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AN EMPIRICAL TEST OF TRADE GRAVITY MODEL CRITERIA FOR THE WEST AFRICAN MONETARY ZONE (WAMZ)

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ABSTRACT

This study gauged the effects of output co-variability, intra-industry intensity of trade and endogenous features of the countries such as common language, border, or colonizer, etc. on bilateral trade. The results confirm that similarities in business cycles influence bilateral trade among the countries. While the positive effects of the real GDP variable coefficient estimate confirms the assertion in the literature that larger countries exert a greater gravitational pull on imports and push to exports (Nigeria accounts for approximately 60 per cent of the GDP, land mass and population of the group), the negative sign of the per capita income variable coefficient estimate is also consistent with expectation that poorer countries (in per capita terms) tend to have lesser trade. Also, the coefficient estimates of the intra-industry trade intensity variables were significant. While the positive sign of the intra-industry trade in agricultural commodities suggest that it can, *ceteris paribus*, lead to trade creation within the region, the negative sign of the agricultural and mineral commodities is reflective of the Krugman's specialization effects arising from the fact that Nigeria is a major exporter of crude oil. It was inferred that these results portends that improvements in per capita incomes of WAMZ countries could invariably be associated with greater trade in the absence of trade barriers and if supported with common currency. This was confirmed by the significance of the trade dummies included in the model.

KEY WORDS: Exchange rate policy, export trade, panel data regression model, WAMZ,

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1. Introduction

The desire to evolve a common currency for the ECOWAS sub region has been in the offing since the birth of the regional integration body in 1975. This was considered expedient given the fact that there exist in the sub region one of the oldest monetary union that has a single currency (CFA Franc) for the Franco-phone West African Countries known as “L’Union Economique et Monetaire Ouest Africaine (UEMOA)”². This informed the setting up of the West African Monetary Zone (WAMZ), the proposed 2nd Monetary Zone for non-UEMOA³, as a prelude and “fast-track” approach to ultimate unification and adoption of a common ECOWAS currency.

The quest for an ECOWAS common currency is further encouraged by the successful story of European Monetary Union (EMU) that adopted the Euro as its common currency beginning from 1999. It is the general belief that Europe’s path to monetary union could be adopted to expedite the ECOWAS common currency project, as it conforms to the theoretical literatures on regional integration sequencing, which progressed from free trade area through customs union and common market to monetary union (Balassa, 1964). This approach requires that intending members of a monetary union must meet some defined optimum currency area criteria which focus on macroeconomic convergence of intending member countries.

The policy approach to the realization of WAMZ so far, seems to draw essentially from these traditional OCA theories that business cycle synchronization and macroeconomic convergence make a currency area an optimal monetary arrangement, other things being equal, by reducing the scope for asymmetric policy responses to the disturbances hitting the union-wide economy {Bayoumi, (1992); Blanchard, O. (1999); Blanchard and Quah (1989)}. However, for about 5 years, the proponents of WAMZ have experimented with this approach but had failed to meet specified convergence criteria. According to Obaseki (2005), “the inability of the member countries to implement policies towards the attainment of the ECOWAS single market objective and the WAMZ convergence criteria led to the postponement of the launching of the WAMZ

²The union is made up of eight countries: Benin, Burkina Faso, Cote d’Ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo and has been in existence first as l’Union Monetaire Ouest Africaine UMOA in 1962 and then UEMOA in 1994.

³ It is currently made up of five countries: Gambia, Ghana, Guinea, Nigeria and Sierra Leone. Liberia and Cape Verde are expected to join later.

