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Using Observable Trade Data to Measure Bilateral Trade Costs in Sub-Saharan Africa

By

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Abstract

Following closely the analytical approach adopted by Head and Mayer (2004) and Novy (2010), this paper derives a micro-founded bilateral trade cost measure for sub-Saharan Africa (SSA) as a function of observable domestic and inter-national trade data. The derived measure of trade cost by Novy (2010), consistent with the Ricardian and heterogeneous firm's models of trade, enables us to track changes in trade costs in SSA over time. This is a significant contribution to the trade cost literature in SSA because measures of many components of trade frictions in SSA have been unreliable.

Based on bilateral trade data from BACI and production figures from the Trade, Production and Protection database by Nicita and Olarreaga (2007) for the period 1980-2003, our estimates of the tariff equivalent bilateral trade costs measure indicate that on average trade costs in SSA are relatively higher than other regions, confirming evidence which indicates trading costs in SSA to be the highest within the global trading system. The estimates indicate that SSA countries traded with each other at a lower cost than they did with other regions with the exception of the EU. Within SSA, member countries of economic blocs traded at relatively lower costs than trade with non-member countries. Using each of the main five economic blocs within SSA as a reference, overall average relative bilateral trade costs within bloc was significantly lower than across blocs. This paper therefore argues for increased efforts at regional integration within SSA to derive benefits from lower trade costs.

JEL Classification: F10, F13, F14, O55, O57

Keywords: Trade Costs, Gravity Model, Bilateral Exports, sub-Saharan Africa

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Outline

1. Introduction and Motivation
2. Literature Review
3. Methodology
4. Results and Discussion
5. Concluding Comments

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1. Introduction and Motivation

Within the modern stream of international trade research, trade costs have engaged the attention of international trade economists due to their importance in explaining the direction and volume of trade between countries. The steady historic decline in trade costs has undoubtedly been one of the main reasons for the increase in international trade to the extent that almost every country trades more today than it did decades ago.

The attention of researchers has been focused on the components and impact of trade costs, with less specific work on the measurement of trade costs. This has mainly been due to the fact that trade costs are inherently difficult to measure because most components that make up trade costs are not quantifiable.

To overcome the inherent difficulty in measuring components of trade costs, economists have indirectly inferred such trade costs from trade flows and prices. To address some of the limitations of the indirect inference approach, this paper applies the micro-founded analytical approach following Head and Ries (2001), Head and Mayer (2004) and Novy (2010), to develop a measure of international trade costs from the gravity equation to measure trade costs in SSA.

Sub-Saharan Africa (SSA) lags behind in terms of global trade flows for a variety of reasons. Non-tariff barriers, poor infrastructure, higher transport costs, inefficient ports, technical standards, remoteness and long overland distances are significant obstacles to both intra-SSA and global trade, meaning the costs of exporting are relatively high among SSA countries. For instance Limao and Venables (2001) and many other studies have argued that, the relatively low level of SSA trade flows is largely due to the poor state of infrastructure.

With respect to intra-SSA trade the major reason for low levels of trade is that most SSA countries do not demand (import) primary commodities (the main exports of SSA countries). However at a disaggregated product level (e.g. food and "simple" manufactures), intra-SSA trade is not so low, especially taking into account that quiet a substantial proportion of intra-SSA trade goes unrecorded.

If SSA countries do not demand (import) primary commodities, the main export commodity of SSA countries, then it means that promoting trade (especially of primary commodities) among SSA countries per se would not be optimal especially if it comes at the cost of more beneficial trade with countries outside SSA. This might partly explains why very little trade goes on between SSA countries in spite of trade liberalisation and the improved market access conditions created by regionalization and/or economic integration.

In addition to the potentially high trade costs in SSA and export structure (primary commodities dependence), there are limitations in reforms that have sought to encourage intra-SSA trade and trade with the rest of the world mainly because of the inability to measure trade cost accurately.

Data on many components of trade frictions (especially NTBs) in SSA and multilateral resistance are not readily available or limited if available.

The micro-founded analytical approach by Head and Ries (2001), Head and Mayer (2004) and Novy (2010) therefore offers opportunities to expand the trade cost literature on developing countries especially in SSA. Analytically solving the gravity equation for the micro-founded bilateral trade cost measure (a function of observable trade data) implies that changes in trade costs over time could be tracked with time series and panel data. The analytical solution is not only useful but interesting because it relates unobservable multilateral trade barriers to observable trade data by showing that multilateral resistance is a function of domestic trade flows. The analytical solution will also allow for a relative measure of trade costs to be obtained and this will be an input to inform trade policy initiatives in SSA.

Exploiting the Head and Ries (2001), Head and Mayer (2004) and Novy (2010) approach, this paper proposes to

I. Estimate trade costs between countries in SSA and their trading partners elsewhere using observable trade data and without imposing arbitrary trade costs functions.

II. Track the variation in the estimated trade costs overtime for SSA and other regions so as to identify the factors that account for changes in the estimated bilateral trade costs in SSA.

2. Literature Review

2.1 Measuring Trade Costs

A review of the literature on trade cost indicates an overwhelming concentration on the indirect measures of trade costs. Most studies have mainly focused on estimating various versions of the gravity model to infer bilateral trade costs either adopting the conditional or the unconditional general equilibrium frameworks.

For almost five decades, trade economists have used gravity models to explain the impact of trade frictions on bilateral trade flows (Bergstrand and Egger, 2011). Following from Tinbergen's (1962) benchmark gravity model for explaining bilateral trade flows, two main theoretical approaches emerged in the international trade literature, namely the conditional and unconditional general equilibrium frameworks. According to Bergstrand and Egger (2011), the main difference between these two approaches was the assumption made about the "separability" of production and consumption decisions from decisions made about the choice of bilateral trade countries.

Being an endowment based model, the conditional general equilibrium approach assumed production and therefore consumption decisions as given and that each country specialized wholly in the production of its own good, which for each country is produced exogenously. The unconditional general equilibrium approach recognized the absence of separability of production and consumption decisions from bilateral trade decisions by making the roles of technology and market structure more explicit (Bergstrand and Egger, 2011).

Two main versions of the conditional general equilibrium gravity equations have been estimated, the "traditional" and "theory-based" versions. The traditional gravity equation to infer unobservable trade costs following from Tinbergen (1962) and Anderson (1979) is of the form;

$$x_{ij} = \varphi_1 y_i + \varphi_2 y_j + \sum_{m=1}^{M} \beta_m ln(z_{ij}^m) + \varepsilon_{ij} \qquad (1)$$

Where x_{ij} is the log of exports from exporter i to importer j, y_i and y_j are the log of GDP of the exporter and importer, z^m_{ij} (m=1,.., M) is a set of observables to which bilateral trade frictions/barriers are related and ε_{ij} is the disturbance term. An underlying assumption made in deriving equation (1) was that prices are unitary across producers implying symmetry in trade costs. Bergstrand (1985) made an attempt to include prices in equation (1) because of the presence of asymmetric trade costs and found that price indexes influenced bilateral trade flows (Bergstrand and Egger, 2011).

A subsequent theoretical refinement of equation (1) was made by Anderson and van Wincoop (2003) following from the findings of McCallum (1995). McCallum (1995) estimated a version of equation (1) for U.S. states and provinces of Canada with two z variables (bilateral distance and a dummy variable that is equal to one if the two regions are located in the same country and equal to zero otherwise). After controlling for distance and size McCallum (1995) found trade between provinces to be twenty-two times more than trade between states and provinces, suggesting that there were substantial trade costs incurred in trade across the United States-Canada border.

Anderson and van Wincoop (2003) argued that the highly overstated impact of national borders on bilateral trade (as found by McCallum) was because the traditional gravity model failed to account for the impact of multilateral trade resistance (i.e. the average trade resistance between a country and its trading partners with the rest of the world) on bilateral trade costs. Anderson and van Wincoop (2003) were therefore motivated to provide a theoretical refinement of the traditional gravity model (henceforth, "theory based" gravity model) to include multilateral trade resistance variables.

