examined in almost every study of this literature review. There are two possible reasons for this finding. The first reason for choosing education may have been the lack of other reliable socioeconomic data available at the time. The second reason is that education is a logical place to begin. This is because education can be used to provide a country's workforce with the ability and knowledge to perform the more technical jobs of the manufacturing and service sectors. It has been established (World Development Report, 1991) that a shift from an agricultural economy to one of industry and service, is a positive step toward increasing economic growth and development. Furthermore, later in this paper it will be shown that education is one of the most important factors in achieving this sector shift. We will now examine some of the studies which led to these conclusions and some of the national studies on educational development.

Recently, there has been a growing trend toward foreign investment. One of the most important types of foreign aid and investment comes in the form of technology transfer. "The underlying assumption is that the acquisition of technology will improve the recipient countries' ability to participate in global trade, and, in so doing, increase their financial health and improve the standard of living of the population". (Hobbs and Kiggundu, 1992, P.1) However, it is not just the money

which is important. Developing countries have a great need for technology transfer. This does not only include technology, but the know-how and ability to use it to the fullest advantage. Along with this trend comes a need for information in regards to global work forces and their capabilities. Investors, governments and international agencies want to know about the relationship between educational levels and the percentage of the workforce employed in agricultural, service and manufacturing/industry sectors. With this knowledge they will be able to establish some measure of the country's ability to handle a transfer of technology.

Toward that end, Hobbs and Kiggundu (1992), have begun such a study. They conducted a global study of 129 countries using U.N. data and found a correlation between primary and secondary education, and the distribution of the workforce by three employment sectors. Their findings showed that when approximately 62% of the age group is enrolled in secondary education, the labour force will be predominantly concentrated in the manufacturing and service sectors, and will be of a sufficient educational level as to support successful technology transfer.

The paper will now continue with a review of some of the most recent national studies on policy development for increased education. Jiang (1992), examined the role of educational expansion in Taiwan's economic development. He found four major ways that education leads to economic development.

- 1) Education increases knowledge and skills that are required in the workplace and which increase labour productivity.

2) Workers who are more highly educated, move to high technology jobs where they are more productive and where they can earn more income. In addition, this leads to increased labour mobility which allows for more efficient allocation of labour to the production process and to continued economic growth.

3) Through education, job opportunities and wages were increased. Improving the quality and earning capacity of the labour force, led to increased labour force participation. This is advantageous for developing countries where labour intensive industries account for a large share of exports.

4) Education may help to equalize the distribution of labour earnings which contributes to social stability and in turn promotes economic development.

In addition, Jiang points out that one of the major factors which helped to improve Taiwan's economic development was the reversal in the early 70's of the "Brain Drain". This reversal occurred thanks to better working conditions, higher national income and more economic development. The main conclusion from this study is that the expansion of education increased economic development by providing a better quality of labour for higher stages of industrial production.

According to Thomas (1992), there has been general agreement that less developed societies, compared to more developed ones, have substantially lower

social and economic indicators. These indicators include GNP, per capita income, employment rate, life expectancy, health status, literacy rate, level of education, quantity of communication media, and percentage of the population living above a defined poverty level.

Although some economists and educators believed that investment in infrastructures was a cure-all for development problems, it was not until planners turned their attention to the special problems of economically depressed nations - such as employment opportunities, social and religious bias, and political influences - that real solutions could be considered. Therefore, it was not uncommon that a basic development strategy was to offer formal education programs to a greater number of a nation's inhabitants. In doing so, education was considered a major determinant in a nation's socioeconomic development (Caruana, 1992, p.2). A case in point is at the University of Malta, where business oriented courses prepare individuals for careers in private industry and government in the field of business, accountancy, and public administration. Other students were sent to highly industrialized countries to receive technical expertise in agriculture, fishing, resource exploration and manufacturing. This is a good example of a country using education to increase its economic development. Advances were made in agriculture and in industry which resulted in sustainable economic growth and development. The greater the access to educational opportunity within a society, the more efficiently individuals can function as productive members of the workforce.

The literature describes several basic roles that education has played in the development of a country. For instance in the case of the Soviet Union, educational reform was accorded a key role in the Soviet Union's successive five year plans. Yet there have been major discrepancies between what was intended by the educational reforms, and what was actually achieved (Raby, 1992).

In the German Democratic Republic (GDR), the promise that a heavy emphasis on polytechnic education would enhance occupational life has never been clearly verified. Upon the GDR's decline, a number of industrial firms turned their backs on any obligation to accept students for any form of prevocational or polytechnic education. A further challenge to the value of polytechnic education was the appearance in the industrial world of the computer. In Western nations, computers have been placed in schools to enhance the learning experience. However, the government of the GDR was afraid that the computers would be used to access systems that were restricted. Therefore, access to computers in the schools was limited. Thus students and teachers were deprived of technical knowledge that has become widespread in the industrialized world (Shafer, 1992). This is a good example of how political influences can affect a country's economic development.

In Pakistan, only a small portion of the budget has been allocated to education. Over time, allocations to education have increased, but the initial increases have favoured spending on higher education, rather than on primary education. (Jailil and McGinn, 1992)

In contrast to the examples above, Indonesia's primary long term goal was for the nation to achieve economic prosperity. Subgoals included improving agricultural production, industrial growth, export/import ratios, educational opportunities, health conditions and population control. The chief strategy for reviving the economy was to concentrate efforts on the occupation in which the majority of the nation's workers were employed - agriculture. It appears that much of the thrust for advanced training was for the attainment of this goal, and thus many non-formal education programs were devised to stimulate the use of improved agricultural techniques. Their plan was designed to achieve a close match between educational offerings and the goals of attaining political, economic and cultural development (Thomas, 1992).

This study on Indonesia further emphasizes the fact that focusing on manufacturing or industry alone is not enough. Economic development can also be achieved by educating workforces in ways that will increase production, not only in industry but in the service sector, or, as in the case of Indonesia the agricultural sector as well.

2.24 Literature Which Directly Led To This Proposal:

While all these studies focused on education, there was one study which found that secondary education is the most important factor and should be the focus, if the goal of economic growth and development is to be achieved.

Hobbs and Kiggundu's (1992) study of 129 countries found that the sector shift from agriculture to industry occurs when enrolment in secondary education reaches

62%. Since a better educated workforce is better able to absorb technology, they can acquire technology more readily and therefore these countries can move faster to industrialization. This, in turn, leads to greater economic development. The country now has greater ability to participate in global trade, which further improves its financial health and standard of living. The end and desired result of all this is greater sustainable economic development. After examining their research study, the idea for a continuation was born.

For the balance of this paper the terminology used will be greater economic development rather than industrialization. This is because industrialization is a misleading term since it does not include the gains from a service economy.

3.0 RESEARCH PROBLEM:

The literature suggests that socioeconomic variables should play a major role in future development plans. Identifying and developing proper socioeconomic indicators is an important task which should concern governments and international agencies since they create most of the development policies and guidelines. While there are a great number of studies on education as a socioeconomic variable, there are few which examine education with other socioeconomic variables, and even fewer which do so on an international scale. Therefore this research explores the dimensions of certain select socioeconomic variables to determine how they relate to secondary education and to economic growth and development. The socioeconomic variables that are found to be effective help to discriminate between

country groupings, allowing for government and international agencies to set policies which increase enrolment in secondary education and increase economic and human development.

4.0 MODEL SECTION

Throughout the reading of the literature there exists an underlying model of development. However, the real task of this study is to select certain variables to act as indicators of secondary educational change which can be used to discriminate among countries at different levels of social and economic development. If they can be used to successfully discriminate, then perhaps these variables can be influenced or manipulated and thereby lead countries toward improved education and hence a better level of physical quality of life and social well being. The hypothesis section of this proposal explains the logic behind each of these variables. The hypothesized end result shows that these variables may be used to discriminate amongst the countries according to groupings which are based on growth rates of secondary education enrolment levels and thus influence economic and human development.

There were three main factors which influenced the selection of the socioeconomic variables which are studied as part of this research. First and foremost, was the availability of data for the variables. Second, the variables selected come from a wide range of social and economic areas. Third, the variables selected all have a certain logic and have been identified as important variables in the literature.

5.0 RESEARCH QUESTION:

RQ. What factors (socioeconomic variables) discriminate among countries at different levels of educational change?

6.0 RESEARCH HYPOTHESES and EXPLANATIONS

The hypotheses for each of the selected socioeconomic variables state whether a specific socioeconomic variable can discriminate among countries based on their GRFSEE and explains how these variables are related to economic and human development. Seven socioeconomic variables are tested in this study including: 1)birth rates, 2)communication, as represented by the number of televisions per 1000 households, 3)power usage as represented by energy consumption per capita, 4)higher savings and investment, 5)life expectancy as a measure of health, 6)the percentage of females in the workforce, and 7)urbanization.

H1: Birth rates will discriminate among countries at different Growth Rates For Secondary Educational Enrolment (GRFSEE). This is because a higher BR can result in fewer teachers per capita and in general less educational resources per capita. The end result is that 1)more of the people go into the workforce without an education and therefore remain in the agricultural sector or 2)they may all go into the workforce after receiving a lower quality education. These factors usually lead to lower productivity and decreased economic development.

H2: The number of televisions per 1000 households will discriminate among countries at different GRFSEE. Providing greater access to televisions which offer educational and informative programming begins a process which can result in increased economic and human development. This is logical because the greater the access to communication, the better educated people are in terms of job opportunities, politics, culture and all types of information. This knowledge of better employment opportunities will lead to more people training to fill these positions. This is a double plus since it will result in better qualified applicants for employers to choose from, and because it results in more skilled and productive workers, which translates into increased productivity and economic development.

H3: Power usage will discriminate among countries at different GRFSEE. An increase in power usage results in increased economic development. This is a positive self-feeding cycle. Industry requires greater use of technology and energy. This increased demand results in more production. Then with economies of scale, power becomes cheaper to use. Cheaper power in turn promotes more use, and therefore greater industrialization and economic development. However, these results are not always entirely positive. Negative results of development such as acid rain and other forms of pollution can also occur.

H4: Savings and investment can be used to discriminate among countries at different GRFSEE. The more money available the greater is the likelihood that people and institutions will have money to invest in education, or for the large amounts of capital required to fund the start up costs for industry. This in turn will lead to greater technical knowledge, industrialization and economic development.

H5: Life expectancy can be used to discriminate among countries at different GRFSEE. The greater one's LE, the more likely one will be to invest time and resources in educating oneself and potentially one's children for the requirements of industry and business. This will result in increased economic development.

H6: The percentage of females in the workforce can be used to discriminate among countries at different GRFSEE. Since more women are working they get more training and education. This will increase their productivity and economic development. Furthermore, more women in the workforce means greater employee selection which usually translates into a more productive workforce and a more equitable distribution of income and employment opportunities. This leads to greater economic stability and development.

H7: Greater urbanization can be used to discriminate among countries at different GRFSEE. Industries require people to be closer together, hence growth of cities. Greater urbanization means greater growth and availability of human capital resource. This results in economies of scale which produces better schools, daycare and of course economic development.

