2010

Distance to market and sub-Saharan African exports

Alberto Behar, *University of Oxford*
Phil Manners

Distance to Growing Markets and Sub-Saharan African Exports

Dr Alberto Behar[*] and Mr Phil Manners[+]

Abstract

A typical person in sub-Saharan Africa is a long way from world markets and is further from world markets now than in 1980. This partly reflects slower growth within Africa than for the world as a whole. Despite slower growth in Africa, African exports have become increasingly regionalized. By 2005, a country in Africa typically exported more than twice as much to a country in its own region as would be expected based on economic size and bilateral distance. This regionalization was not present in the early 1980s and has become stronger over time. We find evidence of positive neighbourhood effects through exports, but sub-Saharan countries benefit less from growth in their own region than this typical relationship indicates. Given the small share of exports destined to their neighbours, low-income countries in sub-Saharan Africa experience relatively modest export growth from growth in the region. These factors imply that African countries are unlikely to pull each other out of poverty and a regional focus may be less effective than a focus on countries outside of the region.

[*] Corresponding author. Post-doctoral Research Fellow, Economics Department and Centre for the Study of African Economies, University of Oxford, Manor Road, Oxford, OX1 3UQ, tel: + 44 7817099883, fax + 44 185 271094, alberto.behar@economics.ox.ac.uk.
[+] The Centre for International Economics, Sydney

1. Introduction

Middle income countries (MICs) in sub-Saharan Africa, such as Botswana, Angola and Mauritius have grown considerably. 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 some sub-Saharan countries may benefit the poor in their neighbouring low income countries (LICs). The effects on neighbouring countries, called neighbourhood effects, can include spillovers in knowledge (economic and social), stability, institutions, migration, investment and trade. Behar, Manners and Nelson (2009) find improvements in logistics quality can increase exports from a country as well as from its landlocked neighbours. Many sources of spillovers and neighbourhood effects have been documented, although not specifically for sub-Saharan Africa.[1] Our focus is on the potential contribution of trade.

The framework we use is a gravity equation. In this framework, bilateral trade between two countries is a positive function of their size and a negative function of the distance between them. Much of Africa's trade performance is claimed to be "explained" using cross-country studies of bilateral trade. For example, Foroutan and Pritchett (1993) conclude that, once one controls for the level of GDP and distance, intra-African trade is about what one would expect.

Distance, a standard feature in the traditional gravity equation, remains an important factor in determining bilateral trade, despite observed patterns of globalization. Anderson and van Wincoop (2004, p1) note

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

Countries tend to trade less with countries that are further away from them, after accounting for country size. Because of this, neighbours tend to be more important trading partners, and their economic growth tends to be more important for trade. These neighbourhood trade effects are what we study in this paper, in four parts.

The paper first describes the trade neighbourhood facing a typical person in different regions of the world and how this has changed through time. A sub-Saharan African person is more economically distant than he used to be, because the countries nearby have grown slowly while those that are far away have grown quickly.

Second, it discusses historical trade patterns and openness in Africa. African exports have grown more slowly than elsewhere in the world. However, the share of African exports going to other African countries has increased: trade is becoming more regionalized.

Third, we proceed to explain these trade patterns using a gravity model. We investigate the effects of trading partner growth on exports using panel data. Panel data has numerous advantages over cross-section data, including the option to control for unobserved bilateral fixed effects. Furthermore, for our application, it is the within group variation in the variables over time that correctly identifies the effect of partner *growth* on exports.

We are by no means the first to use panel data to estimate gravity relationships. Brun et al (2005) use random effects and other estimators to confirm distance is still important. Coe and

Hoffmaister (1999) investigate African trade patterns including a number of fixed effects. Rodrik (1998) argues Africa's relatively poor trade growth is attributable to slow GDP growth, but using cross-sectional and pooled data. This is also supported by Redding and Venables (2003), who use country fixed effects with cross-section data. We use a *full* set of *bilateral* fixed effects, which allows us to directly address the impacts of trading partners' growth and to test whether this effect is different within Africa.[ii]

We find that using a within-groups estimator still generates a sizeable coefficient on a country's GDP and that of its partner, so growth in trading partners is associated with higher trade. This is consistent with explanations that Africa's relatively slow trade growth is partly due to slow growth within its own region. Our gravity model estimates also confirm a pattern of increased regionalization in African trade. Not only are a pair of African countries more likely to trade with each other than anyone else, controlling for GDP and distance, but they have become more likely to trade with each other over time, controlling for changes in GDP. Our message holds for a variety of measures of trade.

Fourth, we use the gravity model estimates and current export shares to simulate the effects of neighbourhood growth on exports for the countries in our sample. These effects are small for many countries because only a small share of their exports currently stays in Africa. Given the modest scope for export-growth from neighbours, we discuss how it may be appropriate for African countries to look abroad for markets for their products rather than turning their attention inwards.

2. The Trade Neighbourhood of sub-Saharan Africa

This section investigates how good the trade neighborhood is in sub-Saharan Africa: are the nearby countries big or are the large export markets generally far away? One way to measure this is to calculate the GDP weighted distance of a country from all other countries in the world (d_i). This 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. To calculate this, we multiply the bilateral distance of country i to country j by the GDP of country j, and sum over all countries in the world, as set out in Equation 1. We use a measure of bilateral distance that captures both the internal distance in a country and accounts for bilateral distance from a number of major cities.[iii]

$$d_i = \frac{\sum_j GDP_j . d_{i,j}}{\sum_j GDP_j} \qquad (1)$$

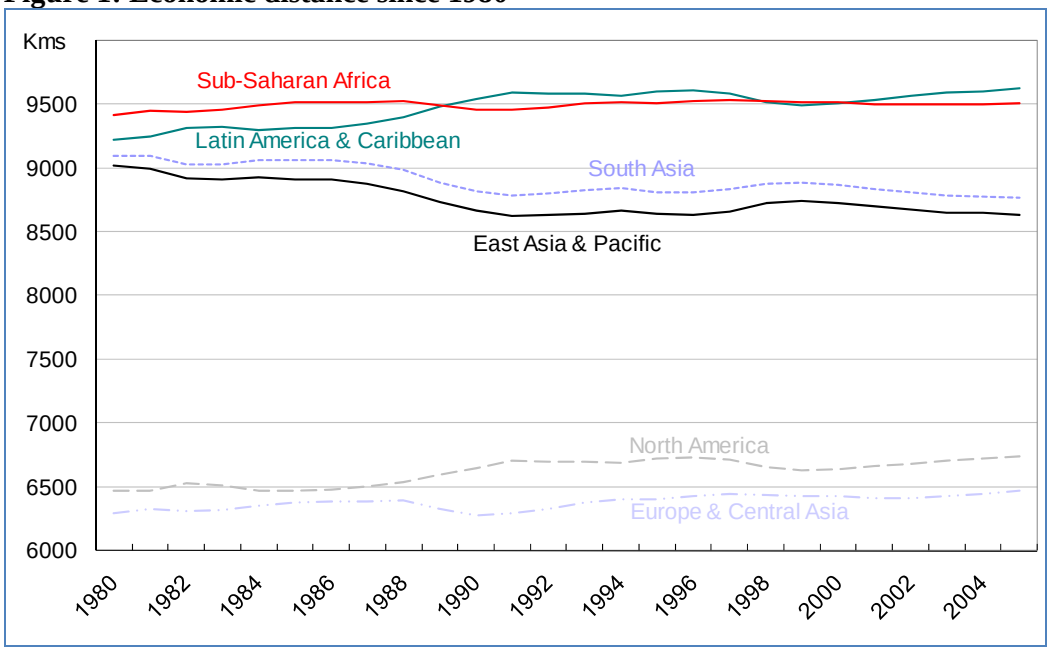
d_{ij} is bilateral distance between countries i and j, GDP is in constant US Dollars (from the World Bank)