The various studies that have made use of the "theory based" gravity model (an enhanced conditional general equilibrium model) have estimated in different ways the gravity equation of the form;

$$x_{ij} = \frac{y_i y_j}{y^w} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma} \qquad (2)$$

Where; $$t_{ij} = \sum_{m=1}^{M} \left(Z_{ij}^{m}\right)^{\gamma m} \qquad (3)$$

Where x_{ij} is nominal exports from country i to j, y_i and y_j is the nominal income (GDP) of exporter i and importer j respectively, y^w is nominal world income (total world GDP), t_{ij} is the bilateral trade costs, γ is the elasticity of substitution among goods, Π_i and P_j are outward and inward multilateral resistance variables respectively. In addition z^m_{ij} (m=1... M) is a set of observables to which bilateral trade frictions/barriers are related.

Studies that made use of the "traditional" gravity model include McCallum (1995), Wei (1996), and Evans (1994) to estimate national border costs; Harrigan (1993), Trelfer (1993), Lee and Swagel (1997) to estimate non-tariff policy barrier costs; Rose (2000), Rose and van Wincoop (2001), Alesina, Barro and Tenreyro (2002) and Jacks, Meissner and Novy (2008) to estimate currency barrier costs; and Head and Ries (1998), Gould (1994), Evans (2003) and Portes and Rey (2005) to estimate information barrier costs. With regards to the "theory-based" model, studies such as Head and Ries (2001), Eaton and Kortum (2002), Anderson and Van Wincoop (2003, 2004) made use of the model to estimate trade barrier costs; Anderson and Van Wincoop (2003) to estimate national border costs and Anderson and Marcouiller (2002) to estimate contract enforcement costs.

Following from the criticisms relating to the empirical validity of the theoretical assumptions underlying the trade cost function[1] a new strand of promising trade cost literature has emerged. Studies such as Engel (2002), Head and Ries (2001), Head and Mayer (2004) and Novy (2010) showed that the traditional and theory based versions of the gravity model underestimates border barrier costs because it does not consider the non-tradable (domestic trade) sector. Trade barriers do not only affect international trade but domestic trade as well. The intuition behind this argument is straightforward. A change in trade barriers will lead to a shift in resources between the tradable sector and nontradable sector (import competing) and this will result in changes in trade flows (either bilaterally or multilaterally). This is especially the case for multilateral resistance of the trading countries because it does depend on domestic trade. This implies that there is the need to include domestic trade in the gravity equation to account for the home bias.

In addition, Novy (2010) argued that the symmetric assumption underlying trade costs within the gravity model might not hold in all cases. Empirically it is possible for one country to impose a higher tariff than the other partner in a trading relation (possibly because of more stringent quality standards and technical requirements), a situation likely for SSA countries within the world trading system.

[1] Omission of the non-tradable sector in the trade cost function, symmetric assumption about outward and inward multilateral resistance, the inclusion of time invariant proxies and omission of important frictions to trade.

The "missing globalization puzzle" (missing trade flow component when predicted trade flows are compared with actual trade flows) has also called to question the use of standard gravity equations to measure trade costs. Coe et al (2002) and other studies have suggested that the inability to explain "missing trade" could be as a result of failure to capture all trade costs components because of lack of information and hidden transactions costs. For instance the inclusion of time-invariant trade cost components such as distance in the gravity equation has meant that the estimates of distance elasticity of trade costs obtained from the gravity equation has remained unchanged in spite of declining transport costs.

Novy (2010) makes an attempt to infer trade costs from trade flows without relying on the trade cost function. Section 2.2 discusses the approach used in deriving the micro founded measure of trade cost. The generality of the measure is discussed in section 2.3

2.2 A Micro-Founded Measure of Bilateral Trade Costs

By building on Anderson and van Wincoop's (2003) micro-founded (i.e. theory based) gravity equation with trade costs, Novy (2010) allows for trade costs to be inferred from easily observable time-varying data without imposing trade cost function (with "questionable" assumptions).

The motivation for Novy's approach was to overcome the drawbacks that were associated with the theory-based gravity framework by Anderson and van Win-coop (2003). The theory-based gravity formulation was a refinement of the traditional gravity equation to include multilateral trade resistance variables. As stated in equation (2) bilateral trade flows depend not only on the bilateral trade barrier but also on the multilateral trade barriers of the two countries involved in the trade relation. The drawback with this framework has to do with the assumptions made by Anderson and van Wincoop (2003) about the multilateral trade resistance variables.

According to Anderson and van Wincoop (2003), the multilateral trade resistance variables in equation (2) which captures the bilateral countries average international trade barriers with all their trading partners can be expressed as;

$$\text{Outward} \qquad \Pi_i^{1-\sigma} = \sum_j P_j^{\sigma-1}\theta_j t_{ij}^{1-\sigma} \quad \forall_i \qquad (4)$$

$$\text{Inward} \qquad \mathrm{P}_j^{1-\sigma} = \sum_i \Pi_i^{\sigma-1}\theta_i t_{ij}^{1-\sigma} \quad \forall_j \qquad (5)$$

Where θ_i and θ_j is the share of world income of country i and j defined as $\theta_i = y_i/y^w$ and $\theta_j = y_j/y^w$ respectively. From equations (4) and (5) bilateral trade costs t_{ij} are summed over and weighted by all destination countries j or origin countries i.

To implicitly solve for multilateral trade resistance (because there are no readily available direct measures of average trade costs) from equations (4) and (5), Anderson and van Wincoop (2003) assumed a bilateral trade cost function of the form $t_{ij} = b_{ij}\, d^{\rho}$ where b_{ij} is the bilateral border indicator between i and j, d_{ij} is the bilateral distance and ρ is the distance elasticity. Trade costs between the two countries i and j were also assumed to be symmetric (i.e. $t_{ij}=t_{ji}$). This implied symmetry between outward and inward multilateral trade resistance between countries i and j (i.e. $\Pi_i=P_j$). Novy (2010) identified three drawbacks with the assumptions made by Anderson and van Wincoop (2003) with respect to the bilateral trade cost formulation due to the possibility of a functional form misspecification and omitted variable(s) problem. Indeed the trade cost function as stated did not include important trade costs determinants such as tariffs and logistics.

Secondly, Novy noted that in practice trade barriers are not time invariant as assumed because over time trade barrier costs have declined as countries phase out tariffs and as transportation costs decline. The inclusion of time invariant proxies such as geographic distance and borders was therefore not useful in capturing empirically time-varying trade costs.

Thirdly, if countries impose different tariffs in their trade relations (as is normally the case), then it is implausible to assume that bilateral trade costs are symmetric. In so far as a country can impose a higher tariff on imports from a partner country relative to what that partner country imposes, bilateral trade costs are asymmetric(i.e. $t_{ij}\neq t_{ji}$). Even if trade tariffs between the two countries are assumed to be the same, it is impractical to assume that other trade frictions will also be the same. Thus it follows that outward and inward multilateral trade resistance between countries i and j are not the same (i.e. $\Pi_i\neq P_j$).

In the light of these drawbacks, Novy (2010)[2] derived an explicit analytical solution for the multilateral trade resistance variables and with that solved the trade costs function. This approach relies on the argument that changes in trade barriers do not only affect international trade but domestic trade as well. In practice when a country phases out or reduces trade tariffs, some goods that are produced for domestic consumption are shipped to foreign countries, implying that trade barriers impact on domestic trade as well.

