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*Reshaping Economic Geography*



**BACKGROUND PAPER**

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**TRADE IN SUB-SAHARAN AFRICA AND  
OPPORTUNITIES FOR LOW INCOME  
COUNTRIES**

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# Trade in sub-Saharan Africa and opportunities for Low Income Countries

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## Highlights

Sub-Saharan African countries are shown to be further from economic markets than most other regions in the world. This largely reflects the small size of economic markets within the sub-Saharan region. As economic production has shifted to East Asia, the distance of sub-Saharan Africa to economic markets has remained unchanged. Europe and North America have moved further away from economic markets and South Asia and East Asia have moved closer to economic markets, on average.

Despite its distance to the major economic markets, more than 80 per cent of sub-Saharan trade is outside of its own region. Using a gravity model, such a trade pattern would be expected given the size of economic markets in sub-Saharan Africa. In fact, sub-Saharan African countries typically under-export to countries outside their own region, while they export about as much to countries within their region as would be expected given their economic size. There is a pattern of increasing regionalization of trade over the past 25 years.

The pattern of sub-Saharan trade is not easily explained by colonial relationships, language barriers, internal geography or logistics, despite all these variables being highly significant in explaining bilateral trading relationships. It may instead reflect tariff and non-tariff barriers, although this conclusion is not tested within this paper.

## Introduction

Middle income countries (MICs) in sub-Saharan Africa such as Botswana, Angola and Mauritius have grown considerably over the past decade (and longer). Botswana's GDP per capita at real purchasing power parity has grown by 6.2 per cent per annum from 1970 to 2004.<sup>1</sup> GDP per capita in Mauritius has grown by 4.2 per cent per annum in the same period. More recently, South Africa, the biggest economy in the region, has had per capita economic growth of 2.7 per cent per annum from 2000 to 2004, with projections of higher growth in the future. The IMF forecasts growth in

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<sup>1</sup> Calculated using the World Bank World Development Indicators, April 2007.

sub-Saharan Africa as a whole of 6.1 per cent in 2007 and 6.8 per cent in 2008 (IMF 2007). Alongside the success stories there are many countries in sub-Saharan Africa that have become economically poorer.

Economic growth in sub-Saharan MICs has implications for the poor who live in these countries and for the poor in neighboring low income countries (LICs). The effects on neighboring countries, called neighborhood effects, can include spillovers in knowledge, stability, institutions, migration, investment and trade.

Global empirical studies have suggested that neighborhood effects are important in many of these areas, often revealed through the importance of distance. Behar (2008) finds evidence that a country experiences a stronger correlation in GDP with bordering countries or countries within a 1500km radius than countries further afield. Distance proxies for physical costs, such as for trade and migration, for information costs and for many other more subtle forms of neighborhood effects. Portes and Rey (2005) note that distance is proxying for information by including the volume of telephone traffic and number of banks. Rauch and Trindale (2002) argue that the distance parameter also captures the effect of an existing network of migrants on trade.

A number of studies have shown the importance of neighborhood to trade, investment, migration and knowledge flows. For trade, most studies find that a one per cent increase in bilateral distance reduces the amount of trade by approximately one per cent (Overman, Redding and Venables 2003; Anderson and van Wincoop 2001a). Distance is also important for investment flows, with a one per cent increase in distance associated with a fall in foreign direct investment between the countries of about one per cent (Lougani et al 2002). Similar findings have also been made for other types of assets (Portes and Rey 2005). For migration, if we fit a gravity model with dummies for each reporting and partner country, we find a one per cent increase in distance is associated with a 1.5 per cent fall in migration between the countries, as measured by their migration stock in 2000.<sup>2</sup>

Trade and neighborhood effects of trade can also effect the movement of knowledge. Coe and Helpman (1995) find that knowledge spills over through trade between developed countries. This result has also been found for developed to developing country trade (Coe, Helpman and Hoffmaister 1997). Others have refined and extended these ideas to show that it is trade in capital good that matters (Eaton and Kortum 2001) and that it also matters who your trading partners trade with (Schiff et al 2002). These trade findings are matched by similar work on knowledge and distance in general and on investment. Keller (2002) finds that spillovers from research and development activity decrease with distance. Javorcik (2004) finds that FDI can bring productivity benefits to upstream industries. Van Pottelsberghe de la Porterie and Lichtenberg (2001) find that FDI outflows rather than FDI inflows are a source of productivity growth for the originating country.

The neighborhood effects of trade would intuitively be expected to decline with the current wave of globalization and reductions in transport costs. There is little evidence that this decline has been significant. Brun et al (2005) find an 11 per cent reduction in the impact of distance on trade. Yet distance remains a crucial factor in explaining trade and international linkages between countries. As Anderson and van Wincoop (2004, p1) note

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<sup>2</sup> This estimation is based on migration stock data from the Development Research Centre for Migration, Globalisation and Poverty.

The death of distance is exaggerated. Trade costs are large, even aside from trade policy barriers and even between highly integrated economies.

This paper explores the trade aspect of neighborhood, and in particular, trade in sub-Saharan Africa. The paper first evaluates the trade neighborhood facing a typical person in different regions of the world and how this has changed through time. It then discusses historical trade patterns in sub-Saharan Africa and estimates a gravity model of bilateral exports to consider some of the determinants of sub-Saharan Africa's trade performance. Finally, it presents simulations of the effect of growth in sub-Saharan MICs on the exports of their low-income neighbors.

## **The neighborhood effects of trade**

A country's exports and imports can depend on its neighbors because distance alters the costs of trade. Having rich neighbors can increase demand for your exports and can also allow you access to cheaper inputs into production. For instance, Eaton and Kortum (2001) find that the price of capital goods is more than 3.5 times as high in Nigeria and Zimbabwe relative to prices in the US, Germany and the UK.<sup>3</sup>

The costs of distance include physical transportation costs and information costs. Estimates of total trade costs are large. Anderson and van Wincoop (2004) estimate that international trade costs for a representative product and representative developed country to be equivalent to an ad valorem tax of 74 per cent. They divide this as follows:

- A tariff of 8 per cent;
- Transportation costs of 21 per cent;
- Costs arising from language of 7 per cent;
- Costs arising from currency changes of 14 per cent;
- Information costs of 6 per cent;
- Security costs of 3 per cent.