monetary union to December 1 2009". This view is supported by Ojo (2005) who believes that there has to be a change in strategy if the objective of WAMZ is to merge with EUMOA to form a West African common currency. This change should conform to EUMOA's approach to the adoption of common currency which differed significantly from the EU's approach. According to Cobham and Robson (1993), the UEMOA has no robust historical antecedents like the EU, especially of successful intra-regional trade integration, but have had a common currency in place for several years. One is therefore inclined to agree with the self-validating theory of Fidrmuc (2001), that the best institutional device to guarantee a credible policy commitment to a monetary union is to have a monetary union itself in place. In other words, a currency area can be a self-validating optimal policy regime, even when monetary unification does not foster real economic integration and intra-industry trade. This is evident from the UEMOA's experience that monetary union may nonetheless become optimal *ex post*, even though the individual countries that join it do not meet the optimality criteria *ex ante*. This is more in conformity with the vast literatures on endogenous optimal currency area which argues that monetary union in itself could act as a catalyst of business cycle synchronization {Frankel and Rose (2000); Fidrmuc Jarko (2001)}.

The objective of this paper is to test alternative trade theories especially one rooted in the specialization versus endogeneity of optimum currency area (OCA) theory for establishing the feasibility of WAMZ.

2. *The Theoretical and Analytical Framework of the Trade Gravity Model*

The theoretical foundations for the trade gravity model can be found in two classes of new alternative trade theories: (a) the Krugman specialization hypothesis model and (b) the endogeneity of OCA hypothesis models. Both theories are rooted in trade geography and represent a forward looking analytical framework, unlike earlier theories which investigated the suitability of a group of partner countries for monetary integration that are by necessity backward looking. These models argue that monetary integration represents a structural break for any group of countries and the single currency will affect all economic and financial areas and the policy decision making process. Consequently, these countries may be confronted with at least two distinct paradigms with quite different implications for future economic and financial developments in the currency areas and the benefits and costs from sharing a single currency. These paradigm shifts are embodied in the "Krugman Specialization hypothesis"

which postulates that increasing specialization and possible greater exposure to asymmetric shocks could follow the adoption of monetary integration; and the “endogeneity of OCA hypothesis” that postulates that countries adopting a single currency are more likely to become more integrated. Both hypotheses have strong theoretical underpinnings.

2.1 The “Krugman Specialization Hypothesis” Test

This hypothesis based upon Krugman (1993) and Krugman and Venables (1996)) is rooted in trade theory that a single currency will allow for the exploitation of economies of scale, and the new literature on economic geography, that postulates a U-shaped relation between integration and geographic concentration. In this literature, very high and very low trading costs favour dispersion of production. When trading costs fall and obstacles to trade fade, firms will be encouraged to exploit increasing returns by relocating and thereby altering the industrial structure. Krugman (1991a), (1991b), and (1992), Bertola (1993), and Rauch (1994) argue that at this stage any external economy leading to increasing return will produce a concentration of some industries in any country that enjoys even a small advantage over the others. To the extent that monetary integration might expedite industry concentration and eventually national specialization, a “common” shock to a specific sector or industry will asymmetrically affect the countries in which that industry is located. Kalemli-Ozcan, Sørensen and Yosha (2001a) provide empirical evidence that private risk sharing enhances specialization in production. More integrated, inter-regional and international financial markets allow regions and countries to insure against idiosyncratic shocks, permitting them to reap the gains from specialization. “The single currency will not affect other trading costs such as differences in conventions, languages, and legal systems. According to Bertola (1993): "at the theoretical level, if increasing returns to scale are as important as recent models of endogenous growth suggest, and if they may be exploited along geographical dimensions as well as over time, then removal of obstacles to factor reallocation may well lead to concentration of production and growth in privileged regions.... .Geographic concentration of production and growth may indeed be necessary to exploit the scale economies made possible by economic integration".

The major criticism of the “Krugman specialization hypothesis” is that it has a bearing on the costs from monetary integration. Mongelli notes that if countries become more specialized and vulnerable to asymmetric shocks, and output fluctuations start diverging, then each member country might feel a higher cost from the loss of the direct control over its nominal exchange rate

and national monetary policy. The intensity and speed with which it displays this effect will depend on a variety of factors including, amongst others, the availability of human capital and knowledge-related variables, R&D expenditure, product cycles, the share of intra- and inter-industry trade, the effective mobility of factors of production including labour, as well as cultural, linguistic, and other historical barriers. Specialization could be expedited by the implementation of the single market programme and the cut back of state subsidies and various privileges for national enterprises.

