Foreign Aid, Resources and Export Diversification in Africa: A New Test of Existing Theories

Osakwe, Patrick N.

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Patrick N. Osakwe*
Trade, Finance and Economic Development Division
United Nations Economic Commission for Africa
P. O. Box 3001, Addis Ababa
Ethiopia.

E-mail: posakwe@uneca.org

Abstract

Recent theoretical literature suggests that aid, geography, and resource endowments affect diversification of exports in Africa. This paper examines the validity of these popular views using a System-GMM methodology and panel data for African countries. The evidence suggests that aid, the quality of infrastructure, and resource endowments are robust determinants of diversification in Africa. It also suggests that there is no systematic relationship between geography and diversification. Furthermore, there is some evidence that institutional factors are important although it is not robust. Finally, the paper offers recommendations on how to promote export diversification in the region.

Keywords: Exports; Aid; Diversification; Africa; Endowments

JEL classification: F13; F35; O14

* The views expressed in this paper are those of the author. No responsibility for them should be attributed to the United Nations Economic Commission for Africa.

I.   Introduction

Policymakers in developing countries have for several decades been confronted with a very serious dilemma. On the one hand, classical trade models suggest that countries should specialize in and export goods in which they have comparative advantages (Bhagwati and Srinivasan, 1983). The idea is that by being more specialized in production and exports resource allocation will be more efficient and each country will increase its welfare and growth. On the other hand, by specializing and exporting a relatively small number of products, countries increase their degree of vulnerability to external shocks. Consequently, policymakers have to find ways to deal with this important trade-off between efficiency and vulnerability. This vulnerability is particularly acute for countries that have comparative advantages in the export of primary commodities.[1]

The prediction of classical trade models that specialization is efficient hinges partly on the assumption that there is no uncertainty. Several authors have shown that in the presence of uncertainty and risk aversion, diversification may be a better policy option than specialization according to comparative advantage (Turnovsky, 1974; Ruffin, 1974). That said, it has also been shown that even in the presence of uncertainty, diversification is inefficient if agents have reasonable access to financial markets and can borrow to smooth consumption intertemporally (Chang, 1991). The problem however is that in most developing countries a large number of people live in rural areas, with imperfect and underdeveloped financial markets, and access to borrowing is limited. For example, over the period 2000-2004 the rural population as a percentage of total population was 24 percent in Latin America and the Caribbean, 61 percent in East Asia and the Pacific, 65 percent in Sub-Saharan Africa and 72 percent in South Asia (World Bank, 2006). In rural economies characterized by these market imperfections and no social safety nets, diversification provides a mechanism to protect agents against income fluctuations. Consequently, although there are good theoretical arguments for specialization according to comparative advantage, in practice policymakers in developing countries are interested in diversifying their production and export structure to reduce vulnerability to external shocks.

A very important aspect of the structure of African countries is their high export concentration and dependence on primary commodity exports. In 1992, developing countries exported 199 commodities while Africa exported 116 commodities. In 2002, the figures were 210 for developing countries and 123 for Africa, indicating that African exports are highly concentrated in relatively few products (Table 1). According to UNCTAD (2003) seventeen of the twenty most important items exported by African countries are primary commodities and resource-based semi-manufactures.[2] An examination of export concentration indices for Africa also leads to the same conclusion. For example, in 1992 the export concentration index for the region was 0.57 compared to 0.25 for developing countries. For 2002, the figures were 0.49 and 0.23 for Africa and developing countries respectively (UNCTAD, 2004).

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[1] Policymakers also face an important trade-off between specializing based on current comparative advantage and moving into new and more dynamic or productive sectors in which they currently do not have comparative advantage but may acquire advantage in the future. In the literature there is no consensus on whether countries should specialize based on current comparative advantage alone, although some authors have emphasized the idea that comparative advantage should be seen as a dynamic, as opposed to a static, concept (Redding, 1999). Against this background, there has been discussions on the need for public intervention in the determination of productive and export structure of economies to ensure that countries produce goods which are most growth-generating (Rodrik, 2005).

[2] Note that the main exports of African countries are not dynamic products in world trade.

Table 1: Main Exports of African Countries

COUNTRY	EXPORTS		
Algeria	Oil, Gas		
Angola	Oil, Diamonds, Minerals, Coffee, Fish, Timber		
Benin	Cotton, Palm oil		
Botswana	Diamonds, Copper, Nickel, Beef		
Burkina Faso	Cotton, Animal Products, Gold		
Burundi	Coffee, Tea, Sugar, Cotton, Hides		
Cameroon	Crude Oil, Petroleum Products, Timber, Cocoa, Aluminium, Coffee, Cotton		
Cape Verde	Shoes, Clothes, Fish, Bananas, Hides, Pozzolana (for making cement)		
Central African Republic	Diamonds, Timber, Cotton, Coffee, Tobacco		
Chad	Cotton, Oil, Livestock, Textiles		
Comoros	Vanilla, Cloves, Perfume oil, Copra		
Congo, Dem. Rep	Diamonds, Copper, Coffee, Cobalt, Crude oil		
Congo, Rep.	Oil, Timber, Plywood, Sugar, Cocoa, Coffee, Diamonds		
Cote d'Ivoire	Cocoa, Coffee, Tropical woods, Petroleum		
Djibouti	Re-exports, Hides and skin, Coffee (re-exported from Ethiopia)		
Egypt	Petroleum, Petroleum Products, Cotton		
Equatorial Guinea	Petroleum, Timber, Cocoa		
Eritrea	Livestock, Hides, Sorghum, Textiles, Salt, Light manufactures		
Ethiopia	Coffee, Hides, Oil seeds, Beeswax, Sugarcane		
Gabon	Crude Oil, Timber, Manganese, Uranium		
Gambia	Peanut & Peanut Products, Fish, Cotton lint, Palm kernels		
Ghana	Gold, Cocoa, Timber, Tuna, Bauxite, Aluminium, Manganese ore, Diamonds		
Guinea	Bauxite, Alumina, Gold, Diamond, Coffee, Fish, Agricultural products		
Guinea-Bissau	Cashew Nuts, Shrimps, Peanuts, Palm kernel, Sawn timber		
Kenya	Tea, Coffee, Horticultural products, Petroleum products		
Lesotho	Clothing, Wool, Mohair, Food, Livestock		
Liberia	Diamonds, Iron ore, Rubber, Timber, Coffee, Cocoa		
Libya	Crude Oil, Petroleum products, Natural gas		
Madagascar	Vanilla, Coffee, Sea food, Cloves, Petroleum products, Chromium, Fabrics		
Malawi	Tobacco, Tea, Sugar, Cotton		
Mali	Cotton, Gold, Livestock		
Mauritania	Fish and Fish Products, Iron ore, Gold		
Mauritius	Sugar, Clothing, Tea, Jewellery		
Morocco	Minerals, Seafood products, Citrus fruits		
Mozambique	Sea food , Cotton,		
Namibia	Diamonds, Copper, Gold, Zinc, Lead, Uranium, Livestock		
Niger	Uranium, Livestock products		
Nigeria	Petroleum, Petroleum products, Cocoa, Rubber		
Rwanda	Coffee, Tea, Hides, Tin ore		
Sao Tome and Principe	Cocoa		
Senegal	Fish, Peanuts, Petroleum products, Phosphates, Cotton		
Seychelles	Fish, Cinnamon bark, Copra, Petroleum products (re-exports)		
Sierra Leone	Diamonds, Rutile, Cocoa, Coffee, Fish		
Somalia	Livestock, Bananas, Hides, Fish		
South Africa	Gold, Diamonds, Metals & Minerals, Cars, Machinery		
Sudan	Oil, Cotton, Sesame, Livestock & Hides, Gum arabic		
Swaziland	Sugar, Wood pulp, Minerals		
Tanzania	Sisal, Cloves, Coffee, Cotton, Cashew nuts, Minerals, Tobacco		
Togo	Cocoa, Phosphates, Coffee, Cotton		
Tunisia	Agricultural Products, Textiles, Oil		
Uganda	Coffee, Fish & Fish products, Tea, Tobacco, Cotton, Corn, Beans, Sesame		
Zambia	Copper, Minerals, Tobacco		
Zimbabwe	Tobacco, Cotton, Agricultural products, Gold, Minerals		

Source: Authors compilation based on information obtained from various editions of country reports produced by the Economist Intelligence Unit.