As they note, trade costs are highly variable across products and countries. They consider that the representative costs would be even higher for a typical developing country.

With such high trade costs, and costs that are dependent on distance, we would expect that countries would trade more with their neighbors. This is one reason why economic changes in your neighboring countries could be important. For instance, economic growth in a neighboring country could:

- increase demand for exports, either intermediate inputs into production or consumer goods; and
- provide a cheaper supply of inputs into production.

The extent of these effects may depend on the reasons for economic growth in the neighboring countries and on the complementarity of production or potential production between the growing neighbors and the home country.

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<sup>3</sup> Consumer goods are often much cheaper in developing countries, providing an even greater relative price differential between capital goods and consumer goods in rich and poor countries.

Much of the growth in Africa over the past decade has been driven by resources, including oil. Oil exporting countries grew at 4.5 per cent per year from 1995-2005, while resource rich countries grew at 3.4 per cent and non-oil exporters grew at 1.3 per cent over the same period (World Bank 2007). Economic growth in your neighbors that is driven by a higher oil price is unlikely to provide you with a cheaper supply of inputs into production. However, higher incomes from oil price movements could raise export demand for the consumer goods that lower income countries produce.

## The Trade neighborhood of sub-Saharan Africa

Sub-Saharan Africa is a long way from the major economic markets in Europe, North America and East Asia. One way to measure this is to multiply the bilateral distance of country i to country j by the GDP of country j, and to sum over all countries in the world.<sup>4</sup> The resulting measure will be lowest for countries that are closest to areas of high GDP and highest for countries that are far from economically important regions. The measure of bilateral distance used captures the internal distance in a country and accounts for the distance from a number of cities.<sup>5</sup>

To aggregate the economic distance measures into regional measures, we use population weights.<sup>6</sup> The regional figure can be interpreted as the average distance of a person in that region from world economic production.

A typical person in Sub-Saharan Africa was almost 50 per cent more distant from economic markets than a typical person in Europe and Central Asia. They were 13 per cent more distant from economic markets than a typical person in the world. There are regions that are in a worse economic position than sub-Saharan Africa. People in Latin America and the Caribbean are, on average, more distant from economic markets. People in Australia and New Zealand are much further from economic markets than people in sub-Saharan Africa, providing strong evidence that the tyranny of economic distance can be overcome.

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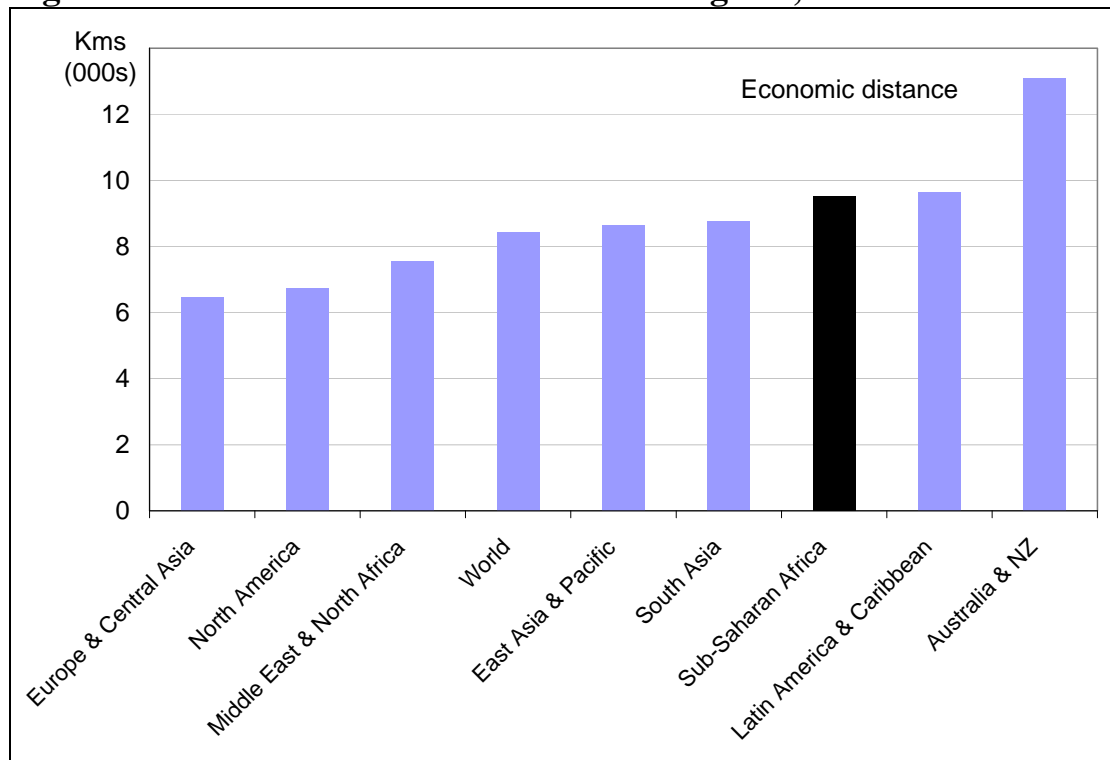
<sup>4</sup> Distance measure for country i is:  $d_i = \frac{\sum_j GDP_j \cdot d_{i,j}}{\sum_j GDP_j}$ , where  $d_{ij}$  is bilateral distance between

countries i and j. GDP is in constant US\$, as measured by the World Bank.

<sup>5</sup> The distance measure used is distw from CEPII, <http://www.cepii.fr/anglaisgraph/bdd/distances.htm>.

<sup>6</sup> The measures for region R is  $d_R = \frac{\sum_j POP_j \cdot d_j}{\sum_j POP_j}$  for all j countries in region R.