2.2 The “Hypothesis of Endogeneity of OCA”

Mongelli (2002) notes that “the intuition behind the hypothesis of endogeneity of OCA is that monetary integration reduces trading costs beyond the elimination of the costs from exchange rate volatility (that can be to some extent hedged)”. He maintains that “amongst others, it precludes future competitive devaluation, fosters trade and financial integration, facilitates foreign direct investment and the building of long-term relationships, and might over time encourage forms of political integration”. Taken to an extreme this paradigm suggests that a group of countries adopting a single currency might develop into an “optimum currency area” *ex-post* even if they don’t constitute one *ex-ante* (Rose (2000) and Frankel and Rose (1998, 2000)).

Beginning with a pioneering work, Frankel and Rose (1997) show that a country’s suitability for entry into a currency union depends on a number of economic conditions. These include, *inter alia*, the intensity of trade with other potential members of the currency union, and the extent to which domestic business cycles are correlated with those of the other countries, conditions that can be said to be endogenous. Using thirty years of data for twenty industrialized countries, they investigated the relationship between the two phenomena and uncovered a strong and striking empirical finding: countries with closer trade links tend to have more tightly correlated business cycles. It follows that countries are more likely to satisfy the criteria for entry into a currency union after taking steps toward economic integration than before.

In a follow-up study, Rose (2000) finds a large positive effect of a currency union on international trade, and a small negative effect of exchange rate volatility. By using a gravity model on a panel covering 186 countries during 1970-1990, Rose finds that countries sharing the same currency trade three times as much as they would with different currencies. Frankel and

Rose (2000) extend the framework of Rose (2000) and use a panel covering 200 countries plus dependencies. Their main findings are that: currency union more than triples trade among partner countries; the ratio of trade to output falls by 0.2 % for every 1 % increase in size (hence, larger countries are relatively more self-sufficient); there is no evidence of trade diversion; and every 1 % increase in trade – to GDP ratio raises income per capita by about 1/3 of a percent over a 20-year period. Frankel and Rose (2000) explore first the link between currency unification and trade and then the link between trade and growth. However the minimum point estimate (from Persson) still estimates a 13 per cent increase in trade from currency unification with a preferred estimate of around 40 per cent.

Fontagné and Freudenberg (1999) emphasize the importance of product differentiation in international trade: intra-industry trade can occur in horizontally differentiated goods (two-way trade in varieties) as well as in vertically differentiated goods (two-way trade in qualities). The former type of intra-industry trade fosters more diversified economies and symmetric shocks (Kenen (1969)), and the endogeneity of OCA paradigm. Fontagné and Freudenberg (1999) find that the elimination of exchange rate variability fosters intra-industry trade and raises its share above that of inter-industry trade. Economic size influences productivity allowing larger political units to attain higher incomes than smaller ones. In the absence of size, trade permits countries to attain economies of scale and higher income levels. An increase in size through economic growth leads to diminishing returns and congestion effects. Public goods can instead be more efficiently supplied by smaller political units.

Alesina, Barro and Tenreyro (2002) noted that as the number of independent countries increases and their economies become more integrated, we would expect to observe more multi-country currency unions. They examined the pros and cons for different countries to adopt as an anchor the dollar, the euro, or the yen, and concluded that while there appear to be reasonably well-defined euro and dollar areas, there does not seem to be a yen area. Drawing largely from the endogeneity hypothesis criteria, they address the question of how trade and co-movements of outputs and prices would respond to the formation of a currency union. They adjudged this response to be important because the decision of a country to join a union would depend on how the union affects trade and co-movements.

Fidrmuc (2001) tested the endogeneity hypothesis of OCA criteria on a cross-section of OECD countries between 1990 and 1999. The findings indicate that convergence of business

cycles relates to intra-industry trade, but has no direct relation between business cycles and bilateral trade intensity. He concludes that as far as intra-industry trade is positively correlated with trade intensities, the result confirms the OCA endogeneity hypothesis. He concludes that the endogeneity of OCA linkage criteria implies extensive business cycle harmonization between the CEECs and EU countries in the medium term.

