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**AFRICAN REGIONAL AGREEMENTS:
THEIR IMPACT ON TRADE WITH OR WITHOUT CURRENCY UNIONS**

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AFRICAN REGIONAL AGREEMENTS: THEIR IMPACT ON TRADE WITH OR WITHOUT CURRENCY UNIONS

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May 2003

Abstract

The aim of this paper is (i) to assess the impact of regional agreements on members' trade in Sub-Saharan Africa (intra-regional trade as well as trade with the rest of the world), controlling for the other traditional determinants, including geography and transport costs and (ii) to compare the respective effect of the preferential trade agreements and the monetary unions. Considering the period 1962-1996, we first assess the average impact of each regional agreement on their implementation period and second we show how these impacts have evolved. An "augmented" gravity model is designed, relying on a transport cost function, in which specific dummies allow trade creation and trade diversion effects to be separated. The model is estimated in panel with bilateral specific effects, to isolate the non-observable characteristics of each pair of countries, and according to the Hausman-Taylor (1981) method, which takes into account a possible endogeneity of some explanatory variables. During their implementation, the African regional trade agreements have generated a significant increase in trade between members, although initially often through trade diversion. In the two agreements of the CFA franc zone, the currency unions have largely reinforced the positive effect of the corresponding preferential trade agreements on intra-regional trade, while dampening their trade diversion effect. Actually, currency unions rather had a trade creation effect (all the more important as the international monetary environment has been more unstable), whereas preferential trade agreements resulted in important trade diversion.

Résumé

L'objectif de ce papier est (i) d'évaluer l'impact des accords régionaux d'Afrique Subsaharienne sur le commerce de leurs pays membres (commerce intra-régional et commerce avec le reste du monde) une fois pris en compte les effets des déterminants traditionnels tels que la géographie et les coûts de transports et (ii) de comparer l'effet respectif des accords commerciaux préférentiels et des unions monétaires. Sur la période d'étude 1962-1996, deux évaluations sont présentées : celle de l'impact moyen de chaque accord régional depuis sa mise en place, et l'évolution dans le temps de ces impacts. Des variables muettes permettant d'identifier les créations et détournements de trafic sont introduites dans un modèle de gravité "augmenté", basé sur une fonction de coûts de transport. Le modèle est estimé en panel avec introduction d'effets spécifiques bilatéraux afin d'isoler les caractéristiques non observables de chaque paire de pays, et selon la méthode de Hausman et Taylor (1981) afin de corriger l'endogénéité potentielle de certaines variables explicatives. Les accords régionaux africains ont engendré une augmentation significative de commerce entre les pays membres, mais souvent au détriment du commerce avec le reste du monde dans les premières années. Dans le cas des deux accords de la zone franc CFA, les unions monétaires ont fortement renforcé les effets positifs sur le commerce intra-régional des accords commerciaux préférentiels correspondants, tout en compensant leurs effets de détournement de commerce. En fait, les unions monétaires ont plutôt eu un effet de création de commerce (d'autant plus important que l'environnement monétaire international a été plus instable), tandis que les accords commerciaux préférentiels ont conduit à d'importants détournements.

JEL Classification: F15; F33; C23.

Keywords: Sub-Saharan Africa, regional agreements, currency union, gravity equation, panel data.

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1. INTRODUCTION

Trade of Sub-Saharan African countries is generally considered as rather low and the growing marginalisation of African countries in world trade has often been stressed. Numerous explanations have been given to this marginalisation, such as the slow growth of economic activities, unfavourable geographical factors and inappropriate transport policies (Amjadi and Yeats, 1995, Yeats, 1998, Collier and Gunning, 1999, Limao and Venables, 2001) or the failure of the trade policy (Collier, 1995, Rodrik, 1998, Yeats 1998). Among the latter, regional agreements have been an important component of trade policy in African countries over the last four decades. Two kinds of regional agreements are likely to enhance African trade: currency unions and preferential trade agreements. There are presently five main African regional areas: the Economic and Monetary Union of West Africa (UEMOA), the Economic and Monetary Community of Central Africa (CEMAC), the Economic Community of West African States (ECOWAS), the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC).¹ The first two are simultaneously preferential trade areas and monetary unions with a common currency (the CFA franc), whereas the three last are only preferential trade areas. So, Africa offers an interesting field of analysis to assess the respective impact of monetary and trade agreements and how they mutually back each other up.

The relative importance of different factors in trade evolution, including common currency, has already been considered in a historical perspective by Estevadeordal *et al.* (2002): an augmented gravity model is used to examine tariffs, transport costs and a “common currency” effect through the gold standard as determinants of the rise and fall of world trade for 1870-1939, controlling for changes in the scale of world economic activity. In the same way, Eichengreen and Irwin (1995) have analysed the extent to which trade blocs and currency arrangements were responsible for the changing patterns of trade observed in the 1930s among 34 developed and developing countries. In the

more specific literature on the trade impact of regional integration in the post-World War II period, there are numerous studies using as counterfactual a gravity model to assess *ex post* preferential trade agreements (notably Frankel 1997, Endoh 1999, Krueger 1999 or Soloaga and Winters 2001) and monetary unions (see for instance Rose, 2000, Rose and Wincoop, 2001, or Frankel and Rose 2002). However, few of them have considered African preferential trade agreements (Foroutan and Pritchett, 1993, Elbadawi 1997, Lyakurwa 1996, Subramanian and Tamirisa 2001, Longo and Sekkat 2001) or African monetary unions (Nitsch, 2002), and they do not deal with the issue of the joint effects of a common currency and the implementation of a preferential tariff on trade.

The aim of this paper is (i) to assess the impact of regional agreements on members' trade in Sub-Saharan Africa (intra-regional trade as well as trade with the rest of the world), controlling for the other traditional determinants, including geography and transport costs and (ii) to compare the relative importance of the preferential trade agreements and the monetary unions in this impact. Considering the period 1962-1996, we first assess the average impacts (taking into account the implementation period of each regional agreement) and second we demonstrate how these impacts have evolved.

As we are interested in the nature of the impact of regional agreement, as well as in its size, we consider not only whether the trade between the members of a regional agreement increased or not, but also, if it did, whether the increase was mainly a trade diversion (TD) or a trade creation (TC), which has very different welfare² and development implications, in particular with regard to competitiveness. To do that, we introduce three dummies into a gravity model for each regional agreement, likely to capture trade creation, import diversion and export diversion respectively. In the assessment of two of the main African regional agreements, the UEMOA and the CEMAC, we must take into account the specific impact of currency unions on bilateral trade. One of the main channels of the currency union on trade being the elimination of the bilateral nominal exchange rate volatility, we

¹ We consider these regional agreements and their antecedents as well (see appendix A.1). For instance, the term UEMOA actually covers the UEMOA agreement and its trade antecedents: UDAO, UDEAO and CEAO.

introduce this variable in the gravity equation in order to distinguish the effects of the trade agreements from those of the currency union.

We design an “augmented” gravity model relying on a transport cost function, instead of the only distance variable. Hence, we avoid an omitted variable bias, which would be captured by the coefficients of the regional agreement dummies and could be particularly important for African countries (see Limao and Venables, 2001 or Brun *et al.*, 2002). Whereas all the studies quoted above regarding the assessment of African preferential trade agreements in a gravity model are cross sectional analyses, we estimate the model in panel, with bilateral specific effects to isolate the non-observable characteristics of each pair of countries which can influence their bilateral trade (such as a common language, historical links, etc.). In former studies, this impact could be partly captured by variables related to African regional agreements. Moreover, we estimate the model according to the Hausman-Taylor (1981) method, which enables us to take into account a possible endogeneity of some explanatory variables. The estimation is also corrected for a potential selection bias.

The main conclusions of the paper are the following: (i) the African regional agreements have succeeded in enhancing intra-regional trade, (ii) those combining preferential tariff and common currency components are the most efficient in increasing intra-regional trade, (iii) the two components have, on average, an equal contribution in additive intra-regional trade, but (iv) currency unions have rather a trade creation effect (all the more important as the international monetary environment is more unstable), whereas preferential trade agreements evidence trade diversion.

Section 2 recalls the traditional gains of preferential trade agreements and currency unions as well as their relevance for African countries. Section 3 presents the augmented gravity model used to assess the African regional agreements. Section 4 specifies the econometric model and presents the evaluations of the *average effect* of each African regional agreement since its implementation. We compare these results for regional agreements with and without a common

² For an exhaustive survey on members’ welfare effects that can be expected from African trade blocs, see Gunning (2001).

currency and, in the case of the UEMOA and CEMAC, we try to untangle the respective impacts of trade and monetary unions. In section 5, the average effect demonstrated in section 4 is divided into three-year sub-periods and we interpret the part of the evolutions induced by the implementation of preferential tariffs and by changes in the relative monetary union advantage. Section 6 concludes.

2. ARE THE TRADITIONAL GAINS OF REGIONAL AGREEMENTS RELEVANT FOR AFRICA?

Any *ex post* assessment of regional agreement on trade flows should consider whether, following its implementation, trade creation (TC) or trade diversion (TD), according to Viner's traditional model (1950), dominates. To answer we propose to compare the impact of regional agreement on the evolution of two different variables: the intra-regional trade and the imports of the members from the rest of the world (ROW)³. A third variable considered is the evolution of members' exports to the ROW: it enables us to observe if the regional agreement induces an increase in the members' competitiveness⁴ or if the increased trade between the members are only a diversion of export flows previously oriented to the ROW.⁵

Of course, the potential intra-regional trade in SSA seems to be quite low, because these countries have similar patterns of trade, as shown by Yeats (1998) with Michaely's index of trade complementarity⁶. However, several empirical studies (see Foroutan and Pritchett, 1993, Rodrik, 1998) show that this intra-SSA trade exists and could be developed by the reduction of trade barriers. Yeats (1998) underlines this potential in sectors such as food products (which represent 14% of the global imports of SSA countries), especially since some African countries have a comparative advantage in the production and export of these goods. Moreover, as noted by Guillaumont P. and S. (1993) for several types of goods (food, industrial or craft industrial goods) which are both produced

³ Under pure TC, intra-regional trade increases and imports from the ROW remain unchanged; under pure TD, the increase in intra-regional trade is entirely offset by a corresponding decrease on imports from the ROW; if there is both TC and TD, intra-regional trade increases more than imports from the ROW decrease.

⁴ from more dynamic gains of the regional agreement, such as the increase in competition inside the area, or the benefits due to economies of scale on the regional market.

⁵ an increase of this third variable signifying an improvement in welfare for non-members (see Winters, 1997).

in Africa and imported from the ROW, the potential for intra-SSA trade is demonstrated by significant informal trade. Hence, the African preferential trade agreements or currency unions are likely to induce an increase in the official (or registered) trade between partners, even if this increase is only small.

Enhancing intra-regional trade may result in trade diversion (TD) as well as trade creation (TC). According to Viner's analysis (1950), or that of Kemp and Wan (1976) relative to preferential trade agreements, in order to limit the risk of TD and the associated loss of welfare, the members must not increase their tariffs on imports from the ROW. Because of the importance of the revenue accruing from customs tariffs in the SSA countries' budgets, there is a pressure to compensate for the loss of tariff revenue due to trade preferences by an increase in the tariffs on imports from the ROW. Then, if custom tariffs increase and some partners produce goods previously imported from the ROW and highly protected, there will be TD, inefficient industries becoming "competitive" on the regional market. According to Cadot, de Melo and Olarreaga (2000), this scheme is accentuated in SSA because of the considerable difference in size of member countries (Côte d'Ivoire in the UEMOA, Cameroon in the CEMAC, Nigeria in the ECOWAS, etc.) and the "dominant" country is usually (i) the most industrialized of the group, (ii) the country with the highest customs tariffs, and (iii) sometimes the only producer. Hence, there is a risk of TD, because the dominant country is less effective than the world's suppliers.