**Figure 1: Economic distance for different regions, 2005**



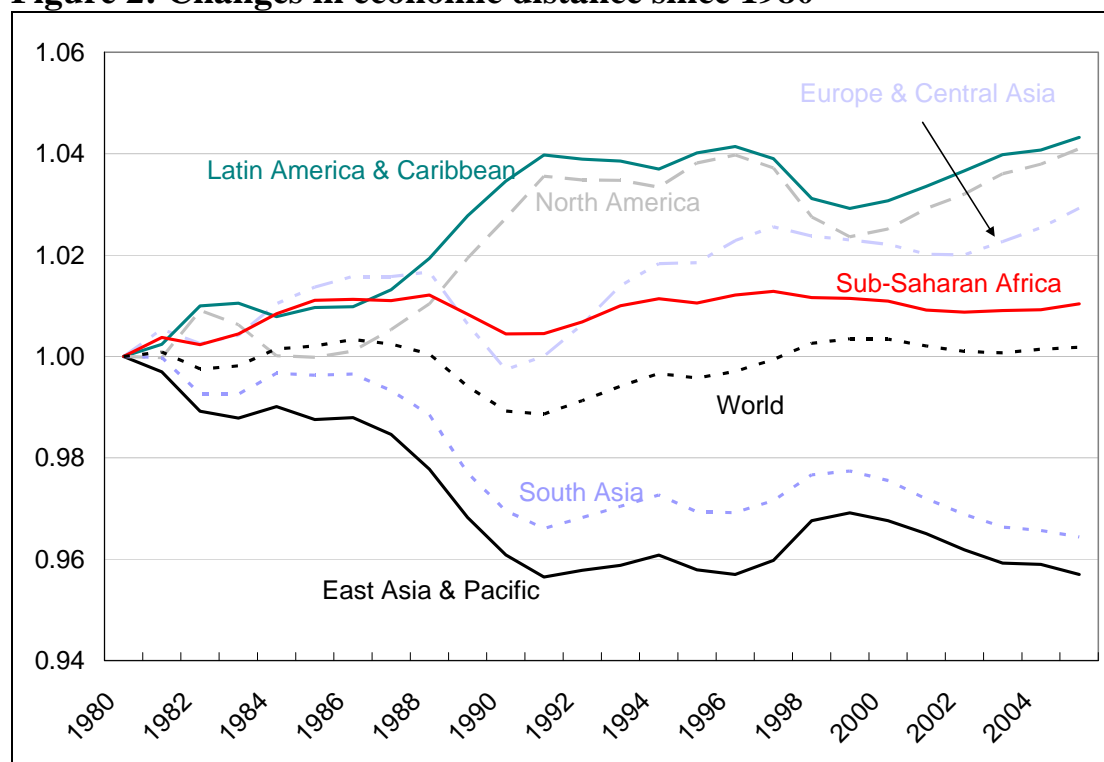
Notes: Country distance measures are aggregated using population weights.

Source: Authors' calculations.

The economic distance of sub-Saharan Africa has increased slightly since 1980 (Figure 2). The economic distance of East Asia and South Asia has fallen as these regions have become increasingly important in the world economy. The economic distance of North America and Europe has risen, again reflecting the shift in economic production to Asia.

Economic distance would be expected to be one factor affecting a country's exports. But it only represents possible changes in foreign demand for exports and does not capture changes in domestic production and therefore the supply of exports.

**Figure 2: Changes in economic distance since 1980**



Notes: Country distances are weighted according to population weights to give region figures. The base year is 1980 for each region.

Source: Authors' calculations.