Following from equation (2), Novy specifies country i's domestic trade flow as;

$$X_{ii} = \frac{y_i^2}{y^w}\left(\frac{t_{ii}}{\Pi_i P_i}\right)^{1-\sigma} \qquad (6)$$

Where x_{ii} and t_{ii} are domestic (intra-national) trade flows and trade costs respectively of country i. From equation (6), the product of the multilateral resistance variables can be solved as;

$$\Pi_i P_i = \left(\frac{X_{ii}/y_i}{y_i/y^w}\right)^{1/\sigma-1} t_{ii}$$

[2] Similar to Head and Mayer (2004)

$$\frac{\Pi_i P_i}{t_{ii}} = \left(\frac{X_{ii}/y_i}{y_i/y^w}\right)^{1/\sigma-1} \qquad (7)$$

As indicated in equation (7), if domestic trade flows in country i (t_{ii}) is known, then given nominal income in country i (y_i), world income (y^w) and the elasticity of substitution (σ), the multilateral trade resistance variables Π_i and P_i would be known. Similarly for country j;

$$\Pi_j P_j = \left(\frac{X_{jj}/y_j}{y_j/y^w}\right)^{1/\sigma-1} t_{jj}$$

$$\frac{\Pi_j P_j}{t_{jj}} = \left(\frac{X_{jj}/y_j}{y_j/y^w}\right)^{1/\sigma-1} \qquad (8)$$

Clearly equations (7) and (8) show that multilateral trade resistance relative to trade costs does not depend on time-invariant proxies but rather easily observable time-varying trade data. The explicit solution for the multilateral resistance variables can be used to solve for bilateral trade costs from the general equilibrium model. To do this Novy (2010) obtained a bidirectional gravity equation by multiplying corresponding gravity equations for domestic trade flows from the opposite direction (i.e. $X_{ij}X_{ji}$). That is;

$$X_{ij}X_{ji} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\Pi_i P_j}\right)^{1-\sigma}\left[\frac{y_j y_i}{y^w}\left(\frac{t_{ji}}{\Pi_j P_i}\right)^{1-\sigma}\right] = \left(\frac{y_i y_j}{y^w}\right)^2\left(\frac{t_{ij}t_{ji}}{\Pi_i P_i P_j \Pi_j}\right)^{1-\sigma} \qquad (9)$$

From equations (7), (8) and (9);

$$X_{ij}X_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2\left[\frac{t_{ij}t_{ji}}{\left[\left(\frac{X_{ii}/y_i}{y_i/y^w}\right)^{1/\sigma-1} t_{ii}\right]\left[\left(\frac{X_{jj}/y_j}{y_j/y^w}\right)^{1/\sigma-1} t_{jj}\right]}\right]^{1-\sigma} = X_{ii}X_{jj}\left(\frac{t_{ii}t_{jj}}{t_{ij}t_{ji}}\right)^{\sigma-1} \qquad (10)$$

Re-arranged

$$\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}} = \left(\frac{X_{ii}X_{jj}}{X_{ij}X_{ji}}\right)^{1/\sigma-1} \qquad (11)$$

Since bilateral as well as domestic trade costs can be asymmetric (i.e. $t_{ij} \neq t_{ji}$ and $t_{ii} \neq t_{jj}$), the tariff equivalent total trade costs (τ_{ij}) could be obtained by taking a geometric mean of trade costs in both directions minus one;

$$\tau_{ij} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1/2} - 1 = \left(\frac{X_{ii}X_{jj}}{X_{ij}X_{ji}}\right)^{1/2(\sigma-1)} - 1 \qquad (12)$$

Where τ_{ij} is the total trade cost (i.e. measures bilateral trade costs relative to domestic trade costs), $t_{ij}t_{ji}$ is the bilateral trade costs of countries i and j and $t_{ii}t_{jj}$ is the domestic trade costs of countries i and j. The measure of the international component of trade costs net of distribution costs in the destination country is given as $\left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)$. This captures what makes international trade costly over and above domestic trade.

Intuitively equation (12) indicates that an increase in bilateral TC relative to domestic TC leads to a decline in τ_{ij} and makes it easier for i and j to trade (increase in bilateral relative to domestic trade). Similarly, if bilateral trade flows increase relative to domestic trade flows, one can infer that it has become easier for the two countries to trade (possibly because bilateral trade costs have declined relative to domestic trade cost), and this will be reflected in a decline in total trade costs.

2.3 Generality of the Micro-Founded Trade Cost Measure

Novy (2010) showed how the micro-founded trade cost function is not specific to the endowment (conditional general equilibrium) model but that it can be derived from unconditional general equilibrium trade models - the Ricardian model by Eaton and Kortum (2002) and the heterogeneous firm's models by Chaney (2008) and Melitz and Ottaviano (2008).

The Ricardian trade model of Eaton and Kortum (2002) sought to capture the interactions between the forces of comparative advantage and geographic distance by emphasizing the negative impact of distance (forces of gravity) on trade, price variation across locations, differing factor rewards across countries as well as variation in relative productivities across industries and countries. By placing emphasis on the supply side as compared to the demand or consumption based analysis by Anderson and van Wincoop (2003), Eaton and Kortum's model demonstrated that the gravity equation can be derived from the Ricardian specification by generalising the Dornbusch, Fischer and Samuelson (1977) model to multiple countries and modelling technology and therefore productivity as a random process (similar to Melitz) which is drawn from a Frechet (Type II extreme value) distribution (ϑ) assumed to be independent across industries and countries.

Each country can produce every single good in the global "goods basket", however there will be only one lowest-cost producer country who will have an average absolute productivity advantage in producing that good. That lowest-cost producer country will produce and serve all other countries provided that the cross-country price difference exceeds the variable bilateral iceberg trade costs, t_{ij}.

If the probability that country i produces a good at the cheapest cost globally (i.e. as compared to other countries j) is given as $\pi_{ij} = \frac{T_i(c_i t_{ij})^{-\vartheta}}{\sum_{i=1}^{J} T_i(c_i t_{ij})^{-\vartheta}}$ then since there is a continuum of goods, country i's share in destination country j's expenditure will be given as;

$$\frac{X_{ij}}{y_j} = \pi_{ij} = \frac{T_i\left(c_i t_{ij}\right)^{-\vartheta}}{\sum_{i=1}^{J} T_i\left(c_i t_{ij}\right)^{-\vartheta}} \qquad (13)$$

Where parameter T_i captures country i's (country-specific) state of technology ('efficiency level') reflecting its average absolute productivity advantage. A high T_i denotes high overall productivity. The cost of a bundle of inputs in country i is given as c_i, t_{ij} is the iceberg international trade costs denoted as the number of units shipped from country i to j for one unit of the good to arrive, X_{ij} is the expenditure by country j on good from country i and y_j is the total expenditure of destination country j on all goods. The parameter $\vartheta > 1$ common to all countries is a measure of comparative advantage and captures the variation in the productivity distribution, with a low ϑ denoting higher heterogeneity and implying that comparative advantage exerts a stronger force for trade.

Following from equation (13), the model yields a gravity equation of bilateral trade flows as

$$X_{ij} = \frac{T_i\left(c_i t_{ij}\right)^{-\vartheta}}{\sum_{i=1}^{J} T_i\left(c_i t_{ij}\right)^{-\vartheta}} y_j \qquad (14)$$

According to Novy (2010), from equation (14) it is not possible to isolate the iceberg trade cost parameter t_{ij} in terms of observable variables because T_i and c_i are generally unknown. Novy therefore uses a similar analytical approach as applied to Anderson and van Wincoop (2002). The trade cost measure derived from Eaton and Kortum (structurally identical to that derived from Anderson and van Wincoop) relates the combination of bilateral and domestic trade cost to the ratio of domestic trade over bilateral trade as;

$$\tau_{ij_{EK}} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1/2} - 1 = \left(\frac{X_{ii}X_{jj}}{X_{ij}X_{ji}}\right)^{1/2\vartheta} - 1 \qquad (15)$$

Novy (2010) argues that equations (12) and (15) imply virtually the same trade cost measure since $\vartheta = \sigma - 1$. This means that the micro founded trade cost measure from the Anderson and van Wincoop theory based gravity equation is the same as that derived from the Ricardian model. On the supply side, Novy argues that because trade is driven by comparative advantage, the sensitivity of trade cost to trade flows as derived from the Ricardian model (as in equation 15) depends crucially on the degree of heterogeneity in relative productivities of countries which is given by ϑ. Similarly on the demand side, equation (12) clearly shows that when trade is driven by love for varieties (based on the Armington assumption that consumers perceive products as different because they come from different countries/locations), the sensitivity of trade cost to trade flows depends on the degree of product differentiation which is determined by the value of σ.