High dependence on commodities is of concern because it increases terms of trade and macroeconomic instability, with potential consequences for output. Furthermore, it could potentially increase the incidence of poor governance and political conflicts. For example, Sachs and Warner (1995) argue that there is a negative relationship between natural resource abundance and economic growth due in part to the fact that resource exports generate huge economic rents. It has also been argued that natural resource dependence increases the risk of civil wars by providing resources for rebel groups (Collier, 2003). More importantly, the dependence of African countries on commodity exports is of concern because the region needs high and sustained growth to make a significant impact on poverty and history has shown that the manufacturing sector is the main source of dynamic and sustained growth (UNCTAD, 2003). The literature on endogenous growth also emphasizes the importance of increasing returns to scale in the manufacturing sector in long-run growth (Matsuyama, 1992).

One of the reasons why the manufacturing sector is important for dynamic and sustained growth is that unlike primary commodities, manufactured goods tend to have high income elasticities of demand and so have more opportunities for export market expansion. By exporting primary commodities, African countries cannot exploit this crucial potential of manufactures for growth and poverty reduction. Lifting this constraint to high and sustained growth is critical to improving the economic performance of the region and enhancing prospects for meeting the Millennium Development Goals. It is true that since the mid-1990s, there has been an improvement in the economic performance of Africa, but recent growth rates observed in the region are still low relative to the 7 percent rate deemed necessary to make a significant reduction in poverty (UNECA, 2006). They are also low relative to rates observed in South Asia and East Asia and the Pacific (figure 1). Therefore, successful diversification into manufactures is needed to increase the likelihood that African countries will be able to reverse this trend in economic performance.

Figure 1: Real GDP per capita growth
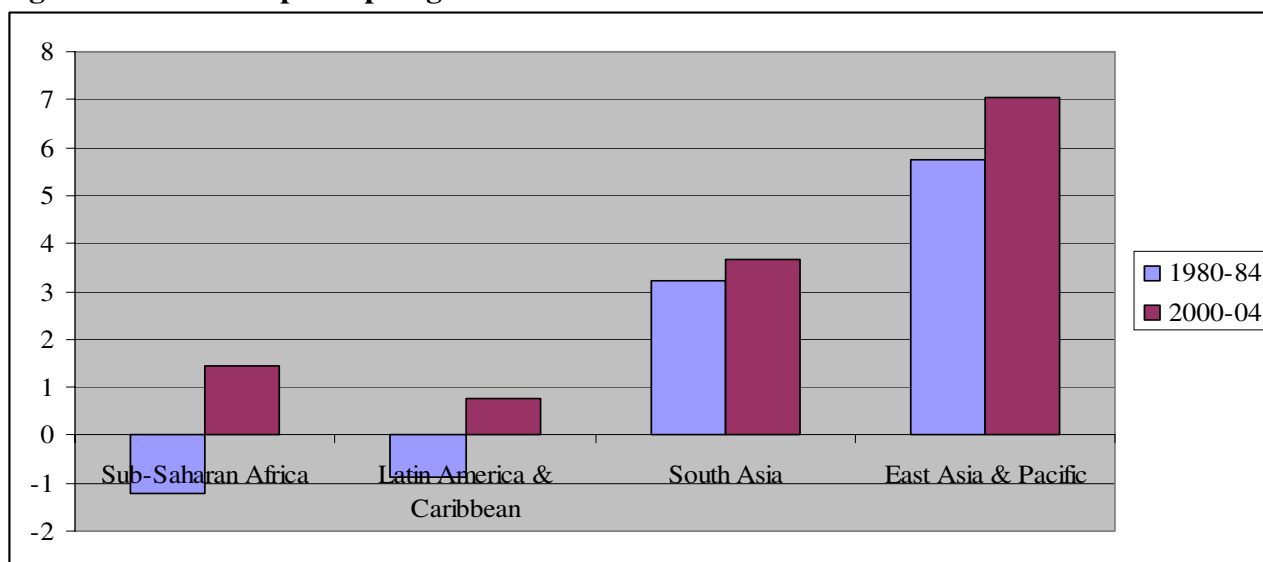
Source: World Bank (2006)

In the literature, several explanations have been offered for Africa's excessive dependence on primary commodity exports and why the region has not made significant progress in diversifying into the production and export of manufactured goods (see Collier, 2003). Three of these explanations have attracted attention in recent years and focus on the impact of geography, foreign

aid, and natural resource endowments. Several authors have emphasized the importance of geographical barriers in the determination of export structure and performance (Breinlich, 2005; Redding and Venables, 2003; Radelet and Sachs, 1998). The idea is that transport costs are high in countries that are geographically isolated from large markets or suppliers and that this inhibits the successful development of manufacturing activities. More specifically, geographic distance or lack of proximity to key export markets can lead to lack of competitiveness and make it difficult for a country to export manufactured goods. Based on this theory, countries that are landlocked, or have limited access to coasts or sea-navigable rivers, should have more concentrated export patterns and less ability to develop manufacturing exports than those that do not face these geographical barriers.

Another explanation for lack of diversification in Africa emphasizes the role of foreign aid (van Wijnbergen, 1985). The idea is that large aid inflows have the potential to increase the price of non-traded goods leading to a real exchange rate appreciation and loss of export competitiveness. This effect is likely to be more severe in economies with capital market imperfections and in the manufacturing sector—where there are externalities such as learning-by-doing. When there is learning by doing in a sector, productivity depends on cumulative output over time. Consequently, by appreciating the real exchange rate and reducing output in the export sector, aid leads to a loss of productivity and so has a negative effect on the development and expansion of manufacturing activities.

The third explanation for lack of diversification in Africa focuses on the role of education and natural resources. This view follows the work of Wood and Mayer (2001; 1998) and the theory is based on an extension of the Heckscher-Ohlin model. The authors are of the view that the differences in export structure between Africa and other developing countries arise from differences in supplies of human and natural resources. They argue that African countries are land abundant relative to countries in Asia. In their model, abundant land raises real income and undermines competitiveness, through its adverse effect on the real exchange rate, thereby making it difficult for Africa to develop successful manufacturing export activities relative to land-scarce developing regions. Consequently, in this framework, Africa's excessive dependence on primary commodity exports is caused by low levels of education and abundant natural resources. Note that in this model land is used in a broad sense to include all sorts of natural resources—land area, oil, minerals etc (Wood and Mayer, 2001; 1998). Therefore, in the empirical analysis we use both measures of land and oil abundance to capture the impact of resource endowments.

This paper examines the empirical validity of these three popular explanations for lack of diversification in Africa and its excessive dependence on primary commodity exports. The tests are conducted using panel data for African countries spanning the period 1985-2002. They are also based on the System-GMM (Generalized Method of Moments) approach, which is a statistical methodology approriate for dealing with models with lagged dependent variables and can account for the potential endogeneity of regressors as well as heterogeneity across countries. The rest of the paper is structured as follows. The next section looks at the structural characteristics of African countries, as well as changes that have taken place in these features, relative to other developing countries. Section III establishes some stylized facts on the correlation between diversification, on the one hand, and measures of aid, geography, and resource endowments on the other. Section IV discusses the econometric method used in the analyses and presents the results of the empirical tests. Section V discusses policy implications of the analyses and offers some concluding remarks.