7.0 METHODOLOGY

7.1 DATA SOURCE

This research was reliant upon the availability of United Nations secondary data for all the variables which were tested. Global data for nine socioeconomic variables, accounting for 125 countries, was obtained from the 1992 Human Development Report or from the 1992 World Bank Development Report. Specifically, data on BR, NTV, PFIW, GDS, and GDI, was taken from the 1992 Human Development Report. Data for secondary education 1965 and 1989, hereafter referred to as SECED>A and SECED>B, URBZN, LE, and ECPC, was obtained from the 1992 World Bank Development Report (WBDR). Even though they were 1992 reference editions, the data reported for the different variables were not all for the same years. The newest data for all variables was for the years 1989-1990, except for the percentage of the age group enrolled in secondary education. These data were for the years 1965 and 1989. The country numbering in the data analysis followed the format used by the 1992 WBDR.

7.2 DATA ANALYSIS

7.21 Variable Selection and Data Preparation

The process began with the selection of SECED variables which were the grouping variables plus eight socioeconomic variables which acted as indicator variables. All the United Nations secondary data were in the required form, except for the enrolment figures on secondary education. These SECED figures were used to compute the variable GRFSEE and to establish the "time to attain estimates" which were then named with the variable name "Years".

Specifically, the GRFSEE figures for each of the 125 countries were used to determine the average annual growth rates for secondary educational enrolment. The growth rate was assumed to be linear over the 24 year time span. The formula used to determine GRFSEE can be found in appendix C. These growth rates were then applied to each country's current level of secondary education and used to compute the time to attain the 62% level which has been shown on average to be a requirement to be classified as an industrialized country.

7.22 Recoding Variables

After omitting countries with missing data, the remaining 101 countries were divided into approximately four equal groups. The criteria or range upon which the groups were based can be found below in Table 1 and is now referred to as the variable "years". This table shows time to attain estimates with the negative sign referring to the number of years a country has already been industrialized. The variable "years" was then recoded to reflect the four groups.

TABLE 1.

OF YEARS IT TAKES TO REACH INDUSTRIALIZATION

GROUP #	TIME TO ATTAIN ESTIMATE
1	LOWEST THRU - 13 YEARS
2	- 12 YEARS THRU 8 YEARS
3	9 YEARS THRU 71 YEARS
4	72 YEARS THRU HIGHEST

7.23 Basic Methodology

The basic methodology employed was DDA. The technique requires a grouping variable and indicator variables. It is recommended that at least 20 cases are available for each indicator variable for robustness. Growth rates for secondary educational enrolment were used as the grouping variable, while the different

socioeconomic variables served as indicator variables. Descriptive Discriminate Analysis tests these indicator variables to determine which ones can best discriminate among countries, based on the countries' different growth rates for secondary educational enrolment. This DDA technique works best when the data are multivariate normal or at least univariate normal. If the data are not perfectly univariate normal then some skewing of the distribution will likely occur, causing variance to be larger for some indicators than for others. When the data are not at least univariate normal then they must be transformed. This was done according to the techniques outlined in Tabachnick And Fidell (1989), and is described in section 7.25. Since it was assumed that the data representing an increase in secondary educational enrolment were linear, the following steps were taken after GRFSEE was computed.

7.24 Choice Among Discriminant Function Analysis (DFA).

There are three types of DFA, direct, hierarchical and statistical (stepwise). In the first type all predictors enter the equation at once, with each predictor demonstrating only its unique association with the groups. This was not chosen since it would not demonstrate how the other indicators associate together, nor the individual contribution of an indicator as a predictor in group membership. The second type of DFA, hierarchical, was not chosen since there was no specific basis for establishing a hierarchy for the predictors as they enter the equation. On the other hand, stepwise DFA was chosen, since there was no reason to assign some

predictors a higher priority than others in regards to order of entry. Furthermore, it allowed for the reduction of predictors based solely on user-specified statistical criteria such as Wilks' Lambda and F TO ENTER values (Tabachnick and Fidell, 1989).

7.25 Preliminary Testing and Data Transformation

A preliminary stepwise DDA was then performed to determine which socioeconomic variables discriminate among the groupings for all the countries. The primary goal is to identify and interpret the combination of predictors (discriminant functions) that separate groups (Tabachnick and Fidell, 1989). The DDA test yielded a canonical discriminant function (CDF). Included in this output was a canonical correlation which singles out the standardized functional coefficient which contains the group of variables with the greatest ability to discriminate. Also produced were the standardized canonical discriminant function coefficients which provide an estimate of the importance of each variable.

The initial results of the DDA showed that the variables were not univariate normal. A box plot was then done which confirmed these findings. Therefore, steps were taken to normalize the socioeconomic variables. The first step was to take the raw data for each indicator variable and find the median value for each of the four groups. The second step was to find the quartile values. Step three was to take the differences in the median and the quartiles. In step four, the difference was subtracted from one to obtain the correction figure, which is the slope. This was the

normalization power. These powers were then used to transform the socioeconomic variables toward normalization. The actual transformational powers for each variable can be found below in Table 2. The resulting variables were then renamed with a TR (which stands for transformed) in front of the original variable name.

TABLE # 2 NORMALIZATION POWERS

ORIGINAL VARIABLE	*	NORMALIZATION POWER	=	TRANSFORMED VARIABLE
NTV	*	0.400	=	TRNTV
BR	*	0.118	=	TRBR
GDI	*	- 0.025	=	TRGDI
GDS	*	0.100	=	TRGDS
LIFEXP	*	0.327	=	TRLIFEXP
ECPC	*	0.320	=	TRECPC
URBZN	*	0.071	=	TRURBZN

7.26 RESULTS OF THE SECOND DDA.

A second DDA was then performed. During this run the eight socioeconomic variables were tested using stepwise DDA. Wilks' Lambda was chosen as the statistical criterion, since it produces the largest multivariate F TO ENTER value. The F value stands for the variables' ability to discriminate among the groupings (Tabachnick and Fidell, 1989). At each step the variables with the largest F TO ENTER were chosen until there were six discriminating variables. The remaining variables with the lowest F TO ENTER were omitted from the equation. The DDA run using SPSS omitted the two most insignificant indicators: TRNTV and TRURBZN since they had low F TO ENTER values. With five socioeconomic variables remaining robustness would indicate that 100 cases are required. Since 101 cases remain, the study is within the guidelines of the recommended number.

The DDA test also yielded canonical discriminant functions which are found in table 3 below. Included in this table for each function is the Eigenvalue, the percent of variance, the cumulative percent, the corresponding canonical correlation coefficients and their significance.

TABLE 3**CANONICAL DISCRIMINANT FUNCTIONS**

FCN #	EIGEN VALUE	PCT OF VARIANCE	CUM PERCENT	CANONI CAL CORRL	SIGNIF -ICANCE
1	4.3099	88.88	88.88	0.9009	0.0001
2	0.4533	9.35	98.23	0.5585	0.1545
3	0.0858	1.77	100.00	0.2811	NA

The Eigenvalue measures the degree of variance consolidated in a matrix. The higher this value, the greater the consolidation. As can be see from Table 3, the first function had the greatest consolidation and the highest percentage of variance explained, and therefore the least deviation from the mean. Function 1 accounted for more than 88 percent of the variance and had a canonical correlation of 0.90. Function 1 also showed itself to be quite significant. It had a significance of 0.0001, which means that the likelihood that these results occurred by chance was only one in ten thousand.

Canonical Discriminant Functions two and three, were found not to be as important since their percent of variance only accounted for an additional 9.35 and 1.77, respectively. The CDF shows which group of variables discriminate among the countries the best. This was clearly function 1, which was composed of six variables. They are: TRPFIW, TRBR, TRGDI, TRGDS, TRLIFEEX, AND TRECPC. By

standardizing the CDF's with coefficients, the effects of size for each variable can be removed, producing a more efficient view of the importance of each variable in the function. The individual standardized CDF's can be seen below in Table 4.

TABLE 4 **STANDARDIZED CDF COEFFICIENTS for function 1.**

SOCIOECONOMIC VARIABLE	STDZD CDF COEFFICIENT SCORE
TRECPC	.604
TRBR	-.364
TRLIFEEXP	.327
TRPFIW	-.106
TRGDS	-.145
TRGDI	-.029

By examining the individual values for each variable in function 1, one can determine which variables were most important to the group function, and therefore which indicator variables carried the most weight as discriminators. Upon examination of the scores there appeared to be a gap between the standardized coefficient scores at approximately the 0.30 level. Those with lower levels appeared to have a very low contribution. Therefore, in the interests of parsimony only the three indicator variables with an absolute value of 0.30 or greater were retained.

This decision was later confirmed by a third DDA run, which is described later. There were three variables in Function 1 which had absolute scores above the 0.30 level they were: TRECPC with 0.604, TRBR with -0.364 and TRLIFEEX with 0.327. Therefore, the first function is composed of the variables ECPC, BR, AND LE, and can be used to discriminate among the countries based on their GRFSEE.

The Standardized Canonical Discriminant Function Coefficients for function 1, shows to be a measure of three variables which all contribute to early stages of modernization (EM) and therefore, will from this point on will be referred to as the EM function. The meaning of the discriminant function is inferred by the researcher from the pattern of correlation between the function and the predictors. The researcher tries to understand what cases A, B and C have in common, and why cases X and Y are different. The meaning of the function is determined by this understanding (Tabachnick and Fidell, 1989). The EM function shows that as LE and ECPC increase, and BR decreases, the likelihood of a country falling into group one and reaching an educational level which would permit industrialization increases.

Other data produced by the DDA included: group centroids for each of the four groups and a graphic display. The centroids are mean discriminant scores for each group in a function. These can be seen below in Table 5, while the graphs can be seen in Appendix D (DDA run 2). The group centroid scores for function 1 show the effectiveness of the indicator variables in discriminating among countries. Those countries in group 1 had the highest group centroids while those in group 4 had the lowest group centroids.

TABLE 5**GROUP CENTROIDS**

GROUP NUMBER	GROUP CENTROID SCORE
1	2.96
2	0.53
3	-1.48
4	-2.44

Furthermore, individual testing for each case (country) was performed. It shows the actual group into which each country fell based on its growth rates for secondary educational enrolment levels, and the group into which it fell based on the EM grouping function. Also shown are the probabilities of a case falling into the group, and the discriminant scores for each case. These results can be seen in Appendix E (DDA run 2).

These results are now summarized below under the heading "classification results-predicted group membership" in Table 6. This table shows the number of cases per group and the number and percentage of countries that correctly fell into the predicted group. A more detailed view can be found in Appendix F. The predicted group membership for the four groups were:

TABLE 6. CLASSIFICATION RESULTS-PREDICTED GROUP MEMBERSHIP

GROUP NUMBER	% CORRECTLY CLASSIFIED
1	86.4
2	70.8
3	47.8
4	72.7

These results were very positive. The overall percentage of grouped cases correctly classified, known as the hit rate, was 69.23%. The prior probability for classifying each group correctly was only 25%. Therefore one would be far better off using the EM function to discriminate among countries.

7.27 The Effects of Suppressor Variables.

It is important to test the variables in each function in order to determine if there are any which make only a marginal contribution or can be shown to be suppressor variables. Thomas (1992) points out that while the Standardized CDF Coefficients show which variables best discriminate, the results may be influenced by suppressor variables. Sometimes a variable acts as a suppressor variable decreasing the F to enter values. This can be demonstrated when its inclusion only decreases

the within groups degrees of freedom, while not increasing the between groups sum of squares (Tabachnick and Fidell, 1989).

