The Relationship between Exports and Growth in Select African Nations

A Senior Honors Thesis

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by

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I. Abstract

The relationship between exports and growth is an important one in economics, particularly for developing nations that seek to improve the livelihoods of their citizens through economic reform. This paper analyzes the theories behind the role that exports play in growth, and seeks to use regression analysis for four African nations' economic data from 1981-2003, namely the Democratic Republic of the Congo, Guinea Bissau, Malawi, and Nigeria. The data show a mostly positive relationship between exports and growth and mixed results for the other independent variables, investment and population.

II. Introduction

Exporting has been a point of thorough analysis and debate for many economists during the twentieth and twenty-first centuries because of its inherent impact on a nation's economic growth. Countries like India, Pakistan, and Korea have all increased their levels of GDP after introducing export-supporting policies and the same can now be said for certain countries in Africa (Balassa). Studies on how trade and growth have been related to each other in the developing world, particularly in Africa, have been surfacing more recently. In fact, this is a very important point to make because a recent report by the African Development Bank stated that Africa is experiencing its "highest economic growth in the last two decades, with the GDP growth rate, which averaged about 5 percent annually in the

past six years, rising to 5.5 percent in 2006, and is expected to reach 6 percent in 2007" (AllAfrica.com).

In analyzing Africa, economists have been studying whether the trade benefits to the economic regions in Africa like ECOWAS, the Economic Community of West African States, have had a significant impact on the continent's economic performance. The question of how our more accessible world will affect the regions in the developing world still remains to be seen, but certain authors like Neil Foster (2006) and Jean Paul Azam (2002) have been looking for the answer in their studies entitled "Exports, Growth and Threshold Effects in Africa" and "Explaining Slow Growth in Africa", respectively. In this paper I hope to continue such analysis of the impact of exports on growth for four specific African nations. The data sets I have used were provided by the World Bank and are the most comprehensive for these nations.

Before I enter a discussion on the merits of exports as they relate to economic growth, I will assess the various economic situations of the Democratic Republic of the Congo, Guinea Bissau, Malawi, and Nigeria. The reasons I have chosen these four countries is because their data sets were the most complete for the Sub-Saharan data from the World Bank, and because they each represent a unique aspect of the Sub-Saharan experience. The Democratic Republic of the Congo (from here on referred to as the DRC), a former Belgian colony, is one of the largest African nations by area, and is located in the central region of the continent (although it is a part of the

Southern African Development Community). The DRC has had its share of political and social turmoil in the 20th century, as evident by the Second Congo War, the political instability created by Joseph Mobutu and his army, and the influx of Rwandan refugees in the country during and after the Rwandan genocides (Naniuzeyi). Considering these political circumstances the country has faced, it is still important to analyze how the economic status of the country has been affected throughout its recent history as many other African nations have faced tremendous political trouble.

Guinea Bissau located on the west coast of the continent is one of the smallest nations in Africa but has had its own tumultuous past. A revolutionary council ruled the country from its independence until about 1984, and in 1998 an uprising within the army pushed the president out of power and eventually led to the Guinea-Bissau Civil War. A coup in 2003 took out the elected president, Kumba Lalá, and only in July 2005 have the presidential elections been reinstated (British Broadcasting Corporation). Thus Guinea Bissau has had political instability in more recent years, and offers a smaller country perspective for this analysis.

In the south of Africa lies Malawi, which is a landlocked country unlike Guinea Bissau, and is one of the more densely populated countries in Africa. The economic statistics for Malawi paint a bleak picture, such as an average gross national income per capita of $160. Most of the labor force in Malawi consists of employment within the agricultural sector. There are high transport costs in Malawi and it has

been a part of structural adjustment programs since the early 1980s. The life expectancy in Malawi has been decreasing over the past few decades, and it is currently at 40 years (British Broadcasting Corporation). Malawi represents a more underdeveloped status compared to most other African economies.

Nigeria has the highest population of any African nation and in a relatively better situation than Malawi. Nigeria can be described as a more westernized nation because it has significantly more manufacturing sites and is the largest producer of oil on the African continent. Many foreign companies have invested in Nigeria, such as the Royal Dutch Shell PLC, and other clothing and automobile manufacturers.   Its legal system is in many ways more advanced than other African nations (British Broadcasting Corporation). Nigeria follows English and common law, as evident by the Supreme Court of Nigeria, but regions in the north also follow Sharia law, which is an Islamic system (Dina et al.). The diversity yet remaining stability in the country provides us with a more perhaps optimistic view of economic analysis for an African nation in that Nigeria has a larger and stronger economy.

In order to present an idea of the economic situation within these countries, I will provide a picture of this through certain descriptive statistics for these nations in comparison to each other.