II.   Structural Characteristics

In this section, we look at selected aspects of the structure of economies in Sub-Saharan Africa relative to those in Asia and Latin America. The objective is to determine whether or not there have been any significant changes in the characteristics of African economies relative to those observed in other developing countries. One of the noticeable changes that have taken place in the structure of African economies is the decline in the share of agriculture in gross domestic product (GDP). In 1990 agriculture accounted for 20 percent of GDP in Sub-Saharan Africa compared to 9 percent in Latin America and Caribbean, 25 percent in East Asia and the Pacific, and 31 percent in South Asia. In 2004, the share of agriculture in GDP fell to 16 percent in Sub-Saharan Africa, 13 percent in East Asia and the Pacific, and 21 percent in South Asia. In Latin America and the Caribbean the share was the same as in 1990. As in most developing regions, the decline in the share of agriculture in GDP in Sub-Saharan Africa has been accompanied by a rise in the share of services. Presently, the service sector accounts for roughly fifty percent of GDP in Sub-Saharan Africa. Despite this decline in the share of agriculture in GDP the sector still accounts for a significant percentage of employment in Sub-Saharan Africa (roughly two-thirds of employment).

Table 2 presents data on other structural characteristics and changes that have taken place in developing countries. As the table shows, relative to other developing countries, Sub-Saharan Africa has very low life expectancy at birth and high dependency ratio. For each of these indicators, the gap between Sub-Saharan Africa and other developing regions increased in the first half of the new Millennium. To the extent that these have implications for labour supply, they are certainly not conducive to the development of a vibrant manufacturing sector. Another interesting difference between Sub-Saharan Africa and the other regions is that it has low savings ratios. Over the period 2000-2004, gross domestic savings in the sub-region represented about 18 percent of GDP compared to 20 percent in South Asia, 21 percent in Latin America, and 35 percent in East Asia and the Pacific. Given the low saving rates observed in Sub-Saharan Africa it is not surprising that the sub-region is the most dependent on foreign aid. The ratio of aid to gross capital formation in Sub-Saharan Africa is relatively high. For example, over the period 2000-2004 the ratio was 27 percent compared to 1.2 percent in East Asia and the Pacific, 1.5 percent in Latin America and the Caribbean, and 3.8 percent in South Asia. The high degree of dependence on aid often raises concerns about the possibility of a link between aid dependence and the lack of success in diversification in Sub-Saharan Africa.

Table 2: Aspects of the Structure of Developing Economies

Variable	1980-84	2000-2004
Gross domestic savings (% of GDP)		
• Sub-Saharan Africa	19.95	17.66
• Latin America & Caribbean	22.68	21.19
• South Asia	16.04	20.63
• East Asia and Pacific	32.13	35.63
Aid (% of gross capital formation)		
• Sub-Saharan Africa	15.42	26.81
• Latin America & Caribbean	1.7	1.53
• South Asia	6.56	3.80
• East Asia and Pacific	2.81	1.16
Manufacturing value added (% of GDP)		
• Sub-Saharan Africa	16.27	13.91
• Latin America & Caribbean	26.52	16.71
• South Asia	15.88	15.68
• East Asia and Pacific	32.43	

Manufactured exports (% of merchandise exports)		
• Sub-Saharan Africa	10.06	32.84
• Latin America & Caribbean	18.67	57.25
• South Asia	53.1	78.21
• East Asia and Pacific	35.30	80.37
Arable land (% of total land area)		
• Sub-Saharan Africa	5.86	7.28
• Latin America & Caribbean	6.32	7.11
• South Asia	42.46	41.95
• East Asia and Pacific	10.50	13.26
Life expectancy at birth (total years)		
• Sub-Saharan Africa	48.40	46.05
• Latin America & Caribbean	64.97	71.74
• South Asia	54.17	63.12
• East Asia and Pacific	64.90	69.63
Dependency ratio (%)		
• Sub-Saharan Africa	0.94	0.90
• Latin America & Caribbean	0.78	0.59
• South Asia	0.76	0.65
• East Asia and Pacific	0.66	0.48

Source: World Bank (2006).

Africa also differs from other developing regions in terms of land endowments. For example, it is well-known that in terms of land area, the African region is relatively land abundant. In 2004, the total land area in Sub-Saharan Africa was 23, 596 thousand square kilometres compared to 20, 057 in Latin America and the Caribbean, 15,885 in East Asia and the Pacific, 8,955 in Middle East and North Africa, and 4,781 in South Asia (World Bank, 2006). A less known fact is that the ratio of arable to total land area is higher in Asia compared to Sub-Saharan Africa. Table 2 shows that for the period 2000-2004, the ratio was 42 percent in South Asia, 13 percent in East Asia and the Pacific, and 7 percent in both Sub-Saharan Africa and Latin America and the Caribbean. Consequently, while Sub-Saharan Africa is land abundant in terms of total land area, it is land-scarce in terms of the percentage of arable to total land area.

Table 3: Classification of African Countries by Manufactures Exports

Range (%)	Share of manufactures in total exports	
	1985-87	2000-2002
0 - 15	Algeria, Angola, Burundi, Benin, Central African Republic, Cameroon, Congo Republic, Comoros, Gabon, Guinea, Kenya, Mozambique, Malawi, Niger, Nigeria, Rwanda, Sierra Leone, Swaziland, Seychelles, Zambia	Algeria, Angola, Burundi, Benin, Central African Republic, Congo Republic, Comoros, Cape Verde, Gabon, Guinea, Kenya, Mozambique, Niger, Nigeria, Sierra Leone, Swaziland
16 - 30	Cote d'Ivoire, Cape Verde, Madagascar, Morocco, Namibia, Senegal, Togo, Zimbabawe	Cameroon, Cote d'Ivoire , Malawi, Namibia, Senegal, Togo, Zambia, Zimbabwe
31 and above	Egypt, Mauritius, Tunisia	Egypt, Morocco, Madagascar, Mauritius, Rwanda, Seychelles, Tunisia

Source : World Bank (2006).

As indicated earlier, relative to other developing countries, Sub-Saharan Africa has an export structure that is highly concentrated in primary commodities. In the 1960s and the 1970s, the sub-region shared this feature of dependence on commodities with most developing countries. However, in the past two decades, several developing countries have successfully transformed their export

structure and are no longer dependent on primary commodities. For example, in the period 2000-2004, the share of manufactures in total exports was 33 percent in Sub-Saharan Africa compared to 57 percent in Latin America and the Caribbean, 78 percent in South Asia, and 80 percent in East Asia and the Pacific. For developing countries as a group, manufactures represent about eighty percent of their exports. Africa happens to be the only developing country region that has not gone through this major structural transformation. That said, within the African region a few countries have made progress on diversification (table 3). For example, in the period 2000-2002, the share of manufactures in total exports was 45 percent in Egypt, 46 percent in Rwanda, 52 percent in Morocco, 66 percent in Seychelles, 71 percent in Tunisia, and 73 percent in Mauritius.