One way to see the effects of suppressor variables, is to examine the pooled within-groups correlation matrix (Appendix G). An example of this effect is demonstrated by looking at **TRLIFEEX** and **TRBR**; it shows a highly negative correlation between the two. It shows that lower LE is correlated with lower BR's. Some of these correlations indicate causality, while some do not. The object is to determine which variables are suppressor variables and to remove them. This will reduce some of the distortion caused by correlations which have no logical or seen causality, and thus reduce the variance in the study.

Another more efficient way to eliminate suppressor variables is to determine the matrix of loading for each variable in the EM function. The matrix of loading shows the importance of each variable in the function independently. It is computed by taking the pooled within groups correlations between discriminating variables and canonical discriminant functions found in the Structure Matrix for function 1 and multiplying it by the CDF. The resulting matrices can be seen below in Table 7.

TABLE 7**MATRIX OF LOADING**

indicator variable	structure matrix score	multiplied by	CDF	equals	matrix of loading score
ECPC	.832	*	.604	=	0.5025
BR	-.756	*	.364	=	0.2752
LIFEEXP	.834	*	.327	=	0.2727
PFIW	.085	*	-.106	=	0.0090
GDS	.324	*	-.145	=	0.0470
GDI	-.182	*	-.030	=	0.0055

Variables which have a matrix of loading with a value of less than ten percent are expected to be suppressor variables. In the interests of parsimony the DDA was run again without these variables. The same three variables which were found to have high Standardized Canonical Discriminant Function Coefficients now remain. They are: **TRLIFEEX**, **TRECPC** and **TRBR**'s. The DDA was now re-run with only these three variables to determine if the other four variables were suppressor variables. The other variables are shown to be suppressor variables if the results show higher **F** to **ENTER** values and therefore lower Wilks values. Wilks' Lambda is a statistical criterion which evaluates the overall reliability of a set of predictors for group membership in DFA (Tabachnick and Fidell, 1989). In addition, and perhaps more

importantly, the removal of suppressor variables is proven by higher Eigenvalues and percent of variance, and lower significance values. Also important is the resulting percentage of group cases classified.

7.3 The Final Results of DDA run 3.

The results of the final and third DDA run showed that the four variables which were dropped were indeed suppressor variables. These results are all shown in Appendix H. The proof that they were suppressor variables was demonstrated by an increase in the percent of variance from 88.88 percent to 94.06%. The EM function accounts for over 94% of the variance and has an improved significance showing that there is almost no way these results could have occurred by chance. Eigenvalues also increased from 4.31 to 4.74.

It should be noted that the percentage of groups correctly classified, dipped slightly to 67.68%. However, this is not very significant as it is less than a two percent decrease and can most likely be accounted for by the fact that the data are slightly skewed since they were not perfectly multivariate normal. Further evidence of this fact is demonstrated since the predicted group membership for groups two and three decreased, while groups one and four increased. The percent correctly classified for the four groups can be seen below in Table 8.

TABLE 8**PREDICTED GROUP MEMBERSHIP**

GROUP NUMBER	% CORRECTLY CLASSIFIED
1	91.3
2	64.0
3	32.0
4	84.6

All the groups showed good results except for group three. One possible explanation is the criteria for separating the groups are not sufficiently different. This problem may be avoided by reclassifying the countries into three groups. Another possible explanation is since all the data are taken from U.N. and World Bank reports there may be other non-recorded variables which may be better. Perhaps some unknown variable would have been a good predictor and thus improved the classification and predictability results in group 3. This should be explored in future research.

In either case, the results of this study after removing the suppressor variables are better, and allowed the EM function to account for over 94% of the variance, with its ability to act as a predictor hardly showing any change, and being almost three times as effective in discriminating than the original probability of only 25%.

The first hypothesis stated that BR's would be a discriminating variable among countries at different GRFSEE. This hypothesis was supported. The TRBR variable was not eliminated during any of the three DDA runs. In fact it survived and had a matrix of loading value of 0.275. TRLIFEEX and TRECPC also were proven to be important variables for discrimination. They had matrix of loading values equalling 0.273 and 0.502, respectively. These findings supported both hypotheses number three and five. Therefore, in accordance with hypotheses one, three, and five birth rates, LE and ECPC were all found to be important indicator variables which were capable of discriminating among different countries' level of educational change.

Hypotheses number two and seven which discussed NTV/1000 households and urbanization, were both found to be insignificant and were eliminated during the first DDA run. It may be very logical that urbanization plays a key role in secondary educational change, but the findings suggest that the other factors carried greater weight and therefore, the urbanization variable was not as significant an indicator. Another possible reason for this occurrence is that the U.N. data on urbanization included industries such as the forest, mining and agricultural industry which do not require as great a degree of urbanization as other industries, such as the automotive industry and finance industries. Also urbanization data in this study includes only those places with greater than one million people, thereby skewing the results for smaller countries with populations of fewer than one million people, which usually

includes countries whose main industries are resource related. This of course makes cross country comparisons more difficult.

Number of TV's per 1000 households was chosen as an indicator representing communication. However, the more important component is the programming, not just the actual ownership of televisions. It is only through educational and informative programming that TVs could have a significant effect on improving QOL and industrialization. Since the data do not reflect programming, it is not surprising that the variable TRNTV was not found to be an important indicator variable.

Hypothesis number four was intended to test the effect of gross domestic savings and investment, and its ability to promote industrialization. There is little doubt that these levels are important to industrialization, for without money to invest in industrialization, and without savings for consumption of industrialized goods, industry could not exist and grow. However, the data for hypothesis four was split into two different criteria GDI and GDS. The calculation of these data among lesser developed countries is very inconsistent. In addition, the conversion to U.S. dollars from foreign currency, adds a great deal of variability since each country has a different currency with fluctuating values. In fact even for the same country results can seem misleading if there are wide swings in the exchange rate. A good example of this would be Canada between the years 1989 and 1993, since the Canadian dollar has fallen so much against the U.S. dollar.

Finally hypothesis 6, which stated that the PFIW can be used to discriminate among countries at different GRFSEE was not fully supported since the variable was

found to be a suppressor variable. This may result since an increase in PFIW may have an effect on some of the other indicator variables. Specifically, an increase in PFIW has been noted to cause a decrease in BRs. A second possibility may be a decrease in the LE of women. This possibility exists since an increase in PFIW results in more women trying to deal with the stresses of balancing both work and family.

7.5 CASE STUDIES

At this point the research will take a closer look at this study's results in terms of specific countries. The results of this study show that ECPC, BR and LE, the EM indicators, were all found to be important socioeconomic indicators for determining and effecting secondary education and hence industrialization. At the beginning of this study, countries were grouped into four groups, based on GRFSEE which showed the approximate time that countries require to reach the secondary educational level needed to be considered industrialized. Now based on the results of the study the countries have been regrouped according to discriminate analysis scores, which were based on the three most influential socioeconomic indicators ECPC, BR and LE. In appendices I and J is a list of the countries for groups three and four, based on their new groupings. By examining these groups certain quantitative ranges can be established for the countries in each group. These quantitative results will now be discussed and will lead toward the establishment of certain profiles for groups number three and four. These profiles will in turn lead

to an individual case study for one country each in group number three and four. Individual case studies for groups number one and two will not be conducted since a general profile for these more industrialized and already industrialized countries, is already widely known and accepted. In addition, governments and development agencies need to focus their time and resources on countries in groups three and four which require aid to help them reach industrialization and to foster increased economic growth. More specifically, the case study discussions will point out the developmental commonalities shared by each of the countries in a group. In addition, a more detailed case study will be done which looks at one specific country for groups three and four. This will be done to demonstrate the overall tendencies and qualities of the country and to properly explain its placement into its specific group.

7.51 Group 4

Based on GRFSEE, 26 countries were predicted to fall into group number four. In fact, based on the EM indicators 22 of these specific countries or 84.6%, fell into their predicted group. These countries in group number four had ECPC which ranged from 13 to 379 with an average of 78.3. Their BR's ranged on the high side from 38 to 53, with an average of 46.6. Somewhat on the depressing side was their LE figures which ranged from 42 to 55 with an average of only 48.5 years. Taken as a whole, the countries which characterize group number four have the highest BR's in the world and the Lowest LE and ECPC. In addition these countries on average only have 10.2 percent of their workforce enrolled in secondary education and the

growth rate for secondary educational enrolment is only .30 percent. Therefore based on GRFSEE alone countries in group number four will take between 72 and 672 years to reach industrialization.

7.52 Group 4 Tanzania - A Case Study

Tanzania is a classic case of a country that belongs in group number four. These countries are at the lowest stage of development and are commonly known as third world or lesser developed countries.

Geographically, Tanzania forms part of what is commonly known as East Africa. Two of its neighbours within East Africa are Kenya and Uganda. The major geographical feature is the Rift Valley system which separates East Africa from Central and Western Africa. Volcanic eruptions have left the soil well endowed and extremely fertile. It is for this reason that Tanzania is able to sustain some of the highest population densities on the continent (Hatch, 1972).

The climate is quite complex due to the large variations in altitude. Trade winds and monsoons come from the east while dry air currents come from the west across the Sahara. In addition a large part of central Tanzania is plagued by the Tsetse fly making travel and communications between the people nearly impossible. This insect has left the central and southern regions of Tanzania uninhabitable and has caused trypanosomiasis and other diseases which have reduced LE and increased IM. Since no method of destroying the pest has been devised, it remains one of the greatest menaces to East African prosperity. Climate, water supply and soil quality

are major determinants to where people can live, prosper and develop. It is these factors in particular that have had the greatest effect on the development and QOL in Tanzania and East Africa (Hatch, 1972).

The African way of family life also had a great influence on development. They have large family units which practice polygamy. Although Tanzania has one of the highest crude BR's of 50 it does not result from the polygamous relationship since women tend to suckle their children for over two years. In addition, men in polygamous relationships produce fewer children than men in monogamous relationships.

Another part of the African culture is its view toward possession of land. It is not a possession limited by boundaries rather, it is a part of the social organization with rights derived from membership in the community. Thus family members used to produce for their own needs through subsistence agriculture, while at times joining with others to create a community market, bridge or other public good.

The Tanzanian people were influenced by a large diversity of peoples. These include: Indians, Arabs, Asians. During the 1900's they were also influenced by Germans and the British who dominated the region for many years. The Arabs introduced cash crops such as coffee, the Asians influenced development by introducing bananas, and by increasing trade.

The Germans ruled for a short time followed by the British who ruled for approximately 40 years. The Germans and later the British introduced missionary and government healthcare along with educational programs and class systems.

In the late 1930's during World War II, Europe became preoccupied with the war and Tanzanians began to take on more of a leadership role. Unfortunately, due to depressed world prices sisal and other major exports fell, leading to decreased revenues. At this time, the Tanzanian government drastically cut social spending to balance the books and to help England fund the war against Germany. This had the greatest impact on education whose budget was cut by 40%. This cut led to a poorly educated workforce in the 1960's, when British rule ended and Tanzania declared its independence.

The Asian and British leadership influenced the country's course of development. The British emphasized the need to set up schools and in accordance with its own traditions stressed the humanities and literacy elements as opposed to a more practical agricultural or technical training. The English also emphasized the importance of class distinctions and its privileges, an ideal that could not be supported by Tanzanians who were struggling to avert hunger, sickness and a short life span. At low real incomes the first priority must be food, then clothes, dwellings and durable goods. This is later followed by luxury goods, services and ultimately an economic system (Bukuku, 1993).