To aggregate the economic distance measures into regional measures, we use population weights.[iv] The regional estimate of economic distance can therefore be interpreted as the average distance of a person in that region from world economic production.

In 2005, a typical person in sub-Saharan Africa was 13 per cent more distant from economic markets than a typical person in the world. This is almost 50 per cent more distant from economic markets than a typical person in Europe and Central Asia, which has the most advantageous position, but less disadvantaged than remote Australia and New Zealand and about as remote as the Latin America & Caribbean. Sub-Saharan Africa's neighbourhood is

therefore relatively poor, primarily because it is a long way from the major markets in Europe, North America and East Asia.

Figure 1: Economic distance since 1980



Notes: Country distances are weighted according to population weights to give region figures. Source: Authors' calculations.

We plot the values from equation 1 in Figure 1, which presents the evolution of economic distance over time. We see that the economic distance of sub-Saharan Africa from world markets has increased slightly since 1980. The economic distance of East Asia and South Asia has fallen as these regions grown fast and become increasingly important in the world economy. The economic distance of North America and Europe has also risen, again reflecting the shift in economic production to Asia.

Economic distance would be expected to be one factor affecting a country's exports. Declining economic distance would mean that a country's neighbours are growing faster than the rest of the world. In a gravity model, the increase in economic distance experienced by sub-Saharan Africa relative to the world would suggest that sub-Saharan trade would have grown more slowly than world trade, other things constant.

3. Sub-Saharan African Trade Performance

Having described the evolution of its economic distance, we now turn to sub-Saharan African trade outcomes. Defined as imports plus exports, trade was 62.7 percent of GDP in 1980 and 66.3 per cent of GDP in 2004 (Table 1). In 1980, sub-Saharan Africa's trade:GDP ratio was amongst the highest in the world. By 2004, many other regions had achieved greater trade ratios and much greater increases in trade to GDP ratios.

Table 1: Sub-Saharan trade as a share of GDP

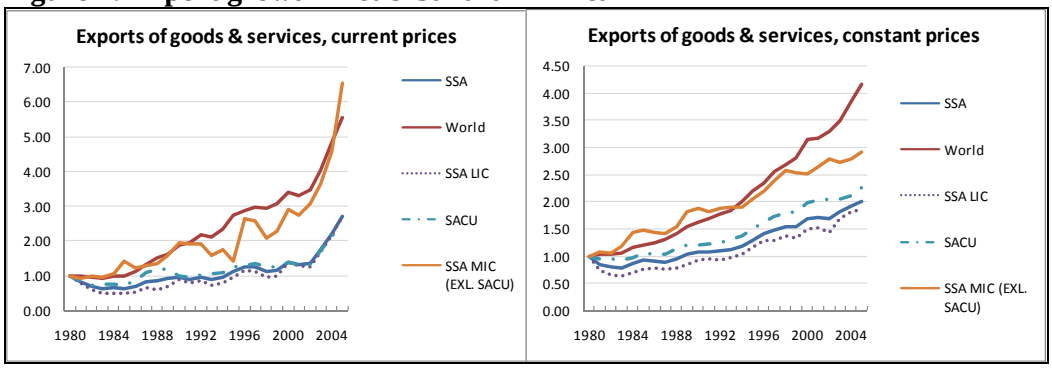
Region	Trade (% of GDP)	
	1980	2004
Sub-Saharan Africa	62.7	66.3
South Asia	20.8	38.9
Middle East & North Africa	64.8	66.3
Latin American & Caribbean	27.7	47.8
East Asia & Pacific	33.8	82.7
European Monetary Union	52.7	76.7
World	38.6	52.1

Source: World Development Indicators.

Total exports from sub-Saharan Africa have grown faster than world exports since 2002 in current US dollars (Figure 2, left panel). This reflects strong export growth for low-income countries and middle income countries, excluding the Southern African Customs Union (SACU). This recent export growth in US$ exports followed slow export growth in sub-Saharan Africa for much of the 1980s and 1990s.

Exports indices for sub-Saharan Africa and the world in constant 2000 prices show less dramatic growth (Figure 2, right panel). This indicates that recent export value growth in sub-Saharan Africa is in large part due to favourable price movements. In constant 2000 prices, exports from each category of sub-Saharan countries have grown more slowly than world exports since 1980 and there is no pronounced upward movement in exports since 2002.

Figure 2: Export growth in sub-Saharan Africa



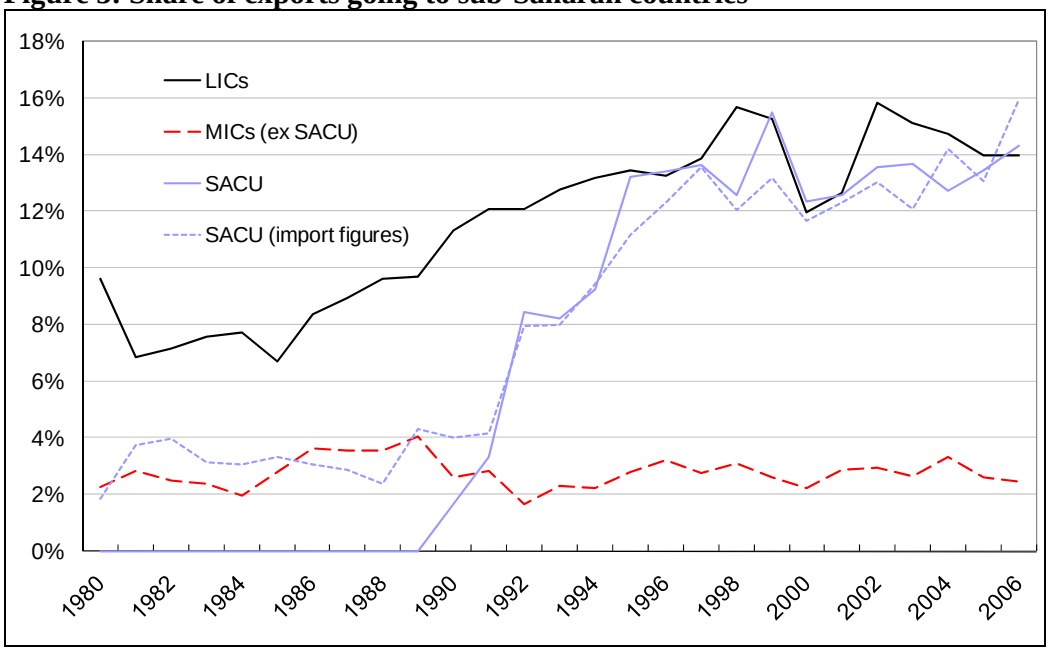
Source: World Bank World Development Indicators. LIC is low-income countries, MIC is middle-income countries and SACU is the Southern African Customs Union.