While there is a big difference between Sub-Saharan Africa and other developing country regions based on the share of manufactures in total exports, a look at the share of manufacturing value-added in GDP presents a different picture. With the exception of East Asia and the Pacific, there isn't really much difference between Sub-Saharan Africa and South Asia or Latin America and the Caribbean over the period 2000-2004. Furthermore, relative to the period 1980-84, there has been a significant decline in the share of manufacturing value-added in GDP in Latin America and the Caribbean. The ratio also fell in Sub-Saharan Africa but the magnitude is much less than in Latin America and the Caribbean. Within Africa, some countries have made significant progress in the growth of manufacturing value-added since the 1990s (see table 4). For example, over the period 1991-2001, the average growth in manufacturing value-added was about 13 percent in Uganda, 9 percent in Ethiopia, 8 percent in Equatorial Guinea and Burkina Faso. In eight Sub-Saharan African countries the growth in manufacturing value-added was negative over the same period: Burundi (-5.8 percent), Comoros (-1.3 percent), Congo Republic (-1.2 percent), Congo Democratic Republic (-5.4 percent), Djibouti (-7.6 percent), Guinea Bissau (-3.5 percent), Malawi (-2.1 percent), and Mauritania (-1.1 percent).

Table 4: Manufacturing Value-added (MVA) in Sub-Saharan Africa

	(1981-2001)							
Country	MVA per capita (dollars)			Share of MVA in GDP (%)			MVA annual growth rates (%)	
	1981	1991	2001	1981	1991	2001	1981-1991	1991-2001
Angola	89	52	41	8.5	4.9	4.8	-3.4	1.9
Benin	38	31	39	9.2	7.6	8.1	2.2	5.3
Botswana	103	154	192	6.2	4.9	4.8	8.7	4.5
Burkina Faso	48	46	72	16.9	14.2	18.2	2.0	7.7
Burundi	19	24	13	9.9	11.7	8.9	5.6	-5.8
Cameroon	138	147	146	11.9	14.8	14.9	2.2	2.8
Cape Verde	38	84	109	5.4	8.5	7.7	9.6	6.2
Central African Rep.	38	49	40	3.9	10.1	8.6	3.1	0.05
Chad	29	36	33	18.6	16.2	16.1	4.8	3.6
Comoros	12	16	15	3.5	3.8	4.1	4.1	-1.3
Congo, Rep. Of	76	102	78	6.6	8.2	8.2	5.2	-1.2
Congo, Democratic Rep.	38	21	7	11.9	9.4	8.6	-0.5	-5.4
Cote d'Ivoire	231	174	185	19.6	20.9	21.6	3.2	3.8
Djibouti	51	37	20	4.9	4.4	3.2	1.7	-7.6
Equatorial Guinea	8	6	11	1.4	1.3	1.3	1.9	8.3
Ethiopia	13	7	15	6.8	4.2	6.0	-0.7	9.1
Gabon	393	413	307	5.4	6.3	5.1	1.6	0.7
Gambia	14	19	15	3.9	5.5	4.4	7.2	1.2

|								
Ghana	37	37	44	9.2	9.4	9.2	6.2	4.0
Guinea	17	21	20	3.4	4.5	3.7	5.5	2.1
Guinea Bissau	32	17	12	14.9	6.8	6.0	-5.3	-3.5
Kenya	33	37	34	9.6	10.3	10.4	5.1	1.9
Lesotho	15	41	58	5.0	10.6	12.4	13.1	5.5
Madagascar	32	26	25	11.4	11.3	10.8	2.2	2.7
Malawi	34	33	23	15.7	16.5	11.1	4.0	-2.1
Mali	17	23	23	6.1	8.6	7.5	7.1	2.6
Mauritania	52	50	36	9.2	9.7	6.2	2.4	-1.1
Mauritius	225	513	842	14.2	19.9	20.7	11.0	5.9
Namibia	207	190	216	9.2	9.9	9.7	2.7	2.9
Niger	19	20	18	4.2	6.1	6.4	4.3	3.9
Nigeria	25	22	18	6.7	5.7	4.9	1.6	1.1
Rwanda	74	60	55	17.7	15.5	15.7	1.2	5.4
Senegal	90	97	118	12.3	12.9	13.6	3.9	4.8
Seychelles	276	618	669	7.3	11.6	12.4	8.9	5.4
Sierra Leone	7	6	7	2.6	3.0	4.9	2.8	1.5
Somalia	…	…	…	…	…	…	...	
South Africa	777	618	597	20.7	20.7	19.3	0.8	1.6
St Tome and Principe	26	24	24	6.2	5.5	5.3	0.3	1.7
Sudan	98	89	112	8.9	8.7	6.6	1.3	4.5
Swaziland	110	329	362	13.6	29.6	28.8	17.9	2.9
Tanzania	18	14	13	10.9	8.5	8.0	0.7	3.3
Togo	48	48	41	8.9	10.5	10.1	3.1	3.4
Uganda	8	10	26	4.3	5.4	9.9	5.0	13.5
Zambia	56	56	59	9.5	12.4	15.0	4.5	2.3
Zimbabwe	192	146	139	22.1	20.0	19.1	3.1	0.3

Source: UNIDO (2004)

III.   Establishing some Stylized Facts

In this section of the paper, we ask whether there is evidence of any co-movement between diversification and the three variables of interest, namely aid, geography and human or natural resources. Obviously, correlations do not imply causality but they do help to establish stylized facts. In general, the results reported in this section are based on a sample of 31 African countries for which we have data on the relevant variables. However, for the correlations using measures of education and geography the sample size is less than 31 because some of the countries in the initial sample do not have data on these variables.

In figure 2, we plot the share of manufactures in total exports against the share of aid in gross capital formation. The figure shows evidence of a negative relationship. That is, across countries an increase in the share of aid in gross capital formation is associated with a reduction in the share of manufactures in total exports. Table 5 presents the correlation between aid and the share of manufacturing in total exports. The correlation between the two variables is negative (36 percent) and is statistically significant at the 5 percent level. The results suggests that countries that depend heavily on aid should, on average, have less diversified exports than those that do not depend on aid. Note that in terms of per capita aid, the main aid recipients in Africa in 2004 were Cape Verde ($282), Sao Tome and Principe ($281), Seychelles ($124), Swaziland ($104), and Zambia ($94) and Senegal ($92). However, in terms of the total monetary value of aid, the main recipients in the

region in 2004 were Ethiopia ($1,823 million), Democratic Republic of Congo ($1,815 milllion), Tanzania ($1,746), Egypt ($1,458), and Ghana ($1,358).
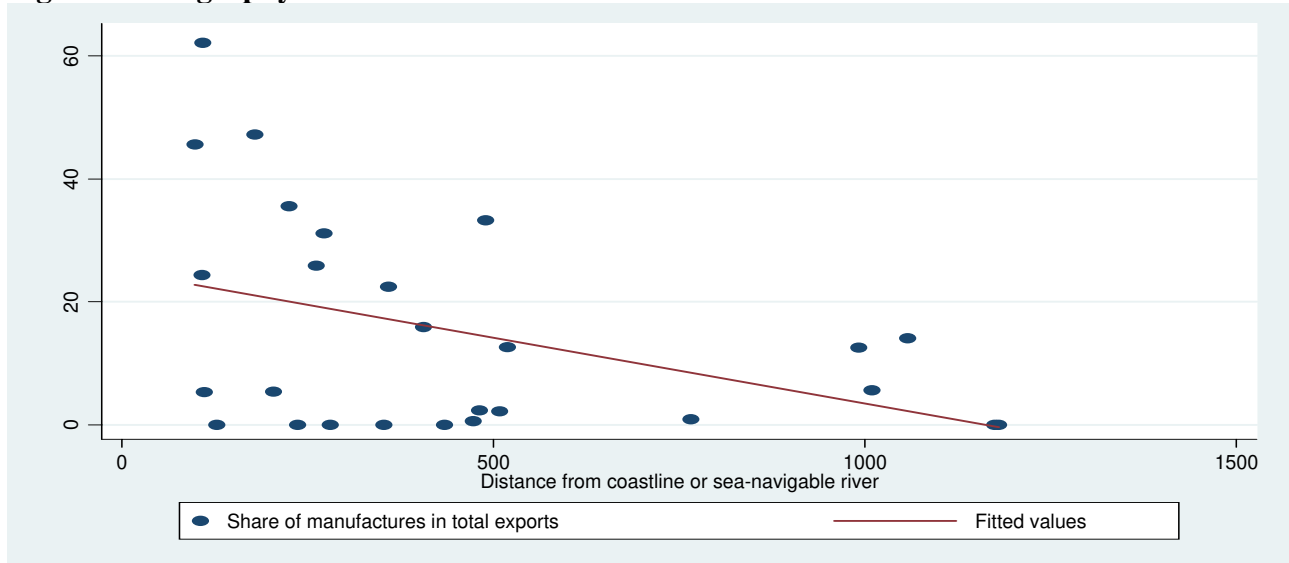
Figure 2: Aid and Diversification