In 1961, Tanzania then known as Tanganyika was the home to ten million people, mostly Africans. In addition to the hostile environment mentioned above, Tanzanians had other obstacles which influenced development. On the economic side these obstacles included an annual per capita income of only \$55. A low rate of industry, most of which was owned by foreigners. There were only 5365 factories

of which 25% had no electrical power. Other obstacles included a LE of only 38 years with approximately half the population under age fifteen. Infant mortality was greater than 33% prior to age two. In addition the BR was extremely high and was still growing. Sickness was universal and therefore, every household accepted sickness and death as part of everyday life. In the 1960's when Tanzania gained its independence these negatives were all starting to reverse. At that time there were many factors which slowly changed the Tanzanian way of life.

To help with the high rate of IM and general sickness of the population the New Tanzanian Government set up and funded rural dispensaries and health centres. All residents of Tanzania were entitled to free treatment and drugs. Unfortunately, this was not enough since there was only one doctor for every 20,000 patients. This compared to one for every one thousand patients in Western Europe.

Birth control was another problem that the new government could not regulate. It was a delicate subject since in countries with high rates of IM, children are prized. In addition, for peasants, children are economic assets and therefore another reason why population explosions are rarely checked.

Even when the government did make strides in reducing IM other problems resulted. This increased the population causing increased BR's, increased unemployment and a greater need for additional educational and medical facilities, as well as an increased need for food. To help with the problems of malnutrition and the need for increased income the Tanzanian people focused on the development of their largest commodity, agriculture.

Other factors which changed the path of Tanzanian development included the introduction of cash crops such as coffee, bananas, cotton, and cashews. This created a greater need for urbanization and resulted in efforts to induce permanent settlements. To accomplish this the Tanzanians still farmed small areas such as one to four acres, however, it did require them to form farming and marketing cooperatives. This in turn led to the need for greater urbanization and new schools which emphasized agricultural and technical training.

The Indian influence and Arab influence helped the people to promote agriculture and exports. Unfortunately for the Tanzanians most of them did not have the training to deal in these types of markets. The Asian people tended to dominate these markets bringing about the concepts of marketing, sales and greater trade (Hatch, 1972).

Government policy now turned to education and training to try and overcome some of these problems. By 1968, primary education became compulsory, causing a major increase in the percentage of school age children in primary schools. The major emphasis of government policy now turned to secondary education, with the opening of agricultural and technical training (Hatch, 1972). Despite these efforts this study showed that by 1989 the number enrolled in secondary education as a percentage of the age group was only four percent, with a growth rate of only 0.08 percent between the years 1965 and 1989.

The government also created policies to inculcate a spirit of service to the nation. In 1964 the president of Tanzania presented a fifteen year plan with three

major goals. The first goal was to raise annual per capita income from \$55 to \$126 U.S.. The second was to substitute trained Tanzanians for expatriates in all skilled professional and managerial posts. The third was to raise LE from 38 years to 50 years. Of these goals it seems their greatest triumph was in regards to LE and post-primary educational training. Tanzanians felt that a genuine effort was being made to find them employment and that their children whose education was being financed would not have to go to other countries to find lucrative posts (Hatch, 1972).

The most dominating factor to development in the 1980's was the acceptance of aid by Tanzania from the World Bank. In fact, by the 1980's, it was perceived by donors that aid was used effectively in Tanzania, despite its low level of development and relative scarcity of skilled workers. Donor agencies were satisfied that there was an absence of corruption. They were aware of the relative lack of a modern physical infrastructure, such as roads, and hydro-electricity, and the nominal development of social services such as school, health and water facilities. This comprised a need for aid matched with a positive domestic environment, conducive and receptive to aid. (Young, 1983).

However, the Tanzanian government's failure to formulate and implement a strategy to restructure the national economy and to reduce its dependence on crude agricultural exports, left the national economy still extremely dependent on the world market. By 1982, the World Bank had become Tanzania's largest creditor - \$792 million.

Although aid was helpful to Tanzania it would lead to other problems. When the international recession worsened, Tanzania's terms of trade deteriorated and as a result Tanzania could no longer afford to pay its heavy international debts nor continue to import the machinery and equipment needed for transport and increased productivity. (Kalyalya, Mhlanga, Seidman, and Semboja, 1988)

By the late 1980's Tanzania still belonged to the group of the 25 poorest countries in the world. Tanzania's GDP was very small, at US \$2.77 billion in 1989 (current prices) or US \$3.36 billion if valued at 1976 prices. Today, the economy is characterized by two distinctive economic structures: a traditional sector and a modern sector, with weak linkages between them. Agriculture accounts for over 60 percent of export earnings and supports about 80 percent of the population (Bukuku, 1993).

The objective of achieving self-reliant growth is still elusive. The economy is still heavily dependent on external markets as well as on external resources. The economic structure which has been created is extremely fragile and vulnerable to both external and internal shocks. However, recent policy reform measures have a potential of reversing the decline in the country's productive capacity and living standards, as well as setting the stage for renewed growth (Bukuku, 1993).

According to 1989 U.N. data, Tanzania's LE had reached 54 years, one of the highest LE in its group. However, it still has one of the highest BR's and a very low level of ECPC. These factors along with the fact that the number enrolled in secondary education as a percent of the age group is only four percent has kept

industrialization and economic growth down. It is for these reasons along with other economic factors that the WBDR classifies Tanzania as the second poorest country and that the HDR places it in the low human development category. The results of this research study also place Tanzania in its lowest development category, making Tanzania an excellent case study for a country in group four.

7.53 Group 3

Countries in group three included 25 cases of which only eight countries or 32 percent fell into the predicted group. There are two possible explanations for this low rate. First, it may be that the results may have been more favourable if three groups had been used instead of four. This may be because the values from which the distinctions are based between groups two and three, may have been too close together. Secondly, it may have resulted because the three EM indicators may only be accounting for some of the factors which lead a country toward industrialization and that the indicator(s) that might improve the results may not have been included in this research and therefore are still awaiting discovery. Therefore, future research should seek out and test for these missing socioeconomic variables.

The countries which did fall into category number three included countries such as India, Kenya, Lesotho and Morocco. Their characteristics include: ECPC which ranged from zero to 425 and averaged 231 well above the average of 78.3 which characterized group number four. BR's ranged from 23 to 53 and averaged 38.3; still quite high but well below the 46.6 average of group number four. LE

showed great improvement ranging from 57.3 to 67.1 and averaging 62. This is a major improvement from the 48.5 average which characterized group 4. The four countries which were expected to fall into group 4 but fell into 3 had a similar average LE of 61.7 and therefore belonged in group 3. It is also interesting to note that these four countries had an average BR of 38.8 and ECPC of 180 which also indicates that they should be in group three instead of group four. However, their GRFSEE average was only .40 percent. Also characteristic of group three was the average levels of secondary education and GRFSEE which were 33.1 and .91, more than three times greater than the average for group four.

7.54 Group 3 Lesotho - A Case Study.

The modern Kingdom of Lesotho inherited its boundaries from the British colony of Basutoland. It has a land area of 11,716 square miles (30,350 sq km), slightly larger than the state of Maryland. It is completely surrounded by the Republic of South Africa (Bardill and Cobbe, 1985).

Lesotho has one of the highest proportions of female-headed households in the developing world, and approximately 90% of such households in Lesotho are headed by widows. The large number of widows compared to widowers in the country can be attributed in part to the general tendency of women to outlive men and the fact that Lesotho men tend to marry later in life than women. Two additional factors are peculiar to Lesotho. The first is the difficulty experienced by widows remarrying. The second factor is the high rate of early mortality for miners,

either due to accidents at work or work related illnesses, such as tuberculosis. This is one of the reasons why LE in Lesotho in 1989 was only 57.3, the lowest for any country in group number three.

On the more positive side, the fact that many women are alone and unable to remarry has helped to give Lesotho a below average BR for countries in group number three. Another contributing factor is that men are only home for a few weeks a year since they migrate to South Africa for higher paying jobs.

Livestock care, a major occupation in Lesotho, is a male task which causes many adult males to be absent from enrolment in education. As a result, female students outnumber males at all educational levels except the university. Even at the university, there are almost as many women as men, a very unusual situation in Africa. Since the mid 1970's, female workers have accounted for much of the increase in wage employment in urban areas because most men migrate to South Africa where the wages are higher than in Lesotho. This leads to greater employment opportunities for women. In addition, employers have a greater incentive to employ women than men, because they can pay them less.

As a result of this migration to South Africa, fathers see their children for only a few weeks during the year. As mothers are out working, children are raised by grandparents and learn to fend for themselves. Since most secondary schools are in towns, children would have to board away from home, and therefore create greater financial strains on families. Perhaps, it is because of these difficulties that the number enrolled in secondary education as a percent of the age group is only 26%.

This is one of the lowest levels for countries in group number three, where the average is 33.1% This problem is further described in Bardill and Cobbe, (1985). Even though 75% of children of primary school age are enrolled in school, the drop-out rate is high, especially at the upper levels. Based on current trends, out of 100 children entering primary school today, 40 will complete their primary education, 17 will enter secondary school, 5 will complete their secondary education. Less than 1 in 100 will enter the university. In addition, the lack of education and its resulting lack of good income opportunities have led to other problems. There have been instances of prostitution, juvenile crime and substance abuse among teenagers at the secondary school age level.

The churches run almost all schools and about half the hospitals and have an important role in social work and politics. The Catholic church (which is the predominant religion, although there are many others), prints literature on religion, fiction and educational subjects. This reflects the long tradition of literacy in the country.

Lesotho's government has an Education Task Force. The belief is that higher educational qualifications lead to higher remuneration. What is of special interest with Lesotho, is that economic returns from education are realized almost solely at the tertiary level. Economic returns from primary and secondary education are virtually zero, at least for men. An obvious implication of the connection between education and salary structure is the important premium placed on tertiary education, a premium for which the country has had to pay dearly. A study done by Cobbe

(1976), proved that it was the rich and better educated families, that had cash employment within Lesotho. It was also these families that had homes in the better neighbourhoods (Bardill and Cobbe, 1985).

Since 1966, when independence was declared, urbanization has risen rapidly. This resulted because domestic agriculture was not increasing quickly enough and because South Africa could not absorb the growth of Lesotho's labour force. By 1980, about 125,000 people (10% of the population), were living in urban areas. Close to 60,000 were based in Maseru, the capital. The remainder were spread between fifteen urban or semi-urban centres, none of which had a population greater than 10,000. Maseru's growth rate has been an alarming 6% a year, and if this trend continues, its population should reach 100,000 well before the end of the century. The recent rapid growth of urbanization in Lesotho has led, as in most developing countries, to the emergence of extremes of affluence and poverty. For the minority of citizens who are in well paid employment in the public and private sectors, there is spacious well-equipped housing, fashionable shopping centres, elegant restaurants, casinos, etc. For the majority of the population who are confined to overcrowded locations, their lives consist of low and uncertain income, inadequate and unsanitary housing, frustration, despair and not uncommonly of violence.

