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Export Composition and Economic Growth in Sub-Saharan Africa: A Panel Analysis

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Abstract

This paper was guided by the hypothesis that it is not exports per se that matter, but different export components influence growth differently. We considered a sample of 35 sub-Sahara African countries based on availability of data on the key variables. Aggregate data were obtained from the most recent World Bank's World Development Indicators and International Monetary Fund's International Finance Statistics online facilities. Disaggregated data on exports and imports were obtained from the United Nation's Statistical Database under Standard International Trade Classification (SITC) Revision 4. The Generalized Methods of Moments estimator was employed during the analysis. We find that it is the growth in agricultural exports, and not manufactured exports, that is significantly associated with per capita income growth in our sample. These countries should adopt policies that increase agricultural exports in the medium term as they design strategies for increasing manufactured exports in the long term. Other factors significantly influencing growth are gross capital formation, capital goods imports, infrastructure, government consumption, and inflation rate, political systems and governance, and education.

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Keywords: Export composition, economic growth, Sub-Saharan Africa

1. Introduction

The role of exports in igniting and sustaining rapid economic growth rates, especially in emerging economies, cannot be underscored. Exporting is associated with static gains that include access to larger outside markets, hence exploiting economies of scale. There are also dynamic gains that include efficiency advances as a result of knowledge and technological spillovers from exporting experience. Exporting is also associated with efficiency in resource allocation, employment generation, and relaxing the foreign exchange constraints. Accordingly, there is little wonder that countries the world over are taking deliberate and purposive efforts to promote exporting activities. Owing to the usually strong synergies between rapid economic growth on the one hand, and exporting on the other, countries usually strive to achieve rapid increases in exports and, by extension, promote economic growth and development.

Indeed, the present literature presents several plausible theoretical arguments supporting the view that exporting activities and overall economic growth are positively associated. On the one hand, exporting implies that a country gains access to the wider external demand, which acts as a stimulus to domestic output and hence economic growth. Second, it is frequently argued that small domestic markets may not grow continuously and that any positive economic shock leading to the expansion of the domestic market is more likely to decay quickly. On the other hand, large external markets do not always encompass growth restrictions on the demand side, and this leads to the exploitation of economies of scale. Therefore, export expansion can be argued to be a stimulus of economic growth (Agosin, 1999; Giles and Williams, 2000; Grossman and Helpman, 1991). Additionally, Verdoorn (1949) dwells on the argument that export growth may generate specialization in the production of export commodities. By extension, specialization is argued to lead to efficiency gains in the export sector owing to the rise in skills due to learning-by-doing. Consequently, resources would flow from the relatively less productive and non-trade sector to the highly productive exports sector, leading to economic growth.

Futher, Chenery and Strout (1966), Balassa (1978), Buffie, (1992) and Riezman (1996), dwell on an indirect argument linking exporting to economic growth. They argue that exporting activities generate foreign exchange that is required to import capital goods. Increase in capital goods imports in turn stimulate a country's capacity to produce. This is more pronounced in developing countries that have an extreme disadvantage in the production of capital goods. In the same line of argument, it is suggested that the most up-to-date knowledge and technology is embodied in the capital goods (plants and equipments) imported from technologically advanced countries. This knowledge transfer through international trade may increase productivity and, by extension, lead to economic growth and development (Hart, 1983 and Chuang, 1998).

Empirically, the relationship between exports and economic growth has been tested in a number of countries, employing time series techniques. It is noteworthy that the evidence generated does not translate into a consensus on the direction of causality of the two series. For that matter, the relationship between exporting and economic growth remains hotly debated by researchers and academics. Some authors

adduce evidence supporting the fact that export growth precedes economic growth hence giving a stance to the export-led-growth (ELG) hypothesis (Arnade et al., 1995; Fosu 1996; Thornton 1996). On the other hand, some authors provide evidence in support of the growth-led-export hypothesis (GLE) by arguing that economic growth precedes export growth (Lancaster, 1980; Krugman, 1984; Henriques and Sadorsky 1996; Al-Yousif 1999; Kemal et al., 2002). The stance of this argument is such that economic growth leads to knowledge and technological development in the various sectors of an economy through the learning-by-doing effect. This effect on the economy becomes a vehicle for export growth especially in those commodities where the country enjoys a comparative advantage. Other authors argue that there is a feedback relationship between export growth and economic growth (Helpman and Krugman, 1985; Dutt and Ghosh, 1994; Thornton 1996; Shan and Sun 1998a; Anwar et al., 2000;). The arguments presented along these lines are that exports may arise from the economies of scale effects of economic growth. At the same time, export expansion may propel further cost reductions leading to efficiency gains, and by extension, leading to economic growth. At an extreme end, some authors find no causal relationship between the two series (Mutairi, 1993; Anwar et al., 2000).

In addition to single country studies, there is substantial cross-country empirical literature on the effects of exports on growth (Voivodas, 1973; Michaely, 1977; Balassa, 1978; Fajana, 1979; Fosu 1990; Lussier 1993; Greenaway and Sapsford, 1994; and Sala-i-Martin, 1997)[1].

These authors provide evidence for the positive association between exports and growth. However, it is worth noting that most of the recent and earlier literature on exports and economic growth concentrated on 'aggregate exports' only. The major deficiency of this approach is that it limits our understanding of the important differences between dissimilar export components and their influence on economic growth. It is argued that even if there is a growth-enhancing or growth-limiting effect of a particular export component, it may not be reflected at the aggregate level, and this may lead to unauthentic conclusions and implications for policy (Ghatak et al., 1997). All the cross-country studies cited above do not explicitly investigate the effect of disaggregated exports on economic growth.