Based on the Melitz (2003) heterogeneous firm framework, Chaney (2008) derived a heterogeneous firm gravity equation with variable and fixed trade costs. The inclusion of both variable and fixed trade costs was based on the argument that variation in trade costs (i.e. transportation cost) does not only affect the export volume of existing exporters (intensive margin) but also the number of exporters (extensive margin). The introduction of bilateral fixed costs of exporting showed that, although the elasticity of aggregate trade with respect to trade barriers (variable and fixed) is negatively related to the elasticity of substitution, the variable trade costs enters the gravity equation with an exponent that depends only on the productivity level while the fixed trade costs enter with an exponent that is inversely related to the elasticity of substitution. With firms having different levels of productivity depending on their draws which is assumed to stem from a Pareto distribution with shape parameter γ, Chaney (2008) derived an aggregate gravity equation of the form;

$$X_{ij} = \mu \frac{Y_i Y_j}{Y^w} \left(\frac{w_i t_{ij}}{\rho_j} \right)^{-\gamma} \left(f_{ij} \right)^{-\left(\frac{\gamma}{\sigma - 1} - 1 \right)} \qquad (16)$$

Where ρ is a weighted measure of differentiated products in the consumer's utility function. Assuming that the economy can be modeled as having one sector of differentiated products (can be generalized to multiple sectors), equation (16) shows total exports (f.o.b) X_{ij} in a sector from country i to j as being a function of country sizes (Y_i and Y_j), workers' productivity in country i (w_i), variable bilateral trade barrier costs (t_{ij}), fixed bilateral trade costs (f_{ij}) and a measure of country *j's* remoteness from the rest of the world (akin to multilateral resistance). Relating the combination of bilateral and domestic trade cost to the ratio of domestic trade over bilateral trade flows, Novy (2010) made use of equation (16) to obtain a trade cost measure of the form;

$$\tau_{ij_{CH}} = \left(\frac{t_{ij} t_{ji}}{t_{ii} t_{jj}} \right)^{1/2} \left(\frac{f_{ij} f_{ji}}{f_{ii} f_{jj}} \right)^{\frac{1}{2}\left(\frac{1}{\sigma - 1} - \frac{1}{\gamma} \right)} - 1 = \left(\frac{X_{ii} X_{jj}}{X_{ij} X_{ji}} \right)^{1/2\gamma} - 1 \qquad (17)$$

The elasticity of the trade cost measure to trade flows in equation (17) depends on the productivity distribution parameter γ that governs the extensive margin of exporting (i.e. exit and entry of firms in to export markets). Melitz and Ottaviano (2008) develop a monopolistically competitive heterogeneous firm model of trade. Firm heterogeneity defined in terms of productivity differences and endogenous differences in terms of the toughness of competition (based on firm numbers and average productivity of firms in that market) across markets. By making use of non-CES preferences they show how an endogenous distribution of mark-up across firms (resulting from the toughness of competition in a market) and productivity differences among firms vary across markets of different sizes that are not perfectly integrated through trade. Based on firms different levels of productivity depending on their draws (assumed to stem from a Pareto distribution with shape parameter k), market size and trade impacts on the toughness of competition and therefore distribution of mark-ups. The impact on toughness of competition and distribution of mark-ups in turn feeds back into the selection of heterogeneous producers (in terms of productivity differences) and exporters in that market. Their motivation was to provide a useful modeling framework suited to the analysis of trade and regional integration in a market where there are heterogeneous firms and endogenous mark-ups.

Heterogeneous firms face sunk costs of market entry, f_E, such as production start-up costs and product development and once they enter the export market they only face variable costs of exporting and no fixed costs. Based on a multilateral model of heterogeneous firms, asymmetric trade costs and comparative advantage, Melitz and Ottaviano (2008) derive a gravity equation for bilateral trade flows from country *i* as;

$$X_{ij} = \frac{1}{2\varphi(k+2)} N_i^E \psi_i L_j \left(C_j^D\right)^{k+2} \left(t_{ij}\right)^{-k} \qquad (18)$$

Bilateral exports from country *i* to *j* is a log-linear function of bilateral trade barrier costs (t_{ij}) and country characteristics such as the degree of product differentiation (φ), the number of entrants (firms) into export markets in country *i* (N_i^E), an index of comparative advantage in technology of country *i* (ψ_i), the number of consumers in country *j* (L_j), and the marginal cost threshold above which domestic firms in country *j* do not produce$\left(C_j^D\right)$. Using the same approach in arriving at equations (15) and (17), Novy (2010) obtains a trade cost measure from (18) as

$$\tau_{ij_{MO}} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1/2} - 1 = \left(\frac{X_{ii}X_{jj}}{X_{ij}X_{ji}}\right)^{1/2k} - 1 \qquad (19)$$

The trade cost measures in (17) and (19) are the same although (17) incorporates fixed costs of exporting (as discussed by Chaney, 2008) whilst in (19) there is no fixed cost of exporting (Melitz and Ottaviano, 2008). This is so because while Chaney (2008) considered fixed and variable cost of exporting, Melitz and Ottaviano (2008) argued that exporting firms only face variable costs of exporting because all fixed costs are incurred before entry into the export market. The derived measure of trade cost by Novy (2010) is therefore consistent with the Ricardian and heterogeneous firms' models of trade.

3. Methodology

3.1 Empirical Model

The empirical approach adopted in this paper is to estimate a trade cost equation that expresses the trade cost parameters as a function of observable trade data, derived in equation (12) as;

$$\tau_{ij} = \left(\frac{X_{ii}X_{jj}}{X_{ij}X_{ji}}\right)^{1/2(\sigma-1)} - 1 \qquad (20)$$

Where τ_{ij} is the tariff equivalent trade cost (i.e. measures domestic trade relative to bilateral trade), X_{ii} and X_{jj} is the domestic trade of countries i and j respectively, X_{ij} and X_{ji} is the bilateral trade of countries i and j respectively, and σ is the elasticity of substitution.

Based on the estimates obtained from equation (20), this paper as an application will seek to find out the trends in the estimated relative average tariff equivalent trade costs for countries from the different regions involved in the global trading system and how that compares with SSA. In addition, this paper will seek to identify the factors responsible for the variation in the estimated tariff equivalent trade costs overtime especially with regards to the bilateral trade costs involving SSA countries. With respect to intra-SSA trade, this paper will compare the trends in the estimated tariff equivalent trade costs among the countries within the different economic blocs/sub-regions within SSA.

3.2 Data

Data for our analysis is constructed from the Trade and Production Database published by CEPII. This dataset provides an updated version of the worldwide data used in Mayer and Zignago (2005). The database contains two main groups of information. The first group which is in two parts covers 28 industrial sectors in the ISIC (International Standard Industrial Classification) Revision 2.

The first part is bilateral trade for 1980-2003 based on BACI, one of the most exhaustive worldwide datasets publicly available. The second part is an extension of industrial production figures from the Trade, Production and Protection database by Alessandro Nicita and Marcelo Olarreaga (World Bank). Information at the country level consists of geographic data used for the estimation of gravity equations published by CEPII, and data on GDP from the World Development Indicators database published by the World Bank. To meet the objectives of this paper, the sector (ISIC rev 2) level bilateral trade and production data is aggregated to the country level. The database used for the paper contains information on 13,174 bilateral country-years, covering about 128,000 observations for 24 years over 1980-2003. The analysis focuses on the manufacturing sector only.

In order to focus the analyses on SSA, the paper concentrates mainly on bilateral trade relations involving SSA countries. This leaves us with a final panel of about 3,346 bilateral country-years covering 13,184 annual observations. With the final dataset, bilateral countries appear in only 7 years on average, making the dataset unbalanced. The use of unbalanced data partially allows bilateral countries to enter and exit the panel. The dataset also contains geographic information that allows us to divide the bilateral country-years into different economic blocs/regions. By this information, we will be able to carry out regional analyses, making it easier for us to identify the differences that exist between bilateral trading partners from different economic blocs/regions.

Bilateral Flows: Exports (X_{ij} and X_{ji}) and Domestic (X_{ii} and X_{jj})

Bilateral exports (i.e. Gross Exports valued at F.O.B) data used in this paper is sourced from the CEPII database. Domestic trade or internal flows for the exporting (i.e. X_{ii}) and importing (i.e. X_{jj}) country is defined as total production minus total exports of manufactures. This is also denominated in thousands of US dollars.

