Spring 2004

The Resource Curse Revisited

Alexis Manning '04
Illinois Wesleyan University

The Resource Curse Revisited

Alexis Manning
Committee:
Dr. Robert Leekley (chair), Dr. Margaret Chapman, Dr. Ilaria Osella-Durbal, Dr. Abigail Jahiel
Department of Economics, Illinois Wesleyan University
Research Honors, Spring 2004

Abstract
This research project examines the phenomenon of the *resource curse*—the inverse relationship between natural resource abundance and economic growth seen in developing countries since 1965. A large body of empirical research detects a negative statistical relationship between natural resource abundance and slow economic growth in developing countries during the latter part of the twentieth century. The *resource curse* argues that natural resources interact with various social, political, and economic factors, and the modification of these factors results in slower economic growth. This paper aims to investigate the validity of the *resource curse*. In contrast with many previous studies, the results of this paper do not find a statistically significant relationship between natural resources and economic growth, and therefore, the results do not support the existence of a *resource curse*. This study also explores some possible theoretical and empirical problems present in previous studies.

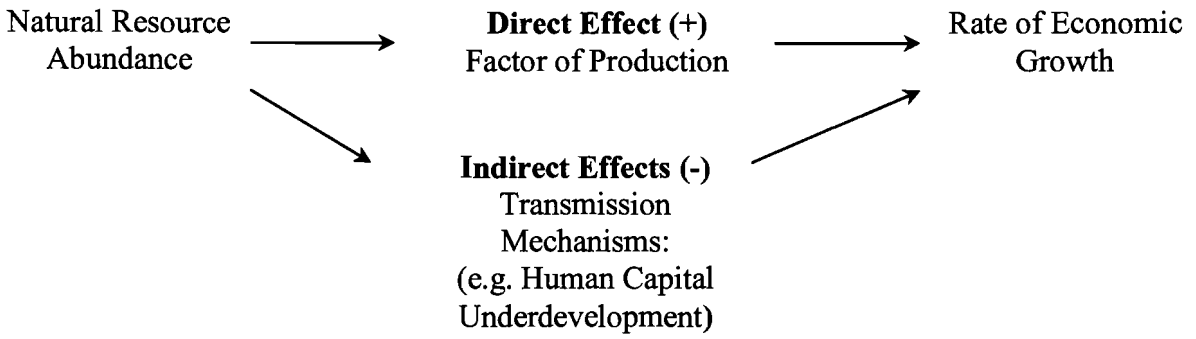
I. INTRODUCTION

Historically, natural resources have played an integral role in the development of currently wealthy, industrialized nations, including Australia, Canada, the Scandinavian countries, and the United States. Logically, natural resources should promote economic development, because natural capital expands the production possibilities of an economy. However, a large body of empirical evidence supports a clear negative correlation between economic growth and natural resource abundance—known as the *resource curse*—in regard to developing nations during the past thirty years (Stevens, 2003).

This study examines the role natural resources may play in the divergence of growth rates among developing countries. Natural resource endowments differ considerably across developing countries, as seen in the striking contrast between the oil-rich Persian Gulf nations and countries like Haiti or Bangladesh, which lack basic natural resource endowments such as fertile land, minerals, and raw materials (Todaro & Smith, 2003). Natural resource endowments can greatly influence the development and the fundamental characteristics of an economy. Therefore, it appears reasonable that natural resource endowments may affect the growth rate of a country.

Clearly, natural resources themselves are not inherently detrimental to economic development, as evidenced by basic economic theory, common sense, and historically based counter-examples. Rather, the *resource curse* argues that natural resource abundance often creates distortions or certain tendencies in an economy, and these distortions then undermine economic performance. These distortions serve as transmission mechanisms, which create and explain the negative correlation between natural resource abundance and economic growth. Figure 1 provides a visual representation of the direct and indirect effects of natural resources on economic growth. Previous studies attribute the *resource curse* with mixed success to the following sources: long-term decline in terms of trade, primary product export revenue volatility, Dutch Disease[1], crowding out effects, government mismanagement, corruption, low levels of human capital as well as others. While, according to Ross (1999) empirical evidence strongly supports the existence of a *resource curse*, the underlying causes or transmission mechanisms remain controversial.

Figure 1: Direct and Indirect Effects of Natural Resources



This study examines the relationship between natural resources abundance, human capital, and economic growth. It first seeks to confirm or refute the presence of the *resource curse* utilizing the most current data available for developing countries as well as various measures of natural resource abundance. If the *resource curse* exists, then there would be a negative correlation between natural resources and growth rates. If the *resource curse* does not exist, then there would either be a positive correlation or a statistically insignificant relationship between natural resources and economic growth. If I detect a *resource curse*, I then seek to determine if low levels of human capital may serve as a transmission mechanism of the *resource curse*. If human capital serves as a transmission mechanism, then low levels of human capital directly hinder economic growth in resource-rich countries, not the actual natural resource endowment.

This study finds little evidence to support the existence of a *resource curse*. A statistically significant relationship does not exist between the most reasonable measures of natural resource abundance and economic growth. The results of this study only find evidence to support the *resource curse* when percent employment in agriculture measures natural resource abundance. The results are compatible with human capital serving as a transmission mechanism. However, the magnitude of the *resource curse* effect is extremely small compared to previous studies, and percent employment in agriculture is the least reasonable measure of natural resources used in this study.

This paper develops as follows: Section II encompasses a review of relevant past literature regarding the *resource curse* and human capital. Section III provides a theoretical model based on previous research and economic concepts. Section IV describes the data used to estimate the model and provides summary statistics of the variables. Section V presents the

empirical model, restates the model in terms of the data, and predicts the effects of each variable. Section VI presents and analyzes the results of the regressions. Section VII explores some possible empirical and theoretical problems present in existing *resource curse* studies. Section VIII summarizes results and discusses avenues of future research.

II. LITERATURE REVIEW

A. Presence of a *Resource Curse*

A large body of empirical evidence supports the existence of a negative correlation between natural resource abundance and economic growth observed during the last several decades of the twentieth in developing nations (Auty, 1997, Sachs and 1995). Sachs and Warner (1995, 1999, 2000) conduct several comprehensive econometric studies analyzing the relationship between natural resource dependency in terms of agriculture, minerals, and fuel with economic growth. They discover a consistent negative correlation between natural resource abundance and economic growth regardless of the inclusion or exclusion of controlling explanatory variables. In their 1995 study, Sachs and Warner discover a clear negative relationship between natural resource-based exports, including agriculture, minerals, and fuels, and GDP growth. Sachs and Warner investigate ninety-five developing countries, and only two resource-rich countries achieve even a 2% annual GDP growth rate from 1970-1989. Both Gylfason (2001) and Sachs and Warner (1999) estimate that a ten percent increase in natural resources—as measured by percent employment of the primary sector in labor force—is correlated with a decrease of one percent in the rate of annual per capita GDP growth (Gylfason, 2001).

