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## OBSTACLES TO EXPANDING INTRA-AFRICAN TRADE

by

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Research programme on:  
Integration and Co-operation in Sub-Saharan Africa

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## PREFACE

The Development Centre's research on Africa since 1997 has centred on the theme of Emerging Africa. An in-depth examination of six countries showing some potential for take-off has identified three ingredients leading to high and sustainable growth:

- 1) access to external non-debt financial resources;
- 2) legitimate political leadership;
- 3) a long-term regional focus.

With these tentative conclusions in mind, in 1999 the Centre launched a research project to pass from country-specific to region-wide analysis, to improve the flow of information for the implementation of co-operation efforts, and to derive policy recommendations for donors and other non-governmental development partners. Regionalism may be fashionable but it is not a new phenomenon in Africa. Indeed, the world's oldest customs union exists in Southern Africa, and the list of both past and present multilateral economic agreements is probably longer than that of any other continent. However, while some successful examples of regional co-operation do exist, Africa's record of creating and sustaining regional frameworks is generally poor. The pressing need for high output growth, industrialisation, employment creation, increasing export trade, higher social and human capital development, and above all lower poverty, is giving regional integration a new lease of life.

A small number of experts from Africa and Europe have been asked to provide the elements to structure our thinking around two, complementary issues:

- 1) What is the scope for increased intra-regional trade in sub-Saharan Africa, in the context of current trends towards freer regional trade?
- 2) Which are the most promising areas of regional co-operation?

The studies included in this special series of Development Centre Technical Papers, together with one by Andrea Goldstein, published in 1999, (TP 154), provide updated analyses on the progress of regional integration in sub-Saharan Africa and will contribute to the debate on this key issue for its development. The papers are also published in anticipation of the Second International Forum on African Perspectives, on the theme of Regionalism in Africa, organised by the Development Centre and the African Development Bank.

Jorge Braga de Macedo  
President  
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## RÉSUMÉ

Ce Document technique analyse les déterminants des échanges intra-africains afin d'évaluer les obstacles potentiels à leur expansion. Celle-ci pourrait favoriser le décollage économique du continent, comme le montrent les arguments tant économiques que politiques. Les relations commerciales sont toutefois extrêmement réduites en Afrique. D'après les statistiques officielles, le commerce intra-africain ne représente qu'une faible part des échanges totaux de chaque pays et est resté à peu près constant dans le temps. Les divers travaux identifient les principaux obstacles, notamment la politique commerciale, le manque d'infrastructures, la non convertibilité des monnaies, la diversité ethnique, culturelle et linguistique ainsi que la très grande instabilité politique. Pour évaluer l'importance respective de ces obstacles, cette étude propose un modèle gravitaire étendu reposant sur un nouvel ensemble de données couvrant 41 pays africains sur la période 1980-1997. Les flux commerciaux bilatéraux entre les pays africains et leurs principaux partenaires ont été utilisés pour identifier précisément les obstacles spécifiques au commerce intra-africain. Outre les variables classiques (revenu, revenu par habitant, distance et surface), les effets de trois autres facteurs (infrastructures, politique économique et tensions politiques) ont été pris en compte. Les résultats empiriques montrent que l'état des infrastructures — en particulier les lacunes des réseaux de télécommunications et de transport — freine considérablement les échanges. En revanche, l'adoption de politiques économiques saines, telles que les programmes d'ajustement structurel et une bonne gestion des taux de change, favorise les échanges intra-régionaux.

## SUMMARY

This paper analyses the determinants of intra-African trade (IAT) to assess the potential obstacles to greater sub-regional trade. Both economic and political arguments suggest that increased IAT can foster a regional take-off. Trade linkages in Africa, however, are very weak. Official statistics show that IAT is a small fraction of each country's total trade and has remained roughly constant over the years. The main obstacles suggested in the literature include trade policy, insufficient infrastructure, non-convertibility of currencies, ethnic, cultural and linguistic diversity and very high political instability. In order to rank such potential obstacles, the study develops an extended gravity model, using a new panel dataset for 41 African countries during the 1980-97 period. Bilateral trade flows between African countries and their major trading partners have been used to identify specific obstacles to IAT. Besides traditional gravity variables (income, income per capita, distance, and surface area), the effects of three additional factors are included: infrastructure, economic policy conduct, and political tensions. Our empirical findings show that infrastructure, particularly poor telecommunication networks and weak transport communications, is a crucial factor hindering IAT. Moreover, we find evidence that sound economic policies, such as the adoption of Structural Adjustment Programmes (SAP) and good exchange-rate management, are conducive to IAT.

## INTRODUCTION

The analysis in this paper builds on recent concerns of economists and policy makers about the policy requirements for fostering a take-off of African economies. Several SSA countries have indeed shown signs of economic recovery during the past decade. Over the 1986-97 period, some countries in West Africa, like Ghana and Guinea, have substantially increased GDP per capita growth. Similarly, growth has resumed in South Africa, after a prolonged economic slowdown, while two other countries in the region, Botswana and Mauritius, have followed exemplary economic development policies. This could lay the ground for a growth take-off in the broader SADC area, as other countries in the region firmly commit themselves to structural reforms and more open trade and investment regimes. Finally, Uganda and, more recently, Ethiopia have substantially improved their growth performance, although starting from very low levels. If Kenya and Tanzania succeed in their reform programmes, growth can also resume on a broader basis in Eastern Africa.

Despite these encouraging, although still to be confirmed, results, Africa still plays a minor role in the world trade arena. Likewise, despite the proliferation of institutions, treaties, protocols and resolutions, the record of regional integration arrangements (RIA) among SSA countries has been disappointing. According to the Lagos Plan of Action, adopted by African Heads of State in 1980, RIAs were supposed to promote “self-sustaining development and economic growth” (Foroutan, 1993). Unfortunately, trade figures as well as most of the literature (e.g. Foroutan, 1993, Elbadawi, 1997) suggest that the regionalism experience has not been satisfactory. Depending on the country, intra-area trade accounted for between 0.02 and 8 per cent of exchanges in 1970 and between 0.1 and 10.5 per cent in 1990. In both levels and rates of growth, intra-African trade (IAT) is very low, especially when compared to other economic integration arrangements.

It has often been claimed that increased linkages amongst African countries, especially through an expansion of intra-regional trade, can play a positive role in fostering a regional take-off. Yet RIAs may produce a variety of outcomes — such as trade diversion, trade creation, terms-of-trade changes, and income convergence or divergence between member countries — and the debate of the net welfare effect of an expansion of intra-regional trade is far from over. In a recent work on regional integration, South-South RIAs were found to be quite problematic (World Bank, 2000). On theoretical grounds, Venables (1999) argues that South-South RIAs are likely to lead to income divergence between member countries.

Nevertheless, other “correct externalities” may provide an alternative rationale for deeper integration (Schiff and Winters, 1997). Insofar as RIAs contribute to intra-regional and extra-regional security, increased bargaining power in trade negotiations, and more policy credibility, their welfare effect is unequivocally positive. Regionalism coupled with good policies (sound macroeconomic management, lower political tensions, and better physical infrastructure) can hence produce welfare gains. In sum, even if pure economic arguments do not alone constitute a sufficient rationale for RIAs, their interplay with politics and policies may nonetheless turn integration into an efficient solution.