Share of manufactures in total exports ●   Fitted values ———
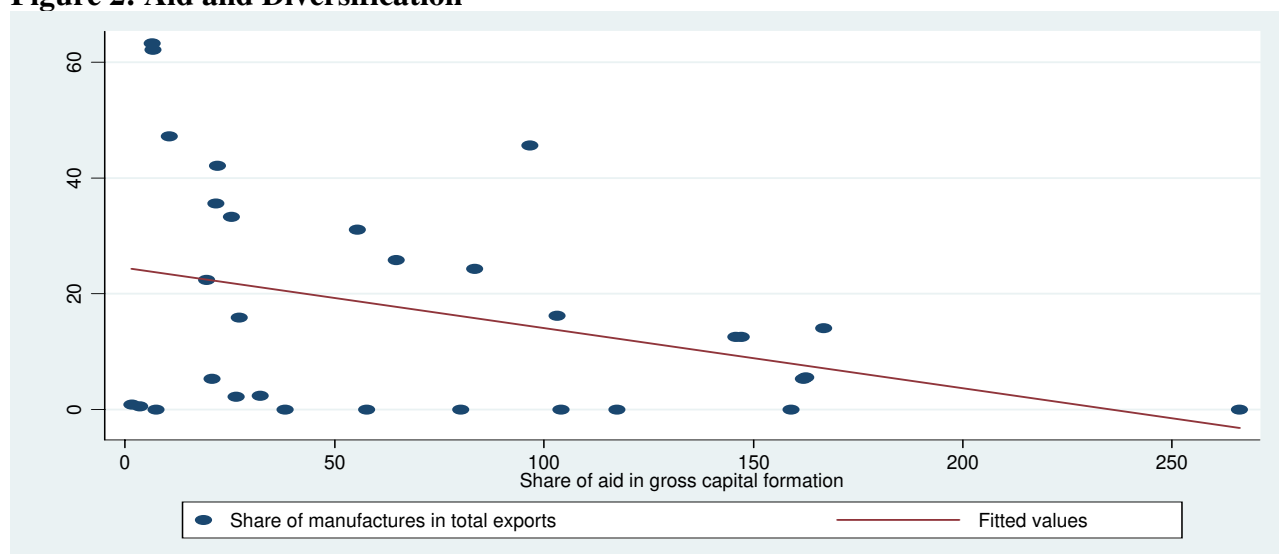
Table 5: Cross-section Correlations with Diversification

| Variable		Correlation Coefficient	No of countries
Aid		-0.357 ** (0.049)	31
Education		0.253 (0.223)	25
Geography	Distcr	-0.416 ** (0.034)	27
	Troppop	-0.435 ** (0.024)	27
	Pop100cr	0.455 ** (0.017)	27
Land endowment		0.225 (0.224)	31

Regarding geography, the correlation between this variable and diversification is negative and statistically significant at conventional levels as suggested by various theories (table 5 and figure 3). In other words, there is evidence that an increase in geographic distance from markets is associated with a decrease in diversification across countries. It is interesting to note that this result is robust to the measure of geography used in the correlation analysis. Three measures of geography were used in the analysis: the mean distance to nearest coastline or sea-navigable river (distcr); the percentage of the population in the geographical tropics (troppop); and the percentage of the total population within 100 km of ice-free coast or navigable river (pop100cr). The first two variables are expected to have a negative sign while the last variable is expected to have a positive sign and this is what we see in the correlation results.

Figure 3: Geography and Diversification

Turning to education, figure 4 suggests that there is a positive but weak correlation between the literacy rate (our proxy for education) and diversification. More specifically, the correlation coefficient between the two variables is low (25 percent) and is statistically insignificant at conventional levels (table 5). Consequently, the results suggest that there is no robust link between literacy and diversification. This may be because the literacy rate is not a very good proxy for the type of skilled labour that is assumed necessary for diversification into non-traditional exports. In our analysis, the literacy rate was used as a proxy due to data limitations.

Figure 4: Education and Diversification
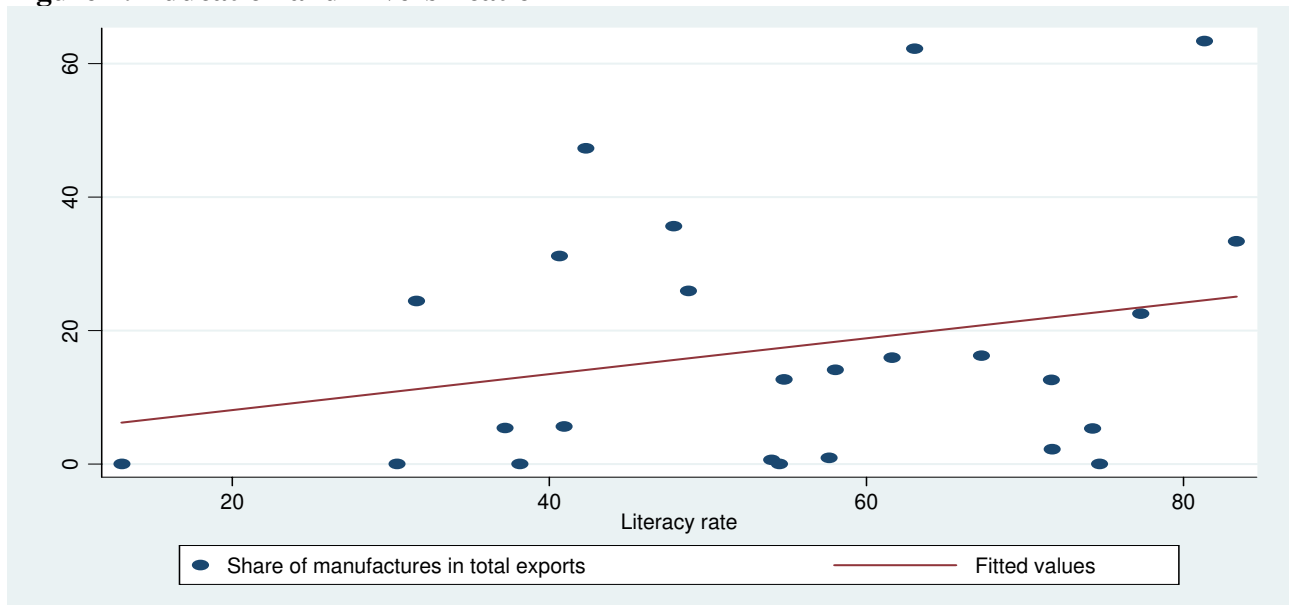
Finally, we examined the correlation between land abundance, as measured by the share of arable to total land area, and diversification. Based on the theoretical models described earlier, there should be a negative relationship between land abundance and diversification. However, as figure 5 shows, there is no clear association between the share of arable to total land and diversification. The correlation coefficient between the two variables is positive (0.22) but is statistically insignificant at conventional levels.