However, there is quite scanty literature investigating the role of export composition on economic growth (Feder, 1983; Fosu, 1990; Ghatak et al., 1997; Hussain, 1998; Greenaway et al., 1999; Srinivasan et al., 2001; Herzer et al., 2004; and Wörz (2005). Additionally, the literature addressing the subject, apart from Fosu (1990), is overly concentrated on Asia, Latin America, and Europe. This leaves a huge knowledge gap for Africa that this paper seeks to fill. This paper tests the hypothesis that not the aggregate exports per se matter, but different export components have a differential influence on economic growth. Put differently, the type of products that a country exports do matter for growth.

Indeed, this is connected to the argument documented by Feder (1983) and Wörz (2005) that efficiency, knowledge spillover, and economies of scale are different across different export components. This, in turn, implies that their growth stimulating power is obviously different. Therefore, the question of interest from the policy perspective extends beyond the influence of aggregate exports on growth and

[1] Cited in Giles and Williams (2000)

dwells on whether export components have a differential stimulating power on economic growth. Gaining insights on the differential impact of export components on growth is a key to successful policy formulation, analysis, and advocacy. In addition, much of the previous country and cross-country studies have been plagued by the endogeneity problem that obviously exists in a growth model with the export variable on the right-hand-side. In light of this, we employed a dynamic panel generalized method of moments (GMM) estimator. In studying growth, this procedure ensures that parameters are estimated consistently in the presence of endogenous right-hand-side covariates.

The paper is organized as follows. Section 2 presents the theoretical framework and the estimation strategy. Section 3 presents a discussion of the findings and section 4 concludes with the paper's implications for policy.

2. Theoretical Framework and Estimation Strategy

The theoretical exposition of the relationship between exporting and economic growth is based on the premise that exporting influences economic growth via productivity enhancement. A number of authors have developed models in which technology and knowledge spillovers are important conduits through which international trade or exports in particular lend a vital synergy to endogenous growth. For instance, Grossman and Helpman (1991) present international trade as being at the forefront of promoting a country's Research and Development sector that is indispensable for growth. This is based on the grounds that in the global trading arena, exporting firms experience knowledge and technological best practices from their competitors as well as consumers. Wörz (2005), present two important arguments through which exporting leads to productivity improvement at the firm level which translates into overall economic growth. The first argument dwells on the fact that a country engaged in production for export will maximize the exploitation of its comparative advantage, which enhances efficiency. This, in turn, triggers resource reallocation from the relatively inefficient non-trade sector to the efficient export sector. Their second argument is based on the premise that producing for the global market is usually associated with a drive to upgrade the quality of the products in line with what international consumer dictates, hence leading to a rise in skills, productivity and, by extension, economic growth. This argument is also supported by Feder (1983) who argues that efficiency enhancement may occur via spillover effects generated by the learning experience of exporters. This, subsequently, generates positive knowledge externalities to the domestic economy as a whole and, by extension, productivity enhancement that is an engine of overall economic growth.

On the other hand, other authors present an important role of capital goods imports in promoting productivity and hence economic growth. The arguments presented, however, still expose exporting as an intermediary. Riezman (1996) and Chenery and Strout (1966) dwell on the argument that export expansion may indirectly affect growth by providing foreign exchange that allows for increasing levels of capital goods imports. Yet, Chuang (1998) and Hart (1983) argue along the lines that knowledge and technology are embodied in equipment and machinery that are sourced from technologically leading countries. This effect is presented to be

productivity enhancing and thus economic growth enhancing. This line of argument has been pursued by other authors (Romer, 1992; Pack, 1992; Coe et al., 1995; Lee, 1995; Pissarides, 1997)[2]. They argue that capital goods imports to a country are proportional to technological spillovers that participating firms experience. The importing countries are argued to be using the ideas and information conceived from the technological leaders for which they lack capacity to develop in isolation. To sum up this argument, exporting provides a country with foreign exchange to import capital goods which bring along with it the aforementioned benefits to the economy.

Empirically, authors like Caselli and Coleman (2001)[3] generated a measure of technological diffusion by considering countries' imports of high-tech equipment, mostly computers. They argue that the accumulation of computers is proportional to spillover of knowledge and technologies. However, in a twist of argument, Wörz (2005) argue that the influence of imports on economic growth is not without ambiguity. Whereas imports of capital goods may enhance growth through embodied technology and knowledge, it may reduce the latitude for learning-by-doing, which dampens growth. Further, they contend that the positive influence of sophisticated importation very much depends on the absorptive capacity of a country in terms of the education of the labor force.

An important theoretical argument that motivates this paper is on the importance of export structure on growth, proposed by Feder (1983) and Wörz (2005). They argue that different export components generate important differences in productivity, externalities and economies of scale and hence influence economic growth differently. They dwell on the argument that the scope for technology and knowledge spillover is highest in the manufactured export components which are usually more skill intensive. Based on their foundation, we present the productivity parameter in the Cobb-Douglas production function as being influenced differently by the different export components. We also include capital goods imports because they embody knowledge and technology that is productivity enhancing.

2.1 The Model

Consider a neoclassical Cobb-Douglas production function;

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} \quad (1)$$

Where Y_{it} denotes total output of economy i at time t, and, A_{it} is the productivity parameter which represents the stock of knowledge, production technology or the blueprint. K_{it} and L_{it} are conventional factors of the production function representing the stock of capital and labor for different economies, respectively. Since exports and imports affect growth via the productivity parameter (A_{it}), we can express this parameter as a function of various export and import components and control for other factors. These export and import (now also called learning coefficients) components are entered with a lag (s) because it is assumed that knowledge accumulation is not instantaneous.