Elasticity of Substitution (σ)

The choice of a value for the elasticity of substitution is very important in the derivation of the trade cost measure. Since the trade cost measure derived in equation (12) is synonymous with the trade costs measure derived from other models (see equations 15, 17 and 19), the choice of a value for σ will depend on values of different parameters used in the other models, namely the Fréchet parameter, ϑ and the Pareto parameter, κ.

Survey estimates of σ in Anderson and van Wincoop (2004) indicates that σ typically falls in the range of 5 to 10. Eaton and Kortum (2002) report their baseline estimate for ϑ as approximately equal to 8, while Helpman, Melitz and Yeaple (2004,) estimate κ -(σ -1) to be around unity, which implies $\kappa \approx \sigma$. Novy (2010) followed closely Anderson and van Wincoop (2004) in setting $\sigma = 8$, indicating that it corresponds to ϑ, $\kappa = 7$. According to Novy (2010) the choice of $\sigma = 8$ can be seen as an approximate parameter value suitable for aggregate trade flows. This paper will set $\sigma = 8$ in line with previous studies[3].

Economic Blocs or Regions

The sample covers 155 countries out of which 39 are African countries. To enable comparisons of the estimated tariff equivalent trade costs to be made, the countries are split into eight (8) regional/economic blocs, made up of SSA, European Union (EU), North America, East Asia and Pacific (EAP), Rest of Europe (i.e. non-EU) and Central Asia, Latin America and Caribbean, the Middle East and North SSA (MENA) and South Asia (the list of countries is provided in Appendix B Table 1). Within the SSA region four economic blocs will be used namely the Economic Community of West African States (ECOWAS), Economic Community of Central African States (ECCAS), East African Community (EAC) and Southern African Development Community (SADC).

4. Results and Discussion

The sample covers 155 countries out of which 34 are SSA countries. In order to focus our analyses on SSA, we concentrate only on bilateral trade relations involving these countries. As is evident from Table 1, there is a large deviation in the incidence of exports and domestic trade of

[3] limits for the range found in the survey by Anderson and van Wincoop (2004) are $\sigma = 5$ and $\sigma = 10$

manufactures in the country groups. Over the period 1980 to 2003, countries in North America on average produced and traded (both domestic and exports) manufactures more than other countries elsewhere.

Although countries in East Asia & the Pacific on average produced more manufactures than member countries in the European Union (EU), countries within the EU exported a higher proportion of manufactures produced mainly to other EU countries, clearly indicating the success of the EU trading bloc. This implies that countries in East Asia & the Pacific traded a higher proportion (about 82 percent) of total manufactured output within their domestic economy than countries within the EU. This might be due to the size of China's production and domestic consumption of manufactures.

Table 1: Summary Statistics

Continent/Region	No. of Obs.	Exports*		Domestic Trade*		Production*	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
SSA	11,522	0.64	1.21	6.50	13.80	7.14	14.90
European Union	44,763	58.80	93.60	126.20	204.0	185.0	294.0
North America	4,181	224.0	178.0	1520.0	1340.0	1744.0	1500.0
East Asia & Pacific	22,071	52.30	100.0	246.7	564.0	299.0	661.0
Rest of Europe & Central Asia	9,483	6.15	8.37	73.60	213.0	79.80	216.0
Latin America & Caribbean	19,048	5.92	11.20	31.0	74.30	36.90	80.40
Middle East & North Africa	11,796	2.06	2.43	13.10	15.20	15.20	16.40
South Asia	5,164	5.56	8.25	47.20	63.40	52.80	71.00
ECOWAS	3,032	0.20	0.30	3.20	5.70	3.40	5.70
SADC	4,272	1.26	1.78	12.50	20.60	13.76	22.2
EAC	2,193	0.36	0.26	4.67	3.87	5.03	4.09
ECCAS	1,038	0.19	0.15	1.005	0.69	1.192	0.81
Other SSA	717	0.08	0.05	0.68	0.58	0.76	0.61

*Denominated in US$ Billions

SSA countries had very low exports and total production of manufactures (not surprisingly as they are overwhelmingly producers and exporters of primary commodities). Almost all (over 90 percent) of the manufactures that were produced in SSA during this period was traded in the domestic economy of the countries involved. This might be as a result of high international trade costs of manufactures relative to domestic trade costs.

Within the SSA sub-region, countries within SADC produced and exported more manufactures than other SSA countries. This can be attributed to the contribution of South Africa, the highest producing country for manufactures in SSA. Countries within ECOWAS on average exported about US$200 million worth of manufactures between 1980 and 2003 and this was about 6 percent of total manufactures produced over this period. The proportion of total production exported by countries within ECOWAS was the least in SSA. This was lower than the average for SSA and significantly lower than the average for Central African countries and SADC.

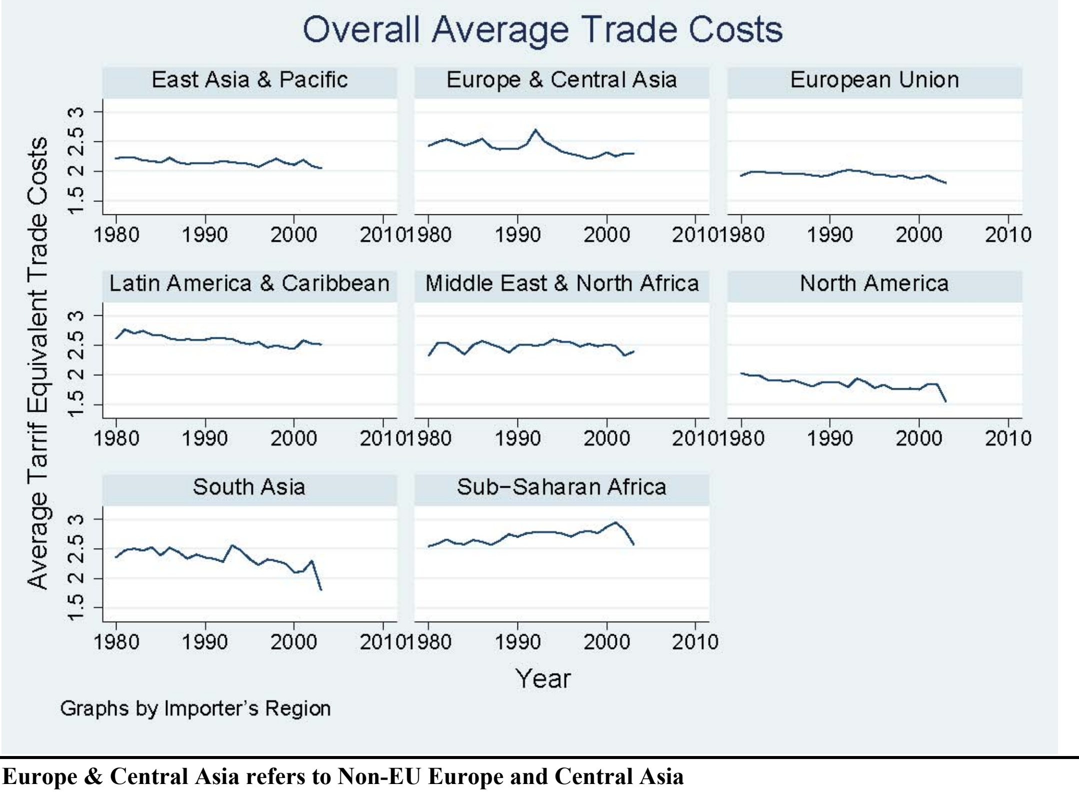
4.2 Discussion of Results

The results obtained in this section relate to our estimate of the tariff equivalent trade cost measure which is obtained from estimating equation (12) with an elasticity of substitution set equal to 8 (i.e. $\sigma = 8$). This estimate is a relative measure of bilateral trade cost compared to domestic trade costs (Novy, 2010). A decline (an increase) in our estimate of the tariff equivalent trade cost implies that bilateral trade flows have increased (decreased) relative to domestic trade flows, and this would be indicative of a decrease (an increase) in bilateral trade costs relative to domestic trade cost.