Figure 5: Land Endowment and Diversification
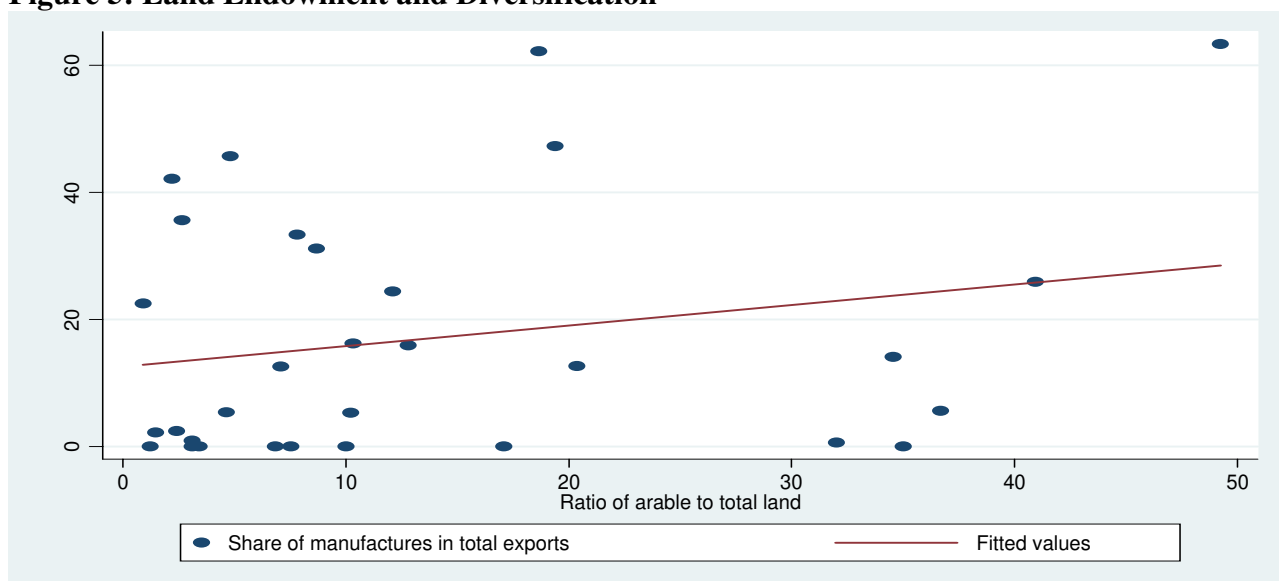
Since the manufacturing sector is the source of dynamic and sustained growth (UNCTAD, 2003), this part of the paper also examines the relationship between manufacturing value-added and our three key variables of interest, namely aid, geography and natural resources. Table 6 presents the cross-section correlation between these variables.

Table 6: Correlations with Manufacturing Value-added

Variable		Correlation Coefficient	No of countries
Aid		-0.237	31
		(0.199)	
Education		0.430 **	25
		(0.032)	
Geography	Distcr	-0.135	27
		(0.503)	
	Tropical population	-0.533 ***	27
		(0.004)	
	Pop100cr	0.102	27
		(0.614)	
Land endowment		0.085	31
		(0.650)	

The key points that emerge from this table are as follows. First, there is no statistically significant relationship between aid flows and manufacturing value-added across countries in the sample. Second, the correlation between land endowment and manufacturing value-added is positive but statistically insignificant at conventional levels. Third, there is strong evidence of co-movement between education and manufacturing value-added. The correlation between these two variables is 43 percent and is statistically significant at 5 percent level. Finally, there is weak evidence that geography is negatively correlated with manufacturing value-added. However, this evidence is not robust because the result is sensitive to the measure of geography used. In particular, it is

significant when we use the share of total population in the tropics as a measure of geography and insignificant when the other two measures are used.

IV.   The Empirical Methodology and Results

To examine the validity of the three theories or explanations for lack of diversification in Africa, we estimate a dynamic panel data equation of the form:

$$Divers_{it} = \alpha Divers_{it-1} + \beta A_{it} + \mu G_i + \theta R_{it} + \sum_j \lambda_j X_{ijt} + \eta_i + \varepsilon_{it} \tag{1}$$

Where:
- $Divers_{it}$ is the measure of diversification in country i at time t;
- A_{it} is a measure of aid in country i at time t;
- G_i is a measure of geography in country i;
- R_{it} is a measure of resource endowment in country i at time t;
- X_{ijt} is control variable j in country i at time t;
- η_i is an unobserved country-specific effect;
- ε_{it} is an i.i.d. error term.

Equation (1) has a lagged dependent variable to account for dynamics in the diversification process and capture the fact that diversification does not take place overnight. It also includes unobserved country-specific effects to capture heterogeneity across countries in diversification. It is important to note that the structure of equation (1) rules out the use of certain estimation techniques. For example, the Ordinary Least Squares (OLS) approach cannot be used because the estimator is biased in the presence of lagged dependent variables or country-specific effects on the right hand side of the equation. Fixed-Effects estimators can account for the country-specific effects but will remain biased in the presence of lagged dependent variables. Furthermore, the Fixed-Effects estimator is not an appropriate technique to use here because some of the explanatory variables of interest—geography—are time-invariant and their parameters will not be identified using this estimator. To address some of these econometric problems we use the System-GMM estimator developed for dynamic panel data estimation (Blundell and Bond, 1998; Arellano and Bover, 1995). It controls for the country-specific effects as well as the bias caused by the inclusion of the lagged dependent variable. Furthermore, unlike the first-difference GMM approach discussed in Arellano and Bond (1991), the System-GMM approach makes it possible to identify the parameters of the time-invariant variables in the model. The estimations conducted in this section are based on unbalanced panel data over the period 1985-2002 and the sample consists of twenty-two African countries for which we have data on the variables needed for the analysis.

The measure of diversification used in the analysis is the share of manufactures in total exports. UNCTAD has also computed diversification indices for African countries. However, the UNCTAD index was not used because it has several missing values and, for several countries, is available for only a few years. Using this index would have reduced the sample size considerably and make it difficult to obtain precise estimates of the parameters of interest. Consequently, the share of manufactures in total exports was used as a proxy for diversification in the paper. Two variables were used to capture the impact of resource endowments. The first is the ratio of arable to total land area and the second is a dummy for oil producing and exporting nations. The use of these two variables allows us to determine whether the results are sensitive to the type of resource endowment

under consideration. The share of aid in gross capital formation was used to capture the effect of aid on diversification. Regarding geography, three measures or proxies were used: the mean distance to nearest coastline or sea-navigable river (distcr); the percentage of the population in the geographical tropics (troppop); and the percentage of the total population within 100 km of ice-free coast or navigable river (pop100cr). Based on the theory, the first two measures are expected to have a negative relationship with diversification while the last measure is expected to have a positive relationship with diversification.