[2] Cited in Barro and Sala-i-Martin (2004)
[3] Cited in Barro and Sala-i-Martin (2004)

$$A_{it} = f(AX_{it-s}, MX_{it-s}, CM_{it-s}, Z_{it})$$
(2)

Imposing factor shares on each of the components will make it easy for us to substitute it back into equation (1).

$$A_{it} = AX_{it-s}^{\gamma} MX_{it-s}^{\lambda} CM_{it-s}^{\mu} Z_{it}^{\rho}$$
(3)

where AX and MX are agriculture and manufactured export components, and CM is capital imports. Z is a vector of control variables including; government consumption and credit to the private sector as percentage of GDP, inflation rate, civil liberties index, , and number of telephone lines per 1000, among others. Combining equation (3) and (1), we obtain:

$$Y_{it} = AX_{it-s}^{\gamma} MX_{it-s}^{\lambda} CM_{it-s}^{\mu} Z_{it}^{\rho} K_{it}^{\alpha} L_{it}^{\beta}$$
(4)

Where $\gamma, \lambda, \mu, \rho, \alpha$ and β are elasticities of output per capita growth with respect to the determinants of growth given in equation (4). Taking natural logs (l) on both sides of equation (4) gives an estimable linear function:

$$lY_{it} = c + \gamma lAX_{it-s} + \lambda lMX_{it-s} + \mu lCM_{it-s} + \rho' lZ_{it} + \alpha lK_{it} + \beta lL_{it} + \varepsilon_{it}$$
(5)

In (5) all coefficients are constant elasticities, c is the intercept parameter, and ε_{it} is the error term which is assumed to be well behaved with zero mean and constant variance (white noise). Accordingly, our parameters of interest, called learning coefficients; $\gamma, \lambda,$ and μ serve to measure the productivity effect of the various export and import components on GDP per capita growth. From equation (5), we test the hypothesis that it is not exports per se that matter for growth but that different components differently influence per capita output growth via productivity. It is frequently argued in the literature that manufactured exports are more productivity-enhancing and hence more growth-enhancing because they are normally more capital intensive and hence more human capital intensive. This implies that manufactured products are associated with greater latitude for spillovers and learning hence expected to have a more robust influence on economic growth.

On the other hand, an increase in agricultural exports influences total output through multipliers on economic activity, value added and employment- direct and indirect effects. For instance, increased agricultural exports increase household incomes, which in turn stimulates farmers' purchases of fertilizers, agricultural inputs and machinery, and a general increase in demand for consumption goods, hence providing forward and backward linkages (Diao et al., 2007). Also there is increased economic activity in form of food and fiber manufacturing, transportation and sales arising from increased agriculture exports. All these activities lead to increase in household incomes in form of wages, salaries, profits and rents. The greater the number of activities performed on the agricultural exports, the greater the multiplier effect, and hence the greater the economic growth. In other words, agricultural exports with value addition yield a greater multiplier effect hence impact more to economic growth than primary products. Analogously since over 70 percent of agricultural output in Africa is produced by small scale farmers, rather than large scale industrial agriculture, there is less incentive for value addition due to the high

implicit costs in form of collection, transportation and storage. The dominance of the small agriculture in one way or another impedes its effect on economic growth.

2.2 Estimation Strategy

In line with the recent literature estimating growth models, we employed the generalized method of moments (GMM) estimator during the analysis. The methodology was developed by Arellano and Bond (1991) and introduced into the growth literature by Caselli, Esquivel and Lefort (1996). In studying economic growth, GMM is superior over other estimators for simple cross-section regressions and other dynamic panel data models. The methodology eliminates biases originating from omitted variables, endogenous right-hand-side variables, omission of initial efficiency, and presence of measurement error. According to Arellano and Bond (1991), the consistency of the GMM estimator mainly depends on the assumptions that the error terms do not exhibit second order serial correlation and that the instruments are valid. The validity of the instruments is established using the serial correlation test and a Sargan test of over-identifying restrictions. If we fail to reject the null hypotheses of the two tests, then we shall be sure that the assumptions of the instruments are valid. A full exposition of the GMM estimator is in the Appendix 3.

2.3 Data Type and Sources

We used a panel of 35[4] sub-Sahara African countries whose selection was based on data availability particularly on the key variables: disaggregated exports and imports. Disaggregated data on exports and imports was obtained from the United Nations Statistics Database under the Standard International Trade Classification (SITC) Revision 4. The components of agricultural and manufactured exports and capital goods imports are used as explanatory variables in the growth model. Aggregate data on GDP per capita, Labor force, credit to the private sector and government consumption as a percentage of GDP, GDP deflator, and gross capital formation as a percentage of GDP were obtained from the most current World Development Indicators (WDI, 2010) online facility of the World Bank. Data on exchange rate was obtained from the most current IMF's International Finance Statistics online facility. Data on the Civil Liberties index was obtained from Freedom House online facility (www.freedomhouse.org). The observation period extends from 1988 to 2007 selected based on the data availability especially on the disaggregated exports and imports which do not have longer time series.

3. Results

3.1 Descriptive Results

Table 1 shows the summary statistics of the variables used in the study for 35 sub-Sahara African countries for the period 1988-2007. We expected to work with 700 observations but due to missing data points for some key variables we end up, on average, with about 300 observations and hence we have an unbalanced panel.

[4] The list of countries is contained in appendix 2

Variable	*Description*	*Mean*	*Std. Dev.*	*Min*	*Max*
GDP per capita growth	Growth rate in percentages	1.121834	6.238654	-46.89249	65.77162
GDP per capita	US $, 2000 constant prices	845.9816	1255.212	102.286	8692.031
Export total	US $	2.86e+09	8.55e+09	3000000	9.80e+10
Agriculture exports	US $	6.29e+08	1.11e+09	338592	1.10e+10
Manufacturing exports	US $	8.76e+08	3.96e+09	1736	4.50e+10
Capital goods imports	US $	1.56e+09	5.22e+09	2.40e+07	6.00e+10
Gross capital formation	% of GDP US $	20.9956	11.07931	-23.76259	113.5779
Labor force	Total of economically active persons	5096052	5910203	110120.9	3.82e+07
Telephone lines	Per 100 people	1.971571	4.085503	.0579306	28.7544
Government consumption	% of GDP US $	14.46118	5.77774	2.287548	39.71343
Domestic credit	% of GDP US $	18.06286	20.84423	0	162.4562
Inflation	GDP deflator % of annual growth	14.71479	32.25547	-33.53161	381.2654
Civil liberties index	Scale 1-7; 1=maximum rights &7=fewest rights	4.37106	1.437805	1	7
Real effective exchange rate	Trade-weighted index (1997=100)	104.481	33.49919	20.24	329.25
Secondary school enrolment rate	% of gross enrolment	30.20424	20.87551	4.803008	95.07371