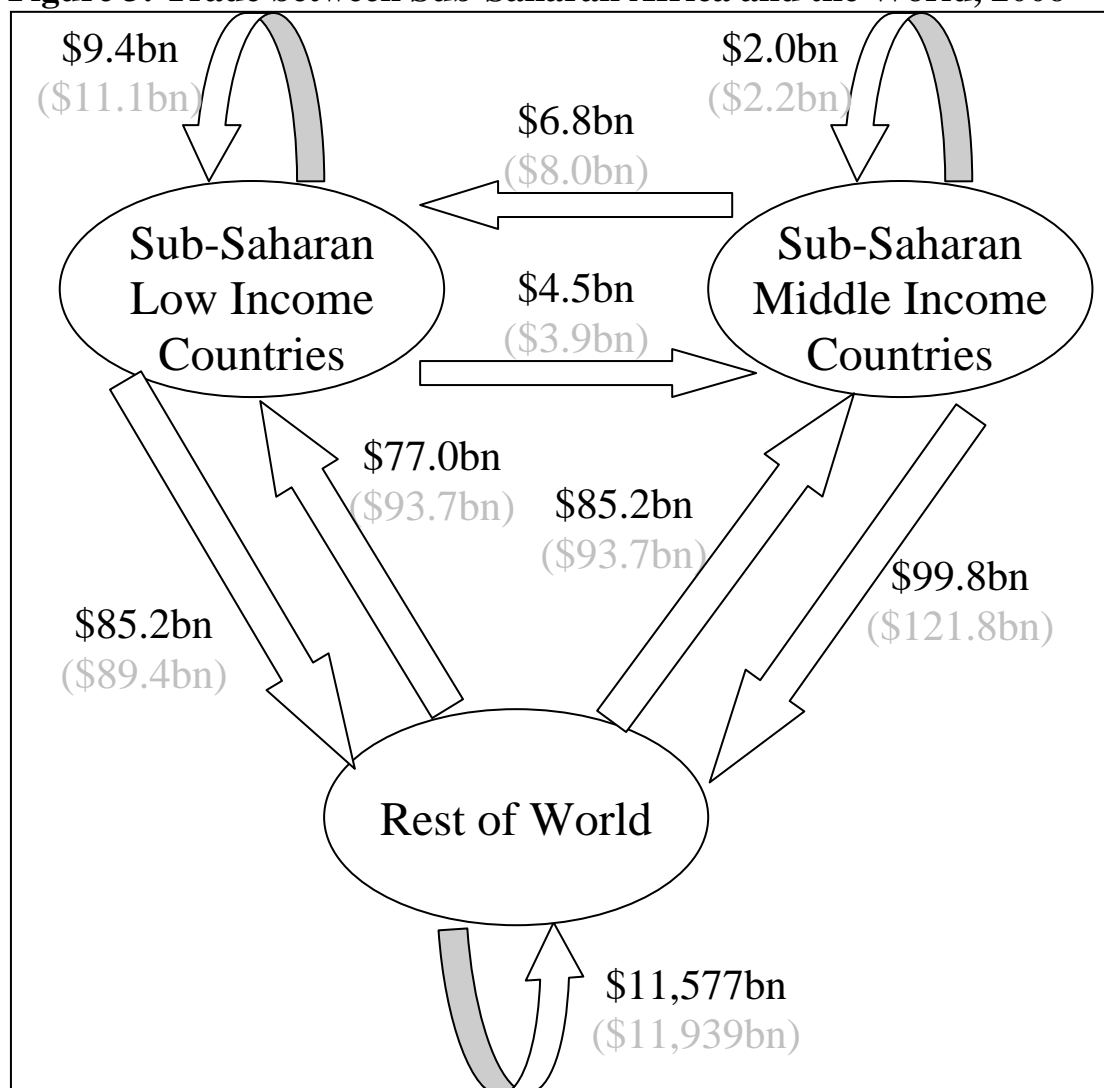
## Sub-Saharan African trade

Most of the trade that sub-Saharan countries do is not with other sub-Saharan countries (Figure 3).<sup>7</sup> Over 80 per cent of the exports from low-income sub-Saharan countries go to countries outside of the sub-Saharan region (\$85.2bn in 2006).<sup>8</sup> These countries only exported \$4.5 billion to sub-Saharan middle income countries and \$9.4 billion to other sub-Saharan low-income countries. A similar picture emerges for middle income countries, with the majority of exports going to countries outside the sub-Saharan region. Sub-Saharan countries also import mainly from countries outside their own region.

<sup>7</sup> The trade data used is the IMF's Direction of Trade Statistics. There are some inconsistencies in the data from sub-Saharan countries. Of the 16 middle income countries in sub-Saharan Africa, the IMF reports trade for 8 individually and for five other sub-Saharan countries in the form of the South African Customs Union (SACU), which includes South Africa, Botswana, Lesotho, Swaziland and Namibia. Because the countries in SACU report in aggregate, there is no information on trade between them. Of the 34 low income countries in sub-Saharan Africa, the IMF reports trade for 33 countries. The coverage of bilateral relationships is less complete, although it is unclear whether this is because there is no trade or because the data is missing. For instance, data for SACU records zero exports to sub-Saharan countries in 1980-1989, yet the importing sub-Saharan countries report imports from SACU. Data from sub-Saharan Africa is likely to get less accurate at the commodity level. Yeats (1990) discusses the accuracy of sub-Saharan historical data in some detail.

<sup>8</sup> Countries are classified as low income or middle income using the World Bank country classifications.

**Figure 3: Trade between Sub-Saharan Africa and the World, 2006**



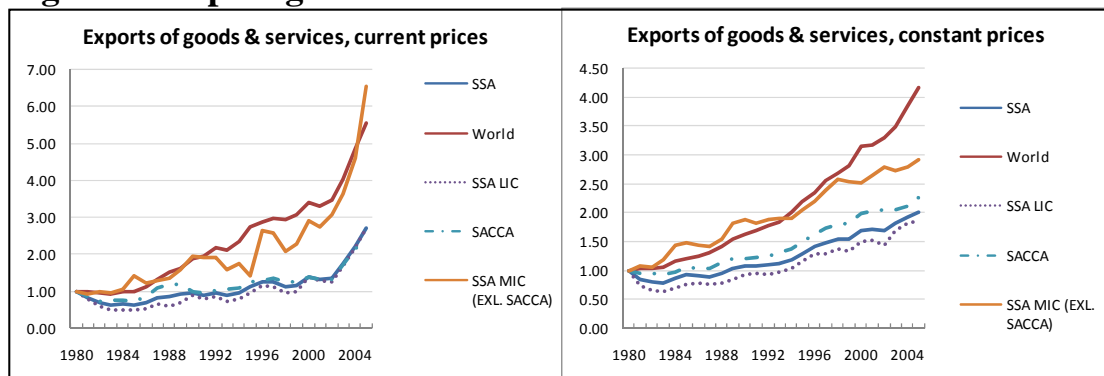
Notes: Data is sourced from the IMF's Direction of Trade statistics. Data are in US\$ (current). The figure in brackets is the corresponding import figure, including the cost of insurance and freight. Not all sub-Saharan countries report trade data, which explains some of the differences in export and import figures.

Total exports from sub-Saharan Africa have grown faster than world exports since 2002 in current US dollars (Figure 4, left panel). This reflects strong export growth for low-income countries and middle income countries, excluding the South African Customs Union (SACU). The recent export growth has followed slow export growth in sub-Saharan Africa for much of the 1980s and 1990s. Again, the slow export growth in the region largely reflects the export performance of SACU.

Exports indices for sub-Saharan Africa and the world in constant 2000 prices show that recent export growth in sub-Saharan Africa is due to favourable price movements (Figure 4, right panel). In constant 2000 prices, exports from each category of countries have grown more slowly than world exports since 1980 and there is no pronounced upward movement in exports since 2002.