On the basis of a new dataset covering 41 African countries over an 18-year period (1980-97), this study analyses the determinants of IAT using an extended gravity model similar to Elbadawi (1997). The obstacles to regional trade most frequently mentioned in the literature (Foroutan and Pritchett, 1993) include insufficient or non-existing transport and communications networks; the existence of a multiplicity of non-convertible currencies for countries outside the CFA franc zone; ethnic, cultural, and linguistic diversity; and very high political instability. Besides these traditional variables, we have added three new sets of variables: infrastructure, economic policy, and threats to political stability. To enhance the explanatory power of our analysis, we included regional dummies for those countries belonging to a RIA to proxy the eventual existence of discriminatory tariffs and non-tariff barriers. Finally, as a robustness check to identify the very specific obstacles hampering IAT, bilateral trade flows between African countries and their major trading partners (EU, USA, and Japan) will also be taken into account.

The paper is organised as follows. In section I, we briefly sketch the recent record of African trade. Section II reviews the relevant literature, while the following section introduces the gravity model, describes the dataset, and presents the empirical results. Section IV concludes.



## I. AFRICA'S TRADE RECORD

Africa is a marginal player in the global economy. Its share in world trade in 1998 was equal to 1.9 per cent, or three percentage points below than at the beginning of the 1980s (IMF, 1999)<sup>1</sup>. Moreover, the pace of regional trade integration has not increased markedly: at 11.4 per cent, IAT is still a small fraction of total African trade flows and has increased by 6.2 percentage points only in almost two decades. Foroutan (1998) shows that no RIA has been successful in raising trade among members beyond a negligible portion of each group's total trade. Most African trade flows are with industrialised countries, particularly the EU, which in 1998 accounted for more than 40 per cent of African exports (Table 1). Notwithstanding geographical proximity, all African countries trade more with EU than with the five largest African economies (i.e. South Africa, Algeria, Egypt, Nigeria and Morocco). Although IAT has roughly doubled in the last two decades, the record of African regionalism is still very poor when compared to other RIAs (Table 2). Intra-regional trade as a share of total trade is more than five times higher in the European Union, more than four times higher in NAFTA, and more than twice as large in Mercosur.

Table 1. **The Structure of African Trade 1980-98**

<i>Percentage Distribution</i>	1980	1985	1990	1992	1994	1996	1998
Industrial countries	66.5	71.4	69.3	69.4	65.4	65.0	61.2
<i>European Union</i>	39.8	52.6	45.2	45.6	42.8	42.6	40.9
Developing countries	13.8	16.1	16.6	20.9	22.0	26.8	28.9
<i>Africa</i>	5.2	4.9	7.3	8.0	8.9	10.2	11.4
<i>Asia</i>	2.7	3.3	4.2	6.4	7.2	9.2	10.2
<i>Non-EU Europe</i>	2.4	3.5	2.2	1.9	1.3	2.1	2.4
<i>Middle East</i>	1.1	1.1	1.5	2.3	2.2	2.2	2.1
<i>Western hemisphere and other countries</i>	2.6	3.6	1.3	2.4	2.5	3.1	2.9

Source: IMF (1999), *Direction of Trade Statistics*.

**Table 2. Intra-Regional Trade 1970-98**  
(as a share of total exports of the region)

	1980	1985	1990	1995	1998
Africa	5.2	4.9	7.3	10.3	11.4
European Union	60.8	59.2	65.9	62.4	60.2
Mercosur <sup>1</sup>	14.3	6.7	10.6	21.6	25.5
NAFTA <sup>2</sup>	33.6	43.9	41.4	46.2	51.0
East Asian economies <sup>3</sup>	22.4	20.7	20.7	26.4	22.2

Source: IMF (1999), *Direction of Trade Statistics*.

Notes: 1) Argentina, Brazil, Chile, Paraguay and Uruguay.

2) Canada, Mexico, and the United States.

3) China, Indonesia, Japan, Korea, Malaysia, the Philippines and Thailand.

It should be noted that the level of IAT is probably underestimated. Cross-border trade between neighbouring countries in Africa is not always tracked at customs, while trade with non-African partners is fully recorded. While we are fully aware of this issue, it is currently impossible to estimate non-recorded trade. Hence, in our analysis, we rely on official data on bilateral exports between African countries.

## II. THE LITERATURE ON REGIONALISM

Our paper focuses on the actual and potential obstacles to expanding intra-regional trade in Africa. However, before starting, two other topics deserve mention. First, is the level of regional trade in Africa really so low, or, more accurately, lower than expected? Second, could regional integration be an effective component of Africa's growth strategy?

At an empirical level, gravity model analyses have established that trade flows between African countries are not lower than expected. If anything, Foroutan and Pritchett (1993), analysing 19 sub-Saharan Africa (SSA) countries in 1980-83, show that intra-area trade is on average 8.1 per cent of total trade, against a predicted value equal to 7.5 per cent. The picture does not change if considering the region's share in world trade. Controlling for a number of economic characteristics, Rodrik (1998) concludes that African countries trade on average as much as expected. According to Rodrik, the long-term decline in Africa's participation in the world trade arena is due to two factors — slower GDP per capita growth than in the rest of the world and an output elasticity of trade above unity.

Elbadawi (1997) covers 28 SSA countries and two time-periods (1980-84 and 1986-90). His main result is that RIAs have had a negligible effect in removing obstacles on intra-SSA trade. However, such results are far from conclusive. Two points in Foroutan and Pritchett's analysis, in particular, merit attention. The first, as pointed out by the authors, is that the analysis does not consider the evolution of potential trade once some structural barriers (e.g. transport barriers) are lowered. The inclusion of such variables into the model may therefore change the results. Second, while the conclusion may still hold for Africa as a whole, a different picture emerges when individual countries are considered. Indeed, of the 19 countries considered, ten (including regional heavy-weights such as Cameroon, Gabon and Kenya) are importing from other African countries less than predicted. For these countries at least, there is a potential to increase IAT by removing some of the obstacles.

Research on regionalism, as well as insights from growth theory, can help understand what policy prescriptions may be derived from this empirical analysis. The literature on regional integration has evolved from the early work of Viner (1950) on trade creation and trade diversion. The so-called "traditional" gains from increased trade in goods, services, and other factors have been well documented (e.g. Krugman, 1991 and Winters, 1993). Mundell (1984), on the contrary, stresses that if a RIA leaves all prices unchanged and goods are sufficiently strong substitutes, the elimination of internal tariffs may bring about a reduction in the demand for goods imported from third parties.