Table 1: Descriptive statistics of the variables used
Source: authors' own calculations from World Development Indicators 2010 and UN Comtrade data set 2009

From Table 1, we note that there is no variable whose standard deviation is zero; therefore, all our variables qualify to be included in the regression. Additionally, it is observed that the maximum and minimum values of our variables are well around the mean values and hence we conclude that there are no outliers. Table 2 shows the average statistics of the paper's key variables by country. Considering the average income per capita growth rate over the period under observation, Equatorial Guinea leads all other countries in our sample with a growth rate of 13%. It is followed by Botswana (5%), Mauritius and Cape Verde (4%), Swaziland, Uganda (3%), Burkina Faso, Congo Republic, Tanzania, Chad, Lesotho, Sudan and Mozambique (2%). The country with the lowest average growth rate over the same period is Cote d'Ivoire (-2.2%) followed by Niger (-1.3%), Central African Republic (-1.2%), Madagascar (-0.96%), Zimbabwe and Garbon (-0.7), and Burundi (-0.6%).

Country	*GDP per capita growth*	*GDP per capital $2000*	*Total Exports (US $)*	*Agricultural exports (US $)*	*Manufacturing Exports (US $)*	*Capital goods imports (US $)*	*Gross capital formation % of GDP*	*Labor force total*	*Inflation/ GDP deflator (%)*
Benin	.747253	324	3.83E+08	2.26E+08	20444444	2.39E+08	17.08	2296182	4.85
Botswana	4.60340	2763.88	2.54E+09	5.69E+08	3.09E+09	1.93E+09	29.02	653914.3	10.01
Burkina Faso	1.68025	205.78	2.84E+08	2.01E+08	29818182	4E+08	19.36	4586035	3.48
Burundi	-.611779	128.76	90542993	56800000	9872493	1.16E+08	12.18	3005372	9.43
Cameroon	-.06340	715.08	2.71E+09	7.55E+08	2.3E+08	8.75E+08	19.01	5114770	4.76
Cape Verde	3.8247	1066.72	1.35E+08	5290360	27390909	2.03E+08	30.93	136979.5	3.33
Central African Rep.	-1.2415	264.37	1.88E+08	51538462	42692308	78000000	10.39	1486123	5.64
Chad	2.1526	196.72	8.7E+08				16.59	2820639	4.77
Congo, Rep.	1.53732	1141.62	2.38E+09	90000000	24666667	2.37E+08	27.17	1105562	6.95
Cote d'Ivoire	-2.237	652.11	4.95E+09	3.12E+09	1.05E+09	1.56E+09	12.66	5516306	5.36
Equatorial Guinea	12.654	2888.14	2.31E+09				51.47	165139.8	9.21
Ethiopia	1.4839	134.92	1.05E+09	5.45E+08	60153846	1.67E+09	18.29	25244098	7.6
Gabon	-.73568	4530.8	3.26E+09	3.94E+08	99000000	8.56E+08	28.38	465794.7	6.32
Gambia	.45444	335.75	1.65E+08	9069231	2892145	92615385	21.1	482744.8	9.96
Ghana	1.2028	244.07	2.21E+09	1E+09	3.11E+08	2.43E+09	18.6	7133370	31.37
Guinea-Bissau	-.18168	164.44	42045149	45333333	742750	29666667	25.95	476475.9	31.97
Kenya	.2025	423.95	3.17E+09	1.22E+09	5.76E+08	2.17E+09	19.79	11881434	10.53
Lesotho	1.5073	379.31	2.86E+08	41200000	4.42E+08	2.01E+08	43.46	719958.4	11.04
Madagascar	-.9633	269.03	9.02E+08	3.03E+08	2.3E+08	4.45E+08	15.48	6278304	15.61
Malawi	.17416	142.67	4.91E+08	4.28E+08	54583333	4.12E+08	19.17	4307710	22.24
Mali	1.0949	221.65	6.35E+08	2.82E+08	33975000	5.58E+08	20.89	2746278	5.83
Mauritania	.17339	428.53	5.09E+08	4.13E+08	30244.84	7.64E+08	22.84	884086.2	8.83
Mauritius	3.5171	3105.94	2.26E+09	4.61E+08	1.1E+09	1.11E+09	25.32	473590.5	7.93
Mozambique	2.3112	223.19	8.57E+08	2.41E+08	5.03E+08	8.02E+08	18.16	7798508	28.51
Niger	-1.3263	186.84	3.74E+08	2.41E+08	50384615	1.92E+08	13.19	2909929	4.33
Rwanda	1.6755	247.44	1.85E+08	69191667	5798708	1.73E+08	16.72	3268688	9.03
Senegal	.21820	478.78	1.51E+09	3.56E+08	3.53E+08	9.98E+08	17.84	3537856	4.69
South Africa	.38189	3229.95	4E+10	6.91E+09	2.68E+10	3.5E+10	19.43	12568533	11.47
Sudan	2.3722	334.37	2.47E+09	4.01E+08	58050000	2.47E+09	16.86	9268853	39.46
Swaziland	2.6813	1202.43	1.04E+09	3.88E+08	9.26E+08	5.68E+08	20.49	310327.6	10.05
Tanzania	1.7726	294.57	1.47E+09	6.55E+08	1.63E+08	1.63E+09	19.77	14303236	15.96
Togo	-.5971	264.37	5.18E+08	1.95E+08	85121875	1.95E+08	18.08	1824532	4.66
Uganda	2.783	231.13	7.28E+08	4.79E+08	79928571	7.84E+08	15.31	9117260	39.17
Zambia	-.4816	371.68	1.61E+09	2.55E+08	1.24E+09	1.07E+09	17.56	3389918	41.47
Zimbabwe	-.73279	591.29	2.03E+09	1.13E+09	7.66E+08	1.57E+09	16.9	4328739	79.43