Exports of Goods and Services (%GDP)
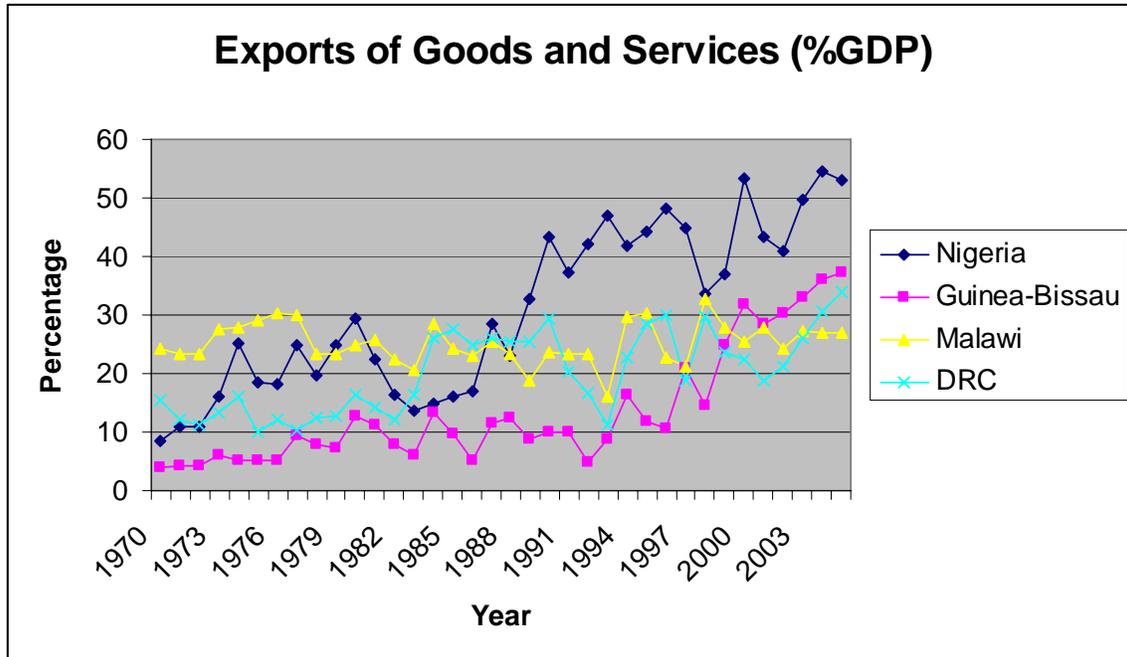
Source: World Bank, World Development Indicators[i]

As seen by the exports of goods and services as a percentage of GDP, Nigeria is for the most part well above the averages of the other three countries, and has shown an overall increasing trend over the past 30 years. Malawi's trend in exports seems to remain along a horizontal line, thus implying that it may be more dependent on the agricultural sector instead of the manufacturing one, because those sectors tend not to experience significant growth. Guinea Bissau has a flat curve up until about the late 90s after which the exports of goods and services as a percentage of GDP start to increase. The DRC has a more fluctuating curve, with increasing and decreasing trends within the 30 year period, probably due in part to the political and social situations that plagued the country in the 20th century.

GDP Constant US 2000 $
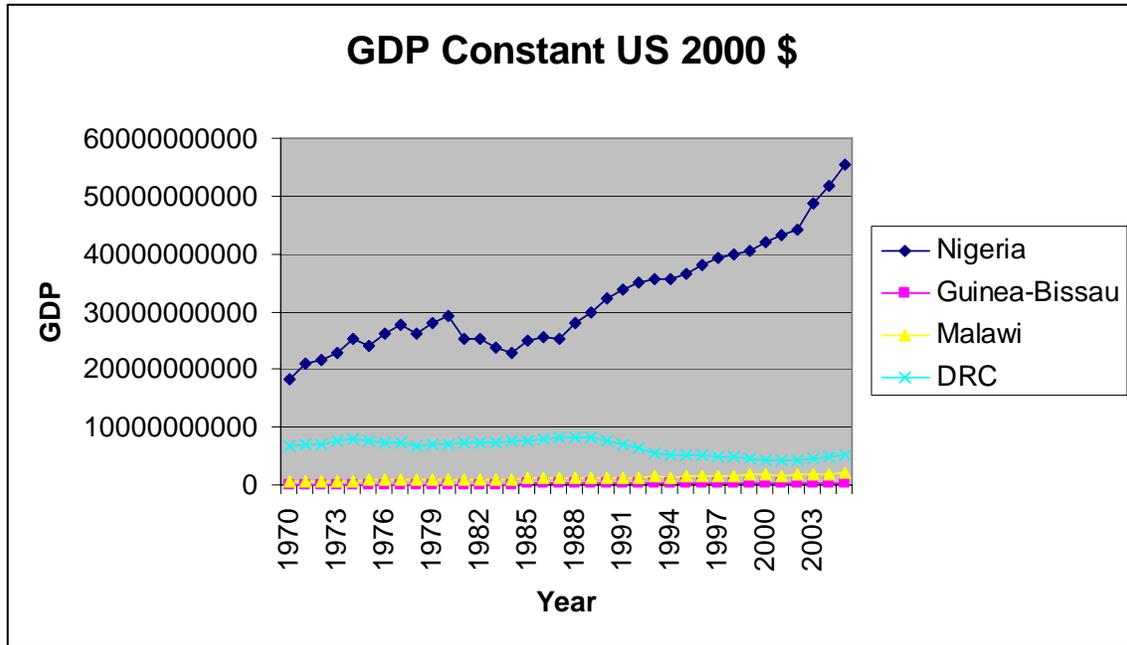
Source: World Bank, World Development Indicators[i]

This GDP graph again places Nigeria in a stratosphere of its own in comparison to the other countries in the study. Nigerian GDP shows an increasing trend while both Malawi and Guinea Bissau have flat lines and GDP figures that are alarmingly lower than Nigeria. The DRC has a more noticeable GDP curve than Malawi and Guinea Bissau, but it seems to be that there is a decreasing trend over the past decade.