New insights were provided by showing that increased trade may create growth spillovers between countries [e.g. Rivera-Batiz and Romer (1991a, b); Grossman and Helpman (1991)]. From an empirical point of view, a number of

studies point to the likely existence of international long-run growth spillovers (e.g. Ades and Chua, 1993). In the case of Africa, Easterly and Levine (1997) found that, *ceteris paribus*, a 1 per cent increase in the growth rate in one given country over a decade resulted in a 0.55 per cent increase in the growth rate in the neighbouring country.

In the presence of scale economies and imperfect competition, theory suggests that potential gains may also arise from market enlargement, both by reducing monopolistic distortion and avoiding firm fragmentation. Moreover, a market enlargement can attract foreign direct investment (FDI) to a region (Blomström and Kokko, 1997)<sup>2</sup>. Economies of scale therefore militate in favour of limiting the number of locations. If IAT is tax-free, market size and access considerations reinforce cost considerations in convincing investors to locate in Africa. On the contrary, if the African market remains segmented, a firm may prefer to locate, for instance, in southern Europe, where, despite higher labour costs, it can easily access the whole African market thanks to trade agreements between Europe and Africa. Without the dynamic advantages accruing from FDI — in terms of technology transfer, organisational know-how, market intelligence, etc. — Africa risks further marginalisation. As Elbadawi (1997: p. 213) notes, “economic integration [could] generate the threshold scales necessary to trigger the much-needed strategic complementarity, and to attract adequate levels of investment (especially FDI) necessary for the development of modern manufacturing cores and the transfer of technology within the region”. There are, however, dissenting voices, most notably Venables (1999) who has demonstrated that, especially if an agglomeration effect is at play, South-South RIAs tend to aggravate income disparities between member countries.

If there are both pros and cons in the theoretical literature on regionalism, empirical analyses have failed to solve the puzzle. In a recent gravity model analysis of nine trade blocs, Soloaga and Winters (1999) do not find evidence of a positive effect on intra-regional trade. Using a growth regression technique, Vamvakidis (1998) also finds little evidence of a positive impact of RTAs on growth for the period 1970-90. It is only the EU that has had a positive impact on the area’s growth rate, while for the other RIAs (ASEAN, Andean Pact, CACM, and UDEAC) the impacts are statistically insignificant. As regards the terms-of-trade, Chang and Winters (1999) observe a substantial fall in the price of US goods on the Brazilian market relative to the prices of the Argentinean ones and conclude that Mercosur has had a positive effect. Another strand of literature on the welfare effects of RIAs makes use of computable general equilibrium (CGE) models (De Rosa, 1998). Two recent studies that find positive net benefits of South-South RIAs are Lewis *et al.* (1999), on Southern Africa, and Flôres (1997) on Mercosur.

If neither economic theory nor evidence provide a clear-cut answer as to why we should worry about increasing IAT, in the second half of the 1990s new contributions have highlighted the existence and the importance of “non-traditional” gains from RIAs (see Fernandez, 1997 and Schiff and Winters, 1997). These include enhancing security, maximising bargaining power in trade negotiations, locking in

reform, and making institutions more credible. These arguments may be particularly important in the case of Africa in view of countries' high propensity to political and military conflicts, as well as their tendency to overturn policies.

For these reasons, we think that variables expressing the quality of economic policies and the degree of political stability, as well as the stock (if not the quality) of physical infrastructure, should be included in the empirical work to grasp a more precise appreciation of the potential of IAT. In doing this, we extend to the regional level some early contributions at the country-level. Easterly and Levine (1997), in particular, have shown how the inclusion of political variables can improve the results of growth regressions in Africa. Richaud *et al.* (1999), for their part, investigate the role of infrastructure in disseminating growth across Africa. They find that improved infrastructure in a given country raises the profitability of investment by both residents and foreigners, thus raising the overall investment ratio and boosting growth in per capita income. Moreover, expansion in one country raises the profitability of investment in neighbouring countries, as it creates a wider market and improves opportunities for export. This, in turn, feeds back and further enhances growth in the initially expanding economy. Finally, Limão and Venables (1999) find that in SSA, the quality of infrastructure has a strong explanatory power for the limited growth of intra-area trade in 1990.

### III. EMPIRICAL ANALYSIS

#### 3.1 The Gravity Model

Gravity equations are a standard empirical framework for investigating patterns of bilateral trade. The gravity model can be derived as a reduced form of a broad class of structural models (see Anderson, 1979 and Bergstrand, 1989). First introduced by Linneman (1966), it relates the value of bilateral flows to national income, population, distance, and contiguity. At an empirical level, such a model has proved successful in predicting the pattern of trade and assessing the effects of commercial and monetary policies. However, insofar as they do not include discriminatory tariffs and non-tariff barriers (TB and NTBs), these models may have a somewhat limited explanatory power. Therefore, in order to capture the eventual existence of discriminatory barriers between the countries, we decided to include regional dummies for those countries belonging to a RIA<sup>3</sup>. It is likely that any preferential relationship between two countries takes the form of a trade agreement, hence the inclusion of regional dummies allows a reasonable specification of the model.

Different specifications of the gravity equation are used in the literature (see Frankel and Wei (1993), Eichengreen and Irwin (1993) and Mekies and van Beers (1994). The basic version is the following:

$$\begin{aligned} \text{TRADE}_{ij} = & \\ & \beta_0 + \beta_1(\text{GNP}_i \text{GNP}_j) + \beta_2([\text{GNPPC}_i][\text{GNPPC}_j]) + \beta_3 \text{DIST}_{ij} + \beta_4(\text{Area}_i \cdot \text{Area}_j) \quad (1) \\ & + \beta_5 |\text{GNPPC}_i - \text{GNPPC}_j| + U_{ij} \end{aligned}$$

where  $\text{TRADE}_{ij}$  is the nominal value of bilateral trade between countries  $i$  and  $j$ ;  $\text{GNP}_i \text{GNP}_j$  is the product of the two countries' nominal national incomes;  $[\text{GNPPC}_i \cdot \text{GNPPC}_j]$  is the product of the two countries' per capita incomes (also in nominal terms);  $\text{DIST}_{ij}$  is the distance between the economic centres of gravity of the two countries (measured in kilometres);  $\text{Area}_i \cdot \text{Area}_j$  is the product of the surface of countries  $i$  and  $j$ ; and  $|\text{GNPPC}_i - \text{GNPPC}_j|$  is the difference between the two countries' per capita income in absolute terms. Variables representing commercial or monetary policies (such as RIAs or currency blocs), infrastructure, or the political economy can be introduced and analysed for their impact on trade.

Some studies specify the gravity equation in double-log form (expressing the dependent variable and all independent variables in logs) and estimate it by ordinary least squares (OLS). This permits coefficients to be interpreted as elasticities, but omits country pairs for which the reported value of bilateral trade is zero. This is undesirable insofar as such observations contain useful information on the (low) level

of trade. For instance, when income levels are low and distances are long, potential trade of small quantities is uneconomical. A solution to this problem is to forego the double-log specification for a semi-log form in which *TRADE* is expressed in levels while independent variables appear in logs. While this allows utilisation of the information contained in the observations for which the observed value of trade is zero, OLS is no longer the appropriate estimator. Since the dependent variable is truncated at zero, estimation by OLS will produce biased results and may predict negative trade flows. The appropriate estimator is Tobit, as employed by Havrylyshyn and Pritchett (1991).