4.2.1 Estimates of Overall Average Bilateral Trade Costs Among Blocs

The estimated overall average trade cost in this case is the ad-valorem tariff equivalent bilateral trade costs over the entire period 1980-2003 with regards to each region/bloc with all trading partners. Figure 1 shows the trends in the estimates obtained for each of the eight regional trading blocs.

Figure 1: Trends in Estimated Relative Trade Costs by Regions (1980-2003)



Europe & Central Asia refers to Non-EU Europe and Central Asia

In addition our estimates indicate that bilateral trade costs relative to domestic trade costs in South Asia and North America have declined modestly, whereas other regions with the exception of SSA have remained fairly stable between 1980 and 2003. Table 2 and Appendix Table 2 shows the sample period average estimates of the tariff equivalent trade cost of the different regional or economic blocs involved in the global trading system. The estimates support the trend shown in Figure 1. Over the period 1980-2003, the cost of trading within SSA was the highest at an average tariff equivalent of 271.5 per cent (Table 2). With respect to five-year period average, Appendix Table 2 clearly shows a decline for all other regions with the exception of SSA. The estimates indicate a gradual increase in SSA trade costs over the five-year period average from 1980-2003. The t-test results for the difference in the average estimates obtained with reference to SSA rejects the null hypothesis that there is no statistically significant difference between the average for SSA and the other regions.

Table 2: Test for difference in Average Trade Costs among Regions (1980-2003)

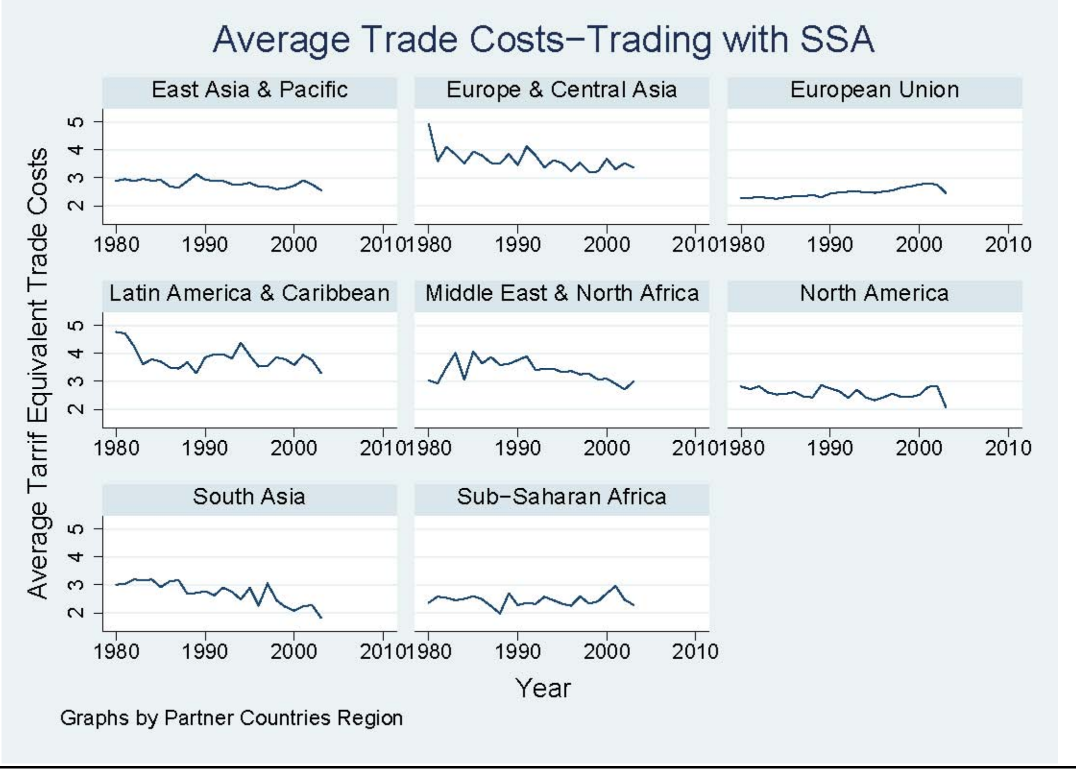
Region	Sub-Saharan Africa (Mean =2.715)				
	Difference	**t-stats**	**Pr(|T|>|t|)**	**Pr(T<t)**	**Pr(T>t)**
European Union	0.776	68.454	0.000	1.000	0.000
North America	0.859	49.806	0.000	1.000	0.000
East Asia & Pacific	0.563	44.395	0.000	1.000	0.000
Rest of Europe & Central Asia	0.358	22.896	0.000	1.000	0.000
Latin America & Caribbean	0.131	9.694	0.000	1.000	0.000
Middle East & North Africa	0.225	15.229	0.000	1.000	0.000
South Asia	0.349	19.807	0.000	1.000	0.000

Clearly the estimated relative trade costs within SSA is the highest with the difference as high as 86 percent compared to North America and 78 percent in the case of the EU. This finding confirms cross-sectional evidence from the World Bank's Doing Business database which indicates that the trading costs in SSA, in general, are the highest within the global trading system and about twice as high as those in high-income OECD countries (see appendix B table 2). It also confirms evidence produced by Portugal-Perez and Wilson (2008) on the variability of trade costs across countries and regions and the predominantly high trade costs observed within SSA as compared to other regions.

4.2.2 Estimates of Average Bilateral Trade Costs-Trading With SSA

To show the variability in trade costs associated with trading among member countries within a region/bloc and with partners outside the region/bloc, estimates were obtained for bilateral trade relations involving SSA. As shown in Figure 2, countries within SSA traded at a lower estimated average relative bilateral cost compared to trading with partner countries outside SSA. Although trade costs are higher in SSA compared to other regions, our estimate of the bilateral trade costs relative to domestic trade cost for countries within SSA are estimated to be lower than bilateral trade costs with other regions over the period 1980-2003.

Figure 2: Trends in Estimated Relative Trade Costs-Trading with SSA (1980-2003)



Europe & Central Asia refers to Non-EU Europe and Central Asia

Our estimates of the tariff equivalent bilateral trade costs in Table 3 indicate that on average intra-SSA tariff equivalent bilateral trade cost is estimated to have been 246.3 percent over the period from 1980-2003. The annual estimates in Appendix Table 3 indicate that with the exception of the EU, the average intra-SSA trade cost was significantly lower than the average trade cost incurred in trading manufactures from SSA countries to other regions. As confirmed by the t-test results in Table 3, though the trade cost incurred by SSA's exports to EU was marginally lower than the intra-SSA trade cost, the difference was not statistically significant at 5%. This implies that for SSA countries the bilateral trade costs relative to domestic trade costs in trading with the EU is the same as with bilateral trade intra-SSA.

This gives an indication to why the EU has been a major traditional trading partner of SSA countries. It is not clear whether the relatively low trade costs incurred with regards to SSA's bilateral trade with the EU has been a cause or effect of the trade pact that has existed between the EU and SSA through the EU-ACP non-reciprocal Preferential Trade Agreement. With regards to developed and developing countries, SSA countries traded at a higher average bilateral cost with other developing countries than with developed countries. Although our estimates in Table 3 show the average tariff equivalent trade cost incurred with regards to both developing and developed countries to be higher than the trade cost incurred intra-SSA trade, the t-test results indicate that statistically there is no significant difference between the trade cost incurred in trading with developed countries.