Subsequent studies by Sachs and Warner analyze the effects of various control variables, such as institutional quality, regional effects, price volatility, and outliers, such as oil-producing nations (Sachs and Warner 2001). The negative correlation between natural resource abundance and economic performance persists despite the inclusion or exclusion of these controlling variables, thus indicating the robust nature of this relationship (Auty, 2001).

The existing literature emphasizes that the *resource curse* persists across numerous measures of natural resources (Auty, 2001). Sachs and Warner (1995) measure resource abundance as dependence on primary exports (percent natural resource exports as a percent of GDP); Gylfason (2001) uses the share of the labor force in the primary sector; Wood and Berger

(1997) use arable land per capita (Auty, 2001). Despite these varying methods of measurement, these studies unanimously find a negative correlation between natural resources and economic growth. The consensus of these studies indicates that the *resource curse* is not sensitive to the type of measurement used to approximate natural resource abundance.

Nonetheless, arable land per capita and dependence on primary sector exports clearly capture two very different aspects of natural resources, and it appears unlikely that these two variables would impact the rate of economic growth in the same manner. In addition, one must question whether arable land per capita truly captures the idea of natural resources. If one were to use arable land per capita as a proxy of an oil-producing country with very little land, this country would be classified as resource poor despite its great wealth in oil. The inconsistency involved in the classification of countries as resource poor and resource rich casts some doubt upon the theoretical basis of the *resource curse.*

Other studies emphasize that the negative relationship between natural resource abundance and economic growth is a relatively recent phenomenon and may simply be an aberration. Historically, the presence of natural resources has played an integral role in economic development, as evidenced by Australia, Canada, and the United States (Stevens, 2003). In addition, time-series studies find that natural resources have promoted economic growth from the late nineteenth century till the 1960's in developing countries. Maloney in his 2002 study asserts that the process of economic growth occurs in the very long run, and therefore, reliable conclusions should not be drawn from cross sectional regressions of the brief, highly unstable period (Stevens, 2003).

Literature emphasizes that the *resource curse* is not inevitable. As stated above, historically, natural resources have proven advantageous to economic growth. In addition, a few natural resource-endowed developing countries, such as Botswana, Chile, Indonesia, and Malaysia have avoided the *resource curse* through systematic economic policies. These countries have used their natural resource wealth to promote, rather than hinder, economic growth (Stevens, 2003).

B. Transmission Mechanisms of the *Resource Curse*

Numerous explanations exist as to why the *resource curse* may afflict a country. According to the existing literature, transmission mechanisms serve an intermediary variable

between natural resource abundance and economic growth. Thus, natural resources inhibit economic growth through these transmission mechanisms. Some of these transmission mechanisms include, long term decline in terms of trade, primary product revenue volatility, Dutch disease[1], crowding out effects, increasing the role of the state, social and political impacts (Stevens 2004). The relative importance of each transmission mechanism varies according to the specific country as well as the measure of natural resource abundance.

Various transmission mechanisms of the *resources curse* exist, though the measurement of natural resources would influence which transmission mechanisms are significant. In the case of percent employment in agriculture, human capital appears to be the most plausible transmission mechanism. Human capital relates to a characteristic of the labor force, and therefore, percent employment in agriculture would affect human capital. Also, education has a lower rate of return in an agriculture-based society (Todaro, 2004) thus indicating that human capital is a plausible transmission mechanism of the *resource cu*rse when natural resource are measured by percent employment in agriculture. On the other hand, % primary sector exports of GDP would relate to transmission mechanisms related to trade, such as primary commodity price volatility, the Dutch Disease, or declining terms of trade. Since I only find a statistically significant relationship between percent employment in agriculture and economic growth, this study focuses on the role of human capital as a transmission mechanism of the *resource curse*.

C. Human Capital as a Transmission Mechanism

Human capital encompasses skills and knowledge of workers, usually derived from education and training, which contribute to productivity. Human capital, rather than natural or physical capital, exerts the greatest influence on economic growth throughout the world. Specifically, human capital generates just under two-thirds of the income in developing nations (Auty, 2001). Thus, previous literature supports the existence of a positive correlation between human capital—generally measured by education—and economic growth.

The relationship between human capital and natural resource abundance remains less decisive. This particular relationship has not received nearly as much attention as other transmission mechanisms of the *resource curse*. Birdsall (1997) finds a negative link between human capital and resource abundance. Also, education in Latin America, a resource-rich region, lags behind the resource-poor countries of East Asia after controlling for differences in income (Birdsall, 1997).

III. THEORETICAL MODEL

A. *Resource Curse*

According to the *resource curse*, natural resources and economic growth vary inversely. As the amount of natural resources increases, the rate of economic growth falls. This pattern is counter-intuitive, because economic theory predicts, *ceteris paribus*, that natural resources enhance an economy's production possibilities, thus augmenting the potential for economic growth. The mere presence of natural resources does not cause economic stagnation. Rather, natural resource abundance induces certain distortions in the economy, which then serve as transmission mechanisms, which, in turn, affects economic growth. These transmission mechanisms directly influence economic growth whereas natural resources only exert an indirect impact via the transmission mechanisms. Some transmission mechanisms include: the Dutch Disease, rent seeking, government mismanagement, and low levels of human capital (Gylfason, 2001).

This study focuses on the role human capital may play as a transmission mechanism, because the results of this study only detect a possible *resource curse* when percent employment in agriculture measures natural resource abundance. The human capital transmission mechanism, as opposed to a trade-related transmission mechanism, relates the best to percent employment in agriculture, because the workforce contains the human capital present in a society. The allocation of the workforce in various sectors of the economy, such as the agricultural sector, is related to the development of human capital.

B. Underdevelopment of Human Capital as a Transmission Mechanism

Human capital represents the skills and knowledge of workers. Human capital improves worker productivity, which then causes economic growth. An economy develops human capital primarily through education and other forms of training. According to the World Bank, human capital as opposed to natural or physical capital exerts the greatest influence on income (Auty, 2001). Thus, the development of education, which generates human capital, plays an integral role in economic growth.

Large natural resource endowments may create distortions in the economy that result in low levels of human capital. If a developing country possesses a large natural resource endowment, this country will devote its efforts and resources to the exploitation of the natural

resource, because it possesses a comparative advantage. Also, primary production appears particularly attractive, because it requires lower levels of initial investment. Primary production and natural resource-based industries do not require high levels of human capital compared to the manufacturing sector. In addition, few positive externalities exist in natural resource-based industries. Also, productivity varies across different economic activities, and manufacturing is significantly more productive than agriculture. Thus, a resource-abundant economy develops a very limited sector of the economy—the natural resource-based industry, and this sector does not require or promote the development of human capital.