### **3.2 Data Issues**

The dataset covers 41 African countries — as reporter and partner countries — and 16 industrial countries (EU<sup>4</sup>, US and Japan) as partner countries only, over the period 1980-97 (see Table A2). Hence, the total number of observations is equal to 41 328<sup>5</sup>. The dataset has been assembled from several sources of data<sup>6</sup> (see below) and is divided into six different sub-sets of variables. The first one includes bilateral flows between the reporter and the partner country. The second groups traditional gravity model variables. The third sub-set includes infrastructure variables. The fourth concerns economic policy variables. The fifth and the sixth sub-sets include political and control variables respectively. The exact definition and sources of the variables are presented in the Appendix. A brief description of the data is given below.

#### ***Bilateral Flows***

Bilateral flows in current US dollars are taken from the IMF Direction of Trade (DOT) Statistics CD-ROM (1999). The annual report covers information on flows (origin and destination of imports and exports) between 49 African countries between 1980 and 1998<sup>7</sup>. We decided to consider the export flows only since import classification is not uniform: some data on imports are c.i.f. (cost-insurance-freight) and others are f.o.b. (free-on-board). As already stated (see section I), the figures probably underestimate the actual value of bilateral flows amongst African countries. Nevertheless, even with some underestimation of the actual figures, IMF DOTS for Africa do not present missing values. According to Yeats (1999), IMF DOTS is the most reliable source of data concerning intra-African bilateral flows: data from UN COMTRADE — even if tabulated both in terms of composition and direction — suffers from deficiencies such as “the very erratic and uneven reporting practices of many Sub-Saharan African countries” (Yeats, 1999, p. 6). Moreover, certain countries — e.g. Kenya, Ghana and Mauritius — started reporting data to the UN Statistical Office (UNSO) only in recent years.

#### ***Traditional Gravity Model Variables***

Gross Domestic Product (GDP) and income per capita (GDPPC) are drawn from the *World Development Indicators* (World Bank, 2000c). Both figures are in US current dollars at PPP. The *Surface Area* variable is also taken from World Bank (2000c) and represents a country's total area including inland bodies of water and some coastal waterways. The variable *DISTANCES* between the major economic

centres of the 57 countries has been calculated by the authors on the basis of the US Geological Survey<sup>8</sup>.

### ***Infrastructure Variables***

Three infrastructure variables were considered for both the reporter and the partner. A dummy variable (*LOC*) takes the value of one if a country is landlocked, zero otherwise<sup>9</sup>. Data on road length (*RD*) per capita (1 000 km per one million inhabitants) are from World Bank Africa Database (World Bank, 2000*b*), World Bank, (2000*c*), World Development Report (various issues), and authors' calculations for the period before 1985. The number of phones (*PH*) per capita is drawn from Banks (1995).

### ***Economic Policy Variables***

These are proxies aimed at capturing the adequacy of macroeconomic policy. A dummy variable takes the value of one for countries implementing Structural Adjustment Program and years when they do so (zero otherwise). The black market premium is from Wood (1988) and FDI inflows in current US dollars are published in World Bank (2000*c*). We consider FDI as a policy variable to proxy confidence in a country's economic management and growth prospects<sup>10</sup>.

### ***Political Variables***

Links between political variables and trade performance are multiple and analysing them is not easy. We focus on the link between political instability and export and select political variables (for the partner and the reporter country) accordingly. Civil war (coded as *WAR*) is a binary variable. All others are count data. Following Easterly and Levine (1997), *COUP* is the number of extra-constitutional or forced changes in the top government elite and/or its effective control of the nation's power structure; riots (*RIOT*) are violent demonstrations or clashes of more than 100 citizens involving the use of physical force; revolution (*REV*) refer to illegal or forced changes in the top governmental elite, attempts of such changes or successful or unsuccessful armed rebellion whose aim is independence from the central government. The political variables are drawn from Banks (1995), Balencie and De La Grange (1996), and Easterly and Levine (1997). It is worth noting that some variables, such as riots or political assassinations, may be subject to reporting bias and measurement errors.

### ***Control Variables***

Given the focus of our analysis, three types of control variables are introduced. First, a dummy variable taking a value of one if a country is an oil exporter. Second, a set of dummies to capture trade diversion effects (*TDRI*). They are equal to one if either the exporter or the importer (but not both) is a member of a RIA. Third, a set of dummies to capture trade creation effects (*TCRI*). They take value one if both the importer and the exporter belong to the same RIA. The last two sets of dummies are the same as in Elbadawi (1997). The RIAs are defined as follows:



- ECOWAS: Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.
- CEAO: Benin, Burkina Faso, Côte d'Ivoire, Mali, Mauritania, Niger and Senegal.
- UDEAC: Cameroon, CAR, Chad (from 1985), Congo, Equatorial Guinea (from 1984), and Gabon.
- CEPGL: Burundi, Rwanda, and Congo Democratic Republic (Zaire).
- COMESA (formerly PTAs): Angola, Burundi, Comoros, Djibouti, Egypt (from 1994), Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique (until 1993), Rwanda, Seychelles, Swaziland, Somalia (until 1993), Sudan, Tanzania<sup>11</sup>, Uganda, Zambia, Zimbabwe.
- SADC (formerly SADCC): Angola, Botswana, Congo Dem. Rep., Lesotho, Malawi, Mauritius (since 1995), Mozambique, Namibia, South Africa (since 1994), Swaziland, Tanzania, Zambia and Zimbabwe.

### 3.3 Analysis of the Results

A large set of infrastructure, economic policy, and political variables was collected. Incorporating all these variables into the regressions, however, poses problems due to potential collinearity. There is a trade-off between the opportunity of using the large amount of information contained in our dataset and the need to arrive at a precise estimation of the impact of the explanatory variables on IAT. We proceed, therefore, in two distinct ways. One method uses principal component analysis to summarise the main features of each of the three sub-sets of variables, then uses the first component as an explanatory variable. The other incorporates all the relevant variables into the regression. This leads to identifying the role of key variables in determining IAT. We start with the second approach.

