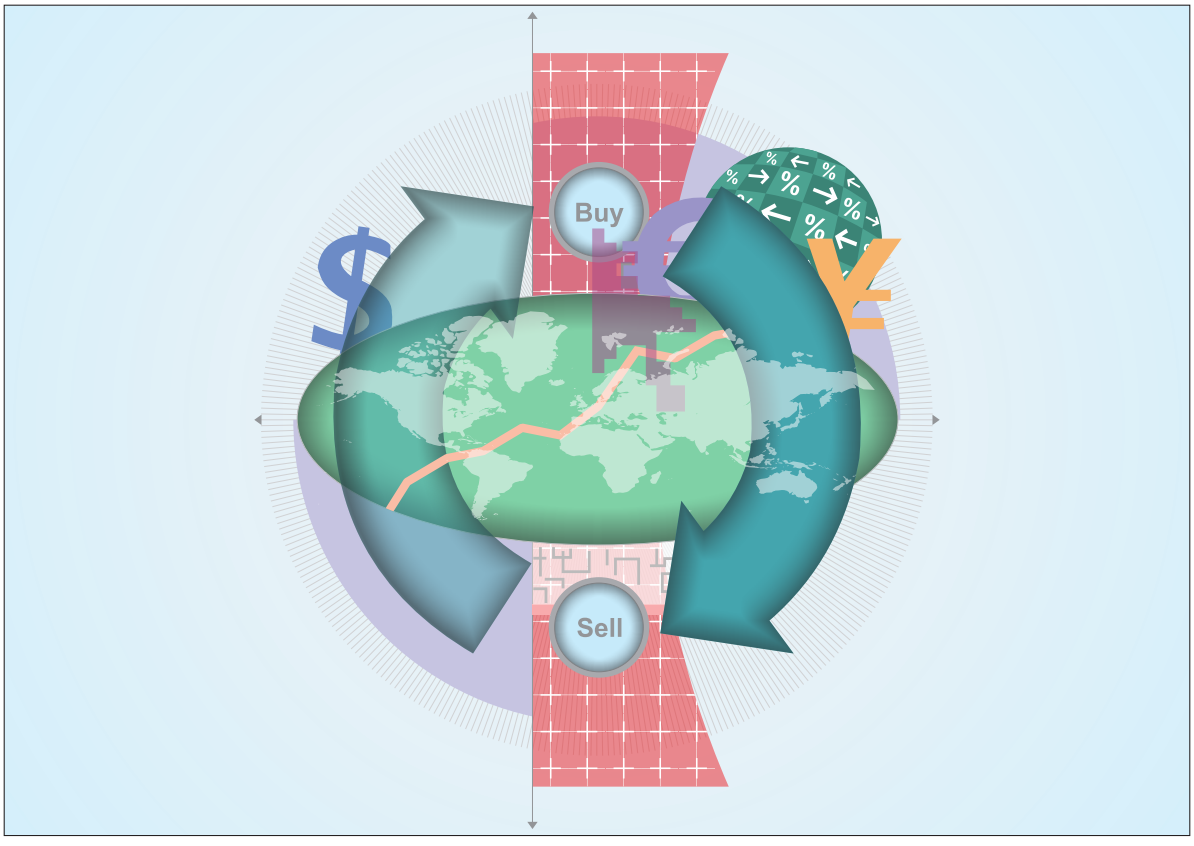

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Exchange Rate and Trade Balance in West African Monetary Zone: Is There a J-Curve?

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ABSTRACT

An attempt is made in this paper to query the existence or otherwise of a J-Curve in four West African Monetary Zone (WAMZ) countries: namely The Gambia, Ghana, Nigeria and Sierra Leone. We use data from 1980Q1 to 2007Q4 and a bounds testing approach, with an autoregressive distributed lag (ARDL) methodology, to cointegration in capturing the impact of devaluation on the trade balance. Our results indicate that cointegration exists among the trade balance, foreign income, the real effective exchange rate and domestic income in all countries. More importantly, our results seem to support the J-Curve hypothesis only in the case of Nigeria with Sierra Leone exhibiting no J-Curve pattern. The differential impact, of this policy of real devaluation, across countries implies that such policies should engender incentives that are compatible with the growth and developmental objectives of member states.

Key words: Trade balance, exchange rate, j-curve hypothesis, autoregressive distributed lag models, real devaluation, parsimonious model

INTRODUCTION

Economies the world over have become increasingly interdependent. While closer ties among nations has been partly driven by the rise in the movement of labour, services and capital- with the latter amid barriers to complete mobility-across national borders, it is trade in goods that is arguably at the core of economic relations among independent states (Bahmani-Oskooee and Brooks, 1999). The potential gains from commodity exchange have been well documented in the classic theories of international trade which emphasize, among other things, the benefits that accrue from comparative advantage and specialization (Krugman and Obstfeld, 2001).