It is important to note that the level of human capital is certainly not the only distinguishing characteristic between an economy based on manufactured exports and an economy based on primary product exports. Although the primary products sector, especially agriculture, does not possess the same growth-creating potential, these sectors often do not reach their potential productivity due to mismanagement, lack of investment, and the structure of global markets (Todaro and Smith, 2003).

On the contrary, resource-deficient countries do not possess the option of natural resource reliance. Therefore, these countries tend to focus on the exportation of manufactured goods. Manufactured goods require comparatively high levels of skill, thus creating a higher demand on education. In addition, the manufacturing sector creates stronger positive externalities. The manufacturing sector encourages the development of technology (Matsuyama, 1992). Manufacturing demands the development of human capital, which, in turn benefits, the entire economy whereas primary production does not require high levels of human capital. Workers trained in the manufacturing sector acquire skills that they can apply to other sectors of the economy (Gylfason, 2001).

If a country centers its economy on natural resources, this country may not develop an extensive educational system, because the core of the economy—the natural resource sector—does not necessitate high levels of education. A country that has a large portion of its labor force allocated in the primary sector, particularly agriculture, generally has low levels of human capital. People do not pressure the government to provide better education, because the rate of return on education is very low. The resource-based economy cannot utilize these new skills, and therefore, additional education does not increase income (Birdsall, 1997). In addition, if multinational companies, instead of the government or nationally based companies control the

natural resource sector, then the development of human capital may be nearly non-existent. Often, multi-national companies import their own skilled employees instead of training members of the local population. As a result, the local economy does not experience human capital development.

Without an effective education system, this economy lacks the ability to develop human capital. Thus, this resource-dependent economy cannot easily diversify into other economic sectors of the economy, such as manufacturing. Considering that human capital represents the most significant component of income creation, an economy based on low human capital-demanding sectors will experience lower levels of economic growth (Gylfason, 2001).

Interestingly, it is plausible that resource-abundant economies will still supply education, despite the lack of demand for education in the economy. Governments may still provide education funded by natural resource revenue windfalls in order to appease its constituents. However, this type of education qualifies as a consumption good rather than an investment good. Therefore, this education does not develop human capital and does not confer positive benefits on the economy (Birdsall, 1997). Unfortunately, it is difficult to separate the investment and consumption components of education empirically. In addition, even if the government supplies education, parents in an agriculturally-based society often elect not to send their children to school as children can contribute to the household income by working in the agricultural fields (Birdsall, 1997).

It is important to keep in mind that the mere correlation between natural resource abundance and low levels of human capital does not necessarily imply that natural resources inhibit the development of human capital. Underdevelopment of human capital and natural resource abundance may both be caused by a third variable, such as poverty. An impoverished country may have no other choice but to depend upon agriculture. Low levels of human capital may simply be a result of poverty and not the direct result of natural resource abundance. Poverty may lead to dependence upon natural resources, and this poverty, not the natural resources, can result in slow economic growth.

IV. DATA AND VARIABLES

A. Data

This study uses data from the 2003 edition of the World Development Indicators database, supplied by the World Bank. My empirical models utilize cross sectional data from 77 developing countries[2]—the same countries that Auty uses in his 1997 study[3] with the exclusion of eight countries due to data availability problems (Auty, 2001). My variables measuring human capital originate from the United Nations Development Report of 2000.

B. Variables

Table 1 provides a concise summary of all the variables involved in this study, listing definitions, sample size, minimum value, maximum value, mean, and standard deviation.

Table 1: Summary Statistics

Variable	Symbol	Definition	Sample Size	Min	Max	Mean	Standard Deviation
Economic growth rate	PC_Grow	Average annual percent change in real GDP growth per capita from 1970-2000	77	-4.2%	7.3%	1.1%	2
Natural Resource Variables:							
% primary sector exports of GDP	Export_GDP	% contribution of agriculture, raw material, food, mineral & fuel exports of GDP in 1970	68	2.3%	69.7%	22.4%	16.4%
% Agriculture of GDP	Ag_GDP	% contribution of land cultivation, fisheries, hunting, forestries & livestock production of GDP in 1970	73	0.3%	70.6%	29.4%	16.4%
Arable land per capita	Land_PC	Hectares of farmable land per capita in 1970	77	0	1.20	.37	.26
% employment in agriculture	Employ_Ag	% of total employment allocated to land cultivation, fisheries & livestock production in 1970	76	0%	93.0%	45.0%	29.0%
Human Capital Variables:							
Adult literacy rate	Lit_Rate	% population over 15 years with basic reading/writing skills in 1980	73	9.6%	96.1 %	59.2%	24.0%
Primary school completion Rate	Prim_Rate	% students successfully completing the last year of (or graduating from) primary school of total number of children of official graduation age in the population in 1980	73	11.0%	100.0 %	66.8%	18.9%
Secondary enrollment rate	Sec_Rate	% children of official school age enrolled in secondary school of total population of the corresponding official school age in 1980	43	2.7%	70.6 %	29.0%	18.3%

I use several distinct measures of natural resources. These proxies include: percent primary product exports of GDP, percent agriculture of GDP, arable land per capita, and percent employment in agriculture of total employment. Arable land per capita simply captures natural resource abundance in terms of agricultural potential. Percent agriculture of GDP is a more inclusive measure as it includes land cultivation, hunting, fishing, forestry, and livestock

production. Percent agriculture of GDP calculates natural resource abundance as a function of how much natural resource contributes to economic wealth. On the other hand, arable land per capita simply measures the presence of a natural resource, namely land under cultivation. Percent total employment in agriculture measures the degree to which an economy is based in agriculture, not the degree to which agriculture contributes to the economic wealth of a country. Conceivably, agriculture could contribute a large portion of the employment in a country, but income generated by agriculture could contribute a surprisingly small portion of GDP. Percent primary product exports of GDP is the most inclusive measure of natural resources as it includes agriculture, food, raw materials, minerals, and fuel. This variable measures natural resource abundance as a function of how much an economy depends on natural resources for income.

One of the main differences between these variables involves the concept of dependence versus presence. Arable land per capita measures the presence of a natural resource. Percent agriculture of GDP and percent primary resource exports of GDP measure natural resource abundance as a function of dependency on natural resources for income creation. Percent employment in agriculture captures the degree to which people earn their livelihood through agriculture, which basically measures the overall agrarian orientation of an economy. Obviously, each of these proxies measure very distinct aspects of natural resources, and I therefore, hypothesize that these measures each impact the rate of economic growth differently (Auty, 2001).