Thus, whereas the trade patterns of SSA countries suggest that the potential TC from these preferential trade agreements is low, the characteristics of their economy (existence of a revenue constraint, asymmetry between the countries, small size of each regional bloc, and their tariffs schemes) suggest that they may result in large TD.

⁶ The average value of this index is 9 for SSA countries, whereas it was approximately 53.4 for the EU when this agreement was set up.

We assume that the nature of the impact of currency unions may be different. We can expect a currency union to reinforce trade between members, making transactions easier and more beneficial since it lowers transaction costs by means of a common currency, as well as the risks, thanks to the absence of exchange rate volatility. As in the case of the preferential tariff implementation, this additional intra-trade can go along with a positive or negative additional trade with the ROW, as the common currency may act as a protection, enhancing the comparative advantage for intra-regional trade. However, TD due to a common currency is not equivalent, in terms of welfare, to TD due to a preferential tariff as this reorientation of trade is generated by a real decrease in domestic costs (as the transaction costs decrease on the intra-regional trade) and does not lead to a loss in government tariff revenue.

The members' trade pattern with the ROW can also depend on the exchange rate regime chosen by the monetary union as it may influence the volatility of the external exchange rate. In the case of the UEMOA and the CEMAC, the two respective single currencies (which have the same acronym, CFA franc) have been pegged to the French franc and are now pegged to the euro. As the main trade partners of the member countries are the European ones, this peg induces a small average volatility of bilateral nominal exchange rates. Let us compare the sample⁷ mean of the bilateral nominal exchange rate volatility over 1962-1996 for three groups: 4.2% for the world except for the countries belonging to currency unions, 2.1% if only one of the two countries belongs to the UEMOA, 1.9% if only one of the two countries belongs to the CEMAC. Hence, currency unions in SSA have reduced the members' exchange rate volatility with the ROW, compared to the volatility for countries non-members of a currency union. This concurs with the conclusion of Savvides (1996), who examines the variability of nominal and real exchange rates of the members of the CFA Franc Zone by comparing it with those of other African countries. With regard to the nominal exchange rate, he concludes that (i) nominal exchange rate variability increased during the flexible exchange rate period for all countries, but (ii) Zone members experienced lower nominal variability in comparison with that of non-members. This lower volatility gives a relative advantage in trade with ROW to the members of

the UEMOA⁸ and the CEMAC. So, we can expect to have a dominant TC effect of the currency unions, as TD is all the more likely as exchange rate volatility with the ROW is high.

Finally, the convertibility regime of the CFA franc may also lower the risk of TD, since it makes transactions with the ROW easier and safer as convertibility is guaranteed by France through the establishment, by each regional central bank in the CFA franc zone, of an operation account with an -in principle- unlimited overdraft facility for each central bank (see Hadjimichael and Galy, 1997). Moreover, when the neighbouring countries do not have a convertible currency, they are induced to export to the monetary unions in order to obtain convertible CFA francs⁹.

3. THE GRAVITY MODEL DESIGNED TO ASSESS AFRICAN REGIONAL AGREEMENTS

The simplest way to assess *ex post* effects of preferential agreements is to observe the evolution of the partners and of the ROW in the global imports or exports of the area. The implicit counterfactual is that, without any agreement, these parts should not change. According to several studies on African preferential trade agreements¹⁰, not only was the part of intra-group exports in the global exports of the countries of the area very slight when the agreement was implemented, but it also failed to rise after the agreement came into effect.

But the failure of African regional agreements cannot be the only explanation of these disappointing results. African countries had to face important handicaps that other countries did not necessarily encounter, in terms of competitiveness, due to a lack of infrastructure, unfavourable geography, small GDP, etc. Hence, the analysis in terms of market share can be misleading: to assess regional agreements, one has to compare the evolution of trade with a counterfactual which predicts

⁷ described in section 4 and in appendix A.4.

⁸ For a study of the relation of exchange rate volatility and trade with ROW in the case of the UEMOA, see Laporte (1996).

⁹ This effect may have been dampened since mid-1993 when the central banks of the two CFA monetary unions decided to no longer change CFA notes presented outside the two respective unions.

¹⁰ de Melo, Montenegro and Panagariya (1993): table 4 p.23; Foroutan and Pritchett (1993): table 1 p.77; Yeats (1998): table 3.2 p.27.

what would have happened, had there been no preferential tariff and no common currency, taking into account these factors. This is why we estimate the counterfactual by a gravity model.

3.1. Assessment of regional agreements with an “augmented” gravity model

We use the standard “generalized” gravity equation developed by Deardorff (1998) (see appendix A.3), adapted to panel data, with a conventional modification: the introduction of the population (and then implicitly the income per capita) of the importing country, to capture the Engel effects, and of the exporting country, to control for factor endowment differences (as done by Frankel, 1997, or Soloaga and Winters, 2001). Then, the log-linear gravity equation is:

$$\ln M_{ijt} = \gamma_0 + \gamma_1 \ln Y_{it} + \gamma_2 \ln Y_{jt} + \gamma_3 \ln N_{it} + \gamma_4 \ln N_{jt} + \gamma_5 \ln \theta_{ijt} + \gamma_6 \ln \overline{DIST}_i + \gamma_7 \ln RER_{ijt} + \eta_{ijt} \quad (1)$$

M_{ijt} : volume of imports of country i from country j ;

$Y_{i(j)t}$: GDP of country i (j), and $\gamma_{1(2)}$ is expected to be equal to unity (see appendix A.3);

$N_{i(j)t}$: population of country i (j), and $\gamma_{3(4)}$ is expected to be negative;

θ_{ijt} : transport costs between i and j , γ_5 is expected to be negative¹¹;

\overline{DIST}_i : average distance of the importing country i from its main partners, weighted by the share of exporters' GDP in world GDP, introduced beside the absolute distance (see the transport costs function below) to take account of “the relative distance of i from suppliers” (the “remoteness”), γ_6 is expected to be positive.

RER_{ijt} : bilateral real exchange rate, γ_7 is expected to be negative.

The usual assumption of the gravity model, namely that transport costs, θ_{ijt} , are a positive function of the distance between two countries ($DIST_{ij}$), sometimes supplemented by the assumption of an impact of a common border (L_{ij}), is not satisfactory: Limao and Venables (2001) emphasize, with a gravity equation estimation, that distance explains only 10% of the change in the transport

costs. Poor road infrastructures represent 40% of the transport costs predicted for coastal countries and 60% for landlocked countries. This is especially relevant for African countries where transport costs seem to be particularly high, even for a given distance, because of location and poor infrastructure (see Amjadi and Yeats, 1995, Collier and Gunning, 1999). Therefore, in order to avoid potential bias in our assessment of African regional agreements, we model θ_{ijt} as follows:

$$\ln \theta_{ijt} = \alpha_0 + [\alpha_1 \ln \text{DIST}_{ij} + \alpha_2 L_{ij}] + [\alpha_3 E_i + \alpha_4 \ln \text{IN}_{it}] + [\alpha_5 E_j + \alpha_6 \ln \text{IN}_{jt}] + \omega_{ijt} \quad (2)$$

DIST_{ij} : distance between the countries i and j ($\alpha_1 > 0$);

$L_{ij} = 1$ if i and j share a common border, otherwise 0 ($\alpha_2 < 0$);

$E_{i(j)} = 1$ if the country i (j) is landlocked; otherwise 0 ($\alpha_3 > 0$, $\alpha_5 > 0$);

$\text{IN}_{i(j)t}$: level of infrastructure of the country i (j), computed as an average of the density of road, railway and the number of telephone lines per capita ($\alpha_4 < 0$, $\alpha_6 < 0$).

We substitute (2) in (1), and the reduced form of the model is:

$$\begin{aligned} \ln M_{ijt} = & \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln N_{it} + \beta_4 \ln N_{jt} + \beta_5 \ln \text{DIST}_{ij} + \beta_6 \ln \overline{\text{DIST}}_i \\ & + \beta_7 L_{ij} + \beta_8 E_i + \beta_9 \ln \text{IN}_{it} + \beta_{10} E_j + \beta_{11} \ln \text{IN}_{jt} + \beta_{12} \ln \text{RER}_{ijt} + \eta_{ijt} \end{aligned} \quad (3)$$

with expected signs: $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 < 0$, $\beta_4 < 0$, $\beta_5 = \gamma_5 \cdot \alpha_1 < 0$, $\beta_6 > 0$, $\beta_7 = \gamma_5 \cdot \alpha_4 > 0$, $\beta_8 = \gamma_5 \cdot \alpha_5 < 0$,
 $\beta_9 = \gamma_5 \cdot \alpha_2 > 0$, $\beta_{10} = \gamma_5 \cdot \alpha_6 < 0$, $\beta_{11} = \gamma_5 \cdot \alpha_3 > 0$, $\beta_{12} < 0$.

3.2. Identifying trade creation, import diversion and export diversion

The effect of regional agreements on trade can now be assessed with regard to the “norm” defined in equation (3). As done by Endoh (1999) and Soloaga and Winters (2001), we introduce three dummies by agreement, capturing the three variables of interest emphasized in section 2 respectively:

¹¹ and equal to $-\sigma$, σ representing the elasticity of substitution across suppliers.

- (i) Intra-bloc trade: $D_I=1$ if both partners i and j belong to the same regional agreement, otherwise 0.
- (ii) Imports of the regional agreement members from the ROW: $D_M=1$ if the importing country i belongs to the regional agreement and if the exporting country j belongs to the ROW;
- (iii) Exports of the regional agreement members towards the ROW: $D_X=1$ if j belongs to the regional agreement and if i belongs to the ROW.

We note α_I , α_M and α_X the coefficients associated respectively with D_I , D_M and D_X .

Hence, regional agreement generates essentially:

- (i) *TC* if the intra-regional trade increases without decrease in the imports from the ROW, i.e. if $\alpha_I > 0$ and $\alpha_M = 0$;
- (ii) “*Imports diversion*” if the propensity to import from the ROW decreases whereas the global propensity to trade with the other members increases, i.e. if $\alpha_I > 0$ and $\alpha_M < 0$;
- (iii) In the same way, there is an “*exports diversion*” if $\alpha_I > 0$ and $\alpha_X < 0$.

3.3. Taking into account specific effects of currency unions

To assess the relative effectiveness of preferential trade and monetary agreements for boosting regional trade, we successively do two kinds of analysis.

First, we compare the impact of regional agreements which are only based on preferential tariffs (ECOWAS, COMESA, SADC) and the impact of the UEMOA and the CEMAC which first were currency unions. Indeed, the coefficients relative to the dummies representing these last two unions capture both preferential trade and currency union impacts.