We have seen that, relative to GDP, sub-Saharan African countries trade more than the world average, but most trade is with countries outside the sub-Saharan region.[v] 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). 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. More than 90% of exports ($99.8 billion) went to countries outside the region. Sub-Saharan countries also import mainly from countries outside their own region.

Although intra-regional trade is low, it is rising. Figure 3 shows that sub-Saharan trade has become increasingly regionalized. 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. This also appears to be true for countries in SACU.[vi] However, exports from other sub-Saharan middle income countries do not appear to have become more regionalized.

Figure 3: Share of exports going to sub-Saharan countries



Notes: South African data is available only from 1998 onwards. LIC is low-income countries, MIC is middle-income countries and SACU is the Southern African Customs Union. Source: IMF Direction of Trade Statistics.

In summary, we have seen that African trade has grown slower than in other parts of the world. We have also seen that the typical African is further from world markets than before. In other words, the fast growing countries are generally far away while the neighbours have been growing slowly. These two observations echo one of the findings in Redding and Venables (2003): sub-Saharan Africa's relatively poor export growth is in part due to the relatively slow improvement in access to markets for its products, because its neighbours have grown relatively slowly.[vii] The next section seeks to quantify the effects of growth in trading partners on trade. It also seeks to confirm our preliminary observation that African countries appear to be trading more with each other than before.

4. Modeling Exports

Spillovers can occur through trade if growth in country *j* increases exports from country *i* to country *j*. In this section we aim to measure the extent of these spillovers and to test whether they differ for sub-Saharan African countries using a gravity model. The section describes the gravity model, the data we use and the empirical results.

4.1 Panel Gravity Model

The gravity equation in its simplest form links bilateral trade flows (x_{ij}) to the size of the exporting and importing countries (y_i and y_j) and the distance between them (d_{ij}) (equation 2). All variables are specified in logs unless otherwise indicated.

$$x_{ij} = \beta_0 + \beta_1.y_i + \beta_2.y_j + \beta_3.d_{ij} \quad (2)$$

Since the pioneering work of Tinbergen (1962) and Poyhonen (1963), gravity equations like (2) have had a long and successful history in explaining bilateral trade patterns. Theory has since followed the empirical success of the gravity equation and provided the justification for the multiplicative functional form that it uses (Anderson 1979, Bergstrand 1985). The theory behind the gravity model views distance as a proxy for bilateral trade costs.

A wide variety of other variables may also affect trade costs and have since been included in the gravity equation. These include common language, common border, colonial relationships, being landlocked or an island, having access to navigable rivers or the coast and having migration linkages. A number of country-specific institutional factors can also play a role in determining export performance. These can have a direct impact on trade frictions, for example logistics quality, but also indirect impacts, for example conflict.

The focus on our paper is quite different. Instead of asking about factors affecting trade frictions and supply-side factors, we are primarily interested in the effects of GDP through the demand side. Furthermore, instead of the impact of GDP on sub-Saharan Africa's export levels, we analyse how they have changed through time, particularly whether growth in trading partners impacts on exports. To understand this, we need to embed the gravity model in a panel setting. The equation that we estimate is therefore of the form of equation 3.

$$x_{ijt} = \beta_{ij} + \beta_1.y_{it} + \beta_2.y_{jt} + \gamma_{1t}.SSX_i + \gamma_{2t}.SSM_j + \gamma_{3t}.SSXM_{ij} + \delta_t + e_{ijt} \quad (3)$$

e_{ijt} is an error term. We allow for bilateral fixed effects capturing trade between two particular countries (β_{ij}). These fixed effects may depend on all the unchanging factors cited above such as distance, historical relationships and institutional factors. This addresses omitted variables bias and allows us to focus on the role of trading partner growth. We also allow for time variation in world trade through time-specific constants (δ_t). The coefficients on own and partner country GDP are then capturing how changes in a country's GDP and

changes in its trading partner's GDP impact on bilateral exports. SSX, SSM and SSXM are dummy variables capturing sub-Saharan specific effects, as explained in more detail below.

Estimating a gravity model in a panel data setting is not new. Brun et al (2005) use a panel gravity model to test whether distance has become more or less important through time. They use a random effects estimator, which allows them to better estimate the effects of cross time-invariant variables such as distance. We are primarily interested in growth or spillover effects and therefore use bilateral fixed effects in our main specifications without being able to identify a distance coefficient or other fixed factors.

Egger (2000) uses a simple theoretical framework and empirical testing to argue for the superiority of fixed over random effects in a variety of settings. Monte Carlo support for the use of bilateral fixed effects is provided in Scheafer, Anderson and Ferrantino (2008). Nonetheless, they warn it can be hard to distinguish between genuine fixed effects and trade persistence/hysteresis. Further discussions on the appropriate modelling and interpretation of various types of fixed effects can be found in Cheng and Wall (2005) and in Egger and Pfaffermayr (2003). More general discussions of specification issues can be found in Anderson and van Wincoop (2004) and in Egger and Pfaffermayr (2004), who do so in the context of foreign direct investment (FDI).

A gravity model also has to consider the treatment of zero and missing bilateral trade data, as this may raise potential sample selection issues (Helpman, Melitz and Rubinstein, 2008). We are potentially missing out on information conveyed by bilateral pairs which never trade. In our application, which focuses on countries that already trade, within-group estimation is only potentially affected if the bilateral relationship is zero or missing and then becomes positive (or vice versa). Cases of this are limited.

To capture changes that are specific to sub-Saharan Africa we create three dummy variables.