Percent primary exports of GDP most accurately measures wealth in natural resources, because it is the most inclusive measure, though percent agriculture of GDP is still a fairly accurate measure as it includes several different aspects of natural resources. Arable land per capita, while it does capture land wealth, it is not as encompassing of a measure. Percent employment in agriculture is the least plausible measure of natural resource abundance, because it deals with a characteristic of the workforce and does not directly measure natural resources or even the wealth generated by natural resources.

I also use several proxies of human capital, because the relationship between natural resources and human capital may vary at different levels of human capital. For example, an economy based in natural resources may still encourage the development of low levels of human capital, as measured by literacy rate. However, a natural resource rich economy may not encourage the development of higher levels of human capital, as measured by the rate of

secondary education enrollment. The measures of human capital in this study includes: adult literacy rate, primary school completion rate, and secondary enrollment rate.

Adult literacy rate measures basic reading and writing skills of adults, and a portion of these adults then comprise the workforce. Literacy rate captures very basic skills whereas primary school completion rate or secondary school enrollment rate measures a higher level of human capital. The relationship between natural resources and human capital may vary at different levels of human capital.

It is also very important to note the time periods of the variables in this study. According to the theory underlying the *resource curse*, natural resource abundance creates distortions or structural changes in an economy—such as the underdevelopment of human capital—which then impedes the rate of economic growth. The chain of events begins with a large quantity of natural resources, which leads to the underdevelopment of human capital, which then results in slower economic growth.

Thus, this paper uses natural resource variables taken from the year 1970, while the human capital variables are taken from the time period between 1980 and 1990, thus allowing time for natural resources to impact the economy. The exact length of this lag is not scientific, though it is reasonable to expect that if natural resources impact the formation of human capital, the effect would not occur instantaneously. I average the human capital variables from 1980 to 1990 so as to compensate for missing data. Ideally, I would measure the rate of economic growth in recent years as to remain consistent with the theory, because the alteration of the growth rate is the last event in the sequence. However, the growth rates of developing countries during the 1990's are very volatile; thus, any conclusions about the overall trend during this period are very tenuous and unreliable. I therefore, average per capita GDP growth rates from 1970 to 2000, which captures the overall pattern of growth.

V. EMPIRICAL MODEL

This section presents my empirical model and restates my hypotheses in terms of the empirical model.

A. Presence of the *Resource Curse*

I regress natural economic growth against resource abundance. This regression establishes whether a *resource curse* exists. If the *resource curse* exists, there will be a negative correlation between natural resources and economic growth. As natural resources increase, economic growth decreases. If the *resource curse* does not exist, then either a positive or a statistically insignificant relationship between the economic growth rate and natural resources will exist. I test this relationship using the following proxies of natural resources: percent primary sector exports of GDP, percent agriculture of GDP, hectares of arable land per capita, percent agriculture of total employment. Even if a correlation between natural resource abundance and rate of economic growth exists, this result does not necessarily imply that natural resource actually cause slow economic growth. In fact, the theory underlying the *resource curse* states that natural resources do not directly impede economic growth. Table 2 summarizes this first regression and lists coefficient signs that the *resource curse* predicts.

Table 2: Presence of a Resource Curse

Variable
Dependent: Rate of Economic Growth
Independent:
Natural Resource Abundance (-)

B. Human Capital and Natural Resource Abundance

I regress natural resource abundance against human capital. A negative correlation between natural resource abundance and human capital would support the *resource curse*. As natural resources increase, human capital decreases. I use the following measures of human capital: adult literacy rate, primary school completion rate, and secondary enrollment rate in order to determine if natural resources affect varying levels of human capital differently. Table 3 summarizes this regression and lists predicted signs according to the *resource curse*.

Table 3: Human Capital and the Resource Curse

Variable
Dependent: Human Capital
Independent:
Natural Resource Abundance (-)

C. Human Capital as a Transmission Mechanism

I regress both human capital and natural resource abundance against economic growth. If the *resource curse* exists, natural resource abundance is inversely related with per capita GDP growth rate and positively correlated with human capital as seen in table 4. If the *resource curse* exists, then this negative correlation between economic growth and resource abundance decreases in magnitude and statistical significance when both resource abundance and human capital serve simultaneously as explanatory variables. The inclusion of the human capital variable accounts for a portion of the natural resource effect seen in the first regression. The natural resource abundance variable may still have a negative correlation with economic growth, because other transmission mechanisms of the *resource curse*, such as the Dutch Disease and primary sector price volatility, still exist. Thus, these other transmission mechanisms create a negative relationship between economic growth and natural resources, and therefore, this regression may not show the traditional positive relationship of natural resource abundance and economic growth.

Table 4: Human Capital as a Transmission Mechanism

Variable
Dependent:
Economic Growth
Independent:
Natural Resource Abundance (-)
Human Capital (+)

Even if the results of the regressions fulfill all the conditions of a transition mechanism, these results would not prove that human capital is necessarily a transmission mechanism. The possibility exists that the negative correlation between natural resources and economic growth is simply the result of omitted variable bias due to the failure to include human capital. Even though these results would be compatible with human capital acting as a transmission mechanism, low levels of human capital and natural resource abundance or dependence may coexist due to situational factors. The mere coexistence of low levels of human capital and high levels of natural resources does not necessitate that a causal relationship exists between the two. The underdevelopment of human capital may be responsible for the slow rate of economic growth, though natural resource abundance is not necessarily responsible for the low levels of human capital. Thus, even if the results satisfy all the conditions for human capital to serve as a transmission mechanism of the *resource curse*, the possibility exists that the *resource curse* may simply be a result of omitted variable bias and not the transmission mechanism theory.

VI. RESULTS

A. Evidence Against the *Resource Curse*

In contrast with previous studies, the results of this study do not generally support the existence of a *resource curse*. These results refute the claim that the *resource curse* exists regardless of the measure of natural resource abundance and the country selection. I do not find a statistically significant relationship between the rate of economic growth and natural resource abundance when measured as percent primary sector products of GDP, percent agriculture of GDP, or arable land per capita. Table 5, 6, 7 summarize these results. As stated earlier in this paper, percent primary sector products of GDP is the most comprehensive measure of natural resources followed by percent agriculture of GDP and then arable land per capita. When percent employment in agriculture serves as the proxy for natural resource abundance, the results indicate some support of the resource curse. Table 8 summarizes these results.

However, percent employment in agriculture is the least compelling proxy for natural resource abundance. Thus, this paper does not find evidence to support the existence of the resource curse when the most reasonable measures of natural resources are use. This paper only detects a statistically significant relationship between natural resources when the least plausible proxy of natural resources—percent employment in agriculture—is used, though even in this case, the magnitude of this relationship is very small.