Second, we try to capture the respective impact of the two aspects (commercial and monetary) of the regional cooperation of the UEMOA and the CEMAC. According to this aim, we cannot capture these effects by the introduction of a currency union dummy, as done by Rose (2000), Frankel and Rose (2002), or Rose and Wincoop (2001): since 1994, the countries covered by the

UEMOA and the CEMAC dummies are exactly the same countries as those belonging to the respective currency unions and, in our sample, the differences before 1994 are too small to distinguish the effect of the currency union and of the preferential trade agreement with dummies¹². However, the effect of the stability of the exchange rate (perfect within the union, differentiated with the ROW due to the choice of the exchange rate regime) can be controlled for by the introduction in the gravity model of the volatility of the bilateral nominal exchange rate between i and j at time t , VOL_{ijt} . The latter is measured by the standard deviation of the first-difference of the monthly bilateral nominal exchange rate (in logarithm) for the year preceding period t (e.g. Frankel, 1997, Rose, 2000 and Estevadeordal *et al.*, 2002). Hence, the coefficients of the regional dummies are now purged from the positive effect of the currency union due to the stability of the nominal exchange rate, and then more closely measure the impact of the preferential trade agreement. It might be recognized that this method does not control for the reduction in the transaction costs due to the common currency and the dummies coefficients may still capture this effect. However, the specific bilateral effect introduced in the estimation takes into account this impact of the common currency, as far as it is constant.

4. SIGNIFICANT AVERAGE EFFECTS OF EACH AFRICAN REGIONAL AGREEMENT ON TRADE.

Our first estimations concern the whole period of implementation of each regional agreement and allow us to assess their average trade impact.

4.1. Data and econometric method

¹² *The differences for 1962-1993*, in terms of members, are:

(i) between the UDEAC (appendix A.1) and the BEAC area (franc CFA): Equatorial Guinea *for 1983-1985* (1983 in the UDEAC and 1985 in the BEAC) and Chad *for 1968-1984* (when it left the UDEAC but not the BEAC);

(ii) between the CEAO (appendix A.1) and the BCEAO area (franc CFA): Mauritania (in the CEAO but not in the BCEAO) contrary to Togo (not in the CEAO but in the BCEAO) and more ambiguously, *before 1984*, Mali (in the CEAO but not in the BCEAO, although in the franc zone) contrary to Benin (not in the CEAO but in the BCEAO).

The trade data are from UN-COMTRADE, which gives the total bilateral imports as declared by the importing country, from 1962 to 1996¹³. The sources of the explanatory variable data and their computations are presented in appendix A.2. To obtain a relevant norm for the assessment of the African regional agreements effects, we eliminate from the sample the trade between OECD countries, mainly compounded by intra-industrial trade¹⁴. The effective sample covers around 150 countries, including 131 developing countries (see appendix A.4). There are thus 225,452 observations (around 50% of the potential trade data¹⁵ over the period 1962-1996), of which 12,018 refer to trade between SSA countries.

Panel data enables one to control for every unobservable factor specific to the importing or exporting countries that influence the level of bilateral trade (e.g. historical, cultural, ethnic, political or geographical factors). Hence, the inclusion of bilateral specific effects in the gravity model ensures that the regional dummies really isolate TD and TC effects¹⁶. These bilateral effects are modelled as random variables, as a fixed-effects model is inadequate¹⁷. However, variables like GDP or infrastructure may be correlated with the random specific effects. The usual way to deal with this issue is to consider the instrumental variables estimation proposed by Hausman and Taylor (1981). If X (Z) denotes the variables variant (invariant) over time, with X_1 (X_2), the exogenous (endogenous) variables, we use the instruments $[QX_1, QX_2, PX_1, Z]$ ¹⁸, as suggested by Breusch, Mizon and Schmidt (1989)¹⁹. The time effects are introduced as fixed parameters.

¹³ The countries which do not declare their imports from a partner or which do not import from this partner are identified in the same way, with a missing value. Hence, our data are not censored at zero.

¹⁴ However, comparative estimations will be made (i) over the total database, (ii) over the trade flows between developing countries, and (iii) over the exchanges between only African countries.

¹⁵ we consider a potential selection bias in estimations.

¹⁶ It has been shown (see Matyas, 1997 or Carrère, 2002) that not taking heterogeneity into account in bilateral trade relations introduces a bias in the coefficients of regional dummies.

¹⁷ the “Within” transformation removes variables, such as distance, common border or some regional dummies, which are time invariant.

¹⁸ Here, Q is a matrix which obtains the deviations from individual means, and P is a matrix which averages the observations across time for each individual.

¹⁹ Because the resulting estimator is consistent but not efficient, as it is not corrected for heteroskedasticity and serial correlation, we follow the suggestion of Hausman and Taylor (1981) and use the first-round of estimates to compute the variance of the specific effects and the variance of the error term. This method has been used for a gravity equation by Brun *et al.* (2002), Egger (2002), or Carrère (2002).

As the unbalanced sample can be subject to a non-ignorable selection rule²⁰, to correct the presence of a selection bias we add three variables to the equation (following the method proposed by Nijman and Verbeek, 1992): (i) PRES: number of years of presence of the couple ij in the sample, (ii) DD=1 if the couple ij is observed during the entire period, 0 otherwise. (iii) $PA_t=1$ if the couple ij was present in $t-1$. As shown in Table 1 below, these variables are significant and so systematically introduced in future regressions, in order to avoid the selection bias.

4.2. Global impact of African Regional Agreements over the period 1962-1996

For each regional agreement (CEMAC, UEMOA, ECOWAS, COMESA and SADC) and their antecedents, we introduce the three dummies²¹ needed to evaluate TC and TD in imports and exports. To improve the reference norm:

(i) we also consider the impact of three non-African regional agreements, evidenced in empirical analysis as having some trade effects on their respective members (see Frankel, 1997, Soloaga and Winters, 2001 or Carrère, 2002): MERCOSUR, ASEAN and ANDEAN (defined in appendix A.1);

(ii) we control for membership of the Yaoundé (1963, 1969) and Lomé (1975, 1980, 1985, 1990) Conventions, which actually changed from 17 to 68 South countries and from 6 to 15 European countries. The dummy “YL” takes the value 1 if the importing country is a member of the European Community or Union (EU) and if the exporting country is an EAMA²² until 1974 and an ACP (Africa, Caribbean and Pacific) since 1975²³. Actually, most of the members of African regional agreements belong to the ACP group, which could influence the orientation and structure of their trade, in particular in their exports to the ROW.

²⁰ i.e. the probability of a pair of countries being included in the sample is not independent of model error, and in particular to the random bilateral specific effects.

²¹ These dummies are modified over the period to capture, from the date of creation of the regional agreements, possible changes in members (see appendix A.1).

²² EAMA: “Etats Africains et Malgache Associés” of the Conventions of Yaoundé (all French-speaking former Belgian and French dependences).

²³ We do not consider a symmetrical impact on the imports of the ACP countries from EU because the Lomé Conventions do not include reciprocal arrangements and even in the Yaoundé Convention, the reciprocity was actually mitigated by many exceptions.

The results are reported in column 1 of table 1 (i.e. without VOL_{ijt}). A Hausman test, based on differences between Within and GLS estimators, reveals correlation between the bilateral specific effects and explanatory variables. Hence, the use of the Hausman-Taylor method is justified. To identify the variables correlated with the specific effects, we estimate several regressions with different sets of endogenous variables²⁴. According to the over-identification test, three sources of correlation are identified: the GDP variables (Y_{it} and Y_{jt}), country size (N_{it} and N_{jt}) and the variables of infrastructure (IN_{it} and IN_{jt}).

Coefficients for the traditional gravity variables are all significant at a 1% level (except for the landlockness of country i , E_i) and have the expected sign: the volume of bilateral imports increases with the GDP with an impact close to unity, the population has a negative (positive) sign for the exporting (importing) country and the distance trade impact is superior to unity (-1.23). Moreover, imports increase with the level of infrastructure of each country; sharing a common land border allows countries to trade 2.5 times more than predicted from the gravity equation²⁵ ($=\exp(0.91)$) and the exports of a landlocked country are 27% below what might be expected. Finally, a real depreciation of the currency of country i against country j lowers its imports from j . Similar coefficients are reported in the literature (e.g. Frankel, 1997, Limao and Venables, 2001, Soloaga and Winters, 2001).

Table 1 here: Results for global regional agreement dummies of the panel estimation, 1962-1996.

The coefficient for the Conventions of Yaoundé and Lomé (“YL” dummy) is significantly positive: the ACP exports toward the EU were 2.3 times higher than predicted from the gravity model over the period. Results for ASEAN, MERCOSUR and ANDEAN are in accordance with the findings obtained with a gravity equation by Frankel (1997), Krueger (1999), Soloaga and Winters (2001) and Carrère (2002).

²⁴ Available upon request.

Coefficients reflecting intra-regional trade are significantly positive for all the regional agreements (except for COMESA): coefficient for intra-CEMAC (UEMOA) trade indicates that members traded 3.25 (3.13) times more among themselves, over the period 1962-1996, than the expected level and the SADC members 3.5 times more since it was created in 1980. Intra-ECOWAS trade has on average been 22% above the norm since it was created in 1975. Members' imports from the ROW are 38%, 43% and 45% below the norm for the UEMOA, the CEMAC and the SADC respectively, but conform to the norm for COMESA and are even higher than the norm for ECOWAS. Finally, all the African regional agreements, except in the case of SADC, show members' exports toward the ROW significantly below the norm, once controlled for the impact of the Yaoundé and the Lomé Conventions²⁶.

Hence, according to the first column in table 1, between 1962 and 1996, the members of the UEMOA and the CEMAC trade over three times more among themselves than expected, which is considerably higher than the other regional agreements with only preferential trade agreements (except for the SADC).

4.3. UEMOA and CEMAC: Effect of the Trade Agreement or of the Currency Union?

What are the respective roles of the preferential trade agreement and the currency union in this additive intra-regional trade? To deal with this issue, the nominal exchange rate volatility between i and j at time t , VOL_{ijt} is introduced in the gravity model. As reported in table 1, column 2,

²⁵ i.e. more than for countries not sharing a common border.

²⁶ A comparison of these results to the existing studies on African regional agreements is complex because of differences in the sample used and the period considered. Several papers use a long sample period but with a different set of countries from ours. For instance, Lyakurwa (1996) and Longo and Sekkat (2001) look at intra-SSA trade for the periods 1980-1992 and 1980-1997 respectively, and Subramanian and Tamirisa (2001) add an estimation on bilateral trade between all the available countries for 1980-1997. In order to compare our results, we present in appendix A.5 the same regressions as table 1 column 1 but on different samples. The African regional agreement dummy coefficients are robust compared to table 1, and they are quite different from those obtained by the authors quoted above, certainly due to the difference in the definition of the dummy variables and in the econometric method used, all of the previous studies being cross-country analysis with an OLS estimator. Other papers on African regional agreements, such as Elbadawi (1997), Foroutan and Pritchett (1993) and Laporte (1996), raise the same problems. As the periods of these studies are shorter, comparisons will be made with our sub-period regressions.

this variable has a strong negative effect on bilateral trade: since the sample mean of VOL_{ijt} is 0.042²⁷ and its standard deviation is 0.1, reducing exchange rate volatility by one standard deviation around its mean (from 0.1 to 0) increases the bilateral trade by an average of 5.1%²⁸ for 1962-1996. Previous results are all unchanged except the coefficients for L_{ij} and for the Yaoundé and Lomé Convention (“YL”), which are reduced by half (but still significant) as a result of a lower volatility between neighbours and within the parties of the “YL” conventions (see later).