Population (total)
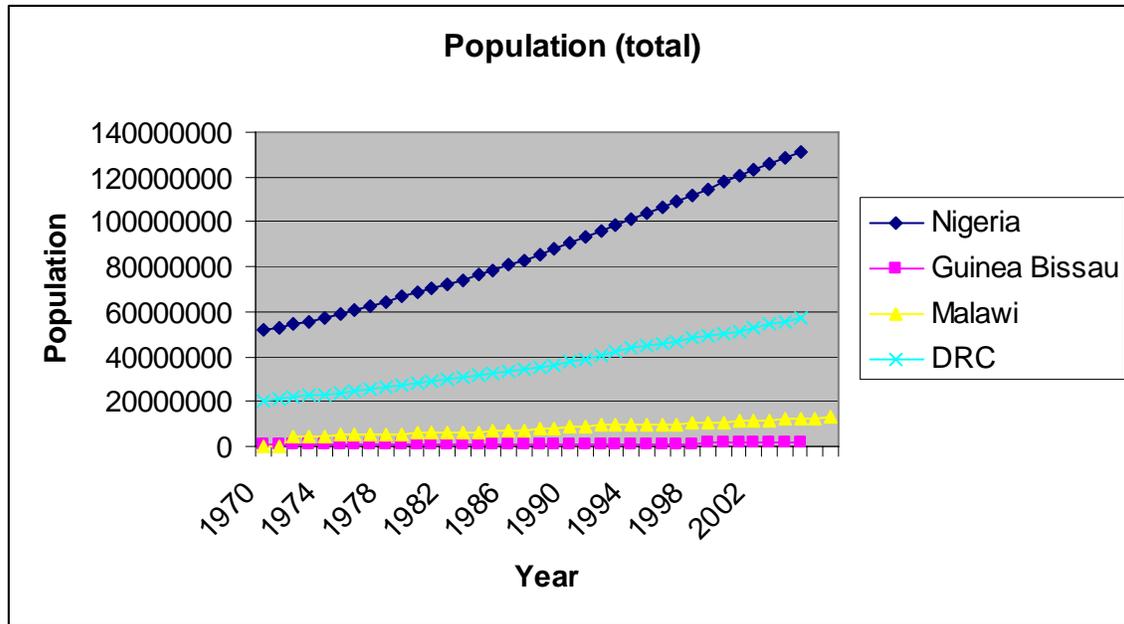
Because output and growth are also heavily dependent on population, it is

important to notice these figures as well. Each of the four countries show an overall

increase in population, but again, Nigeria has the curve with the greatest slope. The

DRC is next in terms of its overall population trend, followed by Malawi and Guinea

Bissau. It is important to remember the sizes of these countries in comparison to their

population; the DRC has the largest area, followed by Nigeria, Malawi and Guinea

Bissau but the populations do not follow in that same order; Nigeria is the most

populated, followed by the DRC, Malawi, and Guinea Bissau.

In terms of the types of sectors in their export market, each country has seen

both increases and decreases in the proportion of exports related to the agricultural

and manufacturing industries. This graph illustrates the exports of agricultural raw

materials exports as a percentage of merchandise exports for the DRC, Guinea Bissau, Nigeria, and Malawi.

Source: World Bank, World Development Indicators[i]

It is evident that for Guinea Bissau and the DRC, the overall percentages have increased from 1970 to 1976 (the years for which the data is available as a complete matrix), and for Malawi and Nigeria, this percentage decreased.

In terms of manufacturing exports as a percentage of merchandising exports, data for Guinea Bissau was only available sporadically, but the overall percentage has risen from 1.95% in 1970 to 7.19% in 1995. For the remaining three countries, it is apparent that Nigeria and the DRC have had an overall decrease from the time period 1972 until 1978, but for Malawi the figure has remained relatively stable.

Manufactures Exports (% of merchandise exports)

Source: World Bank, World Development Indicators[i]

III. General overview of the theories involving trade and growth

Even before the ideas of economists from the past century, Adam Smith described the impact trade can have on production and productivity in his book <u>An Inquiry into the Nature and Causes of the Wealth of Nations</u>. Smith claimed that the primary benefits from trade are that it provides a means for a country's surplus production to channel through and it also brings a return for this surplus injection into the trade market. Thus the labor and capital that was used in order to produce the surplus production of a nation will not be wasted but instead profited from by such trading activity. Smith went further in his theory by saying that not only will this process of trade make use of surplus, but it would also encourage countries to perform at their highest productivity because the idea of having a new market to tap

into pushes firms to increase their efficiency. In the end, such processes will increase the revenue and wealth of society (Smith).