**Figure 4: Export growth in sub-Saharan Africa**



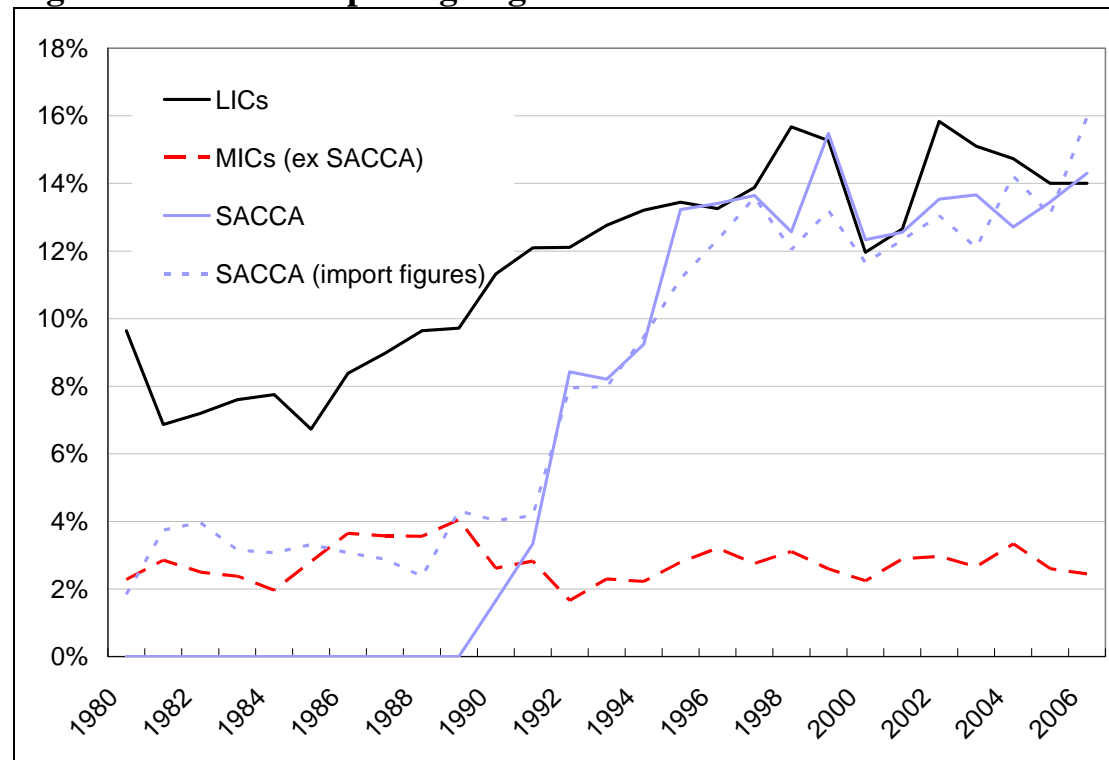
Source: World Bank World Development Indicators.

The slow growth of exports in sub-Saharan Africa in the 1980s and 1990s has been investigated by Redding and Venables (2003). They estimated that exports from sub-Saharan Africa grew by 70 per cent from 1970 to 1997, in real terms. They allocate export growth into two categories: export growth arising from improved access to others markets (growth in economies that you trade with); and export growth arising from greater domestic production. In sub-Saharan Africa, improved access to others' markets, termed foreign market access, was responsible for the entire increase in sub-Saharan exports. The impact of domestic production was actually negative, with sub-Saharan Africa being the only region in the world that experienced negative domestic effects. The negative domestic effects in the region also show up as negative foreign market access effects, because the countries closest to each sub-Saharan African country are other sub-Saharan African countries.

The share of exports from low-income countries in the sub-Saharan region that go to other countries within the region has increased from approximately 8 per cent in the early 1980s to 14 per cent in 2006 (figure 5). This reflects an increased share of exports to sub-Saharan middle income countries. This also appears to be true for countries in SACU.<sup>9</sup> In contrast, exports from sub-Saharan middle income countries (excluding SACU) have not become more regionalized. These countries have continued to export about 3 per cent of their total exports to other countries in the sub-Saharan region.

<sup>9</sup> There appears to be inaccurate reporting of exports to sub-Saharan countries by SACU. Import data from sub-Saharan Africa also supports the conclusion that SACU is now exporting more within its own region.

**Figure 5: Share of exports going to sub-Saharan countries**



Notes: South African data is available only from 1998 onwards. SACCA refers to the South African Customs Union.

## Attempting to explain Sub-Saharan Africa's trade performance

The pattern of sub-Saharan trade initially suggests that the region is not as integrated as it should be. This conclusion has been found to be false in the past for intra-sub-Saharan trade (Foroutan and Pritchett 1992) and for trade between Africa and the rest of the World (Coe and Hoffmaister 1999). The small amount of trade between sub-Saharan countries instead reflected the small sizes of their economies and the trade between sub-Saharan countries and the rest of the world largely reflected economic size and distance. Our results with recent data are broadly supportive of these findings.

Internal geography, infrastructure and trade policy have been noted as other important determinants of trade. For example, Redding and Venables (2003) find that sub-Saharan Africa has low trade levels relative to the income of the region. They find that market access (or distance to foreign markets), poor internal geography and poor institutions explain this in roughly equal proportion. These factors will also be analysed using the gravity model set up discussed below.

## A framework to evaluate sub-Saharan trade

To evaluate trade in sub-Saharan Africa we estimate a gravity equation of bilateral exports between all countries in the world. The gravity model is based on export data

from the UN Comtrade database for the period 1976 to 2005.<sup>10</sup> Export data (in current US\$) is averaged over five year periods.<sup>11</sup> Since we are interested in seeing whether there is more or less trade in sub-Saharan Africa than expected, we cannot use country and partner country dummies. Instead we use GDP, averaged over five years in current US\$, as a measure of economic size. We also include a range of dummy variables that the literature has found to be important such as sharing a common language, a common border, being landlocked and being an island.

The measure of distance used is measures distance between a number of cities in each of the two countries, as calculated by the CEPII.<sup>12</sup>

We are particularly interested in sub-Saharan Africa. Not all sub-Saharan African countries report trade data in the UN Comtrade database. For 2001-2005 we have 1,167 observations of sub-Saharan bilateral trade.

Firstly, we use the most simple gravity model estimation with sub-Saharan dummies to test for sub-Saharan specific factors and whether these have changed through time. We estimate the model on all available data for a particular period. This means that the composition of the bilateral relationships that exist in the data is allowed to change.<sup>13</sup> We include three sub-Saharan dummies:

- SS1 – if the exporter is a sub-Saharan country;
- SS2 – if the importer is a sub-Saharan country; and
- SS3 – if both the exporter and the importer are sub-Saharan.

The equation we estimate is:

$$e_{i,j} = \beta_0 + \beta_1 \cdot y_i + \beta_2 \cdot y_j + \beta_3 \cdot d_{i,j} + \sum_k \beta_k \cdot X_{i,j} + \sum_k \beta_k \cdot X_i + \sum_k \beta_k \cdot X_j$$

Where

$e_{i,j}$  is log of bilateral exports from country i to country j;

$y_i$  and  $y_j$  are the log GDP of country i and country j;

$d_{i,j}$  is the distance between the countries;

$X_{i,j}$  are bilateral relationships such as sharing a common language, border or colonial relationship or both being part of sub-Saharan Africa; and

$X_i$  and  $X_j$  are factors specific to country i and country j such as being in sub-Saharan Africa, logistics performance and physical geography such as being an island or landlocked.