To check whether the results are sensitive to our measure of the exchange rate volatility, two alternative indicators are experimented: (i) the standard deviation of the *level* of the exchange rate (in logarithmic form) during the preceding year ($VOL2_{ijt}$), (ii) the standard deviation of the first-difference of the monthly bilateral nominal exchange rate (in logarithmic form) in the five years preceding the period t ($VOL3_{ijt}$). The exchange rate volatility coefficient is robustly negative and significant and the regional dummy coefficients are also robust and retain their size.²⁹

Members of the UEMOA and the CEMAC now trade twice as much (instead of three times) among themselves as predicted by the gravity model over 1962-1996. Hence, if we assume that, once controlled for (non) exchange rate volatility, the coefficients for intra-regional trade only capture the effect of a preferential trade agreement, it appears that 51% (56%) of the average additive intra-UEMOA (CEMAC) trade observed in column 1 can be attributed to the preferential trade agreement and then 49.4% (44%) to the currency union. This result is in accordance with Nitsch’s (2002) conclusions³⁰ that countries of the CFA zone trade, at best, about 55% more with each other than with an otherwise similar non-monetary union member in West and Central Africa.

It remains that the share attributed to the currency union is certainly underestimated as the preferential trade agreement coefficients in column 2 may still capture some trade-enhancing effects of

²⁷ pairs of countries that share the same currency (and so have $VOL_{ijt}=0$) are excluded for this computation.

²⁸ $[(e^{(-0.494)*(-0.1)}-1)*100$

²⁹ We also test for the correlation between VOL_{ijt} and the bilateral random effects. The instrumentation for this variable does not change the previous results (with a coefficient equal to -0.484).

a currency union such as lower transaction costs. However, this bias is reduced since a part of these transaction costs (such as the absence of foreign currency conversion costs) may be considered as a constant feature of the bilateral trade between members for 1962-1996³¹ and so it is partly captured by the specific bilateral effects introduced in the gravity model.

With regard to UEMOA and CEMAC trade with the ROW, there are also changes in the results compared to column 1 with a significant augmentation of the imports diversion, and a smaller one for the exports (non-significant in the case of the CEMAC). Hence, the currency unions in SSA have dampened the TD effect generated by the corresponding preferential trade agreement: once controlled for the impact of the common currency on trade (through the zero exchange rate volatility), the coefficients for D_M and D_X increased (in absolute value)³². Then, we find the expected impact noted in section 2 for the SSA case: the currency unions in the CFA zones have rather a TC³³ effect whereas the preferential trade agreements have a TD one.

5. CONTRASTED EVOLUTIONS OF THE IMPACT OF AFRICAN REGIONAL AGREEMENTS

A more detailed analysis of these regional agreements can be presented, breaking down the regional dummies into three year sub-periods. Actually, the preferential trade agreements considered in this paper have evolved over the period (due to progressive preferential tariffs) and have not always been operational. Concerning the currency unions, as underlined in section 3, they have been a constant feature for the UEMOA and the CEMAC members since 1962. However, they can influence the evolution of the dummies relative to (i) intra-regional trade as, when the variability of nominal exchange rates between the UEMOA (CEMAC) and the ROW increases, the relative

³⁰ But lower than those underlined by Rose (2000), Frankel and Rose (2002) or Rose and Wincoop (2001), who all conclude on trade over three times higher between members of a currency union.

³¹ except for Equatorial Guinea, which joined the BEAC in 1985, and more ambiguously for Mali, which joined the BCEAO in 1984, but which was already in the franc zone before.

³² Another example of this CFA advantage is given by the reduction of the “YL” coefficient when VOL_{ijt} is introduced: the ACP exports towards the EU are “only” 62% above the norm, instead of 129% in the previous estimations (without VOL_{ijt} in column 1). It may be due to the importance of the CFA in the ACP group, the CFA being in fixed parity with the French franc and stable against the European currencies since 1973 (the sample mean of VOL_{ijt} is 2.6% if “YL”=1).

advantage of the exchange rate stability between members is reinforced³⁴ and (ii) trade between members and ROW, as the currency unions may reduce the variability of nominal exchange rates of the members of the CFA Franc Zone with the ROW in comparison with that of non-members.

The evolution of the estimated coefficients of D_I , D_M and D_X of each regional agreement are represented in figures 1-4 and 6-8³⁵. In the case of the UEMOA and the CEMAC, two sets of estimated coefficients of D_I and D_M are graphed in figures 1-4:

(i) the trade impact of the global regional agreement (i.e. sum of the impact of the preferential trade agreement and the currency union), noted RA in figures and corresponding to the decomposition of the estimations reported in table 1, column 1;

(ii) the trade impact of the only preferential trade agreement component, noted PTA in figures and corresponding to the decomposition of the estimations reported in table 1, column 2 (with the introduction of VOL_{ijt}).

5.1. UEMOA and CEMAC: respective roles of the Preferential Trade Agreement and Currency Union in the evolution of intra-Regional trade.

Insert figures 1-2 here

From figures 1 and 2, we note some likenesses between the intra-regional trade evolution of the UEMOA and the CEMAC over the period.

At first, the intra-regional trade increased, until 1976 for the UEMOA and 1979 for the CEMAC. The preferential trade agreements clearly had an important influence on this global evolution. This corresponds to the implementation period of new preferential tariffs, induced respectively in the two regional areas by the creation of (i) the UDEAO (Customs Union of West

³³ Corresponding to the more general conclusion of Rose (2000), Esteveordal *et al.* (2002) and Frankel and Rose (2002) who suggest that the main effect of currency unions on bilateral trade seems to be a TC.

African States) in 1966 and the CEAO (West African Economic Community) in 1973 and (ii) the UDEAC (Central African Customs and Economic Union), created in 1964³⁶, and its revision in 1973. However, the currency unions also influenced this increase in intra-regional trade: over the sub-period 1971-1979, around 30% of changes is due to the monetary components. To understand this phenomenon, we graphed in figure 5 the evolution of the sample mean of VOL_{ijt} on the same three groups as in section 2: the world (except currency unions), only one of the two countries belonging to the UEMOA, only one of the two countries belonging to the CEMAC. The exchange rate volatility, low in the 1960s, was higher in the 1970s for the three groups. Then, the relative advantage of the exchange rate stability between members has increased, which may have enhanced intra-regional trade.

Insert figure 5: Evolution of exchange rate volatility (VOL_{ijt})

Subsequently, the impact of trade between members tended to decrease during the 1980's, always remaining significant in the case of the UEMOA but disappearing in the case of the CEMAC. Several factors can explain this decline. On the side of preferential trade agreements, this decreasing impact of the CEAO³⁷ and the UDEAC on trade was partly due to the particular conjuncture of the end of the 1970's: once the raw material prices had increased, the countries adopted a more nationalistic development strategy and in particular an industrialization policy by import substitution at the national (and not regional) level. Then, in the middle of the 1980's, the structural adjustment policies implemented in these countries didn't take into account the regional requirements, which may have had negative effects on regional integration³⁸. Finally, the mechanisms of

³⁴ Other features of the bilateral relation between members of the UEMOA and of the CEMAC over the entire period, such as the advantage of the lower costs due to the use of a common currency, are stable and then may not influence the evolution.

³⁵ In the figures, a non-significant coefficient is set equal to zero.

³⁶ in the continuation of the UDE (Equatorial Customs Union, 1959)

³⁷ This observation is similar to Elbadawi's conclusions (1997) which suggest there would be a decrease in the coefficient of the intra-CEAO trade dummy between 1980-1985 and 1986-1990.

³⁸ The structural adjustment policies can have a positive impact on trade (and then on intra-regional trade) as they aim at reforming the incentives system, maintaining monetary and fiscal discipline, and reducing discriminations and impediments to competition and trade. But these policies can also go against long term integration and defeat regional cooperation at the objectives level (dismantling of the selective policies, unilateral tariff reductions which dampen the relative preferences granted to the partner countries, fiscal arbitrage against regional institution financing, etc.) as well as at the implementation level (implementation of the structural adjustment policies at a national level, with different schedules, over different periods)

redistribution of gains and losses of customs revenue inside the communities were blocked because there were some problems in managing the compensation funds between the countries. In the CEAO, Côte d'Ivoire and Senegal had stopped contributing. In 1988, the UDEAC was considered as non-existent and the countries stopped the payment of contributions³⁹. Simultaneously, the role of the monetary unions decreased, probably due to the relative stability of the nominal exchange rate volatility between the CFA franc zone members and the ROW during this period (see figure 5). However, the role of the monetary component in the decline of intra-trade is probably underestimated, as another factor of this decline can be the crisis of the payment system in the monetary unions during the 1980's, a factor still captured by the preferential trade agreement dummies.

Finally, at the beginning of the 1990's, the countries decided to restart the regional integration process and, in 1994, to implement the UEMOA and the CEMAC: there was an increase in intra-trade, even once the effect of the CFA devaluation is controlled for by the RER variable. Once again, this evolution is essentially induced by the preferential trade agreement component, which can nevertheless capture a monetary union aspect: the improvement in the payment system⁴⁰ in the CFA zone during this period.

Hence, with regard to the evolution of intra-regional trade, two conclusions stand out: (i) during each three-year period, intra-regional trade development is actually simultaneously due to both aspects of regional integration and (ii) the monetary component is all the more important as the international monetary environment becomes more unstable. However, as trade integration policies have been fluctuant, contrary to the monetary component of the unions, the observed changes in intra-regional trade is mainly explained by the "stop and go" of the preferential trade integration implementation.

and often only partially, which can generate some regional problems due to the non-coordination of these policies and some speculative behaviours which may enhance informal intra-regional trade). For more details about problems of coordinating structural adjustment policies and the regional integration process over the entire period, cf. Coussy and Hugon (chap. VII, 1993), M'Bet (1997), and table 3 p. 172 in Hugon (2001).

³⁹ Elbadawi (1997) and Lyakurwa (1996) also observed this dysfunction in their estimations.

5.2. UEMOA and CEMAC: respective roles of the Preferential Trade Agreement and Currency Union in the evolution of trade with the ROW.

Insert figures 3-4 here

According to figures 3 and 4, until the end of the 1970's, the continual increase in trade between the members of the regional unions was combined with a significant import diversion⁴¹, entirely generated by the preferential trade agreement component. This TD may be explained by the fact that (i) members maintained their customs revenue by increasing their tariffs on the imports from the ROW, (ii) one of the aims of the preferential taxes for regional products was to develop imports from the area. However, contrary to the CEAO, we could expect from the UDEAC common external tariff that it limits the appearance of TD. Nevertheless, $|\alpha_M|$ are equivalent to (or even higher than) that of the CEAO. Actually, even the definition of the implemented common external tariff explains this result: one of its components was set at the national level and so was used to offset the custom revenue losses due to the harmonization of other customs tariffs, and to ensure minimum protection for domestic industry⁴². Hence, as for the CEAO, tariffs on imports from ROW varied across members and was often higher than the former one, favouring the TD.

During the 1980's, the TD phenomenon generated by the regional agreements decreased (i) progressively, until it disappeared at the beginning of the 1990's in the case of the UEMOA and (ii) suddenly, becoming non-significantly different from zero as of 1983 in the case of the CEMAC. The monetary unions played an important (but non-exclusive) part in this TD decline. Actually, even if the

⁴⁰ the two regional central banks have established inter-bank money markets and new central bank financial instruments. The CFA franc countries have also intensified their efforts to restore the financial health of their banking systems through the restructuring, privatisation, and liquidation of insolvent commercial banks, see Hadjimichael and Galy (1997).