What effect could monetary integration have on relative prices and hence real exchange rates? Beck and Weber (2001) use consumer price data for 81 European cities (in Germany, Austria, Switzerland, Italy, Spain and Portugal) to study the effects of German and European Economic and Monetary Union (EMU) on both intra-national and international relative price volatility. They find that the elimination of nominal exchange rate volatility during EMU has largely reduced cross-borders real exchange rate volatility (by roughly 80 percent). However, distance and national borders still have a positive and significant impact on relative price volatility even in EMU.

Corsetti and Pesenti (2002) argued that a currency area can be a self-validating optimal policy regime, even when monetary unification does not foster real economic integration and intra-industry trade. In their model, they argue that firms choose the optimal degree of exchange rate pass-through to export prices while accounting for expected monetary policies, and monetary authorities choose optimal policy rules while taking firms' pass-through as given. They show that two equilibriums exist, each of which defines a self-validating currency regime. One of the options available and consistent with OCA, they maintained, would be for the firms to preset prices in consumer currency, and a monetary union would be an optimal policy choice for all countries as a common currency would help to synchronize business cycles across them.

Anyanwu (2003) in a study titled "Does monetary union affect trade and output" examined the various theories and paradigms relating to trade and output in monetary union. Applying the endogeneity gravity models similar to Frankel and Rose (2000) and Alesina, Baro and Tenreyro (2000), he estimated the effects of monetary union on bilateral trade and output. His results show that WAEMU countries with the same currency trade about twice as much with each other as countries with different currencies within ECOWAS. The results also show that monetary union among WAEMU countries leads to a ten-fold increase in their output, which otherwise would have been lost without monetary union. He concludes that the test of

endogeneity of OCA criteria hypothesis that important beneficial effects follow *ex post* a monetary union through the promotion of trade and central bank credibility is confirmed.

Three main observations emerged within the literature with regard to the endogeneity of OCA criteria: first, Frankel and Rose, as well as several other authors, including Rodrik (1994), Helpman (1988) and Bradford and Chekwin (1993) raise the issue of simultaneity between trade and growth, and argue that causality may run from investment to growth and then to exports, rather than the other way around. Secondly, Mongelli (2002) noted that EMU has the character of a collective Endeavour both from an institutional and economic standpoint. It would be interesting to see this hypothesis tested in a more detailed model. Furthermore, the trade-channel should be operating in addition to other channels such as the nominal anchor effect (i.e. monetary discipline). Thirdly, relevant question at present in Europe is whether countries are in a currency union because they trade a lot, or start trading more because they are in a currency union. The same has happened for inflation in countries with a poor track record in maintaining low inflation after “anchoring” themselves to low inflation countries. Issing (2001) discusses the endogeneity of political integration, and Blanchard and Wolfers (2000) discuss the endogeneity of labour market institutions.

3. The Model of Endogeneity of OCA Criteria

The analytical model estimated in this section is rooted in the trade gravity models as propounded by Frankel and Rose (1997), Rose (2000) and Masson and Pattillo (2004). These authors maintained that a typical gravity model is usually specified to include as explanatory variables the product of the two countries’ real GDP, both in levels and per capita, the distance between them, and the land areas of the two countries. In addition, a number of dummy variables are included to capture the possible effects of common features of the countries: membership in a free trade area or currency union, a common language, border, or colonizer, etc. The gravity equation is typically specified in logarithms, so that:

$$\ln(X_{ij}) = \beta_0 + \beta_1 \ln(Y_i Y_j) + \beta_2 \ln\left(\frac{Y_i}{Pop_i} \frac{Y_j}{Pop_j}\right) + \beta_3 \ln(Area_i Area_j) + \sum_{k=1}^n \beta_{3+k} D_k \dots \quad (Eq.1)$$