- SSX is a dummy equal to one if the exporter is in sub-Saharan Africa and zero otherwise;
- SSM is a dummy equal to one if the importer is in sub-Saharan Africa and zero otherwise; and
- SSXM is a dummy equal to one if both the exporter and the importer are in sub-Saharan Africa and zero otherwise.

We allow the coefficients on SSX, SSM and SSXM to change through time to capture changes in the pattern of sub-Saharan African trade.

4.2 Data

We use merchandise export data from the IMF *Direction of Trade Statistics* for 1981 to 2005. This data is in current US$. To remove price effects, we deflate nominal exports by the ratio of nominal to real GDP. In doing this, we are implicitly assuming that export prices for each country pair have the same price index as production. As a robustness check, we also use export specific price deflators from the World Bank, calculated as the ratio of exports of goods and services in current US$ to exports of goods and services in constant US$. We also replicate results using export data from the UN's *Comtrade Database* and using mirrored import data from both the IMF and UN as a test of robustness.

We average bilateral export data and GDP data from 1981 to 2005 over five year periods to remove volatility in export figures. This gives us five periods for our panel. For missing values, we assume the missing value is equal to the average of the values that are available, as long as there is data for at least one year. If missing bilateral data is actually representing periods of zero trade, then we are overstating exports.

We are particularly interested in sub-Saharan Africa. Sub-Saharan trade data may be measured with more error than trade data from, for example, the US. To test for this we can compare US reported imports from Nigeria with Nigerian reported exports to the US. These would be expected to differ only due to the costs of insurance and freight included in import figures. While we often observe substantially different figures reported by each country, the correlation of bilateral exports to mirrored imports is over 0.99 for all countries and 0.97 for intra-sub-Saharan trade. The proportion of bilateral mirrored values that deviate by more than 10 per cent does not appear to be systematically higher for sub-Saharan African countries than for other countries.

4.3 Results

We begin by examining the relationship between partner country growth and exports for all countries. We then use this framework to test whether sub-Saharan African trade has become increasingly regionalized.

Export spillovers

Our investigation of the effects of growth on exports uses a fixed effects specification in Table 2.[viii] We initially estimate the gravity equation with economic size and time period dummies, allowing for no specific sub-Saharan changes. The main coefficient of interest, on the GDP of the partner country (Y2), is estimated as 0.84. This is similar to the coefficients estimated in Brun et al (2005).

In Table 2, we also show results accounting for an AR1 autoregressive component in the error term (Baltagi and Wu 1999).[ix] These estimates are similar to the fixed effects specification, but slightly lower, possibly because they shorten the average length of the panel that we can use for estimation. To test for autocorrelation in an unbalanced panel, we employ the Baltagi-Wu locally best invariant (LBI) test. The test statistic was close to 2, which suggests that autocorrelation is not an issue for the regression. Therefore, we use the standard fixed effects model for the remainder of the paper.[x]

Table 2: Panel gravity model estimation

Dependent variable: Bilateral real exports, IMF, in logs	Fixed effects	Fixed effects accounting for autocorrelation
R^2		
-within	0.11	0.08
-between	0.55	0.55
-overall	0.53	0.25
No. obs.	77 913	53414
No of groups	23 137	19558
σ_u (average error from bilateral specific term)	2.78	2.69
σ_e (average error from observation specific term)	1.41	1.24
Explanatory variables:		
Y1	1.25	0.91
	(0.05)	(0.06)
Y2	0.879	0.79
	(0.04)	(0.05)

Notes: Y1 is log GDP of the exporting country, Y2 is log GDP of the importing country, Distance is log bilateral distance. For 2001-2005 results we use nominal exports and GDP as we do not have to worry about changes through time. Huber-White Heteroskedasticity robust standard errors are in parentheses for the fixed effects model, standard errors after accounting for autocorrelation are reported in the second model. Period dummies are included in the regression but not reported.

The coefficient estimates on own and foreign GDP are fairly robust to the choice of data, even though we are only considering variation within each country pair (Table 3). The first three columns replicate the fixed effects analysis in Table 2 using export data from the UN and using mirrored import data from the UN and IMF. The fourth column uses export prices to deflate bilateral exports instead of GDP prices.

Using these specifications, the coefficient on partner country GDP varies from 0.68 to 0.98 and is always significantly different to zero. The simple average of the coefficients from these robustness checks is 0.81. We conclude that, for a typical country pair, growth in one country leads to increased exports from the other country, after controlling for bilateral fixed factors.

Table 3: Robustness checks: alternative data and price effects

Dependent variable: Bilateral real exports, in logs				
Source	Exports, UN	Mirrored imports, IMF	Mirrored imports, UN	Exports, IMF, using export prices
Obs	73775	81759	81875	67863
No of groups	23309	23988	26035	20187
σ_u	2.60	2.71	2.34	2.73
σ_e	1.24	1.42	1.30	1.33
R^2				
- within	0.12	0.10	0.10	0.14
- betw.	0.54	0.59	0.61	0.56
- overall	0.51	0.56	0.59	0.55
Explanatory variables:				
Y1	1.54	1.08	1.04	1.11
	(0.05)	(0.04)	(0.04)	(0.05)
Y2	0.72	0.83	0.96	0.75
	(0.04)	(0.04)	(0.05)	(0.04)

Notes: Y1 is log GDP of the exporting country, Y2 is log GDP of the importing country. If not otherwise stated nominal trade is deflated using the GDP current to GDP constant price ratio of the exporting country. Huber-White Heteroskedasticity robust standard errors are in parentheses. Period dummies are included in the regression but not reported.

The regionalization of sub-Saharan trade

Figure 3 conveyed the increase in the share of exports from most sub-Saharan countries going to other sub-Saharan countries. The regionalization of sub-Saharan exports could potentially be driven by changes in output in the sub-Saharan region relative to the rest of the world, but our analysis in Figure 1 suggested that the economic distance of sub-Saharan countries has increased, not decreased. To test this, we include our three sub-Saharan dummy variables interacted with time dummies. The dummy coefficients will pick up changes in the patterns of sub-Saharan trade through time, after accounting for changes in country size.

The panel model results with sub-Saharan time dummies are reported in Table 4. For easier interpretation, the time dummies are reported with each time period having its own column and each dummy having its own row. In interpreting coefficients, we must remember that the time dummies capture changes in sub-Saharan exports relative to changes in world exports through time. For instance, the SSX dummy captures the export performance over time by a sub-Saharan country relative to other countries, after accounting for changes in GDP. A negative coefficient for SSX in the 2001-05 column would indicate that, over the period 1981-85 to 2001-05, sub-Saharan exports have risen by less than or fallen by more than exports from other countries, after accounting for changes in GDP.