⁴¹ Note that the change in the evolution of the RTA exports towards the ROW (figures not reported here) is less obvious. This may be due to the presence of the "YL" dummy which already includes all the exports of the UEMOA and the CEMAC countries towards the European countries and hence a significant share of the total exports of these regional agreements towards the ROW.

⁴² For a study of the different rates of the regional preferential tariffs and of the CET implemented by the members of the UDEAC, cf. Decaluwe *et al.* (1997).

monetary component had a TC effect since the beginning of the period, it is during the 1980's that this effect gained importance⁴³, until it totally offset the TD effect of the preferential tariff component.

At the very beginning of the 1990's, the UEMOA generated a global net TC (import coefficient non-significantly different from zero), the currency union's TC offsetting the preferential trade agreement's TD. However, over the same period, a strong global TD once again accompanied the CEMAC's increase in intra-regional trade, the currency union's TC dampening only a small part of the preferential trade agreement's TD.

Hence, with respect to the evolution of trade between the unions and the ROW, we note once again the double influence, over each three-year period, of the two aspects of the regionalisation. However, as for intra-regional trade, the impact of the monetary component is more important during periods of international monetary instability. Moreover, we find again the conclusion that monetary unions generate TC (see section 4), compensating (at least in part) for the TD generated by the preferential tariff component.

5.3. Other Preferential Trade Agreements.

The importance of the common currency is emphasized, once again, by comparison with the other regional agreements, in particular with ECOWAS, a preferential trade agreement which encompasses the UEMOA countries.

Insert figures 6-8 here: Evolution of RTA dummies over 1962-1996

Economic Community of West African States (ECOWAS):

⁴³ As noted previously in figure 5, the exchange rate volatility was higher in the 1980s for the "world" whereas it remained relatively stable in the case of the UEMOA and the CEMAC members with the ROW. Hence, the members of the UEMOA

The ECOWAS was operational in 1977, but until 1989 the members focused mainly on the implementation of regional institutions and on the ratification of protocols. Therefore, it is not surprising that, in fig.6, the agreement had no effect on its members' trade for the initial years. After the Dakar meeting in 1979, some customs tariff reductions were implemented⁴⁴, which can explain the slight increase in intra-trade observed for 1983-1988.⁴⁵ The scheme of liberalization really started in 1990 and led to a small increase in intra-trade with a net TC, due to a jointly small decrease in the external customs tariffs and intra-RTA tariffs, because of the structural adjustment policy implemented in most of the member states of the ECOWAS at this period. However, from 1990, there was a constant export diversion.

These results on intra-trade, significant since the 1980s, were more likely due to exports to UEMOA members from ECOWAS neighbouring countries, the latter looking for convertible CFA francs. This effect is all the more likely than during the 1980s Nigeria faced a severe balance of payment crisis and set up rigorous exchange controls leading traders to look for CFA francs through cheap exports to neighbouring CFA countries⁴⁶. But, when few months before the devaluation, the two CFA monetary union central banks decided to no longer change CFA notes presented outside the two respective unions, the incentive given to the Nigerian traders to export to the CFA countries was dampened⁴⁷. This can explain the fall in the intra-CEDEAO trade since 1994 (α_1 non-significant for 1995-1996).

Southern African Development Community (SADC):

The SADCC (Southern African Development Coordination Conference) was created in 1980, partly to counter the regional influence of South Africa. In our estimation, we introduce the sub-period before the creation of the agreement: none of the RTA dummy coefficients was significant for

and the CEMAC actually benefited from an increasing relative advantage in trade with ROW during the 1980's.

⁴⁴Details in Jebuni *et al.* (1997).

⁴⁵ These results are similar to those of Ogunkula (1994) and Elbadawi (1997).

⁴⁶This effect is not really controlled for by the RER variable, since this is calculated from only the official rate of exchange and does not take into account the level of the black market rate (which strongly depreciated with regard to the official one). For more details, see Guillaumont P., and Guillaumont S. (1991), p.40

⁴⁷ For more details, see Hugon (1999).

1977-1979. During the period 1980-1986, there was an increase in intra-SADCC trade and imports TD. Then, we note a stagnation of these phenomena. In 1992, a treaty enhanced the SADCC (becoming the SADC) and thus intra-trade⁴⁸ with a cease in imports diversion. Nevertheless, the exports of the SADC toward the ROW, which were significantly above the norm during the 1980s, decreased during this period.

Our conclusions concerning this agreement have to be attenuated since we have no bilateral trade data for Namibia, Lesotho, Botswana and Swaziland (these countries are not dissociated from South Africa in the COMTRADE database). Hence, the intra-SADC dummy does not capture these countries until 1994, at the same time as South Africa. As countries have important trading relations with the other members of the SADC, the results are quite difficult to interpret.⁴⁹

Common Market for Eastern and Southern Africa (COMESA):

Officially created in 1981, the Eastern and Southern African Preferential Trade Area (preferential trade agreement) became operational in 1984. None of the coefficients reflecting this agreement were significant before 1988. Actually, the liberalization within this agreement was delayed due to difficulties in the negotiations (as for the ECOWAS, this agreement concerns very different countries, a fact which has slowed the applications). The regional institutions only began to really work from the end of the 1980's. Added to the first reductions in the customs tariffs on intra-regional trade, this allowed an increase in intra-trade from 1989, but a decrease in trade with the ROW.⁵⁰ The revision of the treaty in 1993 (beginning of the COMESA) intensified the increase of intra-regional trade, but also the imports and exports TD.

⁴⁸ This result is similar to that of Subramanian and Tamirisa (2001) and Lyakurwa (1996), who emphasize that intra-SADC trade was positive and increased between 1990 and 1997.

⁴⁹ For example, the strong increase of intra-trade observed since 1994 is certainly due to the entry of South Africa (and hence of the four countries linked to it) in the intra-SADC dummy. This problem of data can also explain the decrease in trade with the ROW.

⁵⁰ Elbadawi (1997) has similar conclusions for the period 1986-1990.

6. CONCLUSION

Given the interest of Sub-Saharan countries for regional integration, it is useful to analyse the trade evolution of their member countries to determine whether or not this trade increased and, in this case, if the underlying effect is TC or TD. Actually, if TD dominates, this can worsen competitiveness problems of the member countries of the regional agreement and increase the divergence between the countries (see Venables, 1999, for the UEMOA). Moreover, Sub-Saharan Africa is a particularly interesting field of analysis as two kinds of agreements may enhance its regional trade: currency unions and preferential trade agreements. Hence, we can try to assess the respective impact of each component on the trade between members and with the ROW.

For each African regional agreement, on average during its implementation period, the coefficient reflecting the intra-regional trade is positive and significant (except for COMESA): members of the UEMOA, CEMAC and SADC trade more than 3 times more among themselves than predicted by the gravity equation and around only 1.2 times more for members of ECOWAS. The breakdown of the impact of the preferential trade agreement and the currency union reveals that around half of this average additive intra-UEMOA trade can be attributed to the preferential trade agreements (and 56% in the case of intra-CEMAC) and half to the common currency. Hence, except for the case of the SADC, a regional agreement with both a trade and a monetary component is the most efficient in increasing intra-regional trade. This holds even if we only consider the impact of preferential tariffs. This additional impact of the preferential trade component, when combined with a monetary union, can be due either to an overestimation of the preferential trade agreement coefficients, which capture some trade-enhancing effects of a currency union (such as the lower transaction costs), or to the fact that a currency union and preferential trade agreement may mutually reinforce their impact, especially if we consider the sequence of the integration, with first the implementation of the monetary unions before the tariff reduction (and then, some impediments to the regional integration success, as the competitive devaluation, are eliminated).

A more detailed analysis, based on the evolution of the regional dummy coefficients, reveals that, firstly, the Sub-Saharan African regional agreements generated a significant increase in intra-regional trade⁵¹, but mainly through trade diversion during the first years of the agreements. Afterwards, the UEMOA and the SADC succeeded in generating net trade creation with an increase in the propensity to import from the rest of the World. But in the CEMAC and the COMESA, trade diversion continued over the whole period. In the case of the UEMOA and the CEMAC, the evolution of the currency union relative advantage (in terms of relative stability of the nominal exchange rate of member countries) generated a significant trade creation, which dampened the large trade diversion induced by the implementation of the preferential trade agreements.

References

- Amjadi A. and Yeats A.J., 1995, "Have transport costs contributed to the relative decline of African Exports? Some preliminary evidence", Washington D.C., World Bank Working Paper, N°1559.
- Breusch, T., Mizon, G. and Schmidt, P., 1989, "Efficient Estimation Using Panel Data", *Econometrica*, N° 57, p. 695-700.
- Brun, J.F., Carrère, C., Guillaumont, P., and De Melo, J., 2002, "Has Distance Died? Evidence from a Panel Gravity Model", CEPR N° 3500.
- Cadot, O., De Melo, J. and Olarreaga, M., 2000, "L'intégration régionale en Afrique: où en sommes-nous?", *Revue d'économie du développement* N°2/2000, p. 247-261.
- Carrère, C., 2002, "Revisiting Regional Trading Agreements with Proper Specification of the Gravity Model", *Etudes et Documents E2002-10*, CERDI, University of Auvergne.
- Collier, P., 1995, "The Marginalization of Africa", *International Labour Review*, Vol. 134(4-5), p.541-557.
- Collier, P. et Gunning, J. W., 1999, "Explaining African Economic Performance", *Journal of Economic Literature*, Vol. XXXVII, march, p.64-111.
- Coussy, J. and Hugon, P., 1993, *Intégration régionale et ajustement structurel en Afrique subsaharienne*, Paris, La Documentation Française.
- Deardorff, A., 1998, "Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?", In: Frankel, J.A. (Eds.), *The Regionalization of the World Economy*. University of Chicago Press, chap.1.
- Decaluwe, B. et al., 1997, "A UDEAC Case-Study", in *Regional Integration and Trade Liberalization in SubSaharan Africa*, ed. Oyejide, Elbadawi and Yeo, vol.3, chap. IV, p.86-147.
- De Melo J., Montenegro C. and Panagariya A., 1993, "L'intégration régionale hier et aujourd'hui", *Revue d'économie du développement*, N°2/93, p.7-48.
- Egger, P., 2002, "An Econometric View on the estimation of Gravity Models and the Calculation of Trade Potentials". *The World Economy*, N° 25, p.297-312.

⁵¹ A part of this increase in (official) intra-trade can only result from a regularization of informal trade between the regional agreement members. However, this phenomenon is also one of the aims of regional integration as it permits more transparency on trade flows and a less discriminatory taxation on regional products, since the decrease in tariffs increases the fiscal base.