Whereby X_{ij} is the bilateral trade between the two countries, Y is the real output, Pop is the population, $Area$ denotes the land mass, D the various dummy variables. This specification is consistent with Rose (2000) and a number of others. It was also observed that the other variant of the endogeneity of OCA model as estimated by Frankel and Rose (1997) can be rendered as:

And $BETI_{ij}^E$, $BMETI_{ij}^{ME}$, BTE_i and BTE_j $BTME_i$ and $BTME_j$ $TTME_i$ and $TTME_j$ denotes the bilateral export and total trade; Y_{Ri} and Y_{Rj} are the real GDP of countries i and j. IIT_{ij}^{AG} is the ratio of the agricultural (intra-industry) trade intensity of both countries; IIT_{ij}^{AGMI} is the ratio of the agricultural and mining (intra-industry) trade intensity of both countries; D_1 is a dummy for adjacency or common border; D_2 is a dummy for common language; D_3 is a dummy for common currency and D_4 is a dummy for common colonial ties

Using pooled equation regression models, equations 5 and 6 are estimated for the WAMZ countries. In general, we adopted the 5 x 2 cross sectional panel data to capture the entire bilateral relationships similar to what was done in the previous chapter. These bilateral relationships (cross sections of the panel) are: Gambia-Ghana, Gambia-Guinea, Gambia-Nigeria, Gambia-Sierra Leone, Ghana-Guinea, Ghana-Nigeria, Ghana-Sierra Leone, Guinea-Nigeria, Guinea-Sierra Leone and Nigeria-Sierra Leone.

4. Regression Results of the Trade Gravity Models

The regression result of the trade gravity models specified in Equations 5 and 6 are as shown in Table 1. Equation 1a represents the regression results for the bilateral export trade dependent variable, while that of 1b is for the total bilateral trade dependent variable. The independent variables can be grouped into economic or quantitative variables presumed to be the determinants of endogeneity and qualitative variables captured by the dummies. The equations were estimated using seemingly unrelated regression models from a quarterly sample 1996:1 to 2004:4 amounting to 36 numbers of observations for 10 cross-sections making a balanced panel of 360. The log linear regression models were estimated and the results are summarized into a table for analytical convenience. A review of the estimated equations shows that their goodness of fit is high with adjusted R^2 as high as 85% for both equations. It is worthy to mention that three groups of the relationship of interest in this regression analysis are: (i) the effect of output covariability on trade intensity (which is proxied by the log of the product of the bilateral real as well as per capita GDP of the two countries; (ii) the effect of intra-industry trade on bilateral trade intensity (which is captured in this model by the agricultural and primary commodities intra-industry trade); and (iii) the effects of common features of the countries such as membership in a free trade area or currency union, a common language, border, or colonizer, etc. on bilateral trade.

Bilateral Trade and Real and Per Capita GDP Relatives

As indicated in the theoretical framework, the OCA theory suggests that if there are similarities in the co-variation or correlation of outputs, it is expected to be positively related to the bilateral trade intensity between the two countries. Two measures of output correlations in our model are: (a) log of the product of Real GDP of country i and j in the bilateral trade relations denoted by $LOG(Y_{Ri} * Y_{Rj})$ and (b) the log of the product of their per capita income

respectively which is denoted as: $LOG\left(\frac{Y_{Ni}}{Pop_i} * \frac{Y_{Nj}}{Pop_j}\right)$. This specification is consistent with

Rose (2000). These coefficients are significant especially that of the intra-WAMZ total trade model. However, while the sign of the log of the product of real GDP variable is positive, confirming that similarities in business cycles have positive effects on bilateral trade among the countries, the coefficients of the product of the per capita GDP is negative. This is

consistent with the results of similar gravity models tests by Masson and Pattillo (2004) which seems to capture well the determinants of bilateral trade between countries. The positive sign of the real GDP variable coefficient estimate agrees with their findings that larger countries exert a greater gravitational pull on imports and push to