The SSX dummy is close to zero and not consistently significant. This means that, holding output and a variety of fixed factors constant, sub-Saharan exports to the rest of the world have not risen more than for the rest of the world. The negative SSM dummies suggest exports *to* sub-Saharan Africa from the rest of the world have fallen since 1981-85, relative to exports in general and after accounting for changes in country size. They have not consistently fallen in each of the periods subsequent to 1986-90.

The most striking feature of Table 4 is the upward trend in the SSXM coefficients. This indicates that sub-Saharan African exporters are exporting much more of their exports to other sub-Saharan African countries than they did in 1981-85. The consistently rising coefficients indicate exports have become more and more regionalized every period, as also seen in Figure 5. By 2001-05, sub-Saharan African countries were exporting e^1-1=172% per cent more to a typical sub-Saharan country than to a non-sub-Saharan country than they did in 1981-85, after accounting for changes in GDP and fixed factors.

Table 4: Changes in sub-Saharan trade through time

Dependent variable: Bilateral real exports, IMF				
Obs.	77 913			
Groups.	23 137			
σ_u	2.78			
σ_e	1.41			
R^2				
- within	0.12			
- betw.	0.56			
- overall	0.54			
Coefficients				
Y1	1.30			
	(0.06)			
Y2	0.77			
	(0.05)			
	1986-1990	1991-1995	1996-2000	2001-2005
SSX	-0.12	0.06	0.03	-0.15
	(0.08)	(0.08)	(0.07)	(0.08)
SSM	-0.20	-0.29	-0.41	-0.28
	(0.06)	(0.06)	(0.06)	(0.06)
SSXM	0.36	0.74	0.83	1.00
	(0.15)	(0.15)	(0.14)	(0.15)

Notes: Fixed effects estimator applied to each country pair. Y1 is log GDP of the exporting country, Y2 is log GDP of the importing country, SSX SSM and SSXM are sub-Saharan dummies explained in the text. Huber-White Heteroskedasticity robust standard errors are in parentheses. Period dummies are included in the regression but not reported.

These changes in the pattern of sub-Saharan African trade also emerge if we estimate cross-section regressions for each of our five-year periods and include sub-Saharan dummies (Table 5). We observe that sub-Saharan countries exported about as much to sub-Saharan countries as non-sub-Saharan countries in 1981-85, after accounting for economic size and distance. By 2001-05, they exported $e^{0.93}$-1=153% percent more to a sub-Saharan country than to a non-sub-Saharan country, after accounting for economic size and distance.

In cross-section regressions, we can also test whether a typical trade relationship involving sub-Saharan countries is different to a typical trade relationship not involving sub-Saharan countries, after accounting for economic size and distance between the countries. The negative coefficient on SSX suggests that sub-Saharan African countries exported less to

countries outside their region, on average, than would be expected. They have in some periods also imported less than expected as well, with the coefficient on SSM often being negative.

If we add up the coefficients on SSX, SSM and SSXM, we are comparing typical trade between two sub-Saharan African countries against typical trade between any two non-sub-Saharan countries. We find that the sub-Saharan country pair traded less than a non-sub-Saharan pair in 1981-1985. However, by 2001-05, sub-Saharan country pairs were trading $e^{0.46}$-1=58% per cent more than a non-sub-Saharan pair, after accounting for economic size and distance.

Table 5: Cross-section estimation of the gravity equation

Dependent variable: Bilateral real exports, IMF					
	1981-5	1986-90	1991-5	1996-2000	2001-5
R^2	0.63	0.64	0.65	0.65	0.65
No. obs.	9086	11426	15924	19526	19830
Y1	1.12	1.16	1.19	1.22	1.26
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Y2	0.84	0.88	0.89	0.91	0.96
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Dist.	-1.43	-1.54	-1.48	-1.51	-1.53
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
Sub-Saharan effects					
SSX	-0.32	-0.41	-0.20	-0.18	-0.46
	(0.09)	(0.08)	(0.07)	(0.06)	(0.07)
SSM	-0.03	-0.15	-0.16	-0.19	-0.02
	(0.07)	(0.06)	(0.06)	(0.05)	(0.05)
SSXM	0.08	0.11	0.48	0.58	0.93
	(0.17)	(0.15)	(0.13)	(0.11)	(0.13)
Intra-sub-Saharan trade relative to average relationship	-0.27	-0.45	0.13	0.22	0.46

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

Furthermore, significantly negative SSX dummies show that, relative to the rest of the world, sub-Saharan Africa has systematically exported less to destinations outside of Africa since the early 1980s. This situation has deteriorated in the 2001-5 period.

5. Export spillovers in sub-Saharan Africa

The regression results have documented a positive relationship between growth in trading partners and export growth. For a typical country pair, we have shown that one per cent growth in a trading partner increases bilateral exports by about 0.8 per cent, but growth in a trading partner will have the largest impact on a country's exports if they already trade a lot and if trading partner growth increases demand for the country's exports by a large percentage.

We could calculate intra-sub-Saharan spillovers based on the assumption that this coefficient will also apply to growth in sub-Saharan Africa. However, there may be reasons to expect

that sub-Saharan African countries would benefit more or less from growth in their neighbours than a typical country pair. They may benefit more if income growth leads to agglomeration effects that shift entire industries to sub-Saharan Africa to take advantage of demand in the region.

They may benefit less because income growth may lead to demand for products that are supplied from countries outside the region. Yeats (1998) has pointed out the "non-complementarity" problem in Africa. Complementarity is high if the composition of import needs in an importing country matches the export bundle of an exporting country.

To test whether intra-sub-Saharan spillovers are different, we can include intra sub-Saharan specific dummies in a general regression, as in equation 4. In doing this, we are extending the model in Table 4 to allow the relationship between own and partner country growth and exports to be different for sub-Saharan African country pairs, through the coefficients α_1 and α_2. If α_2 is negative then this indicates that export spillovers from trading partner growth are lower in sub-Saharan Africa than they are in general.

$$x_{ijt} = \beta_{ij} + \beta_1.y_{it} + \beta_2.y_{jt} + \gamma_{1t}.SSX_i + \gamma_{2t}.SSM_j + \gamma_{3t}.SSXM_{ij} + \delta_t + \alpha_1.\mathrm{SSXM}_{ij}.y_{it} + \alpha_2.\mathrm{SSXM}_{ij}.y_{jt} + e_{ijt} \quad (4)$$

Our results, based on the estimation of equation 4, are presented in Table 6. Using IMF export data, we find a negative and significant value for α_2, indicating that sub-Saharan countries have lower export spillovers from growth in the sub-Saharan region than the export spillovers estimated for all country pairs (column i). Subtracting the estimate of α_2 from β_2 gives the total impact of one per cent growth in a sub-Saharan country on exports from each other sub-Saharan country as 0.23 per cent.