Table 2: Average statistics of the major variables used in the study by country.
Source: authors' own calculations from World Development Indicators 2010 and UN Comtrade data set 2009

In terms of GDP per capita in US $ (2000 constant prices), Gabon leads all other countries with an average value of 4530.8$. This is followed by South Africa (3229.95$), Mauritius (3105.94$), Equatorial Guinea (2888.14$), Botswana (2764$), Swaziland (1202.43$), Congo Republic (1141.62$), and Cape Verde (1066$). The rest of the countries[5] have GDP per capita well below 1000$. We find that the country with the highest GDP per capita (Gabon), on average, exports more agricultural than manufactured exports. However, its capital imports bill, on average, is greater than agricultural and manufactured exports treated individually, but lower than total exports.

On the other hand, countries like South Africa, Mauritius, Botswana, and Swaziland, on average, export more manufacturing than agricultural exports. The capital imports bill for South Africa and Mauritius is, on average, greater than agricultural and manufacturing exports treated individually. For Swaziland and Botswana, the capital imports bill is, on average, greater than agricultural exports but less than manufacturing exports. It is noteworthy that South Africa leads all other countries in our sample for total exports, agricultural and manufacturing exports as well as capital goods imports. For total exports and agricultural exports, South Africa is followed by Cote d'Ivoire, Gabon and Kenya; for manufacturing exports it is followed by Botswana, Mauritius, and Cote d'Ivoire; for capital goods imports it is followed by Sudan, Ghana, Kenya, Botswana, and Ethiopia. Overall, apart from Gabon, all countries whose GDP per capita is above $1000, export more manufactured than agricultural products. On the other hand, apart from Lesotho, Mozambique, and Zambia, all countries whose GDP per capita is below 1000$ export more agricultural than manufactured products. However, these findings are mixed; it is not clear that a relatively rich or poor country exports more of a specific product. Therefore, this descriptive information was insufficient for us to gain clear insights on which export component positively and significantly influences GDP per capita growth. Consequently, we extend the qualitative findings into quantitative analysis to determine which export component significantly influences GDP per capita growth. We present a discussion of our quantitative results in subsection 3.2 below.

3.2 Quantitative Results

Table 3 reports the results obtained from the GMM regression. When fitting a model using the GMM estimator, it is imperative to ascertain whether the instruments used satisfy the orthogonality condition, i.e., whether they are uncorrelated with the errors. To address this issue, we employed the Sargan test of over-identification of restrictions. The test statistic has a χ^2 distribution under the null hypothesis that the instruments are valid. We find an insignificant statistic indicating that the Sargan test cannot reject the null hypothesis that all our instruments are valid. Similarly, the Wald test for joint significance of the variables does not reject our econometric specification. Furthermore, the serial correlation test rejects the null of no first order serial correlation but does not reject the null that there is no second order serial correlation. However, according to Baltagi (2005), this

[5] Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Cote d'Ivoire, Ethiopia, Gambia, Ghana, Guinea-Bissau, Kenya, Madagascar, Mali, Mauritania, Niger, Rwanda, Senegal, Sudan, Tanzania, Togo, Uganda, Zimbabwe, Lesotho, Mozambique, and Zambia

is what is expected in a first-differenced equation with the original untransformed disturbances assumed not to be serially correlated.

In table 3 (model 1), we investigate a case in which total exports is the main explanatory variable, in order to gain an insight on whether exports in general influence GDP per capita growth. The results show that total exports positively and significantly impacts per capita income growth. The results indicate that a unit percentage increase in total exports is associated with a growth in per capita income of about .07 percent.

Variables	*Model (1)*	*Model (2)*	*Model (3)*	*Model (4)*	*Model (5)*
Lagged GDP per capita	0.674***	0.812***	0.823***	0.780***	0.760***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exports total	0.0697***				
	(0.000)				
Gross capital formation % of GDP	0.0332**	0.0235**	0.0232**		0.0282*
	(0.0139)	(0.0264)	(0.0263)		(0.0710)
Labor force	-0.121**	0.00410	0.00625	0.00451	0.0208
	(0.0475)	(0.890)	(0.830)	(0.876)	(0.776)
Telephone lines per 1000	0.0281**	0.0226***	0.0212**	0.0149*	0.0145
	(0.0135)	(0.00969)	(0.0151)	(0.0709)	(0.302)
Government consumption	-0.0517	-0.109**	-0.0968**	-0.144***	-0.140**
	(0.253)	(0.0284)	(0.0488)	(0.00172)	(0.0362)
Domestic credit to the private sector	-0.00187	-0.00626	-0.00796	-0.00175	-0.0146
	(0.753)	(0.253)	(0.151)	(0.751)	(0.119)
Inflation	-0.00822***	-0.00761***	-0.00708***	-0.00738***	-0.0112***
	(0.00135)	(0.000396)	(0.00105)	(0.000557)	(0.000163)
Civil liberties index	-0.0253**	-0.0329***	-0.0272**	-0.0356***	-0.0181
	(0.0409)	(0.00925)	(0.0345)	(0.00423)	(0.240)
Secondary school enrolment	0.0660***				0.121***
	(0.00270)				(0.000)
Agriculture exports		0.0180***	0.0202***		0.0247***
		(0.00201)	(0.000275)		(0.00495)
Manufacturing exports		0.00154		0.00130	-0.00542
		(0.614)		(0.666)	(0.263)
Capital goods imports				0.0319***	
				(2.93e-07)	
First order serial correlation	0.000	0.000	0.000	0.000	0.000
Second order serial correlation	0.1534	0.2972	0.2830	0.5396	0.0035
Wald test of joint significance	0.000	0.000	0.000	0.000	0.000
Sargan test	0.1788	0.2144	0.2704	0.3428	0.4799
Observations	247	307	307	307	175
Number of pid	32	30	30	30	29

P values in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 3: Regression Results from GMM Estimation.