Dep. Variable	a. BILAT. EXPORTS			b. BILAT. TOT. TRADE		
	LOG(BTEIJ)			LOG(TTMEIJ)		
Independent Variable	Coef.	t-Stat.	Prob.	Coef.	t-Stat.	Prob.
LOG(Y _{Ri} *Y _{Rj})	0.172	3.8	0.00	0.632	19.1	0.00
LOG{(Y _i /Pop _i)*(Y _j /Pop _j)}	-0.370	-8.3	0.00	0.082	4.2	0.00
LOG(IIT ^{AG} _i /IIT ^{AG} _j)	0.064	4.1	0.00	-0.007	-3.6	0.00
LOG(IIT ^{AGMI} _i /IIT ^{AGMI} _j)	-0.635	-11.4	0.00	0.019	4.8	0.00
Fixed Effects						
GAMGHA--C	1.940			0.203		
GAMGUI--C	0.573			-1.123		
GAMNIG--C	0.779			1.985		
GAMSLN--C	-0.115			-1.713		
GHAGUI--C	0.787			0.202		
GHANIG--C	7.578			2.151		
GHASLN--C	-0.661			0.266		
GUINIG--C	4.098			1.853		
GUISLN--C	1.705			-1.071		
NIGSLN--C	2.230			1.978		
R-squared	0.856			0.978		
Adjusted R-squared	0.851			0.977		
S.E. of regression	0.980			0.203		
Durbin-Watson stat	0.274			0.371		
Log Likelihood						502.2
Mean dependent var		-0.51			7.479	
S.D. dependent var		2.534			1.351	
Sum squared resid		316.8			14.31	
Estimated using Seemingly unrelated regression methods						

exports. This is most likely to be true with respect to trade flows intra-WAMZ given the fact that Nigeria accounts for approximately 60 per cent of the GDP, land mass and population of the group. Her pull on imports is very dominant especially so given her buoyant foreign exchange

reserves derived from exports of crude oil. She also seems to serve as a base for re-exports of food and other consumer products via informal trade within the ECOWAS sub region.

The negative sign of the coefficient of the per capita GDP variable is also consistent with Masson and Pattillo's (2003) findings that richer countries (in per capita terms) also tend to have higher trade and by implication poorer countries tend to have lesser trade. This is largely true since *a priori* information on per capita incomes of the countries indicated that they are all classified among low income and somewhat below the poverty lines. One is therefore not surprised that the sign of the coefficient of this variable is negative. The result can therefore be said to be salutary as it portends that improvements in per capita incomes of WAMZ countries could invariably be associated with greater trade in the absence of trade barriers and if supported with common currency.

This assertion is consistent with the per capita income *ex post* convergence theorists who maintain that regional integration especially the one advanced by creating a monetary union, may lead to convergence of income levels by stimulating growth in the poorer countries through increased trade (Masson and Pattillo (2004)). They further argue that related initiatives to liberalize factor movements would also favor growth of poorer countries by allowing capital and labor to move to the locations where they are most productive. In general, this is consistent with the assertion by Jenkins and Thomas (1996) that "there is a growing consensus that 'convergence clubs' exist, where countries with a lower GNP per capita grow more rapidly because they are members of a trade group, or because domestic policy gains credibility by being tied to the domestic policy of a country with a better economic reputation". Although for now, there are doubts with regard to fiscal credibility of the intending members of WAMZ, especially Nigeria, she can certainly gain from allowing her domestic monetary and exchange rate policy to be tied to a regional convergence benchmark if for no other reason but fiscal discipline effects.

Bilateral Trade and Intra-Industry Trade Intensity

You would recall that from the point of view of endogeneity of OCA theory, if intra-industry trade accounts for a high share in trade, then, *ceteris paribus*, business cycles are expected to become more similar across countries. By contrast, increased bilateral trade intensity may lead to divergence of business cycles if the increase in trade is due mainly to increased specialization as predicted by the alternative OCA view (the Krugman's specialization theory). In order to reflect both theories in our model, I included as explanatory variables and