Taking the ideas of Smith even further, David Ricardo explained the notion of comparative advantage which lays the foundation for why countries engage in trade in the first place in his book Principles of Political Economy and Taxation. When perfect competition exists, and there exists full employment of resources, countries benefit by producing those goods which they can provide at the lowest opportunity cost. This means that a country which makes one product by sacrificing less of another has a comparative advantage in making that good versus another country. If the US makes 1 computer at an opportunity cost of 0.5 cell phones, and Canada makes 1 computer at an opportunity cost of 1 cell phone, then the US has a comparative advantage relative to Canada in making computers. If Canada on the other hand makes 1 widget at the cost of 0.5 chairs, and the US makes 1 widget at the cost of 1 chair, then Canada has a comparative advantage in making widgets relative to the United States.   Thus in this example, it would be advantageous for the United States to produce computers and export them, and import widgets from Canada. Canada will do the exact opposite by exporting widgets, and importing computers. In this way, both countries benefit and can focus on producing that which they are more efficient at, and the result will be growth because of this more efficient production.

The benefits defined by Ricardo's comparative advantage theory are the static gains that result from the redistribution of the excess supply of resources produced

within a country to the new demand arising from the export market. Static gains are a result of comparative advantage, but when redistribution stops, or is exhausted, so do the static gains.

On the other hand, there may be dynamic gains to trade such as export expansion (Thirwall). Dynamic gains from trade are those which shift the production possibility frontier outward. The production possibility frontier is a graph that shows the production characteristics of a country based on that which it is able to produce considering the technological and factors of production restrictions. The points located on a production possibilities frontier curve signify efficient production, whereas points located on the inside of the production function represent inefficient points. At points inside the curve it would still be possible to make more of one good without decreasing the output of the other good. Represented graphically:
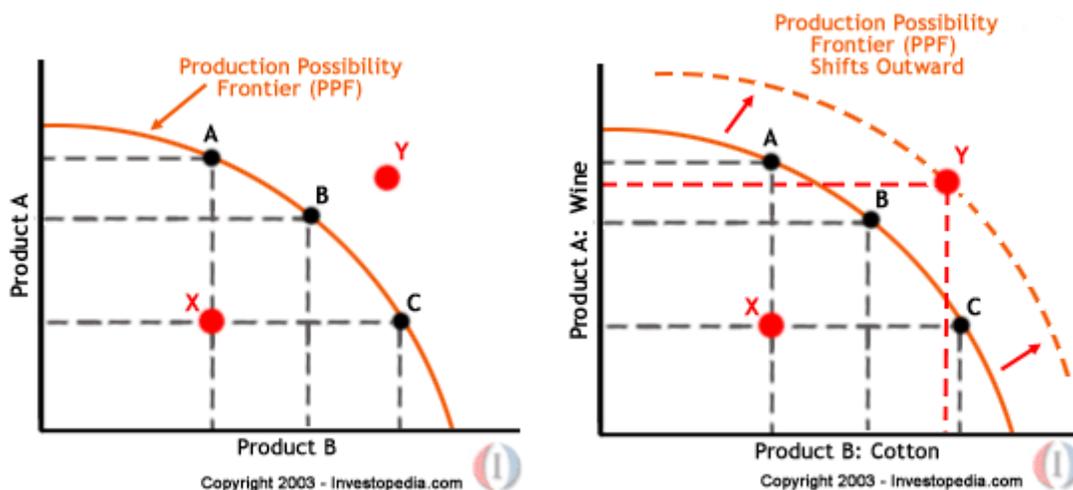
Dynamic gains therefore would shift the PPF line outward because of the increased productivity and efficiencies that would arise from increased trade, or exporting.

In analyzing the benefits to trade, it is also important to note whether the goods being traded are from the manufacturing or agricultural sector because this impacts the benefits and rate of growth that can come about. Within the Sub-Saharan African context, most exports produced are primary agricultural commodities and these goods are more susceptible to changes in prices, or in other terms have a low income elasticity of demand. Also, primary commodities are "land-based activities and subject to diminishing returns" (Thirwall page 134). This means that the more agricultural primary goods are produced, the lower the prices (because of the increase in supply), but this decrease in prices is not coupled with an equally significant increase in demand. The production of agricultural commodities does not have increasing returns and so after a certain point, the marginal product of the labor employed will be lower than the wages. The fixed costs associated with producing primary goods essentially means that the diminishing returns impede the growth associated with such sectors. On the other hand, the manufacturing sector has increasing returns because there are more dynamic gains associated with increasing their production. When there is higher productivity perhaps as the result of increased employment in the manufacturing sector and / or increased technology, there are greater returns because there is a proportionate increase in demand for such goods. Although countries in Africa have a greater agricultural sector than manufacturing sector, it is important to remember that the population in many of

these countries is quite small, some less than 14 million, and so without the possibility of exporting they would not be able to achieve economies of scale (Thirwall).