The gravity model results are shown in Table 1. The economic size variables and the distance parameter have the usual signs and magnitudes.

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<sup>10</sup> The conclusions are unchanged if we use IMF Direction of Trade Statistics data.

<sup>11</sup> The UN export data does not differentiate between zero trade and missing values. If at least one bilateral export figure exists in the five year period then any missing data for the two countries are taken as equaling zero.

<sup>12</sup> This is the same measure as used to calculate economic distance.

<sup>13</sup> The alternative would be to use a set sample of bilateral relationships that are available for all periods. There are only 144 intra-sub-Saharan bilateral trade relationships that would be included in this case.

Bilateral exports from and to Sub-Saharan countries are lower than would be expected given economic size and bilateral distance, represented by the negative coefficients on SS1 and SS2. For example, in the five year period ending in 2005, sub-Saharan countries bilateral exports were 28 per cent less than expected given their economic size and the distance to the partner country. But, sub-Saharan countries trade more with each other than they do with countries outside the region, as represented by the positive coefficient on SS3. The size of the additional trade that sub-Saharan countries do with each other as compared to non sub-Saharan countries has steadily increased since 1980 and is highly significant in the later of the five year periods.<sup>14</sup>

Finally, we can calculate whether sub-Saharan countries trade more with each other than a typical bilateral trading relationship between any two countries. This can be calculated by combining the elasticity of being a sub-Saharan exporter, a sub-Saharan importer, and both exporter and importer being sub-Saharan.<sup>15</sup> The results, in the last row of Table 1, show that sub-Saharan countries now trade about as much with each other as a typical trading relationship, but that in the past they traded much less with each other.<sup>16</sup>

**Table 1: Gravity model estimation through time**

Dependent variable: Log of bilateral exports							
	1980	1985	1990	1995	2000	2005	
Sample	All	All	All	All	All	All	All
R2	0.57	0.59	0.65	0.65	0.66	0.66	0.66
No. obs.	9459	9713	10247	14487	19759	20878	
No. SS	597	460	334	653	1058	1150	
<i>Economic size</i>							
Y1	1.01 (0.01)	1.02 (0.01)	1.08 (0.01)	1.10 (0.01)	1.13 (0.01)	1.18 (0.01)	
Y2	0.78 (0.01)	0.80 (0.01)	0.78 (0.01)	0.78 (0.01)	0.80 (0.01)	0.79 (0.01)	
<i>Bilateral characteristics</i>							
Dist.	-1.37 (0.03)	-1.40 (0.03)	-1.35 (0.03)	-1.37 (0.02)	-1.44 (0.02)	-1.40 (0.02)	
<i>Sub-Saharan effects</i>							
SS1	-0.50 (0.09)	-0.47 (0.10)	-0.12 (0.10)	-0.05 (0.08)	-0.17 (0.06)	-0.28 (0.06)	
SS2	-0.53 (0.07)	-0.39 (0.07)	-0.59 (0.06)	-0.38 (0.05)	-0.28 (0.04)	-0.17 (0.04)	
SS3	0.15 (0.16)	0.28 (0.17)	0.49 (0.17)	0.70 (0.13)	0.77 (0.10)	0.80 (0.10)	
Intra-sub-Saharan trade	-0.73	-0.59	-0.46	0.01	0.06	0.07	

Notes: Y1 is log GDP of the exporting country, Y2 is log GDP of the importing country, Dist is log bilateral distance and SS1, SS2 and SS3 are as explained in text. Huber-White Heteroskedasticity robust standard errors are in parentheses.

<sup>14</sup> These conclusions are robust to ignoring countries in the South African Customs Union.

<sup>15</sup> This could be combined through addition or through the formula we use: Intra-sub-Saharan effect =  $(1+SS1)*(1+SS2)*(1+SS3)-1$ .

<sup>16</sup> The bilateral predictions of trade do not map exactly into predictions of total trade. This is mainly because there are many bilateral relationships that are not modeled.

The estimation above does not account for the myriad other features that influence the extent of trade between nations such as colonial relationships, language, borders and physical geography. This is because the model aimed to account only for economic size and physical distance in testing whether sub-Saharan trade is different to non-sub-Saharan trade. It could be that it is different largely because of the features mentioned above. We analyse this using only the five year period ending in 2005.

Table 2 reports the results of different empirical specifications. Model 1, in the first column, repeats the results for 2005 in Table 1. Model 2 incorporates additional bilateral characteristics such as whether the countries speak the same language, have a common border or have had a colonization relationship. These variables reduce the size of the coefficient on intra-sub-Saharan trade, but it still remains positive and significant.

Model 3 incorporates physical geography, such as whether a country is landlocked or is an island, whether the trading partner is landlocked or is an island and the proportion of the exporting country's population located within 100 kilometers of a navigable river or coast. The variable coefficients are as expected, with islands generally trading more than expected and landlocked countries less. The coefficient on the dummy for whether the exporting country is landlocked is, surprisingly, not different to zero. These physical characteristics lower the coefficients on the SS1 and SS2 dummies somewhat, suggesting that part of sub-Saharan performance is explainable through these geographical characteristics.

Model 4 incorporates a World Bank index of logistics costs.<sup>17</sup> The index is highly significant and of the expected sign. The index is on a scale of one to four. A one unit increase in the index is associated with an 80 per cent rise in bilateral exports. The average sub-Saharan country is 1.5 units below the USA in the logistic performance index. The logistics of the exporting country appear to be more important than the logistics of the importing country. Somewhat surprisingly, the inclusion of the logistics index does not change the under-performance of sub-Saharan exports, as measured by the coefficient on SS1. The inclusion of logistics flips the sign on the coefficient related to the proportion of the population close to a river or the coast.<sup>18</sup> Logistics performance, as measured by this index, is highly correlated with the proportion of the population living near the coast or river.

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<sup>17</sup> Data can be accessed at <http://go.worldbank.org/88X6PU5GV0>.