Table 5: Results of % Primary Sector Exports of GDP

Dependent Variable (Average Per Capita GDP Growth)	Independent Variable (% Primary sector exports of GDP)	t-statistic	Sig Level	Adjusted R^2
1970-2000	-0.007	-0.558	0.2895	-0.01
1970-1980	0.004	0.245	0.4	-0.02
1970-1990	-0.0025	-1.7	0.045	0.03
1980-2000	-0.018	-1.3	0.0975	0.01
1990-2000	0.023	1.2	0.115	0.007

Table 6: Results of % Agriculture of GDP

Dependent Variable (Average Per Capita GDP Growth)	Independent Variable (% Agriculture of GDP)	t-statistic	Sig Level	Adjusted R^2
1970-2000	0.0076	0.532	0.298	-0.01
1970-1980	-0.011	-0.543	0.2945	-0.01
1970-1990	0.013	0.799	0.2135	-0.005
1980-2000	0.0145	0.956	0.171	-0.001
1990-2000	-0.018	-0.96	0.17	-0.001

Table 7: Results of Arable Land Per Capita

Dependent Variable (Average Per Capita GDP Growth)	Independent Variable (Arable Land Per Capita)	t-statistic	Sig Level	Adjusted R^2
1970-2000	-1.2	-1.38	0.085	0.012
1970-1980	-0.754	-0.61	0.273	-0.009
1970-1990	-1.28	-1.24	0.1095	0.007
1980-2000	-1.18	-1.26	0.105	0.008
1990-2000	-1.56	-1.37	0.087	0.011

Table 8: Results of % Employment in Agriculture

Dependent Variable (Average Per Capita GDP Growth)	Independent Variable (% Employment in Agriculture)	t-statistic	Sig Level	Adjusted R^2
1970-2000	-0.013	-1.7	0.0475	0.024
1970-1980	-0.023	-2.18	0.016	0.05
1970-1990	-0.016	-1.75	0.042	0.027
1980-2000	-0.0078	-0.924	0.179	-0.002
1990-2000	-0.0167	-1.65	0.052	0.022

The *resource curse* predicts a negative correlation between natural resources and economic growth whereas historic economic theory states that natural resources should promote, not hinder, economic growth, because natural resources expand the production possibilities of an economy. Therefore, it is possible to interpret the insignificant relationship between natural resources and economic growth as a result of the *resource curse*. Perhaps, the *resource curse* converts what would have been a positive significant relationship into an insignificant relationship. On the other hand, the insignificant relationship may simply indicate that natural resources are not a significant determinant of economic growth.

These results are surprising, because many previous studies claim that the *resource curse* is a strong, robust relationship. In order to demonstrate the consistency of my results, I try to detect the pattern of the *resource curse* by modifying the relevant time period. If the theory underlying the *resource curse* is reflective of reality, this difference should not affect the relationship between natural resources and rate of economic growth. However, in order to eliminate the possibility that a slight variation in time period of economic growth creates drastically different results, in addition to the 1970-2000 time period, I also test for the relationship during the following time periods: 1970-1980, 1970-1990, 1980-2000, and 1990-2000. Regardless of the time period, I do not find a significant, negative relationship between

economic growth and natural resource abundance, measured as arable land per capita, percent primary products of GDP, and percent agriculture of GDP. Tables 5, 6, 7 and 8 display these results. The significance levels never even reach the 0.10 level. Therefore, my regressions indicate that a statistically significant relationship does not exist between natural resources and economic growth. Natural resources do not appear to affect the rate of economic growth.

These results, while unexpected, are important, because they raise some questions about the existing literature on the *resource curse*. If a strong negative relationship between rate of economic growth and natural resources were to exist regardless of country selection and the measure of natural resource abundance, my regression analysis would have detected this relationship. Even more concerning, I cannot replicate the results of Auty's 1997 study despite including a very similar set of countries in my sample and variables in my regressions. In addition, this study does not support the results of Sachs and Warner's 2001 study, which finds a strong, consistent negative pattern between natural resource abundance—as measured by percent primary sector exports of GDP—and rate of economic growth.

B. Evidence Supporting the *Resource Curse*

The only measure of natural resource abundance that appears to follow the *resource curse* is percent of total employment in agriculture as seen in table 9. Even these results do not provide strong support of the *resource curse*. Also, it is necessary to keep in mind that while these results are compatible with the *resource curse*, they do not necessitate a causal relationship between natural resources and human capital. Another variable, such as poverty, could cause both high levels of natural resource dependence and low levels of human capital. However, table 9 summarizes the results of these results based upon the assumption that transmission mechanism theory of the *resource curse* exists. These results use primary school completion rate as the measure of human capital.

In congruence with the *resource curse* hypothesis, a negative relationship exists between natural resources—when measured as percent employment in agriculture—and rate of economic growth. According to these results, if an additional 10% of the total employment in an economy were reallocated to agriculture, the rate of economic growth would decrease by only 0.13%. The magnitude of this effect is very small, which contrasts with Gylfason's 2001 study. Gylfason finds that an additional 10% of the workforce allocated to the primary sector would result in a

1% decline in per capita economic growth (Auty, 2001). According to the results of my study, an additional 77 % of total employment would have to be reallocated to agriculture in order to decrease the rate of economic growth by 1 %. Thus, percent employment in agriculture does not appear to have a strong negative impact upon rate of economic growth in developing countries.

Table 9: Regression Results of Percent Employment Agriculture

Dependent Variable	Constant	Natural Resources (Percent of Total Employment in Agriculture)	Human Capital (Primary School Completion Rate)	F statistic	AdjustedR^2
Economic Growth Rate	1.7	-0.013 (-1.7)*		2.85	0.024
Human Capital	84.7	-0.41 (-4.2)***		17.65	0.201
Economic Growth Rate	-2.07	0.0078 (1.037)	0.043 (5.34)***	15.42	0.289

t-statistics are shown in parentheses (1 tailed test if sign of coefficient predicted correctly)
*indicates significance at .05 level
**indicates significance at .01 level
***indicates significance .0001 level
***indicates significance .0001 level

This study also investigates the role of transmission mechanisms—specifically, human capital—in the creation of the negative correlation between natural resources and economic growth. If a variable, such as human capital, were to serve as a transmission mechanism of the *resource curse*, it would first need to have a negative correlation with natural resources, and second, this variable would need to have a positive correlation with economic growth. The results of this study fulfill both these requirements. This paper finds a negative correlation between primary school completion rate—a measure of human capital—and percent employment in agriculture—a measure of natural resource abundance. A negative relationship between human capital and natural resource abundance indicates that human capital could serve as a transmission mechanism of the *resource curse*, because as natural resources increase, human capital decreases. My results state that for each additional percent of employment allocated to agriculture, the primary school completion rate decreases by 0.41%. The portion of employment dedicated to agriculture appears to significantly impact the accumulation of human capital, and these results are significant at the 0.0001 level.