Most arguments presented in favor of exports are based on the neoclassical school of thought, but others exist such as the BOP Constrained Model and the Virtuous Circle Models. The arguments presented in this paper reflect the neoclassical school of thought, which purports that the export sector produces positive externalities for sectors outside of exporting. The BOP constrained school of thought on the other hand postulates that the balance of payments for a nation (its exports minus imports) constrains the growth rate because eventually a country must repay its debts and cannot "finance ever-growing deficits" (Thirwall). Thus in order to achieve stability and growth, a country must determine the balance of payments equilibrium conditions. These conditions would be the export and import levels (which are dependent on foreign and domestic income levels) that would achieve such equilibrium.

The virtuous circle model of export-led growth deals primarily with the notion of causality between exports and growth. The model says that the increase in productivity causes a circular relationship between exports and growth because export growth leads to output growth which leads to more productive efforts, which leads to greater quality and more competitive products, which leads back to increased export activity (Thirwall).

IV. Literature Review

On an aggregate scale, the impact of globalization and the liberalization of trade that many regions in the world have adapted have "led to a massive expansion in the growth of world trade relative to world output" (Thirwall page 130). Thus trade among nations has become an integral part of the new economies because of trade liberalization. Based on data analysis, economists have claimed that the increase in exports for a given country leads to an increase in gross domestic product. The question now is how this is possible.

As seen by Ricardo's theory and the aforementioned example of comparative advantage in trade, another benefit of exporting is that it creates a new market for producers. Using the example from above, before engaging in trade, the US producers of computers only have their internal market. After trade, now these producers have a new market with the Canadian consumers. Thus if the resources and capital available to them make it feasible to increase production, the computer producers will be able to expand their production and increase their revenues. If this affect is analyzed on an aggregate basis, the sum of all the firms' benefits will expand the national income of the country as a whole (Balassa). This same logic can be applied to a number of producers in a variety of industries. Or, as Thirwall stated, "If production is subject to increasing returns, export growth becomes a continual source of productivity growth" (Thirwall page 135).

By engaging in comparative advantage, countries are able to eventually expand their production and essentially increase their economies of scale. Economies of scale mean that a country (firm) attains minimum costs by producing a large amount. By mass producing, the marginal cost of each unit is reduced. This can therefore bring about cost efficiencies and increased production (Ram).

Other benefits of trade therefore include increased value in the technology of a country. If a nation is able to expand their markets by engaging in trade, then the resulting increased revenues can be reinvested into the production capital and the technology of such factors. By investing in the technology of the production capital, firms and other producers will become more efficient and be able to increase the amount of exports they produce. For example, the shift from handmade production to employing factories helped increase the supply of cotton based goods and expanded the textile industry immensely in the nineteenth and twentieth centuries. This would essentially lead to increased GDP for the country, and its subsequent growth. Some authors, however, claim that the impact of export growth on technological change is curtailed in the case of primary exports because they do not have increasing returns to scale like manufacturing goods (Fosu).

Also, exporting can bring about growth through increasing both domestic and foreign investment within a country. As a nation undergoes increasing exports, the benefits include increased efficiencies due to the expanded nature of producers' markets. In order to meet the increasing demands due to the new export market,

producers must increase the efficiencies in their production practices. Increasing efficiency may mean optimal operations management styles in producing a good, and faster and error-free distribution (by eliminating defects, for example) to the foreign markets. Also, management styles within the country's exporting businesses will improve because they are needed to meet the demand. (These advancements and efficiencies may not only affect the export business, but also the non-export businesses within a country). With better practices, and a more reliable economy, foreigners will be more willing to invest in a booming economy that seems to be decreasing their risk through productive, reliable practices. Foreign direct investment may come to a country in many forms, such as the introduction of foreign corporations into a country or collaborations with already existing firms to expand them through investment. In fact, the capital that is attained through FDI brings about other benefits such as changes in attitudes (Thirwall).

Although it may seem trivial, the idea that increasing investment (that results from increased exports) can bring about new attitudes can actually be instrumental in a country's development. The fruits of efficient practices are mostly the result of a change in mindset on the part of the managers and firms. By essentially educating this population on the ways to meet foreign export demand and about why it is important, the aggregate result would be immense for the country as a whole. Within certain developing nations, this result may be even more magnified because the civil conflicts that exist in parts of the third world have had a deleterious impact

on investment and growth. If exports are able to increase, and more efficient styles are taken on throughout the country, perhaps this commonality in economic goals may impact the political turmoil in a positive manner. Paul Collier concludes that "aid and policy are complementary: aid amplifies the effects of policy, and policy amplifies the effects of aid…Both economic performance and economic structure have powerful effects on the risk of conflict, so that potentially both aid and policy can be expected to affect risk… [T]he higher the level of per capita income, the lower the risk of conflict" (Collier page 436). Thus, if exports do in fact bring about economic growth, then perhaps this could also affect the level of income within a country and in effect the level of conflict as well.

　　　　To expand more on the issue of increased efficiencies, the resulting increase in export activity can lead to greater capacity utilization (Ram). Because of the introduction of a new market for producers, they will be able to theoretically produce as much as their current capital allotment allows. The domestic demand of a good may not be high enough to maximize the use of a country's physical or intellectual capital. The factories, manufacturing processes, and land use that a country can sustain may not be producing the number of units that it could. Also, if there is a decreased production of goods and a less than maximum potential of resource utilization, the labor demand by firms will be lower. By having a lower demand than supply of the working population in a country, there will be less incentive for

workers to attain an educational foundation that would be necessary to work in a manufacturing or other sector (Balassa).