Another issue that needs to be addressed is the choice of control variables used in the regression. The approach adopted is to include a broad set of potential explanatory variables suggested either by theory or the recent empirical literature on the subject. Based on this approach, five control variables were used in the analysis. The first control variable we include in the regression is the quality of infrastructure, measured by the number of telephone lines per 1000 persons. The availability of basic and good quality infrastructure is needed for the development and support of a vibrant manufacturing sector (Abuka, 2005). The level of development, as measured by real per capita income, is also one of the variables we control for. The idea is that countries at higher levels of income are likely to be more diversified than those at lower levels of income (Imbs and Wacziarg, 2003). We also controlled for the potential effect of macroeconomic policy. The measure of macroeconomic policy used in the analysis is the inflation rate. Alternatively, we could have used the real effective exchange rate. However, we did not use this variable for two reasons. The first is that several countries in the sample do not have long time series on the real effective exchange rate. Secondly, aid is one of the explanatory variables in the model and theory suggests that it affects diversification through its impact on the real exchange rate (van Wijnbergen, 1985). Consequently, the aid variable captures the effect of the real exchange rate on diversification and so there is really no need to have a separate control for this variable in the regression. Education is also considered vital for diversification (Wood and Mayer, 2001; 1998). Therefore, we included a control for education in the equation. In the estimation, the literacy rate was used as a proxy for education due to lack of data on skilled labour. Finally, we controlled for the impact of the quality of institutions on diversification. Levchenko (2004) shows that institutional differences are sources of comparative advantage and hence a determinant of the pattern of trade flows. In the estimations, the durability of the political regime in a country was used as a proxy for the quality of institutions. The expectation is that a more durable political regime will lead to more diversification. Table 7 presents descriptive statistics on the variables used in the empirical analyses. More detailed definition of variables as well as the sources of data are in the appendix.

Table 7: Descriptive Statistics

Variable	Mean	Standard deviation	No. of observations
Diversification	16.39	17.89	392
Aid (% of gross capital formation)	70.25	83.65	396
Arable to total land area	14.16	11.91	396
Level of development	2093.30	1675.11	396
Inflation rate	13.95	23.12	396
Education (literacy rate)	53.48	18.73	386
Quality of infrastructure	15.29	20.00	396
Durability of political regime	13.44	12.29	391

Geography			
• Distcr	508.55	350.30	396
• Troppop	0.76	0.41	396
• Pop100cr	0.31	0.31	396

Table 8 presents results of estimation of equation (1) by System-GMM. The column (GMM1) reports results of estimation of the model using "distcr" as a measure of geography. The equations were estimated using lags of all variables dated t-2 and earlier as instruments. Using the Hansen test for overidentifying restrictions we cannot reject the null hypothesis that the instruments used are uncorrelated with the residuals. Consequently, the test suggests that the instruments used are valid. The test for AR(1) errors in the first difference equation rejects the null hypothesis of no first-order serial correlation as expected. Furthermore, as should be expected, the test for AR(2) errors suggest that we cannot reject the null of no second order serial correlation. Turning to the regression estimates, the coefficient on the lagged dependent variable is positive and statistically significant at the 1 percent level. This suggests that there is some path dependence in the diversification process. The aid variable has a negative coefficient and is statistically significant at the 5 percent level. In order words, an increase in aid has a negative effect on diversification in the sample. This finding is in line with the predictions of theoretical models that aid can have a negative effect on diversification because of its potential impact on the real exchange rate. The results also suggest that land endowment, as measured by the share of arable to total land area, is a determinant of diversification in the region. In particular, an increase in the ratio of arable to total land area increases diversification. The coefficient on the variable is positive and statistically significant at conventional levels. This finding is interesting because it suggests that land abundance does not necessarily lead to less diversification as implied by recent theoretical explanations for lack of diversification in Africa (see Wood and Mayer, 2001 and 1998). The finding makes sense because if we look at the data for developing country regions, we find that South Asia and East Asia and the Pacific have higher ratios of arable to total land area and are also more diversified than Sub-Saharan Africa.[3]

Regarding the role of education, the results suggest that the variable is insignificant at conventional levels. This may be because the literacy rate is not a very good proxy for the labour skills considered necessary for effective diversification into dynamic sectors of world trade. As indicated earlier, we used the literacy rate in the analysis because of data limitations. The results also suggest that geography is not a key determinant of diversification in the region. Although the variable measuring geography has the expected sign, it is insignificant at conventional levels. We tried different measures of geography to see if it makes a difference in terms of the results but there was no change in the qualitative results. The columns (GMM2 and GMM3) present results of estimation of equation (1) using alternative measures of geography. As can be seen from the table, the geography variables are insignificant in all cases. This finding supports the recent analyses by the United Nations Industrial Development Organisation that geography is not the main reason for lack of diversification in Africa (UNIDO, 2004).

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[3] Clearly, in terms of physical land area, Sub-Saharan Africa is more land abundant than other regions of the world. However, what is really important in terms of export competitiveness is the quality of available land. When this later variable is accounted for, Sub-Saharan Africa cannot be considered to be more land abundant as it has less land quality relative to most developing country regions.

Table 8: System GMM Estimation Results

	GMM1	GMM2	GMM3
Diversification (t-1)	0.743 ***	0.749 ***	0.746 ***
	(0.000)	(0.000)	(0.000)
Aid (% of gross capital formation)	-0.007 **	-0.007 ***	-0.007 ***
	(0.024)	(0.003)	(0.002)
Arable to total land area (%)	0.139 **	0.139 **	0.137 **
	(0.028)	(0.024)	(0.024)
Level of development	-0.0004	-0.0003	-0.001
	(0.591)	(0.619)	(0.278)
Inflation rate	-0.008	-0.006	-0.005
	(0.486)	(0.618)	(0.648)
Education	-0.029	-0.028	-0.025
	(0.437)	(0.454)	(0.519)
Quality of infrastructure	0.166 ***	0.163 ***	0.166 ***
	(0.000)	(0.000)	(0.000)
Durability of political regime	0.084 *	0.086 *	0.080 *
	(0.060)	(0.068)	(0.086)
Geography			
• Distcr	-0.001		
	(0.665)		
• Pop100cr		0.355	
		(0.894)	
• Troppop			-1.808
			(0.450)
Hansen test	14.08	10.66	10.83
	(1.000)	(1.000)	(1.000)
Test for AR(1) errors	-3.17 **	-3.14 **	-3.13 **
	(0.002)	(0.002)	(0.002)
Test for AR(2) errors	-0.64	-0.64	-0.63
	(0.520)	(0.521)	(0.530)
No of countries	22	22	22
No of observations	356	356	356

Notes: GMM1 refers to the benchmark regression estimation where we use distcr as a measure of geography; GMM2 is estimation using pop100cr as a measure of geography; and GMM3 is estimation using troppop as a measure of geography.

The results support the widely held view that the quality of infrastructure is critical to diversification in the region. The coefficient on this variable is positive and statistically significant at 1 percent level. In addition, the result is robust to the use of different measures of geography. The results suggest that African countries should adopt an effective policy on infrastructure development if they are to make significant progress in diversifying their economies. Another variable that seems to be important in diversification is the institutional environment as measured by the durability of political regimes in a country. The results suggest that the more durable a regime is the more likely the country will be diversified. This is not surprising because a more durable political regime is in a better position to put in place measures that are needed to improve the prospects for successful diversification. Other control variables, such as the inflation rate and the level of development, had coefficients that are statistically insignificant at conventional levels. To further test the robustness of our analyses, we estimated the equations using a different measure of resource endowment. In particular, we examined the role of oil endowments in diversification. The results are presented in table 9.