These results fulfill the second requirement of a transmission mechanism—a positive correlation with economic growth; this study finds that a positive correlation exists between

human capital and economic growth, which supports the *resource curse* hypothesis seen in the third row of Table 9. If the rate of primary school completion increases by 5%, then the rate of economic growth will increase by 0.22%. The coefficient of natural resources actually becomes positive upon the inclusion of the human capital variable. This positive sign is somewhat surprising, because other transmission mechanisms of the *resource curse* could exist besides human capital, which theoretically would detract from economic growth. If I were to include these variables, the positive coefficient of the natural resource variable would increase in magnitude.

The significance and magnitude of the natural resource variable decreases when paired with human capital as an additional explanatory variable, which supports the *resource curse* hypothesis. The inclusion of a human capital variable accounts for the negative correlation between natural resources and rate of economic growth seen in the first regression. After taking into account the effects of human capital, my results indicate that natural resources have an even smaller effect on the rate of economic growth as demonstrated by the exceedingly small coefficient (0.0078) and the high significance level (0.30).

In order to understand the multi-faceted effects of the natural resources, it is necessary to distinguish between the indirect, direct, and total effect of natural resources on economic growth. Table 10 summarizes these various effects. The indirect effect of natural resources on economic growth measures the effect that natural resources exert on economic growth through hindering the development of human capital. The indirect effect of natural resource via the human capital transmission mechanism is -0.018, which is calculated by multiplying the coefficient of the natural resources variable in the second regression (-0.41) seen in table 9 with the human capital coefficient in the third regression (0.043). This indirect effect signifies that an increase of 1% of employment devoted to agriculture, decreases economic growth by 0.018% through the human capital transmission mechanism.

Table 10: Effects of Natural Resources on Economic Growth

Type of Effect	Magnitude of Effect
Indirect Effect though Human Capital	-0.018
Direct Effect	0.0078
Total Effect	-0.0102

The direct effect of natural resources on economic growth is simply the coefficient of natural resources in the third regression (0.0078). This direct effect signifies that if one additional percent of total employment in a country were reallocated to agriculture, the rate of economic growth would increase by 0.0078%. Recall though that this variable is not significant,

and therefore, an increase in employment in agriculture may not affect the economic growth rate in any systematic way. Theoretically, the direct effect of natural resources on economic growth should increase in magnitude with the inclusion of each additional transmission mechanism. The total effect of natural resources on economic growth is simply the summation of the indirect and direct effects. Thus, the total effect of natural resources on economic growth is -0.0102 percent. This coefficient indicates that each additional percent of total employment allocated to agriculture, the rate of 1 hectare increase of arable land per capita decreases economic growth by 0.0102%. Human capital accounts for approximately 69% of the total effect that natural resources exert on economic growth.

Very similar results are generated when literacy rate measures human capital, indicating that percent employment in agriculture affects the literacy rate in a similar manner. When secondary school enrollment measures human capital, the results fulfill the requirements for a transmission mechanism, though the coefficients are even smaller, indicating that natural resources affect the accumulation of higher levels of human capital to an even lesser degree.

These results give reason to believe that the *resource curse* is neither as strong nor as consistent of a pattern as previous literature states. The *resource curse*, if it exists, is strongly dependent upon the exact time period, the measure of natural resource abundance, and the sample of countries.

VII. REXAMINATION OF THE *RESOURCE CURSE*

In contrast with much of the previous literature, this study does not find much evidence to support the existence of a *resource curse*. However, some previous studies contain possible empirical problems, and the theoretical basis of the *resource curse* is disputable as previous sections of this paper mention. This section elaborates on some of the empirical and theoretical problems associated with the *resource curse*.

One methodological problem involves selection bias, which is a problem present in many cross-country regressions. Most of the *resource curse* studies use, at the very most, 85 countries, though the United Nations lists twice this number of nations as developing countries. The samples used in previous studies may simply consist of many resource-rich but economically stagnant economies, such as Nigeria or Bolivia. If the sample does not accurately represent the actual population, then studies cannot draw valid conclusions about the population.

Also, the *resource curse* claims that natural resources affect developing countries similarly despite regional differences. According to the *resource curse*, the growth rates of natural resource abundant economies located in entirely different regions of the world would be more similar than countries with differing natural resource endowments situated in the same region of the world. For example, the economy of a resource abundant country in Latin America, such as Argentina, would be more similar to a resource-rich country in Asia, such as Thailand than a resource poor country located in Latin America.

However, regional and natural resource differences can be difficult to separate, because countries located in the same region may have similar natural resource endowments due to geography. Latin America and Africa, as a whole, are natural resource abundant regions compared to Asia, particularly east Asia. Previous studies may simply capture regional differences that impact growth rates, which are not intrinsically related to natural resource endowment. If these studies capture regional differences rather than purely differences in natural resource endowment, countries classified as natural resource rich would tend to be located in different regions of the world from those countries classified as natural resource poor. In order to test this possibility, I separate the countries used in Auty's 1997 study according to region of the world as seen in table 11. Table 11 shows where the natural resource rich and natural resource poor countries in Auty's sample tend to be located.

Table 11: Natural Resource Endowment by Region

Resource Endowment	Total Countries	East Asia & Pacific	South Asia	Europe & Central Asia	Latin America & Caribbean	Middle East & North Africa	Sub-Saharan Africa
Resource Poor Countries[4]	20	7	3	0	3	2	5
	100%	35.0%	15.0%	0.0%	15.0%	10.0%	25.0%
Resource Rich Countries[5]	65	4	2	1	20	5	33
	100%	6.1%	3.1%	1.5%	30.7%	7.7%	50.1%
All Countries[3]	85	11	5	1	23	7	38
	100%	12.9%	5.9%	1.2%	27.1%	8.2%	44.7%

*This table lists number of countries in sample and percent of natural resource endowment category using same countries as Auty's 1997 study

Note the regional differences between natural resource rich and natural resource poor countries. The most frequent classification of natural resource poor countries is East Asia and

the Pacific (35%) followed by Sub-Saharan Africa (25%). On the other hand, only 6.1% of resource rich countries belong to the East Asia and Pacific region. The most frequent classification of resource rich countries is Latin America and the Caribbean (30.7%) and Sub-Saharan Africa (50.1%). However, only 15% and 25% of resource poor countries come from Latin America and the Caribbean and Sub-Saharan Africa, respectively.

To summarize, natural resources endowment varies according to region, and therefore, countries classified as natural resource abundant tend to come from similar areas of the world. Most of the natural resource abundant countries in Auty's 1997 study are located in Latin America and the Caribbean and Sub-Saharan Africa, while most of the natural resource poor countries are located in East Asia and Sub-Saharan Africa. These classifications indicate that in regards to Auty's sample, Latin America is a resource rich region; East Asia is a resource poor region; the resource endowment of Africa appears mixed.