Unemployment and poverty are accompanied by other problems common in developing countries with rapid urban growth. Rents are often exorbitant and with poor living conditions. Few urban locations have adequate provision for sanitation or water supply, let alone electricity. In fact, in 1967, Lesotho had a minimal rate

of manufacturing, only 0.7%. One reason for this is the low level of electricity, as evidenced by a zero rate of ECPC. Over the next few years some impressive development goals were met. For example, in 1965 enrolment in secondary education as a percentage of the age group was only four percent while by 1989 it had grown to 26%. Although at first glance the expansion in electricity and water, finance, manufacturing, transport and education seems impressive, it is misleading. In several cases, the growth was from such a small base that at the end of the period the proportional contribution for the sector to GDP was still very small, and thus the effects of the rapid growth in the sectors concerned on the economy as a whole remained commensurately small. Health and nutritional problems remained serious despite increased government spending. The 1956-1960 Nutrition Survey, revealed that 75% of all Basotho (the people of Lesotho) were undernourished, and that infant and child mortality rates were rising rather than falling.

Lesotho which appears in group three is a good example of a country that falls into this category. As mentioned above, Lesotho has made some great improvements, but from some originally very low base levels. This has placed a country which ranks in the bottom 34 countries by the WBDR (based on GNP), into our group number three. While its BR of 41 is the median number of all the other countries in the group, its LE is lower than most, and its ECPC is practically non-existent. It is for these reasons that Lesotho's discriminate analysis score is so poor, making it the lowest country in group three. Despite these problems, Lesotho has a good literacy level and has made major strides in its secondary and post secondary

education levels. It is for these reasons that the HDR has placed Lesotho in its medium human development category, and it is these same reasons that has allowed Lesotho to fall into group number three.

8.0 LIMITATIONS

The major limitation of this study comes from the selection of socioeconomic variables. Although the selection was logically based, it was limited by the availability of United Nations data for the selected variables.

This research is limited to those developed and developing countries for which data were collected and reported in the Human Development Report (1992), and in the World Bank Development Report (1992).

In addition, any technical restrictions which were faced by them in their efforts to collect and present international data are inherited during this research study. There is also added variability, since each country collects its own data. However, this is still the most comparable data that is accessible and the effects of the gross differences are not likely to be very great.

Another limitation imposed by this study comes as a result of using DDA analysis for approximately 129 countries. This is because DDA works best when there are at least twenty cases per indicator variable. Therefore, when dealing with this number of countries, analysis of more than six variables will diminish the power of the test.

9.0 BENEFITS

The results of this research may aid global development by determining if relationships exist between the socioeconomic variables tested in this study. Based on a preliminary investigation it appears that this is the second study to test some of these variables, but appears to be the only current study of its kind to globally test these eight socioeconomic variables. It is also the only research study to test and analyze socioeconomic variables using DDA. Some of the socioeconomic variables successfully discriminate among the country groupings. Therefore, governments can now study these socioeconomic variables further, and perhaps set new policies using these variables to influence educational enrolment. This, in accordance with the study's findings may lead to early modernization and increases in social and economic development. This in turn will help countries to increase economic growth and development thereby improving their citizens standards of living and QOL.

The knowledge gained from this study may also help countries to pinpoint some of the social and economic problems and needs which developing countries are experiencing. This result can be achieved simply by examining the socioeconomic variables which were shown to be important in this study. Those variables or groups of variables which best discriminate among the countries represent a foundation for future research. Once these problems have been properly identified appropriate policies can be formulated. It may be possible to initiate government policies which may influence these variables in a positive way so as to promote increased human and economic development. Furthermore, the findings from this study may help

international agencies and countries make better decisions in regards to foreign aid, and in turn to develop more appropriate foreign aid policies. This is possible since the agencies now have more information on which socioeconomic indicators are most influential in regards to economic growth and development.

Some of the results show that certain selected socioeconomic variables are unable to discriminate among the different countries in accordance with their secondary education groupings. This has also been helpful since governments now know that they need to focus their time and attention on other socioeconomic variables which can offer more productive results. It also tells us that other socioeconomic factors are playing a role in economic growth and development. This is useful since it lays the foundation for future research.

10.0 CONCLUSION

Three socioeconomic variables, ECPC, BR and LE were found to be important discriminators among countries with different levels of educational change. The results of this study lend credence, and support much of the literature which was reviewed for this research study. The study results support Grant's theory of linking social and economic variables to form socioeconomic variables. As Grant (1978) stated, the linkage tends to produce symbiotic effects. This allows them to act as good indicator variables which ultimately can be manipulated to produce increased economic and human development.

My research also used and supported Hobb's and Kiggundu's 1992 findings. In accordance with their study secondary education was used to formulate groupings which served as a quantitative measure for evaluating the countries at different stages of educational change.

It is also interesting to discuss the UNRISD study in relation to this research. This is because both studies globally tested data using logically derived socioeconomic variables. In addition, both studies produced a group of socioeconomic indicators capable of discriminating among countries at different stages of development. However, my study had the advantage of using education as a quantitative measure. This allowed my study to produce a function which was capable of discriminating among countries at different levels of educational change. Another advantage was that my study used information from Thomas's 1992 study to account for suppressor variables. This allowed function number one to be refined thereby producing better results.

This study also avoided the criticism of the PQLI as discussed in Hobb's and Kiggundu's 1991 study. This problem was avoided by using stepwise statistical DDA which not only provided a function composed of socioeconomic indicators which discriminated the best, but also showed the specific importance of each indicator in the function. Finally, the study gave support to other studies on education which stated that primary and secondary education are important factors for countries which seek to become industrialized and thereby increase development.

The results of this study show that in general there is support for the hypotheses. ECPC, LE and BR were all found to be important effective variables, which are related to secondary education. These socioeconomic variables may be manipulated in coordination with secondary education to produce increased discrimination among countries, which may enhance decisions in regards to foreign aid. Governments and developmental agencies could study these relationships further, setting new policies which will make use of these relationships to increase economic and human development.

NTV and urbanization were omitted in the initial DDA run. PFTW, GDI, and GDS were suspected of being suppressor variables and were therefore removed. A third DDA run was then performed which confirmed this suspicion. This was noted by the increase in percentage of variance and by higher Eigenvalues for the quality of life function. The percentage of groups correctly classified dropped from 69.23% to 67.68%. However, this decrease in hit rate was not very significant since it was less than two percent, and can most likely be accounted for since the data were not perfectly multivariate normal. It is believed that the results of this study are applicable to all countries since it used global data for a large sample of countries which represented four different stages of development. However, since many countries in groups one and two are already industrialized and since they scored well in terms of the EM function and its components, the major benefactors of this study will be for the countries in groups three and four.

In conclusion, the overall results of this study were very positive, increasing the probability for correctly classifying each group correctly from 25% to 67.68%. Therefore one would be far better off using the EM function to discriminate among countries. In addition, the EM function lent support to the hypothesis. It identified the socioeconomic indicators which were capable of discriminating among countries at different levels of educational change. This allowed governments and developmental agencies to pinpoint more accurately the social and economic problems, telling them where to concentrate their efforts and resources.

Based on these findings, the following policies are recommended as an aid to industrialization and development.

In regards to the findings on ECPC, the researcher suggests that engineers and teachers be sent to developing and LDC's to help educate the people of these countries on how to build power plants and to provide the information needed to be taught in schools for the operation of the new technical energy resources. This will provide greater energy resources for manufacturing and industrialization. In regards to the findings on BR's it is recommended that family counsellors be sent to teach birth control and family planning. In regards to LE it is recommended that doctors and nurses be sent to help establish hospitals and to teach more about nutrition and healthcare. This in turn should promote longer LE. In addition, it is suggested that business leaders be sent to help start factories and to teach the people how to go about identifying the needs of the communities in regards to starting small businesses. Furthermore, psychologists and sociologists should be used to help

establish motivational learning techniques that will help integrate all the above ideas into the different cultures. It is this researcher's belief that the most important criteria for establishing sustainable development is the integration of these ideas within the different cultures so that the people of the LDC's can make use of these ideas and continue to educate their people in this direction even after foreign aid ceases.

As for those variables which were found to be not as important, they are useful since now governments and developmental agencies know to concentrate their time and efforts in other areas which will be more productive. This also lays the foundation for future research. The future researcher should try and identify other non-recorded variables which may serve as good discriminators and which may improve group number three's results. In addition, it may be helpful to discover better methods for calculating the data among groups of countries. This will reduce the variability which is present in different countries data. It would also be interesting to rerun the DDA using the EM function for different time periods and to compare individual country results. Finally, this researcher hopes that this paper will act as a catalyst providing a basis for future development research so that countries which seek early modernization and industrialization, can achieve their goal and so that each day people all over the world can live and enjoy a higher quality of life.

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12.1
APPENDIX A
DATA
DICTIONARY

VARIABLE NUMBER -----	VARIABLE NAME -----	VARIABLE SYMBOL -----	VARIABLE TYPE -----	No. of DIGITS -----	No. of DECIMALS -----	MISSING VALUES -----
1	IDENTIFICATION #	IDENT#	NUMERIC	4	0	9999
2	COUNTRY-NAME	NA	STRING	22	NA	NA
3	1965 SECONDARY-EDUCATION	SECD>A	NUMERIC	4	0	9999
4	1989 SECONDARY-EDUCATION	SECD>B	NUMERIC	4	0	9999
5	BIRTH RATES	BR	NUMERIC	4	0	9999
6	% OF FEMALES IN WORKFORCE	PFIW	NUMERIC	5	1	999.9
7	# OF TVs	NTV	NUMERIC	4	0	9999
8	GROSS DOMESTIC SAVINGS	GDS	NUMERIC	4	0	9999
9	GROSS DOMESTIC INVESTMENT	GDI	NUMERIC	4	0	9999
10	LIFE EXPECTANCY	LE	NUMERIC	5	1	999.9
11	ENERGY CONSUMPTION /CAPITA	ECPC	NUMERIC	7	0	9999999
12	URBANIZATION	URBZN	NUMERIC	4	0	9999

12.1
APPENDIX A
DATA
DICTIONARY

VARIABLE NUMBER	VARIABLE NAME	VARIABLE DEFINITIONS
1	IDENTIFICATION #	- The number identifying the case
2	COUNTRY-NAME	- The name of the country.
3	1965 SECONDARY-EDUCATION	- 1965 data identifying the # enrolled in secondary education as a % of the age group.
4	1989 SECONDARY-EDUCATION	- 1989 data identifying the # enrolled in secondary education as a % of the age group.
5	BIRTH RATES	- The BR expressed as a # of children born\1000 women of a specific age group over 1 year.
6	% OF FEMALES IN WORKFORCE	- The percent of women in the labour force 1988-1990.
7	# OF TVs	- The number of tvs/1000 people.
8	GROSS DOMESTIC SAVINGS	- as a percentage of 1989 GDP.
9	GROSS DOMESTIC INVESTMENT	- as a percentage of 1989 GDP.
10	LIFE EXPECTANCY	- at birth indicating the number of years a baby would live under current conditions
11	ENERGY CONSUMPTION /CAPITA	- converted into kilograms of oil equivalent.
12	URBANIZATION	- as a percentage of the total population.
13	GRFSEE	- Growth rate for secondary educational enrolment. (seced>b - seced>a)/24 years.