<sup>18</sup> This contrasts with the findings of Redding and Venables 2003 for total exports rather than bilateral exports.

**Table 2: Determinants of trade**

Dependent variable: log of bilateral exports						
	Model 1	Model 2	Model 3	Model 4		
Sample	All	All	All	All	All	
R2	0.66	0.68	0.69	0.72		
No. obs.	20878	20717	18908	15112		
<i>Economic size</i>						
Y1	1.18 (0.01)	1.18 (0.01)	1.19 (0.01)	1.04 (0.01)		
Y2	0.79 (0.01)	0.80 (0.01)	0.83 (0.01)	0.77 (0.01)		
<i>Sub-Saharan effects</i>						
SS1	-0.28 (0.06)	-0.29 (0.06)	-0.22 (0.06)	-0.35 (0.07)		
SS2	-0.17 (0.04)	-0.15 (0.04)	0.01 (0.04)	0.14 (0.05)		
SS3	0.80 (0.10)	0.61 (0.10)	0.68 (0.10)	0.70 (0.11)		
<i>Bilateral characteristics</i>						
Dist.	-1.40 (0.02)	-1.30 (0.02)	-1.32 (0.02)	-1.23 (0.02)		
Border		1.17 (0.10)	1.32 (0.10)	1.42 (0.11)		
Language.		1.06 (0.05)	1.03 (0.05)	1.16 (0.06)		
Colony/coloniser		0.96 (0.10)	0.68 (0.09)	0.56 (0.10)		
<i>Physical geography</i>						
Landlocked1			-0.03 (0.04)	-0.20 (0.05)		
Landlocked2			-0.80 (0.04)	-0.78 (0.04)		
Island1			0.15 (0.05)	0.17 (0.05)		
Island2			0.27 (0.04)	0.02 (0.05)		
Pop. 100km from river or coast			0.23 (0.06)	-0.28 (0.07)		
<i>Logistics performance</i>						
LPI1				0.80 (0.04)		
LPI2				0.43 (0.04)		

Notes: Y1 is log GDP of the exporting country, Y2 is log GDP of the importing country, Dist is log bilateral distance and SS1, SS2 and SS3 are as explained in text. Huber-White Heteroskedasticity robust standard errors are in parentheses.

Commodity exports are very important for sub-Saharan countries. They may be more or less subject to economic distance and the sorts of characteristics that are important in explaining total bilateral trade flows. To test this, bilateral commodity exports were constructed as the sum of:

- Exports of food and live animals (SITC code 0)
- Exports of crude materials, inedible, except fuels (SITC code 2)
- Exports of Mineral fuels, lubricants and related materials (SITC code 3).

All other exports were classified as non-commodity exports for the analysis.

As expected there were marked differences in the export performance of sub-Saharan African countries in commodities and other exports. Over the past 15 years, the bilateral dummy for being a sub-Saharan exporter is positive for commodity exports, indicating that sub-Saharan countries export more commodities than expected given their economic size and distance to markets. Economic size is also a less powerful determinant of commodity exports.

The pattern of regionalization in sub-Saharan Africa appears to be primarily due to non-commodity exports. These exports have been more regionalized than predicted for the whole period investigated. Commodity exports within sub-Saharan Africa are also regionalized to some extent.

**Table 3: Commodity and non-commodity exports**

Period	Commodity exports					Non-commodity exports				
	1985	1990	1995	2000	2005	1985	1990	1995	2000	2005
Sample	All	All	All	All	All	All	All	All	All	All
R2	0.45	0.48	0.50	0.50	0.50	0.55	0.64	0.65	0.66	0.66
No. obs.	7572	8181	11493	15657	16908	9179	9734	13847	18572	19662
Y1	0.81 (0.02)	0.83 (0.01)	0.90 (0.01)	0.92 (0.01)	0.98 (0.01)	1.18 (0.01)	1.28 (0.01)	1.32 (0.01)	1.34 (0.01)	1.38 (0.01)
Y2	0.81 (0.01)	0.79 (0.01)	0.79 (0.01)	0.78 (0.01)	0.81 (0.01)	0.73 (0.01)	0.75 (0.01)	0.78 (0.01)	0.80 (0.01)	0.81 (0.01)
Dist.	-1.26 (0.03)	-1.27 (0.03)	-1.28 (0.03)	-1.40 (0.02)	-1.38 (0.03)	-1.55 (0.03)	-1.57 (0.03)	-1.49 (0.02)	-1.60 (0.02)	-1.56 (0.02)
SS1	-0.31 (0.12)	-0.38 (0.12)	0.07 (0.09)	0.19 (0.08)	0.08 (0.07)	-1.64 (0.12)	-1.50 (0.14)	-0.90 (0.09)	-0.75 (0.07)	-0.91 (0.07)
SS2	-0.25 (0.09)	-0.64 (0.08)	-0.39 (0.07)	-0.53 (0.06)	-0.26 (0.06)	-0.45 (0.08)	-0.51 (0.06)	-0.22 (0.06)	-0.22 (0.05)	-0.08 (0.05)
SS3	-0.18 (0.24)	0.50 (0.23)	0.49 (0.18)	0.70 (0.14)	0.65 (0.14)	0.98 (0.20)	1.08 (0.21)	1.20 (0.14)	1.40 (0.12)	1.35 (0.12)
Sub-Saharan intra trade	-0.58	-0.66	-0.02	-0.06	0.32	-1.70	-1.51	-0.82	-0.54	-0.81

## Discussion

Our gravity model suggests that sub-Saharan countries under-trade in general, but are more likely to trade with other sub-Saharan countries than they are with non-sub-Saharan countries.<sup>19</sup> These results are robust to including physical characteristics, colonial ties, language ties, sharing of a common border and logistics performance.

The model does not account for tariffs and non-tariff barriers, applied bilaterally, which may be particularly important in sub-Saharan Africa given the proliferation of regional integration agreements (Alva & Behar, 2008). It also does not account for measures of institutions.