The following extended version of the gravity model was estimated using the Tobit method:

$$\begin{aligned}
\text{Trp} = & \beta_0 + \beta_1^r \log(\text{GNP}_r) + \beta_2^p \log(\text{GNP}_p) + \beta_2^r \log(\text{GNPPC}_r) + \beta_2^p \log(\text{GNPPC}_p) + \\
& \beta_3 \text{Dist}_{rp} + \beta_4 \log(\text{Surf}_r \cdot \text{Surf}_p) + \beta_5 \log|\text{GNPPC}_r - \text{GNPPC}_p| + \\
& \beta_6^r \text{oil}_r + \beta_6^p \text{oil}_p + \\
& \beta_7^r \text{Loc}_r + \beta_7^p \text{Loc}_p + \beta_8^r \log(\text{Road}_r) + \beta_8^p \log(\text{Road}_p) + \\
& \beta_9^r \log(\text{Pho}_r) + \beta_9^p \log(\text{Pho}_p) + \\
& \beta_{10}^r \text{SAP}_r + \beta_{10}^p \text{SAP}_p + \\
& \beta_{11}^r \log(100 + \text{BMP}_r) + \beta_{11}^p \log(100 + \text{BMP}_p) + \beta_{12}^r \log(\text{FDI}_r) + \beta_{12}^p \log(\text{FDI}_p) + \\
& \beta_{13} \text{TDRI} + \beta_{14} \text{TCRI} + \\
& \sum_k \beta_{15k}^r \text{Pol}_k^r + \sum_k \beta_{15k}^p \text{Pol}_k^p
\end{aligned}$$

where indices  $r$  and  $p$  refer to the reporter (exporter) and the partner (importer) respectively;  $TRP_{rp}$  is the bilateral trade between  $r$  and  $p$  (in log and with zero values when it is already zero in levels); and  $POL$  indicates the political variables (see Table A2 for a detailed description of the variables).

Equation (2) captures the major factors of the analysis. The volume of trade ( $TRP_{ij}$ ) between any two countries ( $i, j$ ) is a function of each country's trade potential and their mutual trade attraction. The absolute trade potential of a country depends on its total economic size ( $Y$ ) and trade intensity. The trade intensity is determined by the level of development, proxied by income per capita ( $YC$ ) and geographic characteristics (such as area size). Whereas  $Y$  and  $YC$  are expected to have positive effects on bilateral trade, the impact of size should be negative. The greater the area of the country, the smaller the size of economic activity expected to cross its borders. Trade attraction between two trading partners is also determined by factors that influence the cost of trade, such as transport cost (proxied by distance and by infrastructure), policy and political barriers to trade (trade, currency or regional co-operation schemes), sound economic conditions, and a peaceful environment.

An additional variable is generally included in gravity models to test for the effect of differences between countries' levels of per capita income. Two conflicting effects are involved here. Countries with similar living standards may have a high level of intra-industry trade given that they both produce a broad range of tradable goods (the so-called Linder Hypothesis). However, given that income per capita differences are highly correlated with differences in factor endowments, intra-industry trade may be smaller between countries with similar levels of income.

As far as the parameters are concerned,  $\beta_1$  and  $\beta_2$  are expected to be positive,  $\beta_3$  and  $\beta_4$  are expected to be negative, while  $\beta_5$  is unsigned. With respect to infrastructure variables,  $\beta_7$  should be negative while  $\beta_8$  and  $\beta_9$  should be positive. Concerning economic policy factors,  $\beta_{10}$  and  $\beta_{12}$  should be positive and  $\beta_{11}$  negative. If there are trade diversion effects, then  $\beta_{13}$  will be negative. On the contrary, trade creation effects imply a positive  $\beta_{14}$ . Finally, as political tensions may be harmful to trade,  $\beta_{15}$  is expected to be negative.

Equation (2) is estimated using two different samples. One includes yearly data of bilateral flows between 41 African countries. The other sample contains yearly bilateral flows between 41 African countries, 15 European Union members, the United States and Japan. Given the higher level of development of these 17 OECD countries, only infrastructure, economic policy, and political tensions variables for the 41 African exporters are included in the regressions. The period of observation is 1980-97. Results are reported in Tables 3 and 4 for intra-African trade and extra-African trade respectively. In each table, three sets of results are presented. One refers to the whole sample, the second excludes South Africa, and the third excludes both South Africa and the oil-exporting countries. We decided to present the results both with and without South Africa because of the country's special characteristics — it is by far the most developed country in Africa at the same time as it faced a high degree of political tensions during the apartheid regime.

As usual, the total quality of fit of the gravity model in Table 3 is very high. The regressions explain 75 per cent of the dependent variable, regardless of the sample under consideration. The level of significance of the coefficients for the variables of interests (infrastructure, political stability and economic policy) remains in general similar across regressions. The major differences concern the political variable. The inclusion of South Africa in the sample gives a very different picture. Except for revolution in the partner country, very few political variables are significant in the regressions both with and without South Africa. This confirms the particular status of this country regarding political tensions during the period of observation. Revealing enough is the fact that riots in the exporting country appear as a major obstacle to trade when South Africa is included into the sample, but lose all explanatory power if South Africa is not included. The distinction between samples with and without oil-exporting countries does not seem to be crucial; the inclusion of dummies for such countries is apparently sufficient to capture their idiosyncrasy with respect to IAT. Hence, we focus on the sample without South Africa but with oil-exporting countries.

According to the result in Table 3, the traditional variables of the gravity model are all highly significant except in one case. The size of a country's economy is an important determinant of bilateral trade. Point estimates suggest that a one per cent rise in one country's activity increases its bilateral trade by more than 3 per cent. This is twice the level reported by Elbadawi (1997) and Foroutan and Pritchett (1997). There are differences between our sample and theirs. First, we focus on African countries only, while they also consider other developing countries. This may suggest that the potential for an increased bilateral trade is higher in Africa than elsewhere. The second difference is that we combine cross-section and time series data for almost 20 years. The coefficients for per capita income show that the propensity to export to other African countries declines as incomes rise. This reflects the fact that richer African countries specialise in goods for which there is scarce demand by their neighbours. Insofar as countries with similar level of development trade more, our results confirm the Linder Hypothesis. While Elbadawi (1997) found no per capita income effect, our results are similar to those of Foroutan and Pritchett (1997). Third, distance and surface have the expected negative impact on IAT. Finally, the estimated impact of regional integration schemes is in general not too different from the one obtained by Elbadawi (1997). There is strong evidence of trade creation and weak evidence of trade diversion. With respect to oil exports, this seems to lower IAT.

The value added by this study results from including variables for infrastructure, economic policy, and political instability. The results show that infrastructure is a crucial factor to the development of IAT. All coefficients are highly significant both for exporters and importers. Landlockness of either the importer or the exporter reduces IAT by about 2 per cent. A 1 per cent increase in the stock of transportation and telecommunication infrastructure in the exporting country boosts its export towards other African countries by about 3 per cent. In the importing country, the multiplier is much lower (between 0.6 and 1 per cent). That infrastructure plays a crucial role in raising IAT, and hence regional growth rates, provides further support to the results of Richaud *et al.* (1999), who, albeit in a different context, estimate that 25 per cent of the total gain from improving infrastructure accrues to neighbouring countries, mainly through trade and FDI.

Economic policy indicators also appear to be an important determinant of IAT. However, the main impacts seem to concern the exporter. Except for the black market premium, the coefficients are significant only for exporters. An exporter who adopts a SAP trades about 1 per cent more with the rest of Africa than one who does not. Consistent exchange-rate management, reflected in a lower black-market premium (by, say, 1 per cent) also favours IAT (by almost 2 per cent). Finally, a suitable and attractive economic and institutional environment also boosts IAT.