determinants of bilateral trade two variants of intra-industry trade variables: the first is defined as the log of the ratio of intra-industry trade in agriculture of both countries, $LOG\left(\frac{IIT_i^{AG}}{IIT_j^{AG}}\right)$, designed to capture endogeneity of OCA theory, as *a priori* information suggests very strong similarities in structure of agricultural trade. The second is defined as the log of the ratio of intra-industry trade in primary commodities (agriculture and mineral resources), $LOG\left(\frac{IIT_i^{AGMI}}{IIT_j^{AGMI}}\right)$, designed to capture Krugman's specialization theory effects, given the sharp differences in this variable between Nigeria and the rest members of WAMZ. This stems from the fact that Nigeria is a major exporter of crude oil and a member of OPEC, a marketing cartel that was able over time to guarantee better terms of trade for her members, as against the deteriorating terms of trade faced by the other WAMZ members with regard to exports of solid minerals.

From the Table 1, it can be seen that the coefficient estimates of both variables are significant suggesting that intra-industry trade intensity have significant effects on bilateral trade. However, while the sign of the parameter estimate of intra-industry trade in agricultural commodities is positive, that of bilateral primary commodities trade intensity is negative.

The positive sign of the agricultural trade intensity variables suggest that the positive bilateral co-movements can, *ceteris paribus*, lead to trade creation within the region. This is plausible, given the structure of agricultural trade within the region, which are mostly in staple foods especially grains, tubers, vegetable oils and livestock products (live animals, poultry and eggs). Sufficient pockets of deficit in supply of these products exist within the region, especially in Nigeria, sufficient to pull imports towards her. This fact is evidenced by the large food imports of these countries from the rest of the world which accounts for a significant proportion of their foreign exchange spending annually. Also, there are strong similarities in agricultural export baskets to the rest of the world, made up of cocoa, coffee, palm produce, groundnut and ginger, and they indeed face the same terms of trade. This similarity is therefore supportive of the fact that opportunities exist to negotiate for better terms of trade as a regional group or trade bloc, an action that could lead to *ex post* convergence of business cycles and ultimately trade creation within the sub region.

The negative sign of the parameter estimate of the coefficient of the intra-industry trade in primary commodities is to be expected given the divergence in the structure of commodities trade basket. While oil exports account for about 95 percent of Nigeria's primary commodity exports, the other member countries of WAMZ relied entirely on agricultural and solid mineral exports. Thus, increased dominance of a specialized product like petroleum in the export basket of Nigeria portends the fact that opportunities exist for trade expansion in the face of other endogenous factors such as proximity, adjacency and common currency. While Nigeria's exports of petroleum products to the other WAMZ member countries is expected to increase, a reciprocal increase in agricultural exports of these countries to Nigeria may also take place. Thus, in the event of the emergence of a monetary union, opportunities exist to internalize *ex post* a greater fraction of the region's trade, given this significant and indeed negative divergence of these variables between Nigeria and the rest others.

Bilateral Trade and Qualitative Trade Gravity Indicators

You would recall that the third interest of the estimated gravity model is to measure the effects of common features of the countries such as membership in a free trade area or currency union, a common language, border, or colonizer, etc. on bilateral trade. Consequent on this, four dummy variables were included in the regression analysis, viz.: adjacency, $LOG(D_1)_{ADJ}$, common language, $LOG(D_2)_{LANG}$, common currency, $LOG(D_3)_{CUR}$, and common colonizer.

$LOG(D_4)_{COL}$.