Table 12 clarifies the natural resource endowment of these various regions according to the countries contained in Auty's 1997 study. Table 12 describes the natural resource endowment of various regions of the world according to Auty's sample.

Table 12: Regional Resource Endowment Classification

Region[6]	Total Countries[3]	Resource Poor Countries[4]	% Resource Poor Countries	Resource Rich Countries[5]	% Resource Rich Countries
East Asia & Pacific	11	7	64%	4	36%
South Asia	5	3	60%	2	40%
Europe & Central Asia	1	0	0%	1	100%
Latin America & Caribbean	23	3	13%	20	87%
Middle East & North Africa	7	2	29%	5	71%
Sub-Saharan Africa	38	5	13%	33	87%

These results indicate that East Asia and the Pacific (64% resource poor), and South Asia (60% resource poor) contain predominately resource poor countries, thus qualifying as a resource poor region of the world. Latin America and the Caribbean (87% resource rich), the Middle East and North Africa (71% resource rich), and Sub-Saharan Africa (87% resource rich) contain predominately resource rich countries, thus qualifying as a resource rich region. Though, take note of the total number of countries classified in each region of the world, not just the percentages, because the number of countries varies substantially. It is important to remember

that these classifications are based on the sample of countries in Auty's 1997 study and may not be reflective of actual natural resource endowment of these regions.

The regional variance of natural resources is understandable as natural resources do vary by geography. However, natural resources are one of numerous differences across these regions. Few people would argue that the only, or even the most important, difference between East Asia and Sub-Saharan Africa is natural resource endowment.

The *resource curse* argues that natural resources cause divergence in economic growth rates in developing countries, and many previous studies find a statistical correlation between low rates of economic growth and natural resource abundance. Table 13 calculates the average annual per capita growth rates of countries classified as resource rich and resource poor according to Auty's 1997 study.

Table 13: Growth Rates by Natural Resource Endowment

Resource Endowment	Average Annual Per Capita GDP Growth (1970-1990)
Resource Poor[4]	2.63%
Resource Rich[5]	0.78%

While there appears to be a clear relationship between natural resource endowment and rate of economic growth, regional differences may be the driving force behind these varying growth rates, not natural resources. As I established earlier, most resource abundant countries that Auty uses in his studies are located in Latin America and Sub-Saharan Africa. If predominantly natural resource rich regions, namely Sub-Saharan Africa, and Latin America, have lower growth rates than predominantly resource poor regions, namely East Asia, then regional differences may account for the statistical correlation between natural resource abundance and comparatively slow rates of economic growth. Table 14 indicates that growth rates vary according to region, and this variation may account for the *resource curse*.

Table 14: Growth Rates by Region

Region	Average Annual Per Capita GDP Growth (1970-1990)
East Asia & Pacific	2.80%
South Asia	2.20%
Middle East & North Africa	0.80%
Sub-Saharan Africa	0.74%
Europe & Central Asia	2.90%
Latin America & Caribbean	2.00%

Latin America, Sub-Saharan Africa, and the Middle East and North Africa experience lower rates of growth than East Asia and the Pacific and South Asia. Hence, this difference may account for the statistical relationship between natural resource abundance and rate of economic growth during 1970 to 1990 that previous studies find.

Conceivably, one could argue that natural resource endowment caused the varying rates of growth seen in these regions. However, this argument is not compelling for several reasons. First, so many other differences exist between these regions besides natural resource endowment. A combination of political, economic, and social factors account for the different growth rates. Also, although the level of natural resource abundance may characterize a region, none of these regions consist entirely of resource rich countries or entirely resource poor countries. In conclusion, if the *resource curse* simply captures differences in growth rates across region, which appears possible, then the *resource curse* is not real.

In addition to regional differences, the *resource curse* is very sensitive to the time period, which casts doubt on both the empirical and theoretical foundations of the *resource curse*. Maloney (2002) argues that growth processes occur over the very long run, and any conclusions drawn from cross-country regression analysis during a relatively short, turbulent twenty-year period (1970-1990) are unreliable. Maloney argues that natural resources have historically played an important role in the development of many industrialized nations, such as Australia, Canada, and the United States. Also, natural resources positively impacted Latin America's economy from 1820 to 1950. Therefore, underperformance is not an intrinsic characteristic of natural resource based industries. He asserts that the poor performance of natural resource rich countries involves low technological innovation and poor management. These countries would experience slow growth even if they possessed a stronger base in the manufacturing sector due to underdevelopment of technology.

Also, the theoretical basis of the *resource curse* is not entirely convincing. The theory states that natural resources interact with various factors, which then impact economic growth. Basically, natural resources decrease X (i.e. human capital, manufacturing, stable government, price stability, etc). However, X creates economic growth. Therefore, natural resources hinder economic growth. Several problems exist with this theoretical sequence. Countries with natural resource based economies may have a prior predisposition towards slower grow due to preexisting conditions. Thus, these preexisting conditions may cause them to rely upon natural resources, though natural resources are not responsible for the subsequent slower economic growth. A struggling economy may turn to natural resources as their source of livelihood, because it is the only viable option. The subsequent slow growth that this country may

experience is not a result of natural resources but the factors that compel this country to rely upon natural resources.

Reliance upon natural resources is negatively correlated with per capita income (Auty, 2001). Low-income countries rely upon natural resources, particularly agriculture, because they must first meet the basic life needs of their people. If the goal of an economy is to simply provide basic necessities to its people, then clearly this economy will not experience high rates of growth. Low income, struggling countries would therefore, tend to fall under the category of resource rich due to their dependence on natural resources. While these countries may support the negative statistical relationship between natural resource abundance and economic growth, these countries would not support the theory underlying the *resource curse*.

In addition, the *resource curse* treats distinctly different measures of natural resources as the same. The existing literature states that the exact measurement of natural resources is not important, and the correlation between natural resource abundance and slow economic growth persists despite the differing measures. However, clearly arable land per capita captures a very different aspect of natural resource abundance than primary resource export dependence. A country could qualify as resource poor according to arable land but resource rich according to primary resource dependence as is the case in some oil exporting countries. For example, Kuwait boasts the second largest percent primary resource exports of GDP (69.5%) in my sample but has less than 0.01 arable land per capita—the lowest value in my sample. Thus, Kuwait could qualify either as extremely resource poor or extremely resource rich depending upon the definition of natural resources. Some of the previous literature does not take this effect into account.

Even if the statistical relationship persist regardless of the measure of natural resources, the persistence of this relationship raises doubt about the validity of the theoretical basis of the *resource curse*. The theory states that natural resources interact with various factors, which result in slow growth. However, oil would interact differently with these factors than arable land thus causing different effects in the economy. If the negative correlation between economic growth and natural resource abundance persists regardless of the measure, then most likely other factors, which slow-growing economies share in common are responsible for the slow growth, not natural resources.