The effect of political variables is ambiguous in Table 3. The only significant variable at the 5 per cent level is revolution. However its effect on IAT goes in opposite directions depending on whether the exporter or the importer is concerned. Revolution in the exporting country decreases IAT, while increasing it if occurring in the importing country. If a revolution handicaps production, it follows that imports fill the demand gap while exports decrease. Results concerning the political variable, however, are not robust to the different specifications. One reason may be a high degree of correlation among political variables.

**Table 3. Estimation Results of Equation 2 (Intra-African Trade)**

Parameter	Complete African sample		African sample — South Africa		African Sample — (South Africa + Oil exporter)	
	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
C	-41.19	-6.64	-72.26	-11.43	-114.07	-12.84
YR	2.97	17.57	3.56	20.95	3.84	15.91
YP	3.3	19.53	3.42	20.23	3.46	14.43
YCR	-4.4	-11.48	-2.69	-7.21	-0.46	-0.94
YCP	-0.5	-1.28	-0.23	-0.61	0.43	0.88
DYRP	-0.88	-8.51	-0.75	-7.23	0.06	0.46
LDIS	-5.59	-25.3	-5.19	-23.8	-5.45	-19.76
LSURF	-0.73	-7.08	-0.67	-6.76	-0.4	-3.05
LLOCR	-0.9	-2.92	-1.62	-5.44	-0.97	-2.79
LLOCP	-1.57	-5.11	-2.04	-6.88	-1.66	-4.35
LROADR	2.79	13.74	2.76	14.12	3.08	13.03
LROADP	0.8	3.98	0.64	3.28	0.19	0.81
LPHONER	3.95	15.72	3.27	13.48	2.15	6.42
LPHONEP	1.34	5.36	1.17	4.84	0.67	1.93
SAPR	1.08	4.39	0.73	3.06	0.8	2.89
SAPP	0.22	0.88	0.3	1.28	-0.09	-0.31
LBLACKR	-1.76	-9.13	-1.92	-10.24	-0.32	-1.24
LBLACKP	-0.91	-4.88	-1.1	-6.06	-1.5	-7.04
FDIR	0	5.6	0	3.57	0	-1.28
FDIP	0	2.86	0	0.68	0	-0.81
RIOTR	-0.93	-10.86	0.23	1.68	0.19	1.02
COUPR	-1.47	-2.2	-0.86	-1.35	-1.22	-1.63
REVR	-0.32	-1.2	-0.56	-2.11	-0.84	-2.57
WARR	-1.71	-4.37	-0.06	-0.15	0.17	0.36
RIOTP	-0.45	-6.22	-0.17	-1.28	-0.17	-1.07
COUPP	-0.8	-1.3	-0.09	-0.15	0.45	0.62
REVP	0.7	2.7	0.55	2.18	0.76	2.41
WARP	-1.51	-3.96	-0.56	-1.44	-1.03	-2.13
OILR	-0.36	-0.96	-2.51	-6.63		
OILP	0.24	0.73	0.09	0.29		
ECOWAS	1.23	2.53	1.05	2.21	1.39	2.22
CEAO	2.26	5.41	2.04	4.99	1.08	2.08
UDEAC	3.14	6.83	3.21	7.2	0.81	1.3
CEPGL	-4.11	-7.54	-1.82	-3.37	-1.74	-2.63
COMESA	-1.54	-4.45	-3.64	-10.46	-1.49	-3.2
SADCC	-2.21	-6.25	0.86	2.34	0.2	0.45
LECOWAS	4.8	5	4.99	5.34	7.85	6.84
LCEAO	9.37	11.34	8.64	10.86	6.37	7.02
LUDEAC	3.21	2.91	3.24	3.06	3.12	1.5
LCEPGL	-1.24	-0.47	4.21	1.67	5.82	1.74
LCOMESA	5.62	9.1	2.14	3.56	4.22	5.66
LSADCC	1.54	1.97	6.92	8.08	7.53	7.68
Pseudo R <sup>2</sup>	74.28		75.02		75.9	
No. Obs.	14 098		13 246		8 245	
% positive	40		41		39	

Note: The letters R and P at the end of the first variables indicate when the variables belong to the Reporter Country or Partner Country.

**Table 4. Estimation Results of Equation 2**  
(Reporter Countries: Africa; Partner Countries: EU+USA+Japan)

Parameter	Complete African sample		African sample (excluding South Africa)		African Sample (excluding South Africa + Oil exporters)	
	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
C	-48.45	-16.85	-46.88	-14.63	-60.13	-12.97
YR	2	17.05	1.94	15.38	2.04	10.57
YP	2.39	44.27	2.43	43.64	2.41	36.06
YRC	-0.21	-0.79	-0.21	-0.72	1.6	4.03
YPC	-1.4	-2.28	-1.9	-2.55	-4.41	-2.33
DYRP	-0.62	-1.36	-0.17	-0.29	2.75	1.63
LDIS	-2.62	-15.74	-2.74	-15.37	-3.41	-13.48
LSURF	-0.37	-4.27	-0.37	-4.16	-0.51	-4.15
LLOC	-0.42	-2.19	-0.4	-2.05	-0.53	-2.33
LROADR	0.06	0.47	0.07	0.5	0.36	2.2
LPHONER	0.31	1.89	0.34	2.01	-0.48	-1.94
SAPR	0.28	1.91	0.3	2.05	0.34	2.04
LBLACKR	-0.31	-2.66	-0.29	-2.46	0.49	3.09
FDIR	0	-0.08	0	0.4	0	-0.19
RIOTR	0	0.03	-0.09	-0.99	-0.17	-1.43
COUPR	-0.45	-1.29	-0.46	-1.28	-0.91	-2.26
REVR	-0.29	-1.92	-0.28	-1.76	-0.22	-1.14
WARR	0.08	0.37	-0.01	-0.02	0.24	0.85
OILR	0.43	1.74	0.55	2.03		
ECOWAS	1.49	4.16	1.48	4	-0.51	-0.98
CEAO	-0.81	-2.41	-0.83	-2.41	0.05	0.14
UDEAC	1.89	4.38	1.85	4.2	-1.18	-1.91
CEPGL	-1.39	-3.43	-1.55	-3.63	-2.36	-4.71
COMESA	2.72	10.18	2.92	10.12	3.06	8.15
SADCC	2.12	7.78	1.96	6.56	2.54	7.15
CFAR	0.62	2.06	0.69	2.25	1.59	4.16
Pseudo R <sup>2</sup>	85.87		85.47		84.86	
No. Obs.	7 127		6 914		5 280	
% positive	88		87		85	

*Note:* The letter R at the end of the variables indicates when the variables belong to the reporter country.