- Eichengreen, B. J. And Irwin, D. A., 1995, "Trade Blocs, Currency Blocs and the Reorientation of World Trade in the 1930s", *Journal of International Economics*, Vol. XXXVIII, p.1-24.
- Endoh, M., 1999, "Trade Creation and Trade Diversion in the EEC, the LAFTA and the CMEA: 1960-1994", *Applied Economics*, N° 31, p.207-216.
- Elbadawi, I., 1997, "The Impact of Regional Trade and Monetary Schemes on Intra-SubSaharan Africa Trade", in *Regional Integration and Trade Liberalization in SubSaharan Africa*, ed. Oyejide, Elbadawi and Collier, vol.1, chap. V, p.210-255.
- Estevadeordal, A., Frantz, B. and Taylor A. M., 2002, "The Rise and Fall of World Trade, 1870–1939", NBER No 9318 and forthcoming in *Quarterly Journal of Economics*.
- Foroutan, F. and Pritchett, L., 1993, "Intra Sub-Saharan African Trade: Is Too Little?", *Journal of African Economies*, vol.2, may, p.74-105.
- Frankel, J.A., 1997, *Regional Trading Blocs in the World Economic System*, Institute for International Economics, Washington, DC.
- Frankel, J.A. and Rose, A.K., 2002, "An Estimate of the Effect of Currency Unions on Trade and Growth", *Quarterly Journal of Economics*, N° 469, p.437-467.
- Guillaumont, P., and Guillaumont, S., 1993, "L'intégration économique : un nouvel enjeu pour la zone franc", *Revue d'Economie du Développement*, N° 2/93, p.83-112.
- Guillaumont, P., and Guillaumont, S., 1991, *Ajustement structurel, ajustement informel, le cas du Niger*, édition L'Harmattan.
- Gunning, J. W., 2001, "Trade Blocs: Relevant for Africa?", *Journal of African Economies*, vol. 10, N° 3, p. 311-335.
- Hadjimichael, M. T. and Galy, M., 1997, "The CFA Franc Zone and the EMU", *IMF Working Paper* N°156.
- Hausman, A. and Taylor, E., 1981, "Panel data and Unobservable Individual Effects", *Econometrica*, vol.49, N°6, November, p.1377-1398.
- Hugon, P., 1999, *La Zone franc à l'heure de l'euro*, Paris, Karthala.
- Hugon, P., 2001, *Analyse comparative des processus d'intégration économique régionale*, Ministère des Affaires Etrangères, Serie Rapports d'étude.
- Jebuni, C.D. et al., 1997, "A Case-Study of the ECOWAS", in *Regional Integration and Trade Liberalization in SubSaharan Africa*, ed. Oyejide, Elbadawi and Yeo, vol. 3, chap. II, p.24-65.
- Krueger, A.O., 1999, "Trade Creation and Trade Diversion under NAFTA", *NBER Working Paper* N° 7429, december, New-York: National Bureau of Economic Research.
- Laporte, B., 1996, "L'intégration monétaire avant l'intégration commerciale: le cas de l'Afrique de l'Ouest", *Revue d'Economie du Développement*, N°3/96, p.95-114.
- Limao, N., Venables, A.J., 2001, "Infrastructure, Geographical Disadvantage and Transport Costs", *World Bank Economic Review* 15, 451-479.
- Longo, R. and Sekkat, K., 2001, "Obstacle to Expanding Intra-African Trade", OCDE Development Center, Technical Papers N°169.
- Lyakurwa, W.M., 1996, "Trade and Investment Integration in Sub-Saharan Africa", in *Regionalism and the Global Economy: The Case of Africa*, ed. Teunissen, 1996, chap. III, p.116-155.
- Matyas, L., 1997, "Proper Econometric Specification of the Gravity Model", *The World Economy* N° 20, p. 363-368.
- M'Bet, A., 1997, "The CEAO and UEMOA within ECOWAS : The Road Ahead towards West African Economic Integration", in *Regional Integration and Trade Liberalization in SubSaharan Africa*, ed. by Oyejide, Elbadawi and Yeo, vol. 3 chap. III, p.66-85.
- Nijman, T. and Verbeek, M., 1992, "Incomplete Panels and Selection Bias", In *The Econometrics of Panel Data*, Matyas L. and Sevestre P., ed. Kluwer.
- Nitsch, V., 2002, "Comparing Apples and Oranges: The Effect of Multilateral Currency Unions on Trade is Small," Bankgesellschaft Berlin mimeo.
- Ogunkola, E.O., 1994, "An Empirical Evaluation of Trade Potential in ECOWAS", Final Report, The African Economic Research Consortium (AERC), Nairobi.
- Rodrik, D., 1998, "Trade Policy and Economic Performance in Sub-Saharan Africa", *NBER Working Paper* N° 6562, May, New-York: National Bureau of Economic Research.

- Rose, A.K., 2000, "One Money, One Market: The Effect of Common Currencies on Trade", *Economic Policy*, vol. 30, p. 9-45.
- Rose, A.K. and Wincoop, Van E., 2001, "National Money as a Barrier to international Trade: The real case for Currency Union", *American Economic Review*, vol. 91 No.2, p. 386-390.
- Savvides, A, 1996, "CFA Franc Zone Membership and Exchange Rate Variability", *Journal of African Economies*, vol. 5, N° 1, p. 52-68.
- Soloaga, I., and Winters, A., 2001, "How Has Regionalism in the 1990s Affected Trade?" *North American Journal of Economics and Finance* 12, 1-29.
- Subramanian, A. and Tamirisa, N., 2001, "Africa's Trade Revisited", *IMF Working Paper* N°33.
- Venables, A. J., 1999, "Integration Agreements: A Force for Convergence or Divergence?" *Proceedings of World Bank ABCDE conference, Policy Research Working Paper* No 2260.
- Winters, A., 1997, "Regionalism and the Rest of the World: the Irrelevance of the Kemp-Wan Theorem", *Oxford Economic Papers*, N°49, p. 228-234.
- Yeats, A., 1998, "What can be expected from African regional trade arrangements? Some empirical evidence", Washington D.C., World Bank, *Policy research Working Paper* N°2004.

Table 1: Results for global regional dummies of the panel estimation (1962-1996)

Variables	M_{ijt}			
	(1)		(2)	
$\ln Y_{it}$	0.96**	54.3	0.95**	53.5
$\ln Y_{jt}$	1.15**	72.8	1.14**	72.6
$\ln N_{it}$	0.32**	11.4	0.32**	11.5
$\ln N_{jt}$	-0.38**	-14.8	-0.39**	-15.2
$\ln DIST_{ij}$	-1.23**	-45.7	-1.22**	-45.6
$\ln \overline{DIST}_i$	0.7**	9.6	0.67**	9.2
L_{ij}	0.91**	7.2	0.42**	3.3
E_i	-0.03	-0.5	-0.10	-1.7
E_j	-0.31**	-5.6	-0.31**	-5.7
$\ln IN_{it}$	0.04**	4.9	0.04**	4.8
$\ln IN_{jt}$	0.03**	6.3	0.03**	6.2
$\ln RER_{ijt}$	-0.01**	-6.4	-0.01*	-6.8
PRES	0.034**	15.7	0.03**	16.1
DD	0.17*	2.5	0.18**	2.7
PA_t	0.50**	48.3	0.50**	48.3
Vol_{ijt}			-0.494**	-13.1
YL	0.83**	4.9	0.48**	4.5
ANDEAN intra	1.57**	4.3	1.55**	4.3
ANDEAN imports from ROW	-1.19**	-13.5	-1.21**	-13.8
ANDEAN exports to ROW	-0.26**	-3.0	-0.26**	-3.0
MERCOSUR intra	1.48**	14.5	1.49**	14.6
MERCOSUR imports from ROW	-1.24**	-12.8	-1.25**	-13.1
MERCOSUR exports to ROW	0.66**	3.3	0.62**	3.1
ASEAN intra	1.29**	3.4	1.26**	4.0
ASEAN imports from ROW	1.44**	12.6	1.42**	12.5
ASEAN exports to ROW	2.60**	14.7	2.60**	14.7
CEMAC intra	1.18**	2.4	0.79**	2.5
CEMAC imports from ROW	-0.56**	-5.1	-0.76**	-7.1
CEMAC exports to ROW	-0.34**	-3.2	-0.31**	-2.9
UEMOA intra	1.14**	4.0	0.76**	3.1
UEMOA imports from ROW	-0.47**	-3.8	-0.65**	-7.3
UEMOA exports to ROW	-0.27**	-3.9	-0.39**	-4.2
ECOWAS intra ^{a)}	0.20*	2.0	0.17	1.4
ECOWAS imports from ROW	0.48**	3.2	0.48**	3.1
ECOWAS exports to ROW	-0.42**	-4.0	-0.43**	-4.2
SADC intra	1.29**	5.5	1.28**	4.6
SADC imports from ROW	-0.60**	-4.8	-0.59**	-4.8
SADC exports to ROW	0.34**	3.0	0.34**	3.1
COMESA intra ^{b)}	0.43	1.6	0.42	1.6
COMESA imports from ROW	0.02	0.2	0.01	0.1
COMESA exports to ROW	-1.4**	-13.0	-1.43**	-13.1
Number of obs (NT)	225 452		225 452	
Number of bilateral (N)	13 925		13 925	
R ²	0.59		0.59	
Hausman test	932.7**	<i>chi-2(26)</i>	929.4**	<i>chi-2(27)</i>
Test of over-identification	5.7	<i>chi-2(20)</i>	6.2	<i>chi-2(21)</i>

** and * significant at 1% and 5% respectively (t-student is presented next to correspondent coefficient).

The estimation method is the Hausman-Taylor, with variables Y_{it} , Y_{jt} , P_{it} , P_{jt} , IN_{it} and IN_{jt} as endogenous.

^{a)} respectively without trade intra-UEMOA, without imports of UEMOA from ROW and without export of UEMOA toward ROW;

^{b)} respectively without trade intra-SADC, without imports of SADC from ROW and without export of SADC toward ROW.