In summation, previous *resource curse* studies contain possible empirical and theoretical problems. Contrary to previous studies, this paper does not generally support the existence of a resource curse. The empirical and theoretical problems raise considerable doubt as to whether a *resource curse* exists.

VIII. CONCLUSION

The results of this study do not indicate that natural resources inhibit economic growth in developing countries during the last three decades. The results, for the most part, do not detect a statistically significant relationship between natural resources and economic growth. Only when natural resources are represented by percent employment in agriculture, do the results support the existence of the *resource curse*. The negative correlation between natural resource abundance and economic growth disappears when human capital is taken into account, thus indicating that the *resource curse* could be just the result of omitted variable bias. Also, it is necessary to keep in mind that the magnitude of the *resource curse* demonstrated in that regression is extremely small, especially when compared to the results of previous studies. In summation, the quantity of natural resources a country possesses does not appear to affect the rate of economic growth.

Some resource rich countries experienced relatively rapid economic growth, such as Malaysia and Chile, while other resource rich countries experienced economic stagnation, such as Venezuela and Papua New Guinea. Likewise, some resource poor countries, such as Haiti and Benin, experienced negative growth rates, while other resource poor countries, such as Korea and Taiwan, experienced considerable economic growth. The effect of natural resources varies from country to country. Sweeping generalizations cannot be made about the effects of natural resources. Consequently, future studies should investigate the impact of natural resources on a specific economy. A case-by-case technique rather than a large cross sectional analysis is a more suitable method of investigation. Instead of searching for a universal effect of natural resources, studies should focus on why some countries are able to use their natural resource wealth to promote economic development while others have not been able to transform natural resource wealth into economic wealth.

ENDNOTES

1. Dutch Disease: The contraction of the tradable goods sector—due to appreciation of local currency, which decreases the competitiveness of the country's export sector. Large-scale exploitation and exportation of a natural resource precipitates these events (Rudd, 1996).

2. Country Selection: N=77
Algeria, Argentina, Bangladesh, Benin, Bolivia, Botswana, Burkina, Burundi, Cameroon, Central Africa Republic, Chad, Chile, China, Colombia, Congo, Costa Rica, Cote d'Ivoire, Dominican Republican, Ecuador, Egypt, El Salvador, Fiji, Gabon, Gambia, Ghana, Guatemala, Guyana, Haiti, Honduras, India, Indonesia, Jamaica, Kenya, Kuwait, Lesotho, Liberia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Morocco, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Solomon, South Africa, Sri Lanka, Sudan, Suriname, Swaziland, Syria Arab Republic, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Uruguay, Venezuela, Zambia, and Zimbabwe

3. Country Selection (Auty, 1997), N=85
Algeria, Argentina, Bangladesh, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Chile, China, Colombia, Congo, Dem. Rep., Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt Arab Republic, El Salvador, Ethiopia, Fiji, Gabon, Gambia Ghana, Guatemala, Guyana, Haiti, Honduras, India, Indonesia, Jamaica, Jordan, Kenya, Kuwait, Lesotho, Liberia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Morocco, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Singapore, Somalia, South Africa, Sri Lanka, Sudan, Suriname, Swaziland, Syrian Arab Republic, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Uruguay, Venezuela, Zambia, and Zimbabwe.

4. Resource Poor Countries ≤ 0.30 hectares arable land per capita in 1970, (Auty, 1997), N=20
Bangladesh, China, Colombia, Egypt, El Salvador, Haiti, Hong Kong, Jordan, Kenya, Indonesia, Mauritania, Mauritius, Nepal, Philippines, Singapore, Somalia, South Korea, Sri Lanka, Taiwan, and Tanzania.

5. Resource-Rich Countries >0.30 hectares arable land per capita in 1970, (Auty, 1997), N=65
Algeria, Argentina, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Chile, Congo, Costa Rica, Cote d'Ivoire, Ecuador, Ethiopia, Dominican Republic, Fiji, Gabon, Gambia, Ghana, Guyana, Guatemala, Honduras, India, Jamaica, Kuwait, Lesotho, Liberia, Madagascar, Malawi, Malaysia, Mali, Mexico, Morocco, Nicaragua, Niger, Nigeria, Panama, Pakistan, Papua New Guinea, Paraguay, Peru, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Sudan, Suriname, Swaziland, South Africa, Syria, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Uruguay, Venezuela, Zaire, Zambia, and Zimbabwe.

6. Regional classifications are based upon the World Bank's classification system.

WORKS CITED

Auty, Richard M. "Natural resource endowment, the state and development strategy." Journal of International Development 9 (1997): 651-663.

Auty, Richard M. Resource Abundance and Economic Development. Oxford: Oxford University Press, 2001.

Birdsall, N., D. Ross and R. Sabot. "Education, growth and inequality." Pathways to Growth: Comparing East Asia and Latin America, N. Birdsall, and F. Jasperson. Washington DC: Inter-American Development Bank, 1997. 93-127.

Development Data Group. World Development Indicators. CD-ROM. World Bank, 2003.

Gylfason, Thorvaldur. Natural resources, education and economic development." European Economic Review 45 (2001): 847-859.

Maloney, William F. "Missed Opportunities: Innovation and Resource-Based Growth in Latin America. Economia. 3.1 (2002): 111-167.

Matsuyama, K. "Agricultural productivity, comparative advantage and economic growth." Journal of Economic Theory 58 (1992): 317-334.

Ross, Michael L. "The Political Economy of the Resource Curse." World Politics 51.2 (1999): 297-322.

Rudd, David. "An Empirical Analysis of Dutch Disease: Developing and Developed Countries." Research Honors Spring 1996.

Sachs, Jeffery D. and Andrew M. Warner. "Natural Resources and Economic Growth." Mimeo, Cambridge, MA: HIID, 1995.

Sachs, Jeffrey D., and Andrew M. Warner. "The big push, natural resource booms and growth." Journal of Development Economics 59 (1999): 43-76.

Sachs, Jeffery D. and Andrew M. Warner. "Natural Resources and Economic Development: The curse of natural resources." European Economic Review 45 (2000): 827-838.

Sachs, Jeffrey D., and Andrew M. Warner. "The curse of natural resources." European Economic Review 45 (2001): 827-838.

Stevens, Paul. "Resource Impact: Curse of Blessing? A Literature Survey." Journal of Energy Literature 9 (2003): 3-42.

Todaro, Michael P. and Stephen C. Smith. Economic Development. Eighth edition. Boston: Addison Wesley, 2003.

Wood, A. and K. Berger. "Exporting manufactures: Human resources, natural resources and trade policy." Journal of Development Studies 34 (1997): 35-39.

United Nations Development Program. "Human Development Reports" CD-ROM. United Nations, 2001