Results for bilateral trade between Africa and developed countries (Table 4) again confirm the good econometric quality of the gravity model. For the three samples, the Pseudo  $R^2$  are around 85 per cent. For the purpose of comparison, we also focus on the sample excluding South Africa but including oil-exporting countries. Dummies for CFA and oil-exporting countries are included. The traditional variables of the gravity model are in general significant, and have the expected sign. As far as infrastructure variables are concerned, the road indicator is unsurprisingly insignificant: clearly African trade with developed countries relies more on sea or air than on roads. Landlockness, however, is detrimental to extra-African trade. Telecommunication infrastructures are also crucial to increased extra-African trade. Except for FDI, the indicators of economic policy all have a significant result and the expected sign. Thus, sound economic policy also benefits extra-African trade. Finally, the coefficients for the political variables do not enable us to reach any firm conclusion about their impact on African trade. At the 5 per cent level, no coefficient is significant, while at the 10 per cent level only one coefficient (REV) is significant.

For the whole set of variables used in the regression, point estimates are lower for extra-African trade than for IAT. This means that an improvement of a given indicator increases extra-African trade less than IAT. Different explanations may be advanced. First, extra-African trade already represents a substantial share of total trade and further increases are necessarily limited. Second, African trade patterns with OECD countries, especially in Europe, are closely dependent on history (colonialism) and culture (language) as suggested by Elbadawi (1997). Third, extra- and intra-African trade flows are different in composition and hence react differently to changes in the incentive regime (as expressed by the explanatory variables).

As already mentioned, one problematic aspect of our methodological approach is that, due to collinearity among some variables, it is not always possible to obtain clear-cut results concerning the respective impact of infrastructure, economic policy, and political indicators. In order to avoid this problem, we used principal component analysis to summarise the main features of the variables of each sub-set. The first component is then used as an explanatory variable. The variables are re-coded so that an increase in the first component implies an improvement in infrastructure and economic policy and a worsening of the political situation. Table 5 gives the cumulative  $R^2$  for the principal components. The first row refers to infrastructure variables, the others to economic policy and political instability variables. The results show that first components explain a large share of the variance of the corresponding variables. For infrastructure the share is almost 50 per cent and for the other indicators it is around 40 per cent.

**Table 5. Principal Components Analysis on Three Sub-Sets of Variables**

Variables	Principal Components			
	I	II	III	IV
Infrastructure	0.49	0.66	1.00	
Economic policy	0.41	0.70	1.00	
Political instability	0.41	0.66	0.87	1.00

*Note:* Values in the table are the cumulative  $R^2$ .

The estimation results using principal components are presented in Table 6. The overall quality of fit is again very good. In general the results are very similar to those presented in Tables 3 and 4. Point estimates and the degree of significance for the coefficients are roughly the same for both traditional gravity variables and RIA variables. The values for other coefficients are improved ones. The coefficient for infrastructure is highly significant and positive for both the reporter and the partner and the policy implication is therefore rather sound — improving infrastructure may help to increase IAT. Similar conclusions hold for sound economic policy: both coefficients are positive and significant. The coefficient for the political situation is highly significant and negative for the reporter and insignificant for the partner. An increase in political tensions in the exporting country clearly reduces its trade with African partners. A final interesting result is that, again, point estimates for the effects of infrastructure, economic policy, and the political situations are always significantly higher in the intra-African trade equation than in the extra-African one.



**Table 6. Estimation Results of Equation 2 Using Principal Components  
(Excluding South-Africa)**

Parameter	Intra-African trade		Extra-African trade	
	Estimate	t-statistic	Estimate	t-statistic
C	-112.37	-19.34	-49.92	-16.89
YR	3.88	24.85	2.02	17.85
YP	3.55	23.20	2.43	43.68
YCR	0.99	3.73	-0.07	-0.36
YCP	0.28	1.07	-1.91	-2.63
DYRP	-0.85	-8.08	-0.17	-0.29
LDIS	-5.23	-23.46	-2.75	-15.59
LSURF	-0.86	-9.59	-0.42	-5.54
OILR	-2.82	-7.51	0.57	2.15
OILP	-0.04	-0.14		
INFR	2.04	11.03	0.38	3.19
INFP	1.67	9.27		
EPOLR	0.52	4.07	0.20	2.35
EPOLP	0.46	3.93		
POLR	-0.97	-7.61	-0.23	-3.12
POLP	-0.08	-0.66		
LECOWAS	4.18	4.83	1.41	4.25
LCEAO	8.57	11.02	-0.78	-2.40
LUDEAC	4.99	4.98	1.92	4.51
LCEPGL	2.96	1.15	-1.75	-4.31
LCOMESA	0.71	1.18	2.87	10.10
LSADCC	10.77	13.88	2.10	8.98
ECOWAS	0.72	1.64		
CEAO	1.91	4.82		
UDEAC	4.11	10.11		
CEPGL	-2.45	-4.62		
COMESA	-4.44	-12.69		
SAD	2.96	9.53		
Pseudo R <sup>2</sup>	75.05		85.06	
No. obs.	13 246		6 914	
% positive	40.78		87.20	

## IV. CONCLUSION

This paper has adopted a normative approach for the analysis of intra-African trade. On the basis of the literature on traditional and non-traditional gains from regionalism, we first argued why RIAs are desirable in Africa. Then, on the basis of a gravity model, we identified current barriers to IAT and quantified the potential benefits from their removal.

The results confirm that the size of a country's economy, its wealth and its stage of development have a great impact on current trade flows. Moreover, as expected, distances and country dimension have a negative impact on trade flows. In terms of elasticities, the role played by economic activity is remarkable: points estimates suggest that an increase in one country's activity by 1 per cent increase its bilateral flows by more than 3 per cent. Moreover, as predicted by the Linder Hypothesis, countries with similar levels of development trade more. While the context may be slightly different, these empirical findings support the argument of Rodrik (1998) who explains Africa's marginalisation on world markets in terms of lagging output growth: "because [African countries] have failed to expand their economies at sufficient rates, their importance in world trade has shrunk" (p. 5).

We also show that infrastructure is a crucial factor in the development of IAT. Although literature findings on the impact of infrastructure on growth — particularly as concerns the direction of causality — are not conclusive (Holtz-Eakin, 1994), in Africa the weakness of infrastructure has been proved to be a major determinant of the low level of IAT. This is in accordance with field surveys, according to which exporters consider the poor state of infrastructure as one of the most important bottlenecks for the expansion of African trade flows (WTO, 1997).

Sound economic policies, such as adopting a SAP and following sound exchange-rate management, also appear to be very conducive to a higher IAT. This is in line with the literature on individual African countries which shows that improving economic governance fosters exports and therefore growth (e.g. Sekkat and Varoudakis, 2000). Finally, our results show that (at least in the exporting country) political instability has a direct impact on trade flows.

The *prima facie* inference of our empirical analysis is that improving domestic policies may raise IAT and hence contribute to regional spillovers. As an increasing number of African countries engages in a process of economic reform and promotes openness and competition, more promising outcomes in terms of intra-regional trade are to be expected. Moving from general to more precise implications, as already pointed out in other studies, infrastructure is a key factor for regional take-off in Africa. Combined with the fact that a quarter of the total gain from improved infrastructure benefits neighbouring countries (Richaud *et al.*, 1999), our empirical findings suggest that integration initiatives — and possibly donors' support — should be targeted at investing in, managing, and regulating infrastructure at the regional level. Investment in infrastructure is very costly and may not be bearable by individual countries. Moreover, the fact that benefits are not fully appropriated domestically may generate sub-optimal investment levels<sup>12</sup>. A co-ordinating regional agency could ensure that externalities are taken into account when investment decisions are made,

producing additional benefits in terms of dialogue and co-operation. Unfortunately, up to now the record of such projects is inauspicious (e.g. Goldstein, 2001 in the case of air transport).