Thus the allocative efficiencies are increased as a byproduct of increasing exports within a country. Firms are able to allocate resources better, and maximize and even expand the capacities of producers. By doing so, another side benefit is that there is increased competitiveness within the export industry of a nation. Because of the increased market and potential for trade, countries are able to improve the output of their producers when competition arises because it essentially challenges the firms to do their best because the consumers in the market will have a greater pool to choose from (Sharma et al.).

The other benefit of having export growth is the resulting "relaxation of the foreign exchange constraint" (Abdulai et al. page 2). The foreign exchange constraint leads to decreased trade activity for a nation. By relaxing this constraint, and allowing the "imports of intermediate inputs, export expansion relaxes a crucial bottleneck and facilitates the export of inputs embodying recent techniques" (Ghatak et al. page 214). This means that by importing inputs, the country can focus with greater efficiency and time on the production of the exports that the country can attain greater revenues by focusing on producing goods for which it has a comparative advantage in. Balassa helps to explain this idea by saying that countries which engage in trade can import goods that it needs, such as inputs, but cannot make without placing a significant economic burden on the nation. Thus relaxing a possible foreign

exchange constraint could help to alleviate such inconvenience and increase the

productive capacity and economic growth for a country. India is a prime example of a

country that previously suffered from a severe foreign exchange constraint, especially

in the years following its independence from the United Kingdom. India followed

the Gandhian notion of "self-reliance" as a rebellion against its previous colonization.

This hindered investment and growth for the country until decades later when it

opened its doors to foreign companies and increased imports (Kaushik).

It is important to note, finally, that there are two different models in

describing the relationship between exports and growth; one is the export-led growth

model and the other is the growth-driven export model (Abdulai et al.). The former

theory asserts that comparative advantage sets the stage for trade activity and results

in productive and efficient allocation of resources. Because of this, the export sector

increases and this leads to better technology, more capital available, and overall

growth. The other school of thought is that growth, which can be attained through

human capital, technological improvements that are fostered through patents and

other licensing and foreign direct investment, and the addition of physical capital,

may as a result foster economic growth that is not the result of a specific policy

designed to stimulate export growth. Thus in this theory, the demand for goods after

this increased economic activity may not and probably will not equal the increase in

supply, so the producers must now look to new foreign markets to sell this excess

supply via exporting (Jung et al.). Although both models have been tested, there is no

clear-cut answer as to which model is correct, because then again there is no absolute

answer in the relationship between exports and growth. What is certain, however, is

that by choosing one model and testing for it can help answer certain policy and

other economic questions such as exports policies affect a country's economic growth.

There have been studies already conducted by economists on the impact of

exporting on the growth of GDP. For instance, Bela Balassa in his paper "Trade

Policies in Developing Countries" notes that the growth in countries like Taiwan and

Korea increased significantly after having pro-export policies. Each of these countries

increased the exports of nondurable consumer goods thus creating a market for their

"educated manpower". The ratio of exports to GDP for Taiwan from 1960-69 was 39

percent, and for Korea it was 29 percent thus indicating high contributions of exports

to GDP. Pakistan also experienced rapid growth after importing certain inputs and

because the Export Bonus scheme increased the expansion of the country's industrial

sector.   A. Abdulai and P. Jaquet carried out a test of exports and economic growth

through regression analysis and found that by their positive coefficients, investment,

exports, labor force, and GDP move "in the same directions in the long run" (Abdulai

et al. 9-10). JP Azam et. al. in the study entitled "Explaining Slow Growth in Africa"

summarized the findings of major papers related to export activity on economic

growth in Africa. The point estimates for the studies Azam analyzed all hovered

around 0.10, regardless of differences in the definition of the dependent variable or in

the variances in sample size. This number means that if merchandising exports are

increased by 10 percent, then there is an associated increase in GDP of 1 percent.

This shows an obvious impact of export activity on growth for Africa. Awokuse's

analysis shows that the link between exports and GDP growth was bidirectional in a

case dealing with Korea; this means that there were both export-driven growth and

growth-driven increases in exports. Thus although the specific countries and data

results varied in these studies, all support the notion that exports bring about some

level of growth.

V. Regression

I will conduct an analysis on the relationship between exports and growth for

four African nations; Malawi, Nigeria, Guinea Bissau, and the DRC. Because of the

limited nature of the number of data I have, I will employ the use of a simpler model

to illustrate the basic relationship I am interested in. The general level of production

as a dependent variable is seen in the production function defined by the equation

$$Y = f(L, K, X)$$

where L is the labor input, K is the capital input, X is the level of exports, and Y is the

aggregate real output. A growth equation can be made based on this equation, as

defined by Rati Ram, to be

$$Y' = \beta_L L' + \alpha_K (I/Y) + \beta_X X'$$

where L' is the rate of growth of labor, X' is the rate of growth of exports, Y' is the rate of growth, and I/Y is the investment-output ratio. By "adding a constant term and a stochastic component" to the above equation, we get

$$Y = \beta_0 + \beta_L L' + \alpha_K (I/Y) + \beta_X X' + u$$

We are assuming that the two sectors in the economy are the export and non-export ones. Also, the export sector is assumed to have positive externalities on the non-export sector in terms of its output (as discussed above, increased exports can increase the productivity and efficiencies within firms, and this may be translated to the non-export sector as well in terms of better management styles, etc.). The final assumption here is that capital and labor are inputs to the export and non-export sector (Ram).