12.1

APPENDIX A

DATA

DICTIONARY

ACRONYM

DEFINITIONS

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QOL	quality of life
DDA	descriptive discriminate analysis
LDC	lesser developed countries
U.N.	United Nations
UNRISD	United Nations Research Institute for Social Development
DRR	disparity reduction rates
IM	infant mortality
GNP	gross national product
GDP	gross domestic product
HDR	Human Development Report
WBDR	World Bank Development Report
PQLI	Physical Quality of Life Index
CIDA	Canadian International Development Agency
CA	Correspondence Analysis
CDF	canonical discriminant function

12.2 APPENDIX B - CENTROID GRAPHS - DDA RUN 2

Group 1

* indicates a group centroid

Across: Function 1
Down: Function 2

Group 2

*** indicates a
group centroid**

**Across: Function 1
Down: Function 2**

Group 3

*** indicates a
group centroid**

**Across: Function 1
Down: Function 2**

Group 4

*** indicates a
group centroid**

**Across: Function 1
Down: Function 2**

Ungrouped Cases

* indicates a
group centroid

Across: Function 1

Down: Function 2

12.3 APPENDIX C - DDA RUN 2

Case Number	Actual Group	Highest Probability Group P(U/G) P(G/D)	2nd Highest Group P(G/D)	Discrim Scores
1	4	4 .4207 .9371	3 .0627	-2.4323 -2.4286 -.0435
2	4	4 .9318 .8717	3 .1279	-2.7937 -1.2852 .0275
3	4	4 .7573 .8983	3 .1016	-3.0946 -1.4570 -.2690
4	Ungrp'd	4 .9165 .9050	3 .0945	-2.6409 -1.4274 .5164
5	3	3 .6696 .5099	4 .4872	-2.5261 -.2454 -.8812
6	4	4 .9467 .8914	3 .1078	-2.6645 -1.1118 .7406
7	4 **	3 .1469 .8322	4 .1661	-2.8315 .6252 -2.2599
8	3 **	4 .5831 .9419	3 .0580	-2.6627 2.1506 .1445
9	4	4 .9292 .8258	3 .1737	-3.0681 -.6555 .0654
10	4	4 .9098 .5801	3 .4098	-2.2458 -.0749 .3238
12	3 **	4 .8908 .5994	3 .3966	-2.5738 -.0604 -.0147
13	4	4 .9692 .8441	3 .1553	-2.9429 -.7578 .2797
14	4	4 .9716 .7034	3 .2945	-2.6350 -.4426 -.0084
15	4	4 .9386 .9026	3 .0969	-2.8385 -1.1326 .6454

2 of/de 2

PM-1 3½"x4" PHOTOGRAPHIC MICROCOPY TARGET
NBS 1010a ANSI/ISO #2 EQUIVALENT

PRECISIONSM RESOLUTION TARGETS

Case Number	Actual Group	Highest Probability Group P(D/G) P(G/D)	2nd Highest Group P(G/D)	Discrim Scores
16	4 **	3 .3959 .6607	4 .2363	-3.0327 .9286 -.7433
17	3	3 .5423 .5698	4 .4125	-2.4691 .8788 .4678
18	4	4 .4994 .9722	3 .0278	-3.2396 -2.0555 .6185
19	4	4 .8172 .9213	3 .0786	-3.1335 -1.4370 .1109
20	4	4 .5466 .9165	3 .0834	-3.2239 -1.7166 -.5211
21	3	3 .8949 .8211	2 .1003	-1.2655 .7400 -.9815
22	Ungrp'd	4 .8817 .8230	3 .1754	-2.8470 -.3340 .8295
23	3	3 .0875 .4931	2 .4900	.2161 .6992 -2.2784
24	3 **	4 .8320 .7110	3 .2862	-2.0860 -1.2740 -.4278
25	3	3 .5415 .7740	4 .2048	-2.4380 1.3494 -.2364
26	4 **	3 .6191 .6833	4 .1848	-1.6750 1.1497 .5529
27	3 **	4 .9999 .7548	3 .2424	-2.4118 -.7118 .2813
28	4	4 .5002 .9640	3 .0359	-2.9141 -2.2404 .4117
29	3	3 .7490 .5304	4 .4146	-2.5728 .2883 -.5713

Case Number	Actual Group	Highest Probability Group P(D/G) P(G/D)	2nd Highest Group P(G/D)	Discrim Scores
30	4	4 .3337 .7658	3 .2016	-1.7597 -.3881 1.9482
31	4	4 .7375 .5872	3 .4110	-2.8640 -.0081 -.4180
32	2 **	3 .4074 .5495	2 .4329	-.1794 .6846 -1.4229
33	3 **	4 .9318 .6386	3 .3554	-2.4208 -.1228 .3535
34	3 **	4 .4259 .7237	3 .2756	-2.3844 -1.5645 -1.1916
35	Ungrp'd	3 .3525 .9061	2 .0569	-1.2098 .7359 -2.1343
36	Ungrp'd	3 .5377 .5761	2 .3552	-1.1422 1.3859 .4620
37	2	2 .7199 .4880	3 .4435	-.5672 .5459 .3645
42	Ungrp'd	4 .9657 .7411	3 .2559	-2.5234 -.4446 .4194
44	3 **	4 .7014 .4982	3 .4554	-1.7290 .0155 .8018
45	2 **	3 .8819 .6446	4 .1808	-1.2406 .5436 .3058
46	4	4 .9256 .6251	3 .3668	-2.3190 -.1225 .4185
47	2 **	3 .9682 .7613	2 .1387	-1.1402 .5701 -.6083
48	3 **	4 .7676 .7388	3 .2531	-2.3653 -.1272 1.1206

Case Number	Actual Group	Highest Probability Group P(D/G) P(G/D)	2nd Highest Group P(G/D)	Discrim Scores
49	Ungrp'd	2 .4054 .5869	3 .4058	-.4734 1.8486 -.7022
50	4 **	3 .8596 .5101	4 .4731	-1.7332 -.5763 -.3195
51	4 **	3 .6932 .6525	2 .2099	-1.3683 1.0539 .4775
52	3	3 .6855 .7349	2 .2246	-1.1363 1.4035 -.6142
53	3	3 .9237 .6570	4 .3238	-2.1255 .4450 -.2535
54	2	2 .7942 .6715	3 .3106	-.3950 1.2577 .1997
55	2	2 .2799 .8574	3 .1323	-.5006 1.9306 1.5322
56	Ungrp'd	4 .9760 .6555	3 .3365	-2.1711 -.4244 .3668
57	4 **	3 .8063 .5291	4 .3998	-1.2420 -.4822 .2043
58	3	3 .9287 .7125	2 .2112	-.9693 .6814 -.5010
59	2 **	3 .8645 .6017	2 .3261	-.7967 .6733 -.1149
60	Ungrp'd	2 .2633 .9335	3 .0575	-.0560 1.3375 2.1043
61	2	2 .8974 .6828	3 .2922	-.0144 .5167 -.1495
62	3	3 .2750 .8369	2 .1064	-.5692 -.2846 -2.0755

Case Number	Actual Group	Highest Probability Group P(D/G) P(G/D)	2nd Highest Group P(G/D)	Discrim Scores
63	3 **	2 .6947 .7250	3 .2682	-.1982 1.5875 -.3606 .7617 1.9871 -.7078 -.0336 .3685 -.1946 2.1086 -.8017 -.6981 1.1911 -.5849 2.9439 .5664 2.5669 -.3995 .7239 1.1852 -.5150 -1.7425 1.7082 -.1247 .2192 2.1471 .8856 2.8817 -1.6157 -.4766 .2952 .5647 -1.9876 .2994 2.0128 -.7141 1.4503 .2751 .7316 -.3044 2.5046 .4442
64	2	2 .5246 .9422	3 .0495	
65	2	2 .8538 .6450	3 .3240	
67	1	1 .7619 .9228	2 .0758	
68	2	2 .0209 .7704	1 .2186	
69	3 **	2 .3444 .9555	3 .0424	
70	2	2 .8653 .9044	3 .0738	
71	3	3 .5175 .7989	2 .1203	
72	2	2 .5450 .9517	3 .0464	
73	1	1 .7387 .9958	2 .0042	
74	2	2 .1580 .5529	3 .4236	
75	2	2 .5094 .8805	3 .1163	
76	2	2 .7045 .7460	1 .2430	
77	2	2 .3302 .8663	3 .1314	

Cave Number	Actual Group	Highest Probability Group P(D/G) P(G/D)	2nd Highest Group P(G/D)	Discrim Scores
85	2	2 .9626 .9222	3 .0700	.4481 1.3934 .2301
86	Ungrp	2 .5826 .8279	3 .1235	.4356 -.2771 1.0529
87	2	2 .4813 .9584	1 .0333	1.1510 1.1041 1.6856
88	Ungrp	2 .5633 .7015	1 .2035	.8405 -.5189 .0779
89	3 **	2 .8487 .6418	3 .3511	-.0441 .4637 -.2895
90	Ungrp	1 .3481 .9915	2 .0082	2.3297 -1.9300 -1.1016
91	1 **	2 .0487 .6376	1 .3432	1.7877 1.1896 -2.2333
92	2 **	1 .6919 .9946	2 .0053	2.7470 -1.7561 -.1414
93	Ungrp	3 .8599 .5794	4 .3051	-1.1288 -.2291 .2182
94	2 **	1 .1885 .7877	2 .2121	2.6040 .2464 1.9190
95	3 **	1 .3499 .8417	2 .1512	1.8505 -.5013 -.5097
96	Ungrp	2 .4450 .8069	1 .1532	1.3006 .8492 -1.1878
97	1	1 .9660 .9825	2 .0174	2.7559 -.8305 -.4752
98	2	2 .0371 .9655	1 .0309	1.1989 .9122 3.0940

Case Number	Actual Group	Highest Probability Group P(D/G) P(G/D)	2nd Highest Group P(G/D)	Discrim Scores
102	1	1 .4347 .5021	2 .4960	2.1759 .8852 -.0216
103	1 **	2 .4563 .5051	1 .4916	1.8425 .1404 .8750
104	1	1 .6343 .9060	2 .0936	2.6663 .3584 -.9535
105	2 **	1 .6346 .9311	2 .0688	2.9096 .3529 -.1763
106	2	2 .1390 .5888	1 .4065	2.1155 1.3735 -1.4009
107	1	1 .9947 .9750	2 .0249	2.9497 -.3899 .1274
108	1	1 .8952 .9868	2 .0131	2.7274 -1.0381 -.6539
109	1	1 .9459 .9930	2 .0070	2.9915 -1.1775 -.0487
110	1	1 .8144 .9857	2 .0143	2.9525 -.5040 -1.0486
111	1	1 .9505 .9874	2 .0126	3.2539 -.4294 .4148
112	1	1 .8813 .9972	2 .0028	3.6292 -.8226 .3133
113	1	1 .8911 .9870	2 .0130	2.8877 -.7291 -.8479
114	1	1 .9963 .9860	2 .0140	2.9763 -.7459 .0869
115	Ungrpd	1 .0519 .9033	2 .0967	3.3218 .7097 2.3641

Case Number	Actual Group	Highest Probability Group	P(D/G)	P(G/D)	2nd Highest Group	P(G/D)	Discrim Scores
116	1	1	.1456	.9996	2	.0004	4.2904 -1.4362 1.6141
117	Ungrp'd	1	.0549	.9995	2	.0005	3.8034 -2.1486 2.0195
118	1	1	.6549	.9978	2	.0022	3.0542 -1.7671 -.4971
119	Ungrp'd	1	.7534	.9964	2	.0036	3.1509 -1.1531 -.9844
120	1	1	.4646	.9996	2	.0004	4.2252 -1.2352 .6394
121	1	1	.3943	.9997	2	.0003	3.8861 -.9824 .2788
122	1	1	.4988	.9688	2	.0311	3.2145 .5138 -1.1439
123	1	1	.7648	.9986	2	.0014	3.4130 -1.5235 -.2648
124	Ungrp'd	1	.7728	.9825	2	.0175	3.3026 .1621 -.7609
125	1 **	2	.0044	.7717	1	.2282	2.4479 1.4243