The question that remains to be answered is among agricultural and manufactures: Which export component is more important to growth than the others? Models 2-5 seek to provide an answer to this question.

Findings show that, growth in agricultural exports is positively and significantly associated with per capita income growth (model 2). Specifically, on average, a unit percentage increase in agricultural exports is associated with a growth in per capita income of about .02 percent. This finding is robust across various models even when we include different control variables. However, the link between growth in manufactured exports and per capita income growth is at best weak. The estimated coefficients are not statistically different from zero at any conventional level of significance. Therefore, a growth-enhancing effect can be attributed to agricultural exports and not manufactured for the case of countries in our sample. This empirical finding is in support of the paper's main hypothesis that it is not exports per se that matter, but that different export components differently influence per capita income growth. This finding is however contrary to the widely held theoretical view that manufactured exports are more productivity-enhancing and therefore more growth-enhancing. This is based on the premise that there is greater knowledge and technological spillover associated with manufactured compared to agricultural exports. Additionally, it is frequently argued that manufactured exports are more capital intensive and hence more human capital intensive such that knowledge and its dynamic benefits to the economy is expected to be more imperative in this sector.

Probably this is explained by the great variation in the African countries' exports of both agriculture and manufactures. For instance, from Table1, the standard deviation between manufactured exports is thrice that of agriculture exports, implying that most African countries' levels of agricultural output are closer to the mean than their manufactured exports. In other words most of the African countries export agricultural produces than manufactures. Such a variation affects the level of significance of a variable.

It is apparent that sub-Sahara African countries still enjoy a comparative advantage in agricultural than manufacturing exports. Whereas it is more benefiting for countries in our sample to promote agricultural exports, this is not to suggest that these countries should not pay attention to industrialization at all. These countries should adopt policies that increase agricultural exports in the medium term as they design strategies for increasing manufacturing exports in the long term. It might be the case that the stage of development they have so far attained is not yet conducive for gaining a comparative advantage in manufacturing exports. The evidence found in studies conducted in other parts of the world attribute a growth-enhancing effect to sophisticated rather than non-sophisticated exports (Wörz, 2005; Herzer et al., 2004; and Ghatak et al., 1997). Wörz (2005) found a superior performance of high tech exports for a large group of developing and developed countries (OECD, Asia, and Latin America). Ghatak et al. (1997) found that nontraditional manufactures were more important than traditional manufactures for India. Herzer et al. (2004) found evidence of growth-enhancing effects of manufactured exports rather than primary exports for Chile. Nevertheless, our findings are in line with previous literature for the held view that the composition of exports does matter for growth of a particular economy. Indeed from our SSA sample, we attribute the growth-

enhancing effect to agriculture rather than manufacturing exports. From another perspective, this result may be pointing to the failure of most sub-Sahara African countries to change their export composition from largely low value-added agricultural exports to high value-added manufactured exports. This may account for their meager gains from international trade despite the large volumes traded.

Our findings also articulate the productivity-enhancing and, by extension, growth-enhancing effect of capital goods imports. A unit percentage increase in capital goods imports is associated with a growth of per capita income of about .03 percent and this effect is significant at the 1 percent level. This result strongly supports the widely held theoretical view that capital goods imports, especially from technologically advanced countries, embody the most current knowledge and technology. They, therefore, enhance economic growth via their knowledge and technology-enhancing effect. From a policy perspective, it can be argued that any policy option that stifles capital goods imports, for the case of sub-Sahara African countries, stifles economic growth too. This is due to the fact that most countries in this region have an extreme disadvantage in the production of capital goods. Governments should prioritize the importation of capital goods in order to enhance growth domestically.

The effect of the savings rate in the Solow neoclassical growth model is measured empirically by the ratio of real investment to real GDP. The growth in the gross capital formation as a percentage of GDP is positively associated with GDP per capita growth for the case of countries in our sample. A unit percentage increase in capital formation leads to an increase in GDP per capita growth between .02 and .03 percent. This effect is significant, at most, at the 5 percent level in all our models. Therefore, there is strong statistical evidence that the growth in the gross capital formation as a percentage of GDP drives GDP per capita growth for the case of countries in our sample. Accordingly, policies that increase savings in a country, such as building a strong financial sector, should be of great concern to the policy maker. It is noteworthy that due to collinearity we excluded capital goods imports from all models where gross capital formation is found.

Also, our findings articulate the role played by the country's size of government. We work under the assumption that the impact of government consumption expenditure on growth is ambiguous; either it enhances growth if the expenditure is on education, health and infrastructure or it distort private activities through crowding out effects hence it does not involve any productivity enhancing effects. The results show that the growth in per capita incomes increases with a fall in government consumption expenditure. Specifically, a unit percentage increase in government consumption is associated with a reduction in the GDP per capita growth of 0.1. The negative and significant relationship between government expenditure and growth in our sample is evidence that a greater proportion the share of government consumption expenditure to GDP in SSA that on average stands at 14.5 (see Table 1) is spent on unproductive ventures. Therefore, sub-Sahara African countries should strive to reduce nonproductive government expenditure, for example by reducing the size of their governments.

The inflation variable is measured by the GDP deflator as a percentage annual growth. The coefficient on inflation has the expected negative sign and is statistically significant at the 1 percent level. The negative sign implies that an excessive increase in prices in an economy is a sign of macroeconomic instability and

therefore retards economic growth. A unit percentage increase in inflation leads to a decrease in GDP per capita growth by .01 percent. From the summary statistics (Table 1), we found that the average percentage inflation rate in the sample is 14.7, with a maximum of 381 and a standard deviation of 32. This is evidence that countries in Africa are still experiencing some macroeconomic instability; therefore from a policy perspective, there is need for prudent macroeconomic policies that would involve a mixture of fiscal, monetary and exchange rate policies that are targeted at lowering and stabilizing the rate of inflation.