Table 9: Impact of Oil Endowment

	GMM1: Benchmark	GMM2	GMM3
Diversification (t-1)	0.766 ***	0.761 ***	0.755 ***
	(0.000)	(0.000)	(0.000)
Aid (% of gross capital formation)	-0.008 **	-0.008 ***	-0.009 ***
	(0.014)	(0.004)	(0.000)
Oil endowment	-2.539 *	-3.156 *	-3.264 *
	(0.077)	(0.092)	(0.096)
Level of development	-0.001	-0.001	-0.001 ***
	(0.264)	(0.186)	(0.003)
Inflation rate	-0.011	-0.011	-0.011
	(0.368)	(0.374)	(0.340)
Education	-0.015	0.002	-0.003
	(0.667)	(0.958)	(0.952)
Quality of infrastructure	0.169 ***	0.159 ***	0.175 ***
	(0.000)	(0.000)	(0.000)
Durability of political regime	0.068	0.069	0.057
	(0.117)	(0.138)	(0.197)
Geography			
• Distcr	-0.001		
	(0.873)		
• Pop100cr		2.379	
		(0.539)	
• Troppop			-3.874
			(0.230)
Hansen test	15.85	10.63	11.81
	(1.000)	(1.000)	(1.000)
Test for AR(1) errors	-3.16 ***	-3.19 ***	-3.16 ***
	(0.002)	(0.001)	(0.002)
Test for AR(2) errors	-0.62	-0.63	-0.61
	(0.533)	(0.527)	(0.545)
No of countries	22	22	22
No of observations	356	356	356

Notes: GMM1 refers to the benchmark regression estimation where we use distcr as a measure of geography; GMM2 is estimation using pop100cr as a measure of geography; and GMM3 is estimation using troppop as a measure of geography.

As shown in table 9, oil has a negative effect on diversification and this effect is statistically significant at 5 percent level. The results therefore support the popular view that resource abundance can have a negative effect on diversification. Another interesting thing to note in the table is that the measure of institutional environment is no longer significant when we use oil, rather than land, as a measure of resource endowment or abundance. The durability of political regime, our measure of institutional environment, still has a positive sign but is no longer significant at conventional levels. With the exception of these two differences noted above, the results on the other variables are similar to those of the benchmark model estimation.

V.   Policy Implications and Concluding Remarks

Trade has an important role to play in the economic development of African countries. However, the region is facing serious challenges in promoting both traditional and non-traditional exports as well as in effectively exploiting the potential of international trade for growth and poverty

reduction. Recent evidence suggests that the region has lost market shares for some of its traditional exports (UNCTAD, 2003). Regarding non-traditional exports, the region continues to face difficulties in diversifying into the production and export of dynamic products and so has been unable to derive significant benefits from the tremendous growth that has taken place in world trade. This paper examined the validity of three popular explanations for lack of diversification in Africa using unbalanced panel data for selected African countries spanning the period 1985-2002. The estimation is based on a System-GMM approach that accounts for the endogeneity of regressors and controls for key macroeconomic variables identified in the literature as potential determinants of diversification.

The empirical evidence suggests that aid, quality of infrastructure, and resource endowments are robust determinants of diversification in Africa. In particular, an increase in aid has a negative effect on diversification as suggested in the theoretical literature. The quality of infrastructure also matters in the sense that an increase in the quality of infrastructure increases diversification. The results suggests that resource endowment is important but that the nature of the endowment matters. For example, having a large oil endowment leads to a less diversified export pattern. However, land abundance, as measured by the ratio of arable to total land area, has a positive effect on diversification. The results of the empirical tests also suggest that institutional factors play a role although the evidence is weak because it is sensitive to the control variables used in the estimation and so is not robust. Regarding geography, the correlation tests suggest that there is strong co-movement between geography and diversification. However, in the regression analysis the various measures of geography were not statistically significant at conventional levels. Consequently, although poor geography puts countries at a disadvantage, it is not a major reason for lack of diversification in Africa. The effect of poor geography can be reduced through the development of effective transport and communication infrastructure as demonstrated by the experiences of Switzerland and Austria that are land-locked and yet have been able to develop manufacturing activities.

Having identified the key empirical determinants of diversification in Africa, the key question is what can governments do to enhance diversification efforts in the region? A key policy implication of the econometric results of this paper is the importance of infrastructure in diversification. Consequently, if African countries are to have any success in diversifying their production and export structure, they have to invest in infrastructure development so as to reduce transactions costs and make the region more competitive in the global markets for manufactured goods. This requires development of good transport systems as well as better access to telecommunication instruments and systems. Regional integration can play a key role here. Cooperation in the development of infrastructure will reduce costs of transporting goods across countries in the region as well as to global markets. It will also create a conducive environment for the expansion of intra-African trade.

Another key policy recommendation emanating from the econometric results is that policymakers must have a coherent strategy to manage natural resource endowments so as to avoid the possibility of a 'dutch disease.' For example, countries that have large oil endowments need to ensure that the resources from this endowment are used in a way that does not lead to real exchange rate overvaluation and consequently affect the development of export activities. Regarding aid, the results suggest that it can have potentially negative consequences for diversification and so presents serious challenges to policymakers in aid recipient countries. There is therefore the need for public action in these countries to offset the potentially negative effect of aid on diversification. In this regard, aid can contribute to the development efforts of African countries if it is managed in a way that reduces the potential adverse effects on the real exchange rate. This requires:

- Targeting aid to the development of infrastructure and human capital as well as promotion of private sector investment; and
- Ensuring that, if used for consumption, a large part of it is spent on traded as opposed to non-traded goods to avoid the possibility of a dutch disease.

Clearly, diversification can be achieved through various ways. It could take the form of a movement into the production of higher value-added activities in existing export sectors. It could also be achieved by moving into the production of new export activities. Furthermore, it often occurs through the development of new export markets. The choice of diversification method and strategy will depend on each country's structure as well as an assessment of which of these methods will provide maximum benefits to the economy. That said, it is important to emphasize that diversification is not an end in itself. It is useful to the extent that it enables a country to diversify risk, enhance growth and reduce poverty. Obviously, the likelihood that diversification will play this role in an economy is higher if it is accompanied by an increase in manufacturing value-added. History as well as empirical evidence has shown that manufacturing is the most dynamic sector in world trade. It is also the source of sustained economic growth, which is a necessary condition for poverty reduction. Consequently, if African countries are to maximize the benefits from diversification they must ensure that it is accompanied by an increase in manufacturing value-added.

Data Appendix

Most of the data used in the analysis were obtained from the World Development Indicators 2006 published by the World Bank. Data on the three measures of geography were obtained from the website of the Harvard Center for International Development. Data on the durability of political regimes, a measure of institutional quality, were obtained from the POLITY IV database. The 22 African countries used in the GMM estimations are: Burundi, Benin, Central African Republic, Cote d'Ivoire, Cameroon, Republic of Congo, Algeria, Egypt, Kenya, Morocco, Mozambique, Malawi, Namibia, Niger, Nigeria, Rwanda, Senegal, Swaziland, Togo, Tunisia, Zambia, and Zimbabwe.

The exact definition of the variables used in the estimations is as follows:

1. Diversification is defined as the share of manufactures in total exports. Obtained from World Bank African Development Indicators 2005; data on the share of manufacturing value added in GDP were also obtained from the same source;
2. Aid is defined as official development assistance (expressed as a percentage of gross capital formation);
3. Resource endowment is defined as the share of arable to total land area. A second measure of resource endowment used is a dummy variable for oil producers and exporters. The dummy takes the value 1 if a country produces and exports oil and zero otherwise;
4. The level of development is measured by real per capita GDP (PPP based);
5. The inflation rate is measured by the rate of change of the GDP deflator;
6. Education is the literacy rate (adult literacy rate obtained from World Development Indicators 2005);
7. Quality of infrastructure is the number of fixed line telephone per 1000 person;
8. Durability of political regime is the duration of political regimes in a country as defined in the Polity IV database;
9. distcr is the mean distance to nearest coastline or sea-navigable river (in kilometres);
10. pop100cr is the ratio of population within 100 km of ice-free coast/navigable river to total population;
11. troppop is the percentage of the population in the geographical tropics.

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