Symbols used in Plots

Symbol	Group	Label
1	1	
2	2	
3	3	
4	4	
#		All Ungrouped Cases
*		Group Centroids

12.4 APPENDIX D DDA RUN 2

Classification Results

<u>Actual Group</u>		<u>No. of Cases</u>	<u>Predicted Group Membership</u>			
			<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Group	1	22	19 86.4%	3 13.6%	0 .0%	0 .0%
Group	2	24	3 12.5%	17 70.8%	4 16.7%	0 .0%
Group	3	23	1 4.3%	3 13.0%	11 47.9%	8 34.8%
Group	4	22	0 .0%	0 .0%	6 27.3%	16 72.7%
Ungrouped Cases		17	5 29.4%	5 29.4%	3 17.6%	4 23.5%

Percent of "grouped" cases correctly classified: 69.23%

12.5 APPENDIX E - DDA RUN 2

Pooled Within-Groups Correlation Matrix

	TRPFIW	TRBR	TRNTV	TRGDI	TRGDS	TRLIFEEX	TRECPC	TRURBZN
TRPFIW	1.00000							
TRBR	-.36842	1.00000						
TRNTV	-.00181	-.56539	1.00000					
TRGDI	-.29379	.28377	-.06380	1.00000				
TRGDS	-.11057	-.21347	.31948	-.13087	1.00000			
TRLIFEEX	.13954	-.71712	.60342	-.20221	.28202	1.00000		
TRECPC	-.02265	-.36284	.59123	-.05515	.47001	.48871	1.00000	
TRURBZN	-.14976	-.21784	.58289	.12769	.21803	.39591	.54920	1.00000

Correlations which cannot be computed are printed as ''

12.6 APPENDIX F - DDA RUN 3

- - DISCRIMINANT ANALYSIS - -

137 (unweighted) cases were processed.
 38 of these were excluded from the analysis.
 24 had missing or out-of-range group codes.
 14 had both.
 99 (unweighted) cases will be used in the analysis.

Number of Cases by Group

YEARS	Number of Cases		Label
	Unweighted	Weighted	
1	23	23.0	
2	25	25.0	
3	25	25.0	
4	26	26.0	
Total	99	99.0	

Group means

YEARS	TRBR	TRLIFEEX	TRECPC
1	1.36577	1377878.33309	14.27614
2	1.47863	1024468.56536	9.94406
3	1.52914	678969.53287	5.51872
4	1.56751	391488.26634	3.88372
Total	1.48851	853089.38426	8.24139

Group Standard Deviations

YEARS	TRBR	TRLIFEEX	TRECPC
1	.04114	114083.65122	2.07071
2	.05588	208087.58585	3.05020
3	.05568	288816.18592	2.23674
4	.02238	167750.99454	1.24318
Total	.08757	421337.34397	4.59089

Pooled Within-Groups Correlation Matrix

	TRBR	TRLIFEEX	TRECPC
TRBR	1.00000		
TRLIFEEX	-.70086	1.00000	
TRECPC	-.33780	.47934	1.00000

Wilks' Lambda (U-statistic) and univariate F-ratio
 with 3 and 95 degrees of freedom

Variable	Wilks' Lambda	F	Significance
TRBR	.26493	87.86	.0000
TRLIFEEX	.23170	105.0	.0000
TRECPC	.23062	105.6	.0000

12.6 APPENDIX F - DDA RUN 3

- - DISCRIMINANT ANALYSIS - -

On groups defined by YEARS
Analysis number 1

Stepwise variable selection

Selection rule: Minimize Wilks' Lambda
Maximum number of steps..... 6
Minimum Tolerance Level..... .00100
Minimum F to enter..... 1.0000
Maximum F to remove..... 1.0000

Canonical Discriminant Functions

Maximum number of functions..... 3
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .25000

Variables not in the analysis after step 0

Variable	Tolerance	Minimum Tolerance	F to enter	Wilks' Lambda
TRBR	1.0000000	1.0000000	87.863	.26493
TRLIFEEX	1.0000000	1.0000000	105.00	.23170
TRECPC	1.0000000	1.0000000	105.65	.23062

At step 1, TRECPC was included in the analysis.

Wilks' Lambda		Degrees of Freedom	Signif.	Between Groups
.23062	1	3	95.0	
Equivalent F	105.647	3	95.0	.0000

Variables in the analysis after step 1

Variable	Tolerance	F to remove	Wilks' Lambda
TRECPC	1.0000000	105.65	

Variables not in the analysis after step 1

Variable	Tolerance	Minimum Tolerance	F to enter	Wilks' Lambda
TRBR	.8858894	.8858894	11.542	.16853
TRLIFEEX	.7702301	.7702301	10.750	.17171

12.6 APPENDIX F - DDA RUN 3

At step 2, TRBR was included in the analysis.

		Degrees of Freedom		Signif.	Between Groups
Wilks' Lambda	.16853	2	3	95.0	
Equivalent F	44.9909		6	188.0	.0000

Variables in the analysis after step 2

Variable	Tolerance	F to remove	Wilks' Lambda
TRBR	.8858894	11.542	.23062
TRECPC	.8858894	17.921	.26493

Variables not in the analysis after step 2

Variable	Tolerance	Minimum Tolerance	F to enter	Wilks' Lambda
TRLIFEEX	.4423681	.4423681	8.3026	.13293

At step 3, TRLIFEEX was included in the analysis.

		Degrees of Freedom		Signif.	Between Groups
Wilks' Lambda	.13293	3	3	95.0	
Approximate F	32.4975		9	226.5	.0000

Variables in the analysis after step 3

Variable	Tolerance	F to remove	Wilks' Lambda
TRBR	.5087949	9.0425	.17171
TRLIFEEX	.4423681	8.3026	.16853
TRECPC	.7702233	9.7176	.17460

F level or tolerance or VIN insufficient for further computation.

Summary Table

Step	Action	Vars	Wilks'		
	Entered	Removed	In	Lambda	Sig. Label
1	TRECPC		1	.23062	.0000
2	TRBR		2	.16853	.0000
3	TRLIFEEX		3	.13293	.0000

12.6 APPENDIX F - DDA RUN 3

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Wilks' Fcn	Lambda	Sig
					:	0	.1329 .0000
1*	4.7442	94.06	94.06	.9088	:	1	.7636 .0000
2*	.2610	5.17	99.24	.4550	:	2	.9629 .0587
3*	.0385	.76	100.00	.1927	:		

* marks the 3 canonical discriminant functions remaining in the analysis.

Standardized Canonical Discriminant Function Coefficients

	FUNC 1	FUNC 2	FUNC 3
TRBR	-.34310	1.27937	.45926
TRLIFEEX	.31739	1.35999	-.55701
TRECP	.56907	-.19134	.96844

Structure Matrix:

Pooled-within-groups correlations between discriminating variables and canonical discriminant functions

(Variables ordered by size of correlation within function)

	FUNC 1	FUNC 2	FUNC 3
TRECP	.83711*	.02839	.54630
TRLIFEEX	.83063*	.37162	-.41467
TRBR	-.75778*	.39085	.52251

Unstandardized Canonical Discriminant Function Coefficients

	FUNC 1	FUNC 2	FUNC 3
TRBR	-7.494434	27.94567	10.03184
TRLIFEEX	.1540786E-05	.6602224E-05	-.2704064E-05
TRECP	.2541416	-.8545012E-01	.4324928
(constant)	7.746610	-46.52539	-16.18999

Group Centroids

Canonical Discriminant Functions evaluated at Group Means

Group	FUNC 1	FUNC 2	FUNC 3
1	3.26209	-.48079	-.04033
2	.77081	.70992	.17387
3	-1.26477	.21867	-.29905
4	-2.41074	-.46756	.15604

12.6 APPENDIX F - DDA RUN 3

Case Number	Actual Group	Highest Probability Group	P(D/G)	P(G/D)	2nd Highest Group	P(G/D)	Discrim Scores
1	4	4	.9191	.8378	3	.1612	-2.4760
2	4	4	.7401	.5899	3	.4068	-2.6181
3	4	4	.7910	.8835	3	.1162	-2.8966
4	Ungrp	4	.9436	.8521	3	.1472	-2.7580
5	3**	4	.8272	.7356	3	.2633	-2.4513
6	4	4	.8273	.8681	3	.1316	-2.9003
7	4	4	.5611	.8418	3	.1579	-2.6730
8	3 **	4	.8930	.8045	3	.1947	-2.5053
9	4	4	.9272	.8014	3	.1978	-2.9045
10	4	4	.9857	.7282	3	.2698	-2.3538
11	4	4	.9502	.8195	3	.1800	-2.8534
12	3 **	4	.9928	.6592	3	.3371	-2.3332
13	4	4	.8578	.6862	3	.3122	-2.7851
14	4	4	.8922	.5921	3	.4044	-2.4359
15	4	4	.6936	.5117	3	.0880	-2.7537
16	4	4	.9215	.8752	3	.1245	-3.0493
17	3 **	4	.8974	.6889	3	.3056	-2.3045
18	4	4	.9420	.8625	3	.1370	-2.9379
19	4	4	.9558	.7691	3	.2298	-2.8023
20	4	4	.9377	.8242	3	.1754	-2.9374
21	3	3	.7635	.5767	4	.3781	-1.1273
22	Ungrp	4	.9708	.8362	3	.1631	-2.8267
23	3 **	2	.3009	.6735	3	.2638	.7124
24	3 **	4	.6638	.5992	3	.3965	-1.9217
25	3	3	.2671	.7225	4	.2436	-2.1281
26	4 **	3	.7958	.5869	4	.3680	-1.6890
27	3 **	4	.9362	.5652	3	.4288	-2.2294
28	4	4	.9619	.7992	3	.2001	-2.6758
29	3 **	4	.9481	.6151	3	.3812	-2.3908
30	4	4	.4608	.5182	3	.4407	-1.7155

12.6 APPENDIX F - DDA RUN 3

Case Number	Actual Group	Highest Probability Group	P(D/G)	P(G/D)	2nd Highest Group	P(G/D)	Discrim Scores
31	4	4	.7306	.9001	3	.0995	-2.6736
32	2 **	3	.0864	.6046	2	.3811	-.0314
33	3 **	4	.8705	.8427	3	.1560	-2.4187
34	3	3	.0873	.5090	4	.4903	-3.0044
35	Ungrp	3	.6186	.6539	4	.2551	-.7401
36	Ungrp	3	.5384	.7540	2	.1704	-1.1209
37	2 **	3	.6883	.5527	2	.2242	-.6663
38	4	4	.7385	.9021	3	.0975	-2.7463
40	Ungrp	4	.9271	.5860	3	.4018	-1.9643
41	4 **	3	.7367	.6967	4	.2765	-1.3728
42	Ungrp	4	.9970	.7543	3	.2441	-2.4511
43	Ungrp	3	.8279	.7601	4	.1929	-1.2641
44	3 **	4	.8414	.5714	3	.4079	-1.6999
45	2 **	3	.7069	.5781	4	.2391	-.9997
46	4	4	.8584	.8100	3	.1875	-2.2543
47	2 **	3	.9091	.7440	2	.1450	-.9039
48	3 **	4	.7366	.5923	3	.3959	-2.1634
49	Ungrp	3	.6837	.6046	2	.3537	-.4361
50	4	4	.8179	.5865	3	.3960	-1.5594
51	4 **	3	.6361	.7717	4	.1178	-1.3481
52	3	3	.9967	.7035	4	.1888	-1.0536
53	3 **	4	.9708	.6328	3	.3589	-1.9476
54	2	2	.7448	.5999	3	.3728	-.2346
55	2	2	.2313	.7554	3	.2323	-.3353
56	Ungrp	4	.8988	.6124	3	.3740	-1.8538
57	4 **	3	.7722	.7337	2	.1760	-1.0080
58	3	3	.4437	.6800	2	.2823	.7139
59	2 **	3	.8806	.5842	2	.3012	-.5688
60	Ungrp	2	.1474	.8181	3	.1750	-.2490