Table 3: Test for difference in Average SSA Trade Costs with Regions (1980-2003)

Region	Sub-Saharan Africa (Mean =2.463)				
	Difference	t-stats	Pr(|T|>|t|)	Pr(T<t)	Pr(T>t)
European Union	0.003	0.011	0.9915	0.5043	0.4957
North America	-0.13	-2.646	0.0000	0.0041	0.9959
East Asia & Pacific	-0.349	-8.815	0.0000	0.0000	1.0000
Rest of Europe & Central Asia	-1.100	22.896	0.0000	0.0000	1.0000
Latin America & Caribbean	-1.353	-23.062	0.0000	0.0000	1.0000
Middle East & North Africa	-0.850	-15.198	0.0000	0.0000	1.0000
South Asia	-0.296	-4.813	0.0000	0.0000	1.0000
Developed Economies	-0.051	-1.557	0.1197	0.0598	0.9402
Developing Economics	-0.505	-15.498	0.0000	0.0000	1.0000
Low Income	-0.133	-2.698	0.007	0.0035	0.9965
Lower Middle Income	-0.694	-15.563	0.0000	0.0000	1.0000
Upper Middle Income	-0.725	-15.244	0.0000	0.0000	1.0000
High Income (Non OECD)	-0.528	-11.286	0.0000	0.0000	1.0000
High Income (OECD)	-0.013	-0.382	0.7023	0.3512	0.6488

A similar trend is shown in Table 3 where the difference in intra-SSA trade cost and the bilateral trade cost between SSA and high income OECD countries is found to be statistically insignificant at 5%. Our estimates indicate that the intra-SSA trade cost of 246.3 percent was significantly lower than the SSA bilateral trade costs with middle income and high income (non OECD) countries. SSA countries face lower costs trading manufactures with high income (OECD) countries than countries from other income groups.

Various reasons have been assigned for the relatively high trade costs in SSA which has ensured that SSA lags behind in terms of global trade flows (SSA's total trade volume in 2007 represented about 3 percent of global trade). According to the *African Development Report* (2010), SSA has found it difficult to fully integrate into the global trading system because of recurring conflicts that engulfed certain parts of the region and which made the countries involved unstable leading to an increase in trade costs and thereby a reduction in trade flows.

In addition, close to a third of countries in SSA (15 out of 48) are landlocked hence economically and physically remote from major markets, which helps to explain why SSA on average has higher trade costs than other regions. This is so because transport costs incurred in trading with overseas markets and therefore the overall trade cost increases for such landlocked SSA countries. This is further worsened by the large interior with poor transport networks, poor state of trade infrastructure along the export supply chain as well as weak domestic institutions. The relatively higher international trade cost in SSA has however encouraged domestic and intra-regional trade within SSA. This is consistent with the results obtained for the regional trading blocs within SSA.

4.2.3 Estimate of Average Relative Bilateral Trade Costs-Blocs within SSA

To find out if our estimate of average trade costs differ significantly across blocs within SSA, we compute the relative bilateral trade costs for each bloc/region with all its trading partners over the period. As shown in Table 4, the average relative bilateral trade costs for SADC countries with all trading partners was the lowest at 265.7%, while countries within ECCAS had the highest of 282.8%. Compared to the average for SSA the t-test results shows the average for SADC to be significantly lower, averages for ECCAS and EAC higher and the averages of ECOWAS and other SSA countries not significantly different.

Table 4: Test for difference in Overall Average Trade Costs for SSA (1980-2003)

Sub-region	τ_{ij}	Sub-Saharan Africa (Mean =2.715)				
		Difference	t-stats	Pr(|T|>|t|)	Pr(T<t)	Pr(T>t)
ECOWAS	2.682	0.034 (0.023)	1.472	0.1411	0.9294	0.0706
ECCAS	2.826	-0.110 (0.032)	-3.442	0.0006	0.0003	0.9997
SADC	2.657	0.058 (0.0204)	2.842	0.0045	0.9978	0.0022
EAC	2.791	-0.075 (0.025)	-2.953	0.0032	0.016	0.9984
Other SSA	2.771	-0.055 (0.037)	-1.483	0.1384	0.0692	0.9308

Standard errors are shown in parenthesis

Within SSA, overall relative bilateral trade costs of countries belonging to a bloc is computed to be lower than trading partners who do not belong to the same bloc. As can be seen from Table 5, the average relative bilateral trade cost measure computed from equation 12 for trade partners both belonging to ECOWAS, ECCAS, SADC and EAC stands at 174.4, 177, 174.3 and 153.1 percent respectively. Although member countries within EAC traded at a lower cost than members within the other blocs, for each bloc the average is significantly lower than the average relative trade cost measures with other SSA partner countries that do not belong to that bloc.

For instance in the case of ECOWAS, the computed average bilateral trade cost measure based on trade between ECOWAS and ECCAS, SADC, EAC and other non-SSA member countries stood at 223.7, 349.7, 407.1 and 271.8 percent respectively. A similar trend is observed for the other blocs.

The implication is that within SSA, bilateral trade cost relative to domestic trade costs declined for countries trading with other member countries within a sub-region compared to other non-member SSA countries, and this indicative of increased trade within each sub-region relative to trade outside. This is entirely consistent with the evidence from the literature indicating that regional integration does reduce trade costs and thereby creates increased trade among member countries.

Table 5: Test for difference in Average Trade Costs among sub-regions in SSA

Sub-region	ECOWAS Mean = 1.770	ECCAS Mean = 1.770	SADC Mean = 1.743	EAC Mean = 1.531
ECOWAS (West)		-0.467***	-1.755***	-2.540***
		(0.174)	(0.140)	(0.171)
ECCAS (Central)	-0.493***		-1.644***	-1.754***
	(0.109)		(0.215)	(0.135)
SADC (Southern)	-1.754***	-1.617***		-2.327***
	(0.135)	(0.251)		(0.154)
EAC (East)	-2.327***	-2.419***	-0.576***	
	(0.154)	(0.247)	(0.101)	
Non-SSA	-0.974***	-1.087***	-0.963***	-1.283***
	(0.058)	(0.150)	(0.070)	(0.096)

*p<0.10, **p<0.05, ***p<0.01; Standard errors are shown in parenthesis

Studies such as Deme (1995), Elbadawi (1997), Cernat (2001), Carrere (2004), Coulibaly (2007), EAC (2008), and Afersorgbor and Bergeijk (2011) have produced evidence confirming that regional trade agreements (RTAs) within SSA have significantly increased trade flows among member countries. For instance over the years especially between 2000 and 2006, annual average intra-ECOWAS exports (of mainly manufactures) was valued at US$4.4 billion compared to the US$3.4 billion exports from ECOWAS to all trading partners between 1980 and 2003. The export diversification index (EDI)[4] for ECOWAS has declined from 0.83 in 2000 to 0.77 in 2008 (UNCTAD, 2008).

5. Concluding Comments

This paper is an empirical application of the micro-founded measure of trade costs by Novy (2010). The measure derived indirectly from the gravity equation infers bilateral international trade costs relative to domestic trade costs indirectly from observable trade flows data without imposing specific trade cost functions as is done within the gravity framework. The micro-founded measure captures all trade costs components that hitherto have been impossible to include in the gravity framework because of severe data limitations and the impracticability of measuring some of the trade costs components. This measure, consistent with leading trade theories such as the Ricardian and heterogeneous firms models, offers an enormous opportunity to expand the trade cost literature in SSA.

[4] The EDI published by UNCTAD measures the difference in the structure of trade by a country and the global average. The closer the EDI is to 1, the bigger the difference.

The empirical application to SSA trade in this chapter shows interesting results that are consistent with evidence in other studies. The relative bilateral trade cost measure computed for regions involved in the global trading system between 1980 and 2003 clearly indicates trade costs in SSA to be the highest. The measure was also found to vary across country pairs in the different regions and over time. With regards to trade flows involving SSA, the measures computed indicate that SSA countries had a lower relative bilateral trade costs regarding trade with countries within SSA compared to trade with non-SSA countries. A similar trend is observed for the blocs within SSA, giving an indication of the trade creation impact of RTAs within SSA. This confirms the findings from studies on the potential impact of RTAs on bilateral trade flows within SSA as lower trade costs encourage increased trade.