Further, our findings are assertive on the role played by the political system and governance in enhancing GDP per capita growth. We employed in our estimation the civil liberties index[6] from Freedom House as a means of characterizing a country's political system and governance. This variable has the expected negative sign and is statistically significant at 1 percent. This implies that increase in civil rights enhances economic growth. Literature presents the political system and governance as an important determinant of economic growth (see, for example, Barro, 1996 and 2004). Therefore, sub-Sahara African countries should strive to achieve good governance consisting of maximum possible civil liberties as a precondition for sustained economic growth.

In line with previous literature (Loayza, 1996; and Calderon et al., 2001) our findings are assertive on the economic growth-enhancing role of public services and infrastructure. We employ in our analysis the number of telephone lines per 1000 people as our measure of infrastructure and public services development. The choice of this measure, over others such as kilometers of paved roads and energy generation capacity, was determined by data availability issues. The growth in the telephone lines per 1000 people is positive and significant in our regressions. This implies a growth-enhancing effect via productivity-enhancing effect of infrastructural development. If telephone lines per 1000 people grow by 1 per cent, it leads to an increase in GDP per capita growth of between .02 and .03 percent.

Further, we also find human capital development playing an important role in the growth of GDP per capita. We used secondary school enrolment rate as a measure of human capital development and it was found to be positive and significant at 1 percent. If secondary school enrollment rate increases by 1 percent, it leads to an increase in GDP per capita growth between .07 and .12 percent. Therefore, sub-Sahara African countries should invest in human capital development through education for favorable economic growth outcomes.

4. Conclusions

This paper was guided by the hypothesis that it is not exports per se that matter, but different exports components influence growth in varying ways. We considered a sample of 35 sub-Sahara African countries determined by data availability on the key variables of the study and not by arbitrary selection. The GMM estimator was employed during the analysis. We find that growth in

[6] Civil Liberties Index was sourced from Freedom House. It presents freedom of expression, religion, education, travel and other personal rights. Countries are ranked on a scale of 1-7. A country with fewest rights is given a rank of seven and a country with maximum rights is given a rank of one.

agricultural exports is positively and significantly associated with per capita income growth for countries in our sample. However, the contribution of manufactured exports to per capita income growth is insignificant. Therefore, a growth-enhancing effect can be attributed to agricultural exports and not manufactured export for the case of countries in our sample. This empirical finding is in support of the paper's main hypothesis that some export components are more important for growth than others. However, it is against the widely held theoretical view that manufactured exports are more productivity- and growth-enhancing due to the greater knowledge and technological spillover associated with manufactured compared to agricultural exports.

It seems the case that sub-Sahara African countries in our sample still enjoy a comparative advantage in agricultural rather than manufacturing exports. Whereas it is more benefiting for countries in our sample to promote agricultural exports, this is not to suggest that they should not pay attention to industrialization at all. These countries should adopt policies that increase agricultural exports in the medium term as they design strategies for increasing manufacturing exports in the long term. It might be the case that the stage of development they have so far attained is not yet conducive for gaining a comparative advantage in manufacturing exports. Generally, our findings are in line with previous literature for the held view that exports per se do not matter for growth. However, our results may be pointing to the failure of most sub-Sahara African countries to change their export composition from largely low value-added agricultural exports to high value-added manufactured exports. This may account for their meager gains from international trade despite the large volumes traded.

Our findings also articulate the productivity-enhancing and, by extension, growth-enhancing effect of capital goods imports. This result strongly supports the widely held theoretical view that capital goods imports, especially from technologically advanced countries, embody the most current knowledge and technology. From a policy perspective, it can be argued that any policy option that stifles capital goods imports, for the case of sub-Sahara African countries, stifles economic growth too. This is due to the fact that most countries in this region have an extreme disadvantage in the production of capital goods. Governments should prioritize the importation of capital goods in order to enhance growth domestically. Other factors that significantly influence economic growth are gross capital formation percentage of GDP, infrastructure, government consumption, the inflation rate, political systems and governance, and human capital development.

One major weakness with our data is that the 35 countries that were selected are heterogeneous in nature. Their differences rage from social-political, economic, demographic and geographical. For instance some of the countries have been relatively politically stable since independence, such as Kenya, Malawi, Mauritius, Tanzania and Zambia. Others are relatively more industrialized, such as Mauritius and South Africa. Even among those considered agricultural countries, some depend chiefly on one export crop, such as Burundi Ethiopia and Uganda. Others are resource rich, particularly the mineral and oil producing countries. Others are landlocked, such as Burundi, Malawi, Rwanda, Uganda and Zambia. Some are either conflict or post conflict countries. Such diversity might lead to misleading generalized deductions. Therefore future research could put this diversity into consideration. Also, for further research, a deeper disaggregation of export

components is still needed that may consider individual commodities or their broad groups as regressors in a growth model.

Bibliography

Agosin, M. (1999), "Trade and Growth in Chile", *Cepal Review,* Vol.68, pp.79–100.

Chuang, Y.-C. (1998), "Learning by Doing, the Technology Gap, and Growth", *International Economic Review*, Vol. 39 (3), pp. 697–721.

Al-Yousif, Yousif K. (1999),"On the role of exports in the economic growth of Malaysia: A multivariate analysis", *International Economic Journal* 13: 67 – 75.

Anwar, Muhammad S., and Sampath, R. K. (2000), "Exports and Economic Growth", *Indian Economic Journal*, Vol. 47(3), pp. 79–88.

Arnade, C. and Vasavada U. (1995), "Causality between productivity and exports in agriculture: Evidence from Asia and Latin America", *Journal of Agricultural Economics,* Vol.46, pp.174-186.

Arellano, M., and S. Bond (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", Review *of Economic Studies,* Vol. 58 (2), pp. 277-97.