Fig. 1. Evolution of the intra-UEMOA dummies over 1962-1996

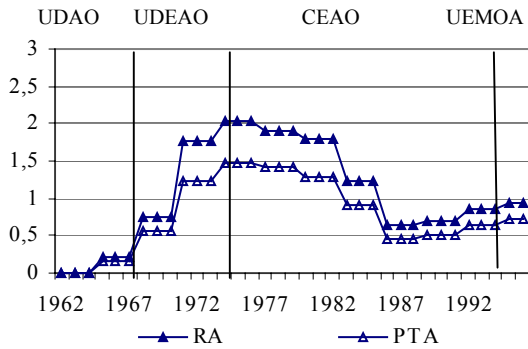


Fig. 2. Evolution of the intra-CEMAC dummies over 1962-1996

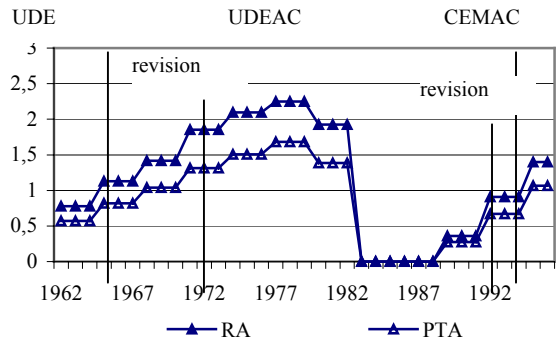


Fig. 3. Evolution of the UEMOA imports dummies over 1962-1996

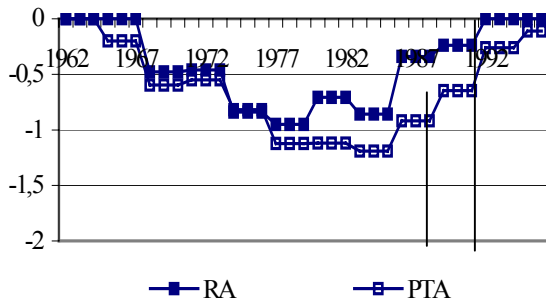


Fig. 4. Evolution of the CEMAC imports dummies over 1962-1996

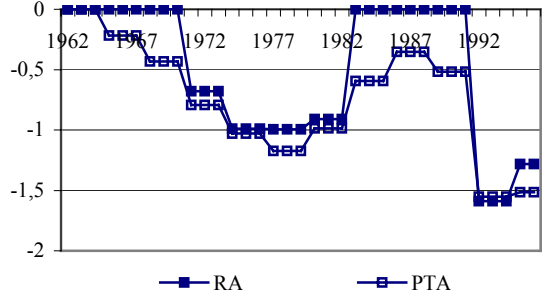


Fig. 5: Evolution of exchange rate volatility (VOL_{ijt}) over 1962-1996

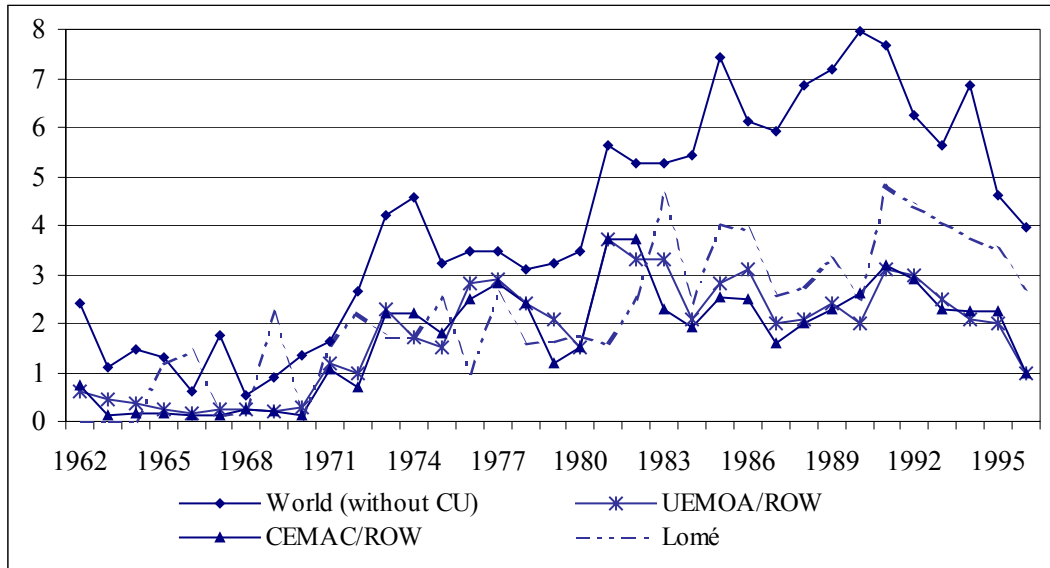


Fig. 6. Evolution of the ECOWAS dummies over 1975-1996

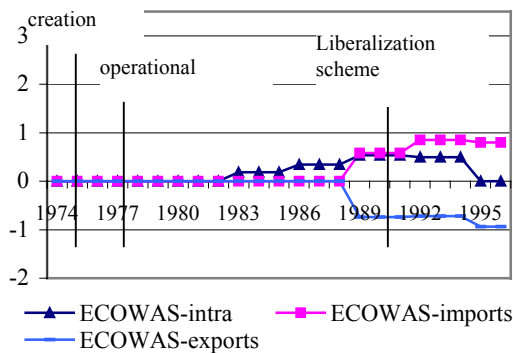


Fig. 7. Evolution of the SADC dummies over 1980-1996

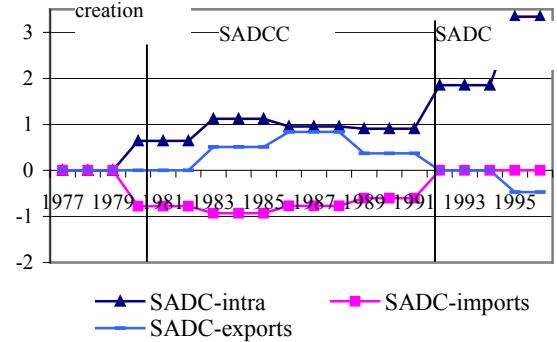
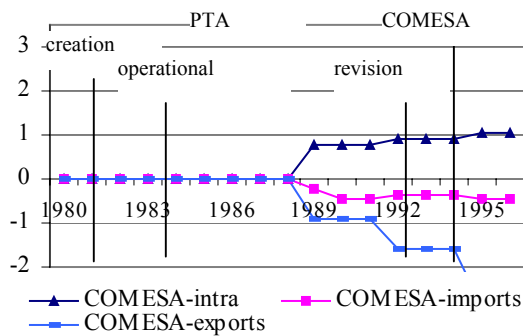


Fig. 8. Evolution of the COMESA dummies over 1984-1996



Appendices to
“AFRICAN REGIONAL AGREEMENTS: THEIR IMPACT ON TRADE WITH OR
WITHOUT CURRENCY UNIONS”

A.1. : Definition of the regional agreements studied

	ECOWAS	SADC	COMESA	CEMAC	UEMOA	ANDEAN	MERCO SUR	ASEAN
1962				1962 (UDE) Congo Central African.Rep. Gabon Chad Cameroon (61)	1962 (UDAO) Burkina Faso Côte d'Ivoire Mali Niger Senegal			
1964				1964 (UDEAC) Congo Central African	Mauritania			
1966				Gabon Chad (absent de 1968 à 1984)	1966(UDEAO) Burkina Faso Côte d'Ivoire			
1969				Cameroon Equatorial Guinea (83)	Mali Niger Senegal Mauritania	1969 Bolivia Chile Colombia		
1973					1973 (CEAO) Benin (84) Burkina Faso Côte d'Ivoire	Ecuador Peru Venezuela		
1975	1975							
1980	Benin	1980(SADCC)						
1984	Burkina Faso <i>Cape Verde</i> Ivory Coast Gambia Ghana Guinea Guinea- Bissau <i>Liberia</i> Mali Mauritania Niger Nigeria Senegal Sierra Leone	Angola <i>Botswana</i> Malawi Mozambique <i>Namibia (90)</i> <i>Lesotho</i> <i>Swaziland</i> Tanzania Zambia Zimbabwe	1984(PTA) Angola Burundi Comoros Djibouti Ethiopia Kenya <i>Lesotho</i> Malawi Mauritius Mozambique Rwanda Somalia Sudan <i>Swaziland</i>		Mali Niger Senegal Mauritania			
1991							1991 Argentina Brazil Uruguay Paraguay	
1992	Togo	1992 (SADC) Mauritius (95) South Africa (94)	Tanzania Uganda Zambia Zimbabwe					1992 Indonesia Singapore Philippines Malaysia Thailand
1994			1993 (COMESA) <i>Eritrea</i> Madagascar <i>Namibia</i> Seychelles	1994(CEMAC) Congo Central African Rep. Gabon Chad Cameroon Equatorial Guinea	1994(UEMOA) Benin Burkina Faso Côte d'Ivoire Mali Niger Senegal Togo			
1996								

Countries written in italic are not available as reporter countries in COMTRADE. For example, bilateral trade of Lesotho, Namibia, Botswana, Swaziland and South Africa is not desegregated in this data set.

A.2. : Sources and data definition

- M_{ijt}** : COMTRADE, total bilateral imports of country i from country j at time t. This variable is in current dollar so it has been divided by an index of the unit value of imports, taken from IMF, to obtain a real flow of trade.
- Y_{i(j)t}** : CD-ROM WDI, World Bank 1999, GDP of country i at time t in constant \$ 1995.
- N_{i(j)t}** : CD-ROM WDI, World Bank 1999, total population of country i at time t.
- DIST_{ij}** : Data for distance are extracted from the software developed by the company CVN. The distance is measured in kilometers between the main economic city of the country i and that of country j and orthodromic, i.e. taking into account the sphericity of Earth.
- L_{ij}** : Dummy equal to one if the countries i and j share a common land border, 0 otherwise.
- E_{i(j)}** : Dummy equal to one if the country i is landlocked (i.e. do not have a direct access to the sea), 0 otherwise.
- IN_{i(j)t}** : This index is built using 4 variables from the database constructed by Canning (1996): the number of kilometer of roads, of paved roads, of railways, and the number of telephone sets/lines per capita of country i (j) at time t. The first three variables are divided by the land area (WB, 1999) to obtain a density. Thus, each variable obtained is normalized to have a same mean equal to one and an arithmetic average is calculated (similar computation as Limao and Venables, 2001). As the final year of the data set is 1995, an extrapolation had to be made to cover the year 1996.
- $\overline{\text{DIST}}_i$** : average distance of country i to exporter partners, weighted by exporters' GDP share in world GDP ("remoteness" of country i). The ten main trade partners are identified for each country according to bilateral flows averaged over 1980-96 (in COMTRADE).
- RER_{ijt}** : We extract from the IFS data set the nominal exchange rate for each country against US dollar (NER_{i/\$}, country i's currency value of 1 US\$), and the consumption price index for country i (CPI_i), for each year from 1962 to 1996. If the CPI is not available for a country, we consider the GDP deflator of the country. The bilateral real exchange rate (RER) is computed as following: $\text{RER}_{ij} = (\text{CPI}_j) / (\text{CPI}_i) \cdot (\text{NER}_{i/\$} / \text{NER}_{j/\$})$, where i is the importing country and j the exporting one. For each pair of countries, we specify the RER such as its mean over the period is zero.
- PRES** : number of years of presence of the couple ij's in the sample;
- DD** : takes the value 1 if the couple ij is observed during the entire period (62-96), 0 otherwise.
- PA_t** : takes the value 1 if the couple ij was present in t-1 (PA₀=0 by hypothesis).
- VOL_{ijt}** : volatility of the nominal exchange rate between i and j at time t, measured by the standard deviation of the first-difference of the monthly bilateral nominal exchange rate (in logarithm) for the year preceding period t: measure of volatility within the year t-1. $\text{VOL}_{ijt} = [(1/n-1) \sum_m (\Delta \ln \text{NER}_{ij, m, t-1} - \Delta \ln \text{NER}_{ij, \cdot, t-1})^2]^{1/2}$, n=12, $\forall m=1..n, \forall i, j, t$;
- VOL2_{ijt}** : standard deviation of the *level* of the exchange rate (in log) during the preceding years, $\text{VOL}_{ijt} = [(1/n-1) \sum_m (\ln \text{NER}_{ij, m, t-1} - \ln \text{NER}_{ij, \cdot, t-1})^2]^{1/2}$, n=12, $\forall m=1..n, \forall i, j, t$;
- VOL3_{ijt}** : standard deviation of the first-difference of the monthly bilateral nominal exchange rate (in log) in the five years preceding t (so from t-5 to t-1), as Rose (2000).

A.3. : Derivation of the gravity model.