My model is more reflective of the exogenous growth model because I do not use an initial GDP variable, nor do I employ the use of government spending and research and development, which are essential to the endogenous growth model. There is significant literature on the endogenous growth model, but considering data and other circumstantial restraints, it was more fitting to use the exogenous growth model. The neoclassical model explains that the rate of growth is exogenously determined, but oversimplifies this relationship. The endogenous growth theory supports the idea that government policies may impact growth. This model takes ideas from microeconomics and applies them on an aggregate level; just as households maximize utility while considering their budgetary constraints, firms do the same

while trying to increase and maximize profits. In addition, firms and producers are affected by the human capital available and technological advances they are able to employ (Abdulai et al.).

In his paper "Exports, Growth and Threshold Effects in Africa", Neil Foster uses this theory and produces a linear growth model which I have modeled my own regressions after. The equation is

$$\Delta \ln GDP_{it} = \beta_1 \ln INITGDP_{it} + \beta_2 INV_{it} + \beta_s \Delta POP_{it} + \beta_4 SECMRW_i + \beta5 \, \Delta \ln EXP_{it}$$

$$+ \, \mu_i + \varepsilon_{it} + \eta_t$$

"where $\Delta \ln GDP_{it}$ is the growth in income for a country in period t, $\ln INITGDP_i$ is (log) initial GDP per capita, INV is the ratio of investment to GDP, ΔPOP is population growth, SECMRW is the percentage of the working age population in secondary schooling…and μ_i and η_t are country and time specific constants and ε_{it} is a normally distributed term" (Foster page 1062). Also, Δ is the Greek letter delta, implying a change or difference, and ln is the abbreviation for the mathematical function log.

For the purposes of my regression, I have altered Foster's equation to

$$\Delta \ln GDP_t = \beta_1 INV_t + \beta_2 \Delta POP_t + \beta_3 \, \Delta \ln EXP_t + c$$

where c is a constant term, INV is investment, EXP stands for exports, and POP is population. My investment variable is PPP over investment / XRAT (where XRAT stands for exchange rate) in Current Prices as given by data in the Penn World Tables. Because I did not employ the use of panel data, and instead conducted

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analysis for each country individually, it was not necessary for my variables to be defined by a period "it" subscript like Foster did but instead just a time period "t" subscript. Based on the theories and concepts reviewed earlier, I hypothesize a negative coefficient between the investment variable and growth, because INV is defined as the inverse of investment. Finally, I hypothesize that the relationship between exports and growth and population and growth to be positive and for the coefficients to also be positive.

One of the key issues in dealing with time series data is that of stationarity and nonstationarity. A stationary process in econometrics is assumed to be unchanging with time; if the opposite occurs, that is the characteristics of a series vary over time, then data is nonstationary. Stationarity allows one to "model the process via an equation with fixed coefficients that can be estimated from past data" (Pindyck et al. page 493). Because few time series are stationary, and because figures like GDP are usually nonstationary, I tried to solve this problem in my data and regression by using the first-differences of my variables. The first difference is basically done by subtracting a variable in time period t minus that variable in time period t-1. I used this procedure for exports (for which I took the log as deduced by Foster's equations), and population. (I did not do this for investment because it is already defined as the change in capital stock from one period to the next, thus already being first differenced.)

By following Foster's model and using the first-difference form of my variables, the regression results were as follows[ii]:

The Democratic Republic of the Congo

Dependent Variable: GDP
Method: Least Squares
Sample: 1981 2003
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.015200	0.029307	0.518641	0.6100
EXPORTS	0.095291	0.026655	3.574944	0.0020
INVESTMENT	4.63E-05	5.77E-05	0.803071	0.4319
POPULATION	-2.46E-08	2.15E-08	-1.143752	0.2669

R-squared	0.525057	Mean dependent var	-0.007949
Adjusted R-squared	0.450066	S.D. dependent var	0.023012
S.E. of regression	0.017065	Akaike info criterion	-5.146775
Sum squared resid	0.005533	Schwarz criterion	-4.949298
Log likelihood	63.18792	F-statistic	7.001610
Durbin-Watson stat	0.983258	Prob(F-statistic)	0.002311

Nigeria

Dependent Variable: GDP
Method: Least Squares
Sample: 1981 2003
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.061201	0.078110	-0.783529	0.4430
EXPORTS	0.082425	0.044312	1.860112	0.0784
INVESTMENT	-1.14E-05	0.000125	-0.091584	0.9280
POPULATION	2.83E-08	2.57E-08	1.100394	0.2849