Africa is facing a double tragedy: its countries are over-represented among the world's poorest and the frequency of civil wars is the highest<sup>13</sup>. A number of authors have recently shown that political instability is partly the outcome of bad economic performance and poverty. We document the negative impact of political tension on economic activity. While signing agreements, protocols, or conventions is far from enough to eliminate such tensions, improvement in the economic situation will help significantly. Apart from the argument presented in the introduction concerning the role of RIAs in fostering regional peace, if increased intra-African trade succeeded in fostering regional economic take-off and initiating an "African virtuous circle", it could also contribute to reducing political tensions.

## APPENDIX

**Table A1. Reporter and Partner Countries**

Report and Partner Countries	Partner Countries
Algeria	Austria
Angola	Belgium and Luxembourg
Benin	Denmark
Burkina Faso	Finland
Burundi	France
Cameroon	Germany
Central African Republic	Greece
Chad	Ireland
Congo, Dem. Rep.	Italy
Congo, Rep.	Netherlands
Cote d'Ivoire	Portugal
Egypt, Arab Rep.	Spain
Ethiopia	Sweden
Gabon	United Kingdom
Gambia, The	Japan
Ghana	United States
Guinea	
Guinea-Bissau	
Kenya	
Liberia	
Madagascar	
Malawi	
Mali	
Mauritania	
Mauritius	
Morocco	
Mozambique	
Niger	
Nigeria	
Rwanda	
Senegal	
Seychelles	
Somalia	
South Africa	
Sudan	
Tanzania	
Togo	
Tunisia	
Uganda	
Zambia	
Zimbabwe	

Table A2. Variable List

	Variable Name	Description	Source
<i>Dependent Variable</i>	TRP <sub>i</sub>	Log (Exports from country i to country j) — or zero when zero in levels — current international \$	IMF DOTS 1999 CD-ROM
<i>Traditional Gravity Model Variables</i>	Y	GDP at PPP — current international \$	WDI 1999 CD-ROM
	YC	GDP per capita at PPP — current international \$	WDI 1999 CD-ROM
	DIS <sub>i</sub>	Distances between main economic centres between country i and country j	<a href="http://www.indo.com/cgi-bin/dist">Www.indo.com/cgi-bin/dist</a>
	SURF	Country's total area (sq km)	WDI 1999 CD-ROM
<i>Infrastructure Variables</i>	LLOC	Dummy for landlocked country	
	ROAD	Road length per capita (1 000 km per 1 000 000 inhabitant)	WDI 1999 CD-ROM, African Development indicators (1997), World Development Report
	PHONE	Telephone mainlines per 1 000 people	Banks (1995)
<i>Economic Policy Variables</i>	SAP	Dummy for Structural Adjustment Program	
	BLACK	Black market premium	Wood(1988), World Currency Yearbook
	FDI	Foreign direct investment, net — current US\$	WDI 1999 CD-ROM
<i>Political Variables</i>	RIOT	Number of violent demonstrations or clash of more than 100 citizens involving the use of physical force	Banks (1994), Balencie and de la Grange (1996), Easterly and Levine (1997)
	COUP	Number of extra-constitutional or forced changes in the top government elite and/or its effective control of the nation's power structure	Banks (1994), Balencie and de la Grange (1996), Easterly and Levine (1997)
	REV	Number of illegal or forced changes in the top governmental elite	Banks (1994), Balencie and de la Grange (1996), Easterly and Levine (1997)
	WAR	Dummy for civil war on national territory	Banks (1994), Balencie and de la Grange (1996), Easterly and Levine (1997)
<i>Control Variables</i>	OIL	Dummy for Oil Exporting country	
	ECOWAS	Country i and country j membership in RI scheme	Elbadawi (1997), Yeats (1998), Official RI scheme internet site
	CEAO	Country i and country j membership in RI scheme	Elbadawi (1997), Yeats (1998), Official RI scheme internet site
<i>Other Control Variables</i>	UDEAC	Country i and country j membership in RI scheme	Elbadawi (1997), Yeats (1998), Official RI scheme internet site
	CEPGL	Country i and country j membership in RI scheme	Elbadawi (1997), Yeats (1998), Official RI scheme internet site
	COMESA	Country i and country j membership in RI scheme	Elbadawi (1997), Yeats (1998), Official RI scheme internet site
	SADCC	Country i and country j membership in RI scheme	Elbadawi (1997), Yeats (1998), Official RI scheme internet site
	L (RI scheme)	Country i or country j membership in RI scheme	Elbadawi (1997), Yeats (1998), Official RI scheme internet site

## NOTES

1. In the present paper, the term bilateral flows refers to exports [IMF Direction of Trade (DOT) Statistics].
2. Such an argument is based on the concept of “Investment Deterring Aspects of hub and Spoke” (Baldwin, 1992). His analysis draws on the theoretical works of Krugman (1991) and examines the impact of commercial policies on the location of firms.
3. Information on bilateral tariff and non-tariff barriers could not be included due to the lack of a comprehensive database.
4. Belgium and Luxembourg have been considered as a single country following the aggregation in IMF DOT Statistics.
5.  $(41 \cdot 40 + 41 \cdot 16) \cdot 18 = 41\,328$ .
6. We are grateful to Ludwig Söderling for providing the most recent data.
7. The total number of African countries considered in the final dataset has been restricted to 41 due to the data availability of some variables of the RHS (right hand side) sets. Moreover, the IMF DOTS — trade data for South Africa refer to the South African Customs Union, which includes Botswana, Lesotho, Namibia, South Africa and Swaziland. The RHS data have been changed accordingly.
8. Taken from <http://www.indo.com/cgi-bin/dist>.
9. This variable has been considered since direct access to the sea is a major advantage for trading, especially in Africa.
10. The economic policy variables used in this study are imperfect proxies for structural policies, since outcome variables may not reflect policies only (e.g. exogenous factors could have affected observed outcomes). However, given the broad spatial and temporal coverage of our study, no data are available to measure directly economic policies. To our knowledge, the only attempt to build an indicator based directly on policy variables for Africa is Bonaglia *et al.* (2000). Unfortunately that study covers the period 1985-97 and a smaller sample of countries.
11. In September 2000, Tanzania withdrew from the Common Market for Eastern and Southern Africa (COMESA).
12. National policymakers underestimate the gains associated with the investment in infrastructure because they do not internalise the positive externalities accruing to neighbours. Each individual country only invests up to the point where its marginal cost equals its own marginal gain, which results in sub-optimal investment in infrastructure projects.
13. For instance, the number of civil wars in Africa is about one half of the total number of civil wars in developing countries while its population represents about 20 per cent of total population in developing countries.

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