Other researchers have sought to explain sub-Saharan underperformance based on institutions and internal geography (Redding and Venables 2003). They found that aggregate exports are higher if a country has more of its population or land within 100 kilometers of a navigable river or the coast. In their work, this internal geography explains one quarter of the underperformance of sub-Saharan African exports for

<sup>19</sup> Note that we are measuring predicted trade using the coefficients on our dummy variables. This weights countries differently to the actual aggregation of amounts of trade.

1994 to 1997. Their measure of institutional quality, expropriation risk from the International Country Risk Guide database, explains a further quarter of sub-Saharan export underperformance. (A further quarter is explained by market access and the last quarter remains unexplained.)

Reconciling these results and our own is an area for future work. In addition, the results above need to be confirmed using IMF Direction of Trade Statistics and UN import data. Finally, there is scope for considerable work exploring the composition of sub-Saharan trade and how this matters and considering the implications of product complementarity in a gravity model setting.

## **How big are the regional export externalities from growth in sub-Saharan Africa?**

A number of countries in sub-Saharan Africa have grown strongly over the past five years and some for much longer, as discussed above. This could have an impact on the neighbors of these countries. In particular, growth in sub-Saharan MICs could increase the demand for exports from their neighbors.

Gravity models show the relationship between economic size and trade. This provides evidence of the impact of the growth of neighbors on trade in the long run. However, using the gravity model in this way could be misleading if some other common factors, such as geography, have driven GDP and exports to their current levels. We can also estimate gravity model relationships using changes in exports and changes in GDP, which gives an estimate for a more medium run relationship between GDP growth and export growth.

The gravity model in levels associates a one percent rise in the GDP of an importing country with a 0.8 per cent rise in the exports from its trading partners (see Tables 1 and 2). If this relationship were to occur in sub-Saharan Africa, then a 10 per cent rise in GDP in sub-Saharan middle income countries would lead to a 0.4 per cent rise in exports from sub-Saharan LICs.<sup>20</sup>

## **References**

Alva, M & A Behar (2008); “Factors that contribute to (or detract from) successful outcomes in African Regional Agreements”, Paper prepared for World Bank WDR2009 Project

Anderson, J.E. and E. van Wincoop (2004), “Trade costs”, *NBER Working Papers*, No. 10480, May.

Anderson, J.E. and E. van Wincoop (2001a), “Gravity with Gravitas: a Solution to the Border Puzzle”, *NBER Working Papers*, No. 8079, January.

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<sup>20</sup> Five per cent of sub-Saharan LICs exports go to sub-Saharan MICs. Therefore the increase in exports is equal to  $5\% * 10\% * 0.8$ .



Behar, A. (2008), "Neighbourhood Growth Effects: an Annual Panel Data Approach", Paper prepared for World Bank WDR2009 Project

Brun, J., C. Carrere, P. Guillaumont and J. de Melo (2005), "Has Distance Died? Evidence from a Panel Gravity Model", *World Bank Economic Review*, Vol. 19, No. 1, pp 99-120.

Coe, D. and E. Helpman (1995), "International R&D Spillovers", *European Economic Review*, Vol. 39, pp859-887.

Coe, D., E. Helpman and A. Hoffmaister (1999), "North-South R & D Spillovers" *The Economic Journal*, Vol. 107, No. 440, pp. 134-149.

Coe, D. and A Hoffmaister (1999), "North-South Trade: Is Africa Unusual", *Journal of African Economies*, Vol. 8, No. 2, pp228-256.

Eaton, J. and S. Kortum (2001), "Trade in Capital Goods", *European Economic Review*, Vol. 45, pp 1195-1235

Elbadawi, I., T. Mengistae and A. Zeufack (2006), "Market access, supplier access, and Africa's manufactured exports: an analysis of the role of geography and institutions", *World Bank Policy Research Working Papers*, No. 3942, June.

Faroutan, F. and L. Pritchett (1993), *Journal of African Economies*, Vol. 2 No. 1, pp74-105.

Helliwell, J. (1997), "National Borders, Trade and Migration", *NBER Working Papers*, No. 6027, May.

Helpman, E., M. Melitz and Y. Rubinstein (2007), "Estimating trade flows: Trading partners and trading volumes", *NBER Working Papers*, No. 12927, February.

IMF (2007), *World Economic Outlook: Globalisation and inequality*, Washington: IMF, October.

Javorcik, B. (2004), "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages", *The American Economic Review*, Vol. 94, No. 3, pp. 605-627.

Keller, W. (2002), "Geographic localization of international technology diffusion", *American Economic Review*, Vol. 92, No. 1. (Mar., 2002), pp. 120-142.

Loungani, P., A. Mody and A. Razin (2002), "The Global Disconnect: The role of transactional distance and scale economies in gravity equations", *Scottish Journal of Political Economy*, Vol. 49, No. 5, pp 526-543 , November.

Overman, H., S. Redding and A. Venables (2003), "The Economic Geography of Trade, Production and Income: A survey of empirics", London: LSE Research Online.

Portes, R. and H. Rey (2005), "The determinants of cross-border equity transaction flows", *Journal of International Economics*, Vol. 65, pp. 269-296.

van Pottelsberghe de la Porterie, B. and F. Lichtenberg (2001), "Does Foreign Direct Investment Transfer Technology across Borders?" *The Review of Economics and Statistics*, Vol. 83, No. 3, pp. 490-497.

Rauch, J. and V. Trindale (2002), "Ethnic Chinese networks in international trade", *Review of Economics and Statistics*, Vol. 84, pp116-130.

Redding, S and A.J. Venables (2004), "Economic Geography and International Inequality", *Journal of International Economics*, Vol. 62, pp53-82.

Redding, S. and A.J. Venables (2003), "Geography and Export Performance: External market access and internal supply capacity", *CEPR Discussion Paper Series*, No. 3807, February.

Schiff, M., Y. Wang and M. Olarreaga (2002), "Trade related technology diffusion and the dynamics of North-South and South-South integration", *World Bank Policy research Working Papers*, No. 2861, June.

World Bank (2007), *African Development Indicators*, Washington: World Bank.

Yeats, A. (1990), "On the Accuracy of Economic Observations: Do Sub-Saharan Trade Statistics Mean Anything?", *The World Bank Economic Review*, Vol. 4, No. 2, pp135-156.