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Appendix

Table 1: List of Countries

Sub Saharan Africa	**Europe**	**Latin America &**	**North America**
ECOWAS	**EU**	**Caribbean**	Canada
Benin	Austria	Argentina	USA
Burkina Faso	Belgium & Luxembourg	Bahamas	
Cape Verde	Bulgaria	Barbados	**East Asia and Pacific**
Cote d'Ivoire	Cyprus	Belize	Australia
Gambia	Czech Rep.	Bolivia	Bahrain
Ghana	Denmark	Brazil	Burma
Liberia	Estonia	Chile	Cambodia
Niger	Finland	Colombia	China East Timor
Nigeria	France	Costa Rica	Fiji
Senegal	Germany	Cuba	Hong Kong
Sierra Leone	Greece	Dominican Rep.	Indonesia
Togo	Hungary	Ecuador	Japan
	Ireland	El Salvador	Korea
SADC	Italy	Guatemala	Lao PDR
Madagascar	Latvia	Haiti	Macau
Malawi	Lithuania	Honduras	Malaysia
Mauritius	Malta	Jamaica	Mongolia
Mozambique	Netherlands	México	New Zealand
Seychelles	Norway	Nicaragua	Papua New Guinea
South Africa	Portugal	Panama	Philippines
Zambia	Poland	Paraguay	Singapore
Zimbabwe	Romania	Peru	Taiwan
	Slovakia	Saint Lucia	Thailand
EAC	Slovenia	Suriname	Tonga
Burundi	Spain	Trinidad and Tobago	Vietnam
Kenya	Sweden	Uruguay	
Rwanda	Switzerland	Venezuela	**MENA**
Tanzania	UK		Algeria
Uganda		**South Asia**	Egypt
	Rest of Europe &	Afghanistan	Iran
ECCAS	**Central Asia**	Bangladesh	Israel
Cameroon	Albania	Bhutan	Jordan
Central African Rep.	Armenia	India	Kuwait
Congo	Azerbaijan	Nepal	Lebanon
Equatorial Guinea	Bosnia and Herz.	Pakistan	Libya
Gabon	Croatia	Sri-Lanka	Morocco
	Georgia		Oman
Other SSA	Iceland		Qatar
Eritrea	Kazakhstan		Saudi Arabia
Ethiopia	Kyrgyzstan		Syria
Somalia	Macedonia		Tunisia
Sudan	Moldova		UAE
	Russian Fed.		Yemen
	Serbia and Montenegro		
	Tajikistan		
	Turkey		
	Turkmenistan		
	Ukraine		

Table 2: Estimates of Tariff Equivalent Overall Average Relative Trade Cost

Year	Region/Bloc

	SSA	EU	NA	E&CA	EAP	LAC	SA	MENA
1980	254.3	192.5	202.7	242.7	221.6	261.5	235.8	232.1
1981	258.6	198.1	198.9	249.0	223.7	276.7	247.6	253.8
1982	265.6	198.8	199.0	253.8	223.3	269.5	250.3	254.5
1983	259.1	197.6	191.1	249.2	218.0	274.2	247.0	246.3
1984	257.5	196.7	190.8	243.4	217.1	267.7	252.4	234.4
1985	264.7	196.1	189.2	247.9	214.5	267.1	238.7	250.2
1986	261.7	196.2	190.3	254.8	222.4	261.5	251.6	257.2
1987	256.5	195.0	185.2	240.6	214.4	258.6	244.7	251.5
1988	264.1	192.9	180.5	236.8	212.1	259.9	233.5	246.1
1989	274.5	191.0	186.8	238.2	213.8	259.1	240.4	237.6
1990	270.4	193.5	186.8	237.5	213.2	259.3	235.4	249.7
1991	276.2	199.1	187.2	245.2	214.2	262.5	233.1	251.3
1992	278.2	201.7	179.3	269.6	217.2	261.6	228.2	249.0
1993	277.9	200.5	193.9	249.9	214.9	260.4	255.9	251.2
1994	278.1	198.6	187.8	242.0	213.6	254.4	247.4	259.7
1995	275.6	193.9	177.8	232.5	212.1	251.4	232.6	255.5
1996	270.1	194.1	183.2	229.1	207.3	255.2	222.7	254.6
1997	278.4	190.2	175.8	225.6	214.5	246.1	232.2	247.7
1998	279.9	192.7	175.8	220.8	221.0	249.8	229.3	252.3
1999	276.5	187.8	176.9	224.4	213.8	245.6	225.1	248.0
2000	286.6	188.9	175.2	231.6	210.8	243.5	209.9	251.2
2001	294.3	192.4	184.9	225.3	219.1	257.9	212.0	248.8
2002	282.3	185.1	183.9	229.7	208.6	252.7	229.6	232.5
2003	257.9	180.0	154.7	230.2	205.1	251.3	181.0	238.9
				Period Averages				
1980-84	259.0	196.7	196.5	247.6	220.7	269.9	246.6	244.2
1985-89	264.3	194.2	186.4	243.7	215.4	261.2	241.8	248.5
1990-94	276.2	198.7	187.0	248.8	214.6	259.6	240.0	252.2
1995-99	276.1	191.7	177.9	226.5	213.7	249.6	228.4	251.6
2000-03	280.3	186.6	174.7	229.2	210.9	251.4	208.1	242.9

Table 3: Estimates of Tariff Equivalent Average Relative Trade Cost-Trading with SSA

Year	Region/Bloc							
	SSA	EU	NA	E&CA	EAP	LAC	SA	MENA
1980	236.2	227.2	281.4	492.5	289.4	476.7	301.0	303.9
1981	258.3	228.2	271.8	360.0	295.3	470.9	303.2	293.3
1982	253.7	232.9	282.4	410.8	288.4	425.3	319.6	350.4
1983	245.0	227.5	260.1	383.5	296.6	361.5	315.7	401.5
1984	250.0	225.8	253.0	351.6	289.5	378.7	319.5	305.8
1985	259.3	230.5	256.0	394.1	292.7	371.0	291.9	406.9
1986	248.5	234.5	262.2	379.9	269.7	350.0	312.2	363.8
1987	224.0	234.4	246.1	353.3	264.6	345.6	317.0	387.0
1988	197.6	239.3	242.4	351.5	288.2	367.8	267.5	358.5
1989	269.7	230.2	286.3	384.7	313.2	329.1	271.0	362.5
1990	227.7	243.9	274.5	346.2	293.0	386.0	277.3	375.7
1991	233.2	248.2	265.0	412.1	289.7	396.8	262.1	389.5
1992	231.8	250.5	241.2	380.0	288.8	397.4	289.8	340.8
1993	257.5	250.7	270.1	337.4	277.7	381.7	275.4	344.7
1994	245.0	249.5	242.6	362.8	276.0	437.3	247.6	344.9
1995	232.4	246.4	232.6	353.0	282.2	392.7	289.4	333.3
1996	225.5	251.2	243.2	325.0	269.2	353.1	225.9	337.1
1997	258.6	255.1	256.4	354.3	269.4	354.9	305.0	325.2
1998	233.5	265.9	244.1	321.5	259.7	386.0	245.2	327.4
1999	240.5	269.3	244.7	322.5	262.7	378.9	221.6	306.8
2000	269.8	276.4	251.4	367.8	271.8	358.5	207.6	309.4
2001	295.6	280.2	280.4	330.6	291.2	394.3	223.4	291.5
2002	247.2	276.4	283.6	353.2	276.4	376.0	227.9	271.2
2003	228.5	245.2	206.6	336.3	256.2	330.2	182.7	299.1
	Period Averages							
1980-84	248.6	228.3	269.7	399.7	291.8	422.6	311.8	331.0
1985-89	239.8	233.8	258.6	372.7	285.7	352.7	291.9	375.7
1990-94	239.0	248.6	258.7	367.7	285.0	399.8	270.4	359.1
1995-99	238.1	257.6	244.2	335.3	268.6	373.1	257.4	326.0
2000-03	260.3	269.6	255.5	347.0	273.9	364.8	210.4	292.8

Table 4: Trading Across Borders: Border Trade Costs

	OECD	EU	EAP	LAC	MENA	S. ASIA	SSA
Documents to Export*	4.4	4.5	6.4	6.6	6.4	8.5	7.7
Time to Export(days)	11	11.5	22.7	18	20.4	32.3	32.3
Cost to Export Container**	1058.7	1025.3	889.8	1228.3	1048.9	1511.6	1961.5
Documents to Import*	4.9	5.3	6.9	7.1	7.5	9	8.7
Time to Import(days)	11.4	12.1	24.1	20.1	24.2	32.5	38.2
Cost to Import Container**	1106.3	1086.5	934.7	1487.9	1229.3	1744.5	2491.8

Source: World Bank, Doing Business 2011, *Number of Documents; **US$