Dep. Variable	a. BILAT. EXPORTS			b. BILAT. TOT. TRADE		
	LOG(BTEIJ)			LOG(TTMEIJ)		
Independent Variable	Coef.	t-Stat.	Prob.	Coef.	t-Stat.	Prob.
C	-10.036	-7.9	0.00	-4.702	-14.3	0.00
LOG((GDPI?)*(GDPJ?))	-0.262	-2.3	0.02	0.363	12.2	0.00
LOG((NGDPI?/POPI?)*(N	1.112	11.4	0.00	0.878	31.8	0.00
LOG(XAGI?/XAGJ?)	0.238	15.4	0.00	0.00012	0.1	0.96
LOG(XAGMII?/XAGMIJ?)	-0.819	-14.9	0.00	-0.122	-14.3	0.00
DCUR?	-3.329	-6.9	0.00	-2.746	-34.4	0.00
LOG(DADJ?)	0.184	0.9	0.37	0.095	3.3	0.00
DCOL?	-1.100	-8.0	0.00	-0.481	-13.7	0.00
R-squared	0.376			0.752		
Adjusted R-squared	0.362			0.747		
S.E. of regression	2.153			0.680		
Durbin-Watson stat	0.080			0.032		
Log likelihood				206.7		
Mean dependent var		-1.44			7.479	
S.D. dependent var		2.696			1.351	
Sum squared resid		1502			162.5	
Estimated using Seemingly unrelated regression methods						

The regression result is as shown in table 2. In general, the coefficient estimates of these dummies were significant for the bilateral total trade but not significant for the bilateral export trade functions. This result shows that intra-WAMZ total trade

was significantly influenced by these variables. While adjacency had positive effects, differences in currency and language had significant negative effects. These tended to confirm the Rose effects of currency union dummies on trade expansion and/or contraction for the WAMZ. A widely cited recent paper (Rose, 2000), using a global sample, finds that currency unions increase trade by about a factor of 3 from cross-sectional results while time-series analysis with fixed effects give somewhat lower estimates of around 1.7 (Glike and Rose, 2002). Although a simulation to estimate the effects of trade gravity models on the extent of trade creation would be conducted, it is most likely that the outcome will compare favorably with these results. This would be subject to particularities which Masson and Pattillo (2004) pointed out. In particular, they note that “while it is useful to have the widest sample possible if that sample is homogeneous, it may also be the case that there are particularities in a region that make it not comparable to others”. Perhaps the non-significance of these dummies with regard to the bilateral trade coefficients could be attributed to these “particularities” such as lack of common borders and common currency, while the dummies for common language and common colonizer are not strikingly distinguishing enough to make a difference. Lack of common border becomes much more important, in the face of weak transportation links within the ECOWAS sub region and between many African countries. The Rose effect could also have been compromised by poor data on regional trade, as there seems to be a consensus among policy analysts that an appreciable unrecorded trade takes place within the sub region.

5. Summary of Findings and Conclusions

This model tested the hypothesis that there are significant **ex ante** similarities in business cycles induced by intense bilateral trade and other elements of its “gravity” sufficient enough to make the intending members of WAMZ an optimum currency area **ex post**. Using econometrics methods, the study gauged the effects of output co-variability, intra-industry intensity of trade and endogenous features of the countries such as common language, border, or colonizer, etc. on bilateral trade. The results show that:

- a) The coefficients of the log of the product of the GDP and the per capita incomes were significant, confirming that similarities in business cycles influence bilateral trade among the countries. However, the positive sign of the real GDP variable coefficient estimate confirms the assertion in the literature that larger countries exert a greater gravitational pull on imports and push to exports, since Nigeria accounts for approximately 60 per cent

of the GDP, land mass and population of the group. The negative sign of the per capita income variable coefficient estimate is also consistent with expectation that richer countries (in per capita terms) tend to have higher trade and by implication poorer countries tend to have lesser trade.

- b) The coefficient estimates of the intra-industry trade intensity variables were significant. While the positive sign of the intra-industry trade in agricultural commodities suggest that it can, ceteris paribus, lead to trade creation within the region, the negative sign of the agricultural and mineral commodities is reflective of the Krugman's specialization effects arising from the fact that Nigeria is a major exporter of crude oil.
- c) While adjacency had positive effects, differences in currency and language had significant negative effects. These tended to confirm the Rose effects of currency union dummies on trade expansion and/or contraction for the WAMZ.

In concluding the study inferred that the maintenance of independent flexible exchange rate policy by either party to the bilateral trade makes no difference in terms of export performance, and may indeed constitute an impediment to free trade within the WAMZ region. Among the impediments identified are the microeconomic costs of foreign exchange conversion and high incident of trade diversion associated with it.

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