Baltagi, B. (2005). "Econometric Analysis of Panel Data", 3rd ed. Chichester, UK: John Wiley &Sons.

Barro, R.J., and X. Sala-i-Martin (2004), Economic Growth (Second Edition). The MIT Press, Cambridge, Massachusetts, London, England

Barro, R.J. (1996), "Democracy and Growth", *Journal of Economic Growth,* Vol.1 (1), pp.1-27

Blundell, Richard, and Stephen Bond, (1997), "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models", *Journal of Econometrics*, Vol. 87, pp. 115-143.

Buffie E. (1992), "On the condition for export-led growth", *Canadian Journal of Economics,* Vol. 25, pp. 211-225.

Calderon, C., Easterly, W., and Serven L., (2001), Infrastructure and Growth in Latin America. Washington: World Bank. Unpublished paper.

Caselli, F., Esquivel, G., and Lefort, F. (1996), "Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics", *Journal of Economic Growth*, 1363-389.

Chenery, Hollis B. and Alan M. Strout (1966), "Foreign Assistance and Economic Development", *The American Economic Review*, Volume LVI, Number 4, Part I, September 1966.

Coe, D.T., and E. Helpman (1995), "International R&D Spillovers", *European Economic Review* Vol. 39 (5), pp. 859-887.

Xinshen Diao, X., Hazell, P., Resnick, D., and Thurlow, J., (2007), "The Role of Agriculture in Development: Implications for Sub-Saharan Africa." International Food Policy Research Institute, research Report 153

Dutt, S. D. and Ghosh, D. (1994), "An Empirical Investigation of the Export Growth – Economic growth Relationship", *Applied Economics Letters*, Vol. 1, pp. 44-48.

Feder, G. (1983), "On Exports and Economic Growth" *Journal of Development Economics* Vol.12 (1), pp. 59-73.

Fosu, A. K. (1996), "Primary Exports and Economic Growth in Developing Countries", *World Economy,* Vol.19, pp. 465 – 475.

Ghatak, Subrata, and Stephen Wheatley Price. (1997), "Export Composition and Economic Growth: Cointegration and Causality Evidence for India" *Review of World Economics,* Vol. 133 (3), pp. 538–53.

Giles, J. A. and Williams, C. (2000), "Export-led Growth: A Survey of the Empirical Literature and Some Non-causality Results", *Journal of International Trade and Economic Development*, Vol. 9(3), pp. 261–337.

Greenaway, D., Morgan W., and Wright, P. (1999), "Exports, Export Composition and Growth", *Journal of International Trade and Economic Development*, Vol. 8 (1), pp. 41-51.

Grossman, G. M., and Helpman, E. (1991), Trade, Innovation, and Growth in the Global Economy. Cambridge, Mass.: MIT Press.

Hart, O. (1983), "The Market Mechanism as an Incentive Scheme," *Bell Journal of Economics,* Vol. 14, pp. 366-382.

Helpman, E., and Krugman, P. (1985), Market structure and foreign trade. (Cambridge, MA: MIT Press)

Henriques, I., and Sadorsky, P. (1996), "Export-led Growth or Growth-driven Exports? The Canadian Case", *Canadian Journal of Economics*, Vol. 29, pp. 540-55

Herzer, D., Nowak-Lehmann, F. and Siliverstovs, B. (2004) Export-Led Growth in Chile: Assessing the Role of Export Composition in Productivity Growth. *Ibero America Institute for Economic Research (IAI) Discussion Papers* number 103, Ibero-America Institute for Economic Research.

Hussain, M.N. (1998), "Africa's External Sector and Economic Growth: Broad Pointers for Development Assistance" in Henock Kifle (ed.) *Towards a New Partnership for African Development*, Abidjan: African Development Bank.

Kemal, A. R.; Musleh ud Din; Usman Qadir; F. Lloyd; and S. Colombage Sirimevan. (2002), "Exports and Economic Growth in South Asia." A study prepared for the South Asia Network of Economic Research Institutions.

Krugman, P.R. (1984), Import protection as export promotion. In Monopolistic Competition in International Trade, ed. H. Kierzkowski, Oxford: Oxford University Press.

Lancaster, K. (1980), "Intra-industry Trade under Perfect Monopolistic Competition" *Journal of International Economics* Vol.10, pp.151–175.

Loayza, N. (1996), "The Economics of the Informal Sector: A Simple Model and Some Empirical Evidence from Latin America", *Carnegie-Rochester Conference Series on Public Policy*, pp. 45: 129-62.

Mutairi, Naief Al. (1993), "Exports and Pakistan's Economic Development." *Pakistan Economic and Social Review*, Vol. 31(2), pp.134–46.

Riezman, R.G., Summers, P. M., and Whiteman, C. H. (1996), "The Engine of Growth or its Handmaiden? A Time Series Assessment of Export-led Growth", *Empirical Economics*, Vol. 21, pp. 77-113.

Shan, J. and Sun, F. (1998), "On the Export-led Growth Hypothesis: The Econometric Evidence from China", *Applied Economics*, Vol. 30, pp. 1055–65.

Srinivasan, T.N. and J. Bhagwati (2001) "Outward Orientation and Development: Are Revisionist Right?" in D. Lai and H. Snape (eds), *Trade, Development and Political Economy* (Essays in Honor of Anne O. Krueger), New York: Palgrave Publishers.

Thornton, J. (1996), "Cointegration, Causality and Export-led Growth in Mexico", 1895-1992. *Economics Letters*, Vol. 50, pp.413-416.

Verdoorn, P. (1949), "Fattori che Regolano lo Svilluppo della Produt-tivit_a del Lavoro," *L'Industria*, Vol.1, pp. 45-53.

Wörz, J. (2005), "Skill Intensity in Foreign Trade and Economic Growth", *Empirica,* Vol. 32(1), pp. 117-144.

Yang, D. T., and X. Zhu. 2004. Modernization of agriculture and long-run growth. Preliminary and incomplete notes.