We test the robustness of this result using export and mirrored import data from the UN and IMF (columns ii to iv). Using this data, export spillovers in sub-Saharan Africa are estimated as smaller than for a typical country pair with α_2 always being negative. However, the difference is not statistically significant. For none of the data sources do we find any evidence that trade spillovers between sub-Saharan countries are greater than for a typical country pair. Using the evidence in Table 6, we take 0.65 as the estimate of $\beta_2 - \alpha_2$, which is the simple average across the four sources of data that we have used. We can then simulate the impact of growth in sub-Saharan Africa on the exports from other sub-Saharan countries.

Take Mali as an example. In 2006, 4 per cent of its exports went to countries in sub-Saharan Africa. If the rest of sub-Saharan Africa grew by 10 per cent then Mali could expect its exports to increase by 0.26 per cent, holding GDP constant in the rest of the world (10% growth * 4% export share * 0.65 export spillover coefficient).

Table 6: Spillovers specific to sub-Saharan Africa

	(i)	(ii)	(iii)	(iv)
	Real exports, IMF	Real exports, UN	Mirrored real imports, IMF	Mirrored real imports, UN
Obs.	77913	73775	81759	81875
Groups.	23 137	23309	23988	26035
σ_u	3.97	2.75	4.08	3.03
σ_e	1.41	1.24	1.42	1.30
R^2				
- within	0.12	0.12	0.10	0.10
- betw.	0.35	0.52	0.34	0.47
- overall	0.35	0.42	0.33	0.47
Y1	1.29	1.60	1.15	1.08
	(0.06)	(0.05)	(0.05)	(0.05)
Y2	0.82	0.72	0.87	0.98
	(0.05)	(0.05)	(0.05)	(0.06)
Y1.SSXM (α_1)	0.05	-0.09	-0.53	-0.20
	(0.31)	(0.36)	(0.23)	(0.26)
Y2.SSXM (α_2)	-0.59	-0.01	-0.06	-0.14
	(0.20)	(0.21)	(0.24)	(0.36)
SSX time dummy				
1986-1990	-0.12	-0.01	-0.03	0.04
	(0.07)	(0.09)	(0.06)	(0.07)
1991-1995	0.06	0.10	0.02	-0.07
	(0.08)	(0.09)	(0.06)	(0.07)
1996-2000	0.03	0.18	-0.09	-0.03
	(0.08)	(0.09)	(0.06)	(0.07)
2001-2005	-0.15	0.07	-0.03	-0.07
	(0.08)	(0.09)	(0.07)	(0.07)
SSM time dummy				
1986-1990	-0.20	-0.15	-0.05	-0.02
	(0.05)	(0.05)	(0.06)	(0.05)
1991-1995	-0.28	-0.14	0.13	0.14
	(0.06)	(0.05)	(0.06)	(0.06)
1996-2000	-0.41	-0.25	-0.07	0.06
	(0.06)	(0.06)	(0.07)	(0.06)
2001-2005	-0.27	-0.15	-0.31	-0.12
	(0.06)	(0.06)	(0.07)	(0.06)
SSXM time dummy				
1986-1990	0.41	0.06	0.18	0.22
	(0.14)	(0.16)	(0.13)	(0.15)
1991-1995	0.83	0.57	0.60	0.49
	(0.16)	(0.17)	(0.15)	(0.17)
1996-2000	1.00	0.68	0.88	0.59
	(0.19)	(0.21)	(0.18)	(0.21)
2001-2005	1.27	0.69	1.24	0.84
	(0.24)	(0.27)	(0.21)	(0.28)

Notes: Y1 is log GDP of the exporting country, Y2 is log GDP of the importing country, SSX, SSM and SSXM are as described in text. Huber-White Heteroskedasticity robust standard errors are in parentheses. The regressions also include unreported time dummies.

In Table 7, column II, we show potential impacts of growth across the sub-Saharan region for each low-income sub-Saharan country. We base our estimates on 10 per cent growth in sub-Saharan Africa and a spillover coefficient of 0.65. The export effects are generally quite small, as intra-regional trade makes up a relatively small share of total exports. For the median low-income country, exports to sub-Saharan Africa comprise 11 per cent of total exports. But there is also considerable variation in the impacts of regional growth. Countries

such as Zimbabwe, Togo, Senegal, Kenya and Zambia send more than a third of their exports to other sub-Saharan countries. For these countries, regional growth is most important and could lead to increases in total exports of 2-4 per cent. For other countries, such as Chad, whose exports are destined primarily for the USA, regional growth may not impact directly on exports much at all.

Table 7: Export impacts of regional growth

Country	(I) Share of exports to SSA (%)	(II) Impact on exports of 10% SSA growth (%)	(III) Share of exports to SSA MICs (%)	(IV) Impact on exports of 10% SSA MICs growth (%)
Zimbabwe	66.9	4.35	41.4	2.69
Togo	55.0	3.57	1.7	0.11
Senegal	42.8	2.78	2.6	0.17
Kenya	38.0	2.47	1.2	0.08
Zambia	36.3	2.36	22.3	1.45
Malawi	29.7	1.93	12.8	0.83
Cote d'Ivoire	28.4	1.84	3.7	0.24
Benin	26.6	1.73	3.5	0.23
Niger	23.0	1.50	0.1	0.01
Uganda	21.9	1.42	0.9	0.06
Mozambique	20.2	1.31	15.6	1.01
Guinea-Bissau	19.3	1.25	0.1	0.01
Tanzania	17.5	1.13	3.1	0.20
Liberia	16.7	1.09	15.5	1.01
Burkina Faso	14.4	0.93	0.2	0.01
Mauritania	12.6	0.82	2.8	0.18
Burundi	10.8	0.70	0.1	0.00
Ghana	9.3	0.60	2.5	0.16
Nigeria	8.9	0.58	3.8	0.25
Central African Republic	7.0	0.46	0.2	0.02
Gambia, The	6.9	0.45	0.3	0.02
Congo, Dem. Rep.	6.3	0.41	0.7	0.04
Sao Tome and Principe	5.8	0.38	1.3	0.08
Mali	4.0	0.26	1.2	0.08
Somalia	4.0	0.26	0.0	0.00
Rwanda	3.1	0.20	0.3	0.02
Ethiopia	3.1	0.20	0.3	0.02
Sierra Leone	2.5	0.16	0.3	0.02
Madagascar	2.2	0.14	1.7	0.11
Guinea	1.5	0.10	0.2	0.01
Sudan	1.3	0.09	0.0	0.00
Comoros	1.1	0.07	0.1	0.00
Chad	0.4	0.03	0.1	0.01

Notes: Calculations are based on simulated growth of 10 per cent in specific region and no change in GDP elsewhere. The simulations assume a spillover coefficient of 0.65. Export shares are for 2006 from the IMF Direction of Trade Statistics. Share of exports to sub-Saharan middle-income countries and all sub-Saharan countries only includes export figures allocated to specific countries or the Southern African Customs Union.