12.6 APPENDIX F - DDA RUN 3

Case Number	Actual Group	Highest Probability Group	P(D/G)	P(G/D)	2nd Highest Group	P(G/D)	Discrim Scores
61	2	2	.9024	.7860	3	.2032	.3362
62	3	3	.3557	.6112	2	.2910	-.0640
63	3 **	2	.7300	.5081	3	.4591	-.1475
64	2	2	.4474	.9239	3	.0638	.9725
65	2	2	.7369	.6081	3	.3421	.1608
66	1	1	.4689	.9783	2	.0216	2.6570
67	1	1	.7744	.9475	2	.0522	2.5939
68	2	2	.7775	.9460	1	.0321	1.3405
69	3 **	2	.0314	.9246	3	.0738	.7094
70	2	2	.6685	.8711	3	.0993	.9356
71	3	3	.5234	.6256	4	.2145	-1.3008
72	2	2	.3620	.9197	3	.0719	.3847
73	1	1	.4354	.9965	2	.0035	3.3437
74	2	2	.1075	.5015	3	.4429	.4924
75	2	2	.8927	.8735	3	.1169	.6124
76	2	2	.7619	.7158	1	.2605	1.5538
77	2	2	.4085	.7916	3	.1973	-.1456
78	2	2	.7709	.9148	3	.0542	1.1088
79	4	4	.6066	.8628	3	.1354	-2.2595
80	Ungrpd	2	.9148	.7198	3	.2515	.2695
81	Ungrpd	2	.4487	.7022	3	.2516	-.1455
83	3	3	.4558	.7059	2	.2262	-1.0682
84	Ungrpd	4	.0000	.8825	3	.1044	-.3925
85	2	2	.9638	.9148	3	.0733	.7577
86	Ungrpd	2	.0817	.8256	3	.0837	.6956
87	2	2	.6201	.9515	1	.0351	1.3552
88	Ungrpd	2	.3197	.6912	3	.1547	.9945
89	3 **	2	.8131	.6645	3	.2955	.2408

12.6 APPENDIX F - DDA RUN 3

Case Number	Actual Group	Highest Probability Group	P(D/G)	P(G/D)	2nd Highest Probability Group	P(G/D)	Discrim Scores
90	Ungrpd	1	.1459	.9954	2	.0045	2.8004
91	1	1	.7339	.9159	2	.0831	2.3764
92	2 **	1	.3724	.9948	2	.0052	3.2216
93	Ungrpd	4	.0393	.5901	3	.2853	-.7220
94	2 **	1	.1332	.7911	2	.2087	2.7878
95	3 **	1	.3331	.8356	2	.1601	2.1528
96	Ungrpd	1	.4470	.5347	2	.4477	.6560
97	1	1	.4555	.9640	2	.0357	2.8210
98	2	2	.0039	.9726	1	.0215	1.2587
99	3 **	2	.3902	.6271	3	.3450	-.4608
100	Ungrpd	2	.0160	.9576	3	.0311	.5695
101	Ungrpd	2	.0482	.9712	3	.0264	.5035
102	1	1	.6330	.6525	2	.3458	2.4226
103	1 **	2	.2693	.8853	1	.1097	2.0382
104	1	1	.4526	.9264	2	.0733	2.8594
105	2 **	1	.7232	.9823	2	.0177	3.3894
106	2 **	1	.1505	.6553	2	.3424	2.4879
107	1	1	.8902	.9659	2	.0341	3.3273
108	1	1	.7315	.9854	2	.0146	3.0271
109	1	1	.9810	.9842	2	.0158	3.2593
110	1	1	.5819	.9913	2	.0087	3.1842
111	1	1	.8871	.9755	2	.0244	3.5448
112	1	1	.9367	.9960	2	.0040	3.9003
113	1	1	.8084	.9925	2	.0074	3.2276
114	1	1	.9711	.9705	2	.0294	3.2960

12.6 APPENDIX F - DDA RUN 3

Case Number	Actual Group	Highest Probability Group	P(D/G)	P(G/D)	2nd Highest Group	P(G/D)	Discrim Scores
115	Ungrp	1	.0019	.9768	2	.0232	3.5744
116	1	1	.1598	.9986	2	.0014	4.6309
117	Ungrp	1	.4119	.9950	2	.0050	4.0753
118	1	1	.7353	.9960	2	.0040	3.4580
119	Ungrp	1	.3927	.9982	2	.0018	3.4740
120	1	1	.2844	.9995	2	.0005	4.6768
121	1	1	.7188	.9990	2	.0010	4.2998
122	1	1	.6467	.9841	2	.0159	3.6101
123	1	1	.7568	.9980	2	.0020	3.8637
124	Ungrp	1	.9058	.9906	2	.0094	3.5936
125	1 **	2	.0057	.8651	1	.1346	2.6101

Symbols used in Plots

<u>Symbol</u>	<u>Group</u>	<u>Label</u>
1	1	
2	2	
3	3	
4	4	
#		All Ungrouped Cases
*		Group Centroids

* indicates a group centroid

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12.6 APPENDIX F - DDA RUN 3

Group 2

* indicates a
group centroid

Across: Function 1
Down: Function 2

12.6 APPENDIX F - DDA RUN 3

Group 3

* indicates a
group centroid

Across: Function 1

Down: Function 2

12.6 APPENDIX F - DDA RUN 3

Group 4

* indicates a
group centroid

Across: Function 1

Down: Function 2

12.6 APPENDIX F - DDA RUN 3

Ungrouped cases

Across: Function 1

Down: Function 2

12.6 APPENDIX F - DDA RUN 3

Classification Results -

Actual Group	No. of Cases	Predicted Group Membership			
		1	2	3	4
Group 1	23	21 91.3%	2 8.7%	0 .0%	0 .0%
Group 2	25	4 16.0%	16 64.0%	5 20.0%	0 .0%
Group 3	25	1 4.0%	5 20.0%	8 32.0%	11 44.0%
Group 4	26	0 .0%	0 .0%	4 15.4%	22 84.6%
Ungrouped Cases	24	6 25.0%	7 29.2%	4 16.7%	7 29.2%

Percent of "grouped" cases correctly classified: 67.68%

Classification Processing Summary

- 137 Cases were processed.
- 0 Cases were excluded for missing or out-of-range group codes.
- 14 Cases had at least one missing discriminating variable.
- 123 Cases were used for printed output.

12.7 APPENDIX G GROUP 3

COUNTRY #	COUNTRY NAME	SECED-B	BR	LIFEEXP	ECPC	GRFSEF	DISCRIM SCORI
21	INDIA	43	32	59.1	231	0.67	-1.13
25	KENYA	23	53	59.7	100	0.79	-2.13
34	LESOTHO	26	41	57.3	0	0.92	-3.00
52	MOROCCO	36	35	62.0	247	1.04	-1.05
58	PARAGUAY	29	34	67.1	232	0.67	-0.07
62	THAILAND	28	23	66.1	352	0.58	-0.06
71	BOTSWANA	37	47	59.8	425	1.42	-1.30
83	NICARAGUA	43	41	64.8	261	1.21	-1.07
AVG		33.1	38.3	62.0	231.0	0.91	-1.23
MIN		23.0	23.0	57.3	0.0	0.58	-3.00
MAX		43.0	53.0	67.1	425.0	1.42	-0.06
COUNT		8.0					

FELL INTO #4

5	NEPAL	30	39	52.2	25	1.04	-2.45
8	LAO PDR	27	41	49.7	39	1.04	-2.51
12	ZAIRE	24	45	53.0	71	0.79	-2.33
17	NIGERIA	19	50	51.5	138	0.58	-2.30
24	HAITI	19	34	55.7	53	0.58	-1.92
27	GHANA	39	44	55.0	68	1.08	-2.23
29	TOGO	22	45	54.0	51	0.71	-2.39
33	MAURITANIA	16	46	47.0	114	0.63	-2.42
44	BOLIVIA	34	43	54.5	257	0.67	-1.70
48	COTE D'IVOIRE	20	51	53.4	173	0.58	-2.16
53	CAMEROON	26	42	53.7	147	0.88	-1.95
AVG		25	44	52.7	103	0.78	-2.21

FELL INTO

#2							
23	CHINA	44	20	70.1	598	0.83	0.71
63	TUNISIA	44	30	66.7	520	1.17	-0.15
69	COSTA RICA	41	28	74.9	622	0.71	0.71
89	BRAZIL	39	28	65.6	915	0.96	0.24
99	IRAQ	47	42	65.0	774	0.79	0.46
AVG		43	30	68.5	686	0.89	0.39

COUNTRY #	COUNTRY NAME	SECED>B	BR	LIFEEXP	ECPC	DISCRIM SCORE
1	MOZAMBIQUE	5	45	47.5	85	-2.48
2	TANZANIA	4	50	54	38	-2.62
3	ETHIOPIA	15	44	45.5	20	-2.9
6	CHAD	7	44	46.5	17	-2.9
7	BHUTAN	5	38	48.9	13	-2.67
9	MALAWI	4	53	48.1	41	-2.9
10	BANGLADESH	17	42	51.8	57	-2.35
11	BURUNDI	4	46	48.5	21	-2.85
13	UGANDA	13	50	52	27	-2.78
14	MADAGASCAR	19	45	54.5	40	-2.44
15	SIERRA LEONE	18	48	42	77	-2.75
16	MALI	6	50	45	24	-3.05
18	NIGER	6	51	45.5	40	-2.94
19	RWANDA	7	51	49.5	41	-2.8
20	BURKINA FASO	7	47	48.2	17	-2.94
28	CNTRL AFRCN R.	11	44	49.5	30	-2.68
30	ZAMBIA	20	50	54.4	379	-1.72
31	GUINEA	9	46	43.5	73	-2.67
38	AFGHANISTAN	8	50	42.5	90	-2.75
46	SENEGAL	16	46	48.3	156	-2.25
50	PAUPA NEW GUINEA	13	38	54.9	233	-1.56
79	ANGOLA	11	47	47	203	-2.26
AVG		10.2	46.6	48.5	78.3	-2.6
MIN		4	38	42	13	-3.05
MAX		20	53	54.9	379	-1.56
COUNT		22				
FELL INTO						
#3						
26	PAKISTAN	20	46	57.7	233	-1.69
41	MYANAMAR	24	31	61.3	82	-1.37
51	GUATEMALA	21	41	63.4	171	-1.35
57	EL SALVADOR	26	37	64.4	233	-1.01
AVG		22.8	38.8	61.7	179.7	-1.4

END

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