R-squared	0.410709	Mean dependent var		0.009741
Adjusted R-squared	0.317664	S.D. dependent var		0.023247
S.E. of regression	0.019203	Akaike info criterion		-4.910732
Sum squared resid	0.007006	Schwarz criterion		-4.713255
Log likelihood	60.47342	F-statistic		4.414054
Durbin-Watson stat	2.262039	Prob(F-statistic)		0.016218

Malawi

Dependent Variable: GDP
Method: Least Squares
Sample: 1981 2003
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.017467	0.026452	0.660312	0.5170
EXPORTS	-0.026530	0.063202	-0.419763	0.6794
INVESTMENT	-0.000120	0.000350	-0.343447	0.7350
POPULATION	3.75E-09	4.80E-08	0.078193	0.9385

R-squared	0.021459	Mean dependent var	0.011182
Adjusted R-squared	-0.133048	S.D. dependent var	0.024788
S.E. of regression	0.026385	Akaike info criterion	-4.275261
Sum squared resid	0.013227	Schwarz criterion	-4.077784
Log likelihood	53.16551	F-statistic	0.138884
Durbin-Watson stat	2.514775	Prob(F-statistic)	0.935505

Guinea Bissau

Dependent Variable: GDP
Method: Least Squares
Sample: 1981 2003
Included observations: 23

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.047885	0.077348	0.619080	0.5432
EXPORTS	0.088063	0.037798	2.329859	0.0310
INVESTMENT	-2.88E-05	0.000425	-0.067730	0.9467
POPULATION	-1.23E-06	1.61E-06	-0.765254	0.4535

R-squared	0.253801	Mean dependent var		0.010690
Adjusted R-squared	0.135980	S.D. dependent var		0.039615
S.E. of regression	0.036823	Akaike info criterion		-3.608616
Sum squared resid	0.025763	Schwarz criterion		-3.411139
Log likelihood	45.49909	F-statistic		2.154121
Durbin-Watson stat	1.776032	Prob(F-statistic)		0.127034

In evaluating the regression, attention is paid to the R-squared term, the signs on the coefficients of the independent variables, and the statistical significance of the independent variables. To start with the R-squared terms, for the DRC it was 0.52507, for Nigeria 0.410709, for Malawi 0.021459, and for Guinea Bissau 0.253801. The R-squared term is equal to $1 - (ESS/TSS) = (RSS/TSS)$ where ESS is error sum of squares, TSS is total sum of squares, and RSS is regression sum of squares. The R-squared values can range from 0 to 1, where 0 would mean that the regression model "does nothing to help explain the variation in Y" (Pindyck et al. page 72). The higher value of R-squared means that the model and regression line are a good fit, and vice versa. The DRC had the highest R-squared of all the countries, followed by Nigeria,

Guinea Bissau, and Malawi. The reasons behind a low R-squared may be that there is unexplained variation in Y, as could be the case for Guinea Bissau and Malawi.

The signs on the coefficients give somewhat mixed results. For all of the countries except for Malawi, the coefficient of exports is positive, which is expected. The relationship between exports and growth is not positive for Malawi perhaps due in part to the extenuating circumstances in the country such as the high HIV/AIDS infection rate, or the high percentage of the population that lives off of subsistence farming. The exports were significant at the 1% level for the DRC, the 5% level for Nigeria, and the 5% level for Guinea Bissau. Thus, the sign and the significance of the coefficient on exports support the hypothesis that exports have a positive effect on growth.

The coefficient for investment is positive for the DRC and negative, as expected, for the remaining countries. However, investment is not statistically significant even at the 10 percent level for any of the countries. This variable has decreased from its level in 1981 to its level in 2003 for the DRC, and may be part of the reason as to why its relationship with growth is negative.

The population variable shows a positive sign for both Nigeria and Malawi, and a negative sign for the DRC and Guinea Bissau. Both the DRC and Guinea Bissau experienced a great deal of political and economic turmoil which significantly reduced the efficiency of their economies, and could have ultimately led to an overall decline of output per capita. While the relationship between population and output

seems to be negative in my model, the coefficient on may be picking up the effects of other factors, such as a decline in public services and infrastructure, which could have happened at the same time that population was increasing.

VI. Conclusion

The relationship between trade and exports is one that is agreed upon by economists from many different schools of thought, and the areas of contention are usually those dealing with the causality issues or the extent of the role that exports play in economic growth. This paper supports the export-led growth theory. As AP Thirwall stated, "export growth is the only component of demand that provides the foreign exchange to allow other components of demand in an economy to grow faster" (Thirwall page 133).

From the analysis presented on the select African nations of Malawi, Nigeria, Democratic Republic of Congo, and Guinea Bissau, we see that exports play an important role in the GDP growth of their respective economies. Not only is the specific role that exports play in the growth for the nations important here in the analysis, but it is also important because economic development has and will play an instrumental role for the development of nations in Africa.

Appendix

i. All data was obtained from the World Bank's World Development

Indicator database and from the University of Pennsylvania's Penn World

Tables.

ii. EViews Version 5.0 was the software program used to conduct regression

analysis.

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