We also simulate the impact on exports of growth in sub-Saharan middle income countries (Table 7, column IV). For the median low-income country, only 1.2 per cent of exports go to middle-income sub-Saharan countries. Growth in these countries may therefore have limited impacts on exports from many low-income countries. For low-income countries in Southern

Africa such as Zimbabwe, Zambia, Mozambique and Malawi, growth in middle income countries in the region can be important, as South Africa is an important export destination.

The effects we have simulated are generally small and we have argued that this is attributable to current low export shares. In turn, the low intra-African export shares have been attributed to low African GDP. If Africa grows faster than the rest of the world for a sustained period, the export share would change. Therefore, by holding the export share constant in our simulations, we are underestimating the trade-induced neighbourhood effects. Furthermore, if regionalization continues in a sustained manner, the effects would be a little bit larger. Our simulations would only be accurate for relatively short periods of African growth.

6. Conclusions and policy implications

We find that the economic distance of a typical person in sub-Saharan Africa is further from world markets than people in most other regions. The distance has increased since 1980. At the same time, export growth in sub-Saharan Africa has generally been much slower than export growth in the world.

We also document a regionalization pattern in sub-Saharan exports. Despite the slow growth and relatively low spillover effects in GDP within the region, sub-Saharan African countries now trade more with each other than they did in the 1980s. The increase in intra-regional trade has not reflected patterns of growth: countries that have grown have not tended to source a greater share of their exports from within the region. In fact, we find that trading partner growth has a smaller impact on exports within sub-Saharan Africa than it does for a typical country pair.

The regionalization pattern is suggestive of falls in trade barriers on the continent, although there are other possible reasons for this pattern. Yang and Gupta (2007) for example suggest regionalization patterns have not been driven by successful regional integration agreements, which have been unnecessarily complex and not properly implemented. The World Bank (2009) argues regionalization is being observed elsewhere in the world. It suggests this is because of increased fragmentation of the production process into tasks shared by many countries; such fragmentation increases the importance of timely delivery and hence makes trade between countries in the same region more likely than before.

Our paper also estimates potential impacts of growth in sub-Saharan Africa on exports from low-income countries. Growth across SSA of 10 per cent would be expected to lift exports by less than 1 per cent for most countries in SSA. This reflects both the small share of exports typically going to other SSA countries and the low spillovers between SSA countries. The impact of trading partners on total exports is therefore typically small, indicating that African countries may not rely on growth in their neighbours to help their own economic development. Intuitively, this aligns with growing countries demanding products that are not produced within SSA.

By holding the share of exports constant, we are potentially underestimating the impact. Furthermore, should the regionalization pattern continue such that the share of exports to other African countries rises further, trade-related neighbourhood spillovers may rise.

Nonetheless, it appears that sub-Saharan Africa's LIC export fortunes still remain dependent on the world economy and will remain so for the foreseeable future. Modest growth rates abroad would have bigger effects because of the already large size of those markets. Even dramatic growth in SSA would produce moderate trade-related spillover effects. Furthermore, our results have suggested that a typical African pair already overtrades and that a typical African country underexports to the rest of the world, holding other factors constant.

What are the policy implications? Should efforts to integrate continue or should Africa be looking abroad? Our results suggest that, in general, African countries should be trying to exploit export opportunities beyond the continent. For example, it should be taking the opportunities of increased demand from the large and rapidly expanding Indian and Chinese Economies. Furthermore, as these countries grow richer, this may allow Africa to develop new forms of comparative advantage in labour intensive manufactures (Geda and Meskel, 2008) or more likely to benefit from supplying resources to these countries.

Our results also contradict the view that SSA countries can easily use each other in symbiotic economic development. On past evidence (Yeats, 1998), growth in one African country has not tended to provide a platform for other countries to grow. This makes sense if economically growing countries have had rising demand for products not produced in Africa. Economic development in Africa may be more closely tied to its ability to integrate into global supply chains rather than simply supply chains within its own region.

Opening up to the world implies a renewed commitment to multilateral trade agreements, such as the DOHA round of the WTO. At the very least, African countries should not allow regional trade agreements to draw attention from the world stage. Furthermore, multilateral agreements reduce the potential for the trade diverting effects of regional agreements (Jebuni, 1997).

Whether Africa chooses to focus on intra-regional trade or inter-regional trade has implications across many other policy areas, including trade facilitation. While agreements may reduce legal trade costs, transport costs also have an important impact on trade flows (Behar and Venables, forthcoming). Transport is especially expensive in Africa and can be made cheaper with infrastructure provision, ease of transit and especially increased competition in the transport sector (Teravaninthorn and Raballand 2008). This is being increasingly recognized by donors engaged in aid-for-trade (Huchet-Bourdon, Lipchitz and Rousson, 2009).

The additional insight of this paper is that there may be higher value to improving infrastructure that links SSA to the world than that which just links SSA. Port improvements would be a good example of outward-oriented improvement. Worldwide, Wilson, Mann and Otsuki (2003) find port improvements would have an especially beneficial impact on trade.

These implications are especially important for the many small countries whose neighbours are not big. Our arguments echo those of Collier (2007), who writes that such countries must look abroad for exports and, ultimately, economic growth. Collier argues that countries with big African neighbours can to some extent orient their economies to these potential growth poles. We have suggested a handful at most could benefit from trade links with South Africa. In this case, it is important for regional agreements which exist on paper to become effective agreements in practice (Yang and Gupta, 2007). As noted by Khandelwal (2004), the low-

complementarity of SSA countries may mitigate the potential for regional giants like Kenya and South Africa to be effective growth poles. These views are echoed in our results.

What about the landlocked countries who are far from big economies? For these countries, it is essential to make interventions to overcome this geographical disadvantage (Collier, 2007). In other words, if you cannot buy your neighbour's products, the least you can do is ease your neighbour's access to someone who can. In fact, Freund and Rocha (2010) find that transit delays are the most harmful impediment to African exports. To address this problem, cross-border infrastructure corridors are being built throughout the continent (Teravaninthorn and Raballand, 2008) and the example of a one stop border post at Chirundu on the Zambia-Zimbabwe border needs to be replicated. This is an example of simultaneously reducing intra-African trade costs and inter-regional trade costs.

Some policies to reduce trade barriers are expensive. Infrastructure decisions should be based on the costs and benefits of the specific infrastructure, of which the results from this study form only a small component. Besides, interventions to facilitate the movement of goods are a second best solution required because it is hard for people to move across borders. An alternative approach to expensive infrastructure could be to reduce the restrictions on people so they can move to locations that are more economically viable and integrated into the global economy.