As in Deardorff (1998), assume each country i is specialized in a single commodity, with a representative consumer maximizing a homothetic utility function:

$$U_i = \left(\sum_j b_j C_{ji}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \quad (\text{A1})$$

where σ is the common elasticity of substitution between any pair of countries' products subject ($\sigma > 0$), and $b_j = b_i, \forall i, j$ guarantees symmetry and a single price for each product variety. Product differentiation is at the national level (rather than at the firm level as in the monopolistic competition version), and CES preferences (rather than Cobb-Douglas) implies that bilateral trade decreases with distance. Each consumer Maximization of (A1) subject to the budget constraint $Y_i = p_i x_i$ (with x_i the production of country i) gives:

$$C_{ji} = \frac{1}{p_i} b_j \left(\frac{p_i}{\bar{P}_i} \right)^{1-\sigma} Y_i \quad (\text{A2})$$

where

$$\bar{P}_i = \left(\sum_j b_j p_i^{1-\sigma} \right)^{1/(1-\sigma)} \quad (\text{A3})$$

is the CES price aggregator in country i associated with the minimization of expenditures in the utility maximization problem and p_i is the price in the country of destination i facing consumers. Assume that the relationship between the price in the country of origin j , p_j , and the country of destination i , p_i is given by :

$$p_i = p_j e_{ij} \theta_{ij} \quad (\text{A4})$$

In (A4), e_{ij} represents the nominal bilateral exchange rate and θ_{ij} the transport costs function between i and j . This term is usually proxy by the distance between the two countries.

To get the standard gravity-based model, assume balanced trade and let $\gamma_j = Y_j / Y^W$ be the share of country j in world income, Y^W . Expenditures of all countries i on the good produced in j are $\sum_i p_i C_{ji}$. Then, $Y_j = \sum_i p_i C_{ji}$ and substituting the value of C_{ji} from (A2) into this expression gives:

$$b_j = \gamma_j \left(\sum_i \gamma_i \left(\frac{p_i}{\bar{P}_i} \right)^{1-\sigma} \right)^{-1} \quad (\text{A5})$$

Substituting (A5) into (A2), the volume of imports of country i from j is given by:

$$M_{ij} = \frac{Y_i Y_j}{Y^W} \left[\frac{\frac{(p_i)^{-\sigma}}{(\bar{P}_i)^{1-\sigma}}}{\sum_h \gamma_h \left(\frac{p_h}{\bar{P}_h} \right)^{1-\sigma}} \right] = \frac{Y_i Y_j}{Y^W} \theta_{ij}^{-\sigma} e_{ij}^{-\sigma} \left[\frac{\frac{(p_j)^{-\sigma}}{(\bar{P}_i)^{1-\sigma}}}{\sum_h \gamma_h \left(\frac{p_h}{\bar{P}_h} \right)^{1-\sigma}} \right] \quad \forall i, j, h=1..n \quad (\text{A6})$$

So, according to (A6), the volume of imports (M_{ij}) of i from j depends on:

- i) the product of partners' income, $Y_i Y_j$, relative to the world income, Y^W ;
- ii) the transport costs between i and j, θ_{ij} ,
- iii) the bilateral nominal exchange rate, e_{ij} , and on prices in the exporting country, p_j , relative to the CES price aggregator, \bar{P}_i , in the importing country. As price indexes are not available for our sample, this term is proxied by the bilateral real exchange rate, RER_{ij} .
- iv) in the last term, γ_h represents the share of country h in world income and \bar{P}_i can be considered as a “CES index of country i’s barriers-to-trade factors” as an importer (see Deardorff, 1998). Hence, a variable of average distance of the importing country from its main partners, \overline{DIST}_i , weighted by exporters’ GDP share in world GDP, has to be introduced to take account of “the relative distance of i from suppliers” (the “remoteness”).

Hence, using these proxies and the log-linear form of (A6), we obtain:

$$\ln M_{ij} = \kappa_0 + \kappa_1 \ln Y_i + \kappa_2 \ln Y_j + \kappa_3 \ln \theta_{ij} + \kappa_4 \ln \overline{DIST}_i + \kappa_5 \ln RER_{ij} + \eta_{ij}$$

with $\kappa_1 = \kappa_2 = 1$, $\kappa_3 = -\sigma < 0$, $\kappa_4 > 0$ and $\kappa_5 < 0$.

A.4. : Countries in the sample.

OECD	Sub-Saharan Africa	Latin America and the Caribbean	Asia and the Pacific	Others
Australia	Angola	Argentina	Bangladesh	<i>Albania</i>
Austria	South Africa*	Bahamas	Brunei	<i>Armenia</i>
Belgium + Luxembourg	Burundi	Barbados	Bhutan	<i>Azerbaijan</i>
Canada	Benin	Belize	China	Bulgaria
Germany	Burkina Faso	Bolivia	Fiji	<i>Belarus</i>
Denmark	Central African Rep.	Brazil	Hong Kong	Czech Rep.
Spain	Côte d'Ivoire	Chile	Indonesia	Algeria
Finland	Cameroon	Colombia	India	Saudi Arabia
France	Congo	Costa Rica	<i>Cambodia</i>	Egypt
United Kingdom	<i>Comoros</i>	Dominican Rep.	<i>Lao PDR</i>	Estonia
Ireland	Cape Verde	Dominica	Macao	<i>Georgia</i>
Iceland	Djibouti	Ecuador	<i>Mongolia</i>	Greece
Italy	Ethiopia + Eritrea	Grenada	Malaysia	Bosnia and Herzegovina
Japan	Gabon	Guatemala	Nepal	Hungary
Korea, Rep.	Ghana	Guyana	Pakistan	Iran
United States	Guinea	Honduras	Philippines	Israel
Netherlands	Guinea-Bissau	Haiti	Papua New Guinea	Jordan
Norway	Gambia	Jamaica	Singapore	<i>Kazakhstan</i>
New Zealand	Equatorial Guinea	Mexico	Salomon Islands	Kyrgyz Rep.
Portugal	Kenya	Nicaragua	Thailand	Kuwait
Sweden	Madagascar	Panama	<i>Vietnam</i>	Lithuania
Switzerland + Liechtenstein	Mali	Peru	Western Samoa	Latvia
	Mozambique	Paraguay	Sri Lanka	<i>Macedonia</i>
	Mauritania	El Salvador	<i>Tonga</i>	Morocco
	Mauritius	Suriname	<i>Kiribati</i>	Malta
	Malawi	Trinidad and Tobago	<i>Vanuatu</i>	Oman
	Niger	Uruguay		Poland
	Nigeria	St. Vincent and the Grenadines		Romania
	<i>Rwanda</i>	Venezuela		<i>Russian Federation</i>
	Sudan	<i>St. Lucia</i>		Slovenia
	Senegal	<i>Antigua and Barbuda</i>		Slovak Rep.
	<i>Sierra Leone</i>	<i>St. Kitts and Nevis</i>		Syrian Rep.
	Sao Tomé and Príncipe			<i>Tajikistan</i>
	Seychelles			<i>Turkmenistan</i>
	<i>Somalia</i>			Tunisia
	Chad			Turkey
	Togo			<i>Ukraine</i>
	Tanzania			<i>Uzbekistan</i>
	Uganda			
	Zaire			
	Zambia			
	Zimbabwe			

Countries written in *italic* are not available as reporter countries in COMTRADE (only as partners).

* South Africa includes bilateral trade of the group of countries: South Africa + Lesotho + Botswana + Namibia + Swaziland.

A.5 : Results for different samples of countries (1962-96).

Variables	M _{ijt}					
	Complete sample		intra- DC		intra- SSA	
ln Y _{it}	0,99**	59,3	0,92**	27,4	0,90**	5,2
ln Y _{jt}	1,14**	84,6	1,10**	28,3	1,14**	6,1
ln N _{it}	0,13**	11,4	0,29**	6,1	0,08	0,8
ln N _{jt}	-0,65**	-22,7	-0,38**	-7,8	-0,36**	3,8
ln DIST _{ij}	-1,17**	-44,3	-1,54**	-33,7	-1,63**	-40,0
ln DIST _i	0,75**	15,6	0,7**	5,2	0,51**	4,1
L _{ij}	0,92**	7,7	0,94**	6,1	0,98**	4,9
E _i	-0,16**	-3,7	-0,15*	-2,1	-0,22**	-2,6
E _j	-0,49*	-2,0	-0,55**	4,0	-0,71**	-4,1
ln IN _{it}	0,04**	4,2	0,06**	5,1	0,10**	7,5
ln IN _{jt}	0,03**	7,2	0,04**	5,3	0,05**	4,6
ln RER _{ijt}	-0,01**	-4,0	-0,01*	-4,1	-0,03*	-2,0
PRES	0,04**	18,1	0,02**	6,0	0,06**	5,5
DD	0,02	0,2	0,20	1,1	0,52	1,6
PA _t	0,49**	49,0	0,49**	30,9	0,43**	10,2
YL	0,82**	7,4				
EU intra	0,31*	2,2				
EU imports from ROW	0,24**	3,2				
EU exports to ROW	0,36**	5,1				
ANDEAN intra	1,11**	9,4	1,89**	4,8		
ANDEAN imports from ROW	-1,17**	-10,5	-1,02**	-8,8		
ANDEAN exports to ROW	-0,79**	-4,2	-0,18	-1,5		
MERCOSUR intra	1,42**	14,9	1,55**	14,1		
MERCOSUR imports from ROW	-1,91**	-17,6	-1,62**	-15,7		
MERCOSUR exports to ROW	0,89**	5,4	1,51**	5,9		
ASEAN intra	1,44**	3,2	1,09**	3,7		
ASEAN imports from ROW	1,27**	12,1	1,55**	7,5		
ASEAN exports to ROW	2,56**	14,4	2,84**	10,8		
CEMAC intra	1,16**	2,6	1,22**	2,6	1,10*	2,1
CEMAC imports from ROW	-0,52**	-5,1	-0,62	-4,1	-0,65**	-2,6
CEMAC exports to ROW	-0,35**	-3,3	0,49**	3,4	0,70*	2,4
UEMOA intra	1,12**	3,3	1,38**	3,8	1,35**	3,4
UEMOA imports from ROW	-0,52**	-5,5	-0,51**	-4,1	-0,80**	-3,5
UEMOA exports to ROW	-0,32**	-3,3	-0,20	-2,6	-0,24**	-3,2
ECOWAS intra ^{a)}	0,32*	2,0	0,31**	2,0	0,29**	3,6
ECOWAS imports from ROW	0,44**	3,5	0,33**	2,3	0,47**	2,6
ECOWAS exports to ROW	-0,42**	-4,1	-0,43**	-3,1	-0,78**	-2,9
SADC intra	1,31**	3,4	1,33**	3,2	2,10**	5,4
SADC imports from ROW	-0,57**	-4,6	-0,42**	-2,7	-0,67*	-2,4
SADC exports to ROW	0,34**	3,0	0,47**	3,2	0,56*	2,0
COMESA intra ^{b)}	0,47	1,8	0,42	1,5	0,58*	2,0
COMESA imports from ROW	0,07	0,6	-0,05	0,4	0,06	0,2
COMESA exports to ROW	-1,45**	-13,8	-1,5**	-10,5	-1,62**	-5,2
Number of obs (NT)	240 691		91 050		12 012	
Number of bilateral (N)	14 387		7 305		931	
R ²	0,64		0,56		0,59	

** and * significant at 1% and 5% respectively (t-student is presented next to correspondent coefficient).

The estimation method is one of Hausman-Taylor, with variables Y_{it}, Y_{jt}, P_{it}, P_{jt}, IN_{it} and IN_{jt} as endogenous.

a) respectively without trade intra-UEMOA, without imports of UEMOA from ROW and without export of UEMOA toward ROW

b) respectively without trade intra-SADC, without imports of SADC from ROW and without export of SADC toward ROW