References

Anderson, J.E. (1979) "A Theoretical Foundation for the Gravity Equation", *The American Economic Review*, Vol. 69, No. 1, pp 106-116.

Anderson, J.E. and E. van Wincoop (2003), "Gravity with Gravitas: a Solution to the Border Puzzle", *The American Economic Review*, Vol. 93, No. 1, pp 170-192

Anderson, J.E. and E. van Wincoop (2004), "Trade costs", *Journal of Economic Literature*, No. 3., pp 691-751.

Baltagi, B. H. and P. X. Wu (1999), "Unequally Spaced Panel Data Regressions with AR(1) Disturbances," *Econometric Theory*, Vol.15, pp 814–23.

Behar, A., P. Manners and B Nelson (2009), "Exports and Logistics", *Department of Economics Discussion Paper 439.*

Behar, A. and A.J Venables (forthcoming), "Transport Costs and International Trade", in *Handbook of Transport Economics*, eds André de Palma, Robin Lindsey, Emile Quinet and Roger Vickerman.

Bergstrand. J. (1985). "The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence", *The Review of Economics and Statistics*, Vol. 67, No. 3, pp 474-481.

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.

Cheng, I. and H. Wall (2005), "Controlling for heterogeneity in gravity models of trade and integration", *Federal Reserve Bank of St. Louis Review*, Vol. 87, No. 1, pp 49-63.

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

Collier, P. (2007), *The Bottom billion: Why the poorest countries are failing & what can be done about it*, Oxford University Press: Oxford

Egger, P. (2000), "A note on the proper econometric specification of the gravity equation", *Economics Letters,* Vol. 66, pp25-31.

Egger, P. and M. Pfaffermayr (2003), "The proper panel econometric specification of the gravity equation: A three-way model with bilateral interaction effects," *Empirical Economics*, Vol. 28, No. 3, pp 571-580.

Egger, P. and M. Pfaffermayr (2004), "Foreign Direct Investment and European Integration in the 1990s", *The World Economy,* Vol. 27, No. 1, pp 99-110

Foroutan, F. and L. Pritchett (1993), "Intra-sub-Saharan African trade: Is it too little?" *Journal of African Economies,* Vol. 2 No. 1, pp74-105.

Freund, C. and N Rocha (2010), "What Constrains Africa's Exports", *World Bank Policy Research Paper 5184*

Geda, A. and A. Meskel (2008), "China and India's Growth Surge: Is it a curse or blessing for Africa? The Case of Manufactured Exports", *African Development Review*, Vol. 20 No 2, pp 247-272

Helpman, E., M. Melitz and Y. Rubinstein (2008), "Estimating trade flows: Trading partners and trading volumes", *Quarterly Journal of Economics*, Vol. 123 No. 2, pp 441-487

Huchet-Bourdon, M., A. Lipchitz and A. Rousson (2009), "Aid for Trade in Developing Countries: Complex Linkages for Real Effectiveness", *African Development Review*, Vol. 21 No. 2, pp 243-290

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.

Jebuni, C.D. (1997), 'Trade Liberalization and Regional Integration in Africa', in A.Oyejide, I. Elbadawi and P. Collier (eds.), *Regional Integration and Trade Liberalization in Sub-Saharan Africa*, Macmillan, London.

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

Khandelwal, P. (2004), "COMESAand SADC: Prospects and Challenges for Regional Integration", *IMF Working Paper, WP/04/227*, IMF: Washington

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

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

Poyhonen, P (1963). "A Tentative Model for the Volume of Trade between Countries", *Welwirstschaftliches Archiv* 90: 93-99

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

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

Rodrik, D. (1998), "Trade Policy and Economic Performance in Sub-Saharan Africa", *NBER Working Papers,* No. 6562, May.

Scheafer, Anderson and Ferrantino (2008), "Monte Carlo Appraisals of Gravity Model Specifications", *Global Economy Journal*, Vol. 8 No. 1, Article 2.

Teravaninthorn, S. and G. Raballand (2008), *Transport Prices and Costs in Africa: A Review of the Main International Corridors*, Washington: The World Bank

Tinbergen, J (1962). *Shaping the World Economy: Suggestions for an International Economic Policy*, New York: Twentieth Century Fund.

Wilson, J, C Mann and T Otsuki (2005), "Assessing the benefits of trade facilitation: a global perspective", *The World Economy*, Vol. 28 No. 6, pp 841 - 871

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

World Bank (2009), *World Development 2009: Reshaping Economic Geography*, Washington: World Bank

Yang and Gupta (2007), "Regional Trade Arrangements in Africa: Past Performance and the Way Forward", *African Development Review*, Vol. 19 No. 3, pp 399-431

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, pp 135-156.

Yeats, A (1998), "What can be expected from African Regional Trade Arrangements? - Some Empirical Evidence", *World Bank*

Endnotes

[i] See for example Portes and Rey (2005), Rauch and Trindale (2002), Overman, Redding and Venables (2003), Anderson and van Wincoop (2003), Loungani et al (2002), Keller (2002) and Javorcik (2004).

[ii] We do not claim that the choice of method used by previous papers is inappropriate to their purposes. Brun et al (2005) are particularly interested in the distance coefficient, which fixed effects would eliminate, and use alternative methods to address potential endogeneity bias. Similarly, the fixed effects reported by Coe and Hoffmaister (1999) contain information of direct interest to them. Besides, computing power may have been an obstacle to a full specification of dummies given their use of a non-linear estimator.

[iii] The distance measure used is distw from CEPII, http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

[iv] The measures for region R is $d_R = \frac{\sum_j POP_j . d_j}{\sum_j POP_j}$ for all j countries in region R.

[v] 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 Southern 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 be less accurate at the commodity level. Yeats (1990) discusses the accuracy of sub-Saharan historical data in some detail.

[vi] 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.

[vii] Referring to this as foreign market access, Redding and Venables (2003) attribute a substantial proportion of the variation in export growth to changes in import demand, especially from close countries. Our focus is demand-side linkages like these, but Redding and Venables also model supply-side linkages, which are also influenced by institutional factors. Overall, they find that the poor export performance in sub-Saharan Africa is due about in equal parts to poor external geography , poor internal geography and poor institutional quality.

[viii] Estimates using random effects or pooled OLS are reasonably similar to the fixed effects mode. The fixed effects model is preferred as a Hausman test rejects the coefficients from the random effects specification.

[ix] We thank an anonymous referee for this suggestion.

[x] With this data, it is not possible to test the sensitivity of the results to heteroskedasticity and autocorrelation simultaneously using generalized least squares estimation. Our software package (Stata 10 MP) was not able to perform the computation because there are more than 20 000 bilateral relationships that form the fixed effects for the model.