Concerted efforts by nations at establishing both bilateral trade links and subsequent formation of regional trading blocs, such as NAFTA, MERCOSUR, SADC, GCC among others, are the upshot of this widely held view on the gains from trade. The West African Monetary Zone was formally launched in December 2000 with the key objective of promoting trade among The Gambia, Ghana, Guinea, Nigeria and Sierra Leone. However, considerable challenges arise especially in terms of macroeconomic policy stance within countries and the requisite coordination across them. For instance, the influence of policymakers on the exchange rate may stir their interest towards gaining

deeper insight into how the deployment of that influence would affect crucial external sector aggregates in particular the trade balance (Himarios, 1985; Gupta-Kapoor and Ramakrishnan, 1999; Lal and Lowinger, 2001).

Since the Bretton Woods Accord collapsed in 1973, many countries have gravitated towards floating exchange rates with heightened interests on the effects of devaluation on the trade balance in both developed and developing economies (Artus, 1975; Spitaller, 1980; Krugman and Baldwin, 1987; Bahmani-Oskooee and Alse, 1994; Marwah and Klein, 1996; Hacker and Abdulnasser, 2003; Nadenichek, 2006). The sequence of events in the traditional argument is that currency depreciation first leads to deterioration in the trade balance before improvements become obvious. This response pattern mimics the letter J hence the label J-curve phenomenon. The evidence is however not as clear-cut as the theory appears to imply. Infact, the vast empirical literature on the J-curve is inundated with conflicting outcomes which have been attributed to the multiplicity of samples, models and methods that were used in the analyses.

Although investigation on the exchange rate-trade balance nexus has a long history in economics, it is the extension to capture this relationship in a time series though multi-country trading bloc context that distinguishes the present attempt. More specifically, an interesting attempt is made to unearth answers to key questions such as; Is there a J-curve effect in the WAMZ countries? If yes, it becomes pertinent to know the response pattern since a delayed J-curve (Rosensweig and Koch, 1988; Moffett, 1989) signifies a more prolonged worsening of the trade balance while the absence of this effect has a different policy implication altogether. Thus, the novelty value of this study cannot be over-emphasized. First, we consider the J-curve effect in WAMZ which, to the best of our knowledge, is a pioneer attempt at explicitly querying the trade balance effects of exchange rate policies in WAMZ countries. Also, using quarterly data from 4 countries (Rose and Yellen, 1989; Rose, 1991; Shirvani and Wibratte, 1997; Wilson, 2001) over the period 1980-2005 we employ the Autoregressive Distributed Lag (ARDL) approach to cointegration which has been demonstrated to outperform competing cointegration approaches in small samples (Pesaran *et al*., 2001).

Finally, since the WAMZ is still a nascent bloc, we opine that relevant policy lessons can be gleaned with a view to improving the lot of member countries.

EXCHANGE RATE AND THE TRADE BALANCE: A LITERATURE SUMMARY

The theory and empirical evidence: Theoretically, currency depreciation influences the trade balance via two important channels. The volume effect, due implicitly to more expensive imports, raises the export volume while the volume of import declines resulting in an increase in the trade balance. A countervailing import value effect moves the trade balance in the opposite direction (Krugman and Obstfeld, 2001; Hacker and Abdulnasser, 2003). Hence, the net effect on the trade balance depends on which effect dominates. These adjustments take place over time hence a J-shaped time path of the trade balance results from depreciation. The claim in the orthodox J-curve theory is that, at the outset, the import value effect outweighs the volume effect since prices are assumed to respond faster than export and import quantities to exchange rate movements. Many explanations of this slow adjustment mechanism have been proffered. First, the market players might not immediately observe changes in competitive conditions and the rules of the game (recognition lag). Second, since many contracts have been designed using the old exchange rate establishing new business orders may not be instantaneous (decision lag). Third, delivery of old orders and difficulties with regard the acquisition of new capital may take a while (delivery and

replacement lags). Finally, suppliers need to be convinced that the changes in market conditions are large enough and expected to be persistent before the option value to waiting, as against expansion, becomes less attractive (production lag) (Junz and Rhomberg, 1973). In sum, therefore, following an initial decline in the trade balance a strengthening volume effect leads to an improvement-J-curve- in response to devaluation.

In contrast, the empirical literature appears far from reaching a concensus on the existence or otherwise of the J-curve phenomenon. Several studies have investigated the trade balance effects of devaluation but regardless of the samples, number of countries, model specification and estimation techniques employed in the analysis, this effect seems, at the best, ambiguous. Miles (1979) failed to find evidence of the J-curve using annual data from 14 developed countries. Sundararajan and Bhole (1988) found similar result for India. More recently, the studies of Demeulemeester and Rochat (1995), Shirvani and Wilbratte (1997) and Wilson (2001) seem to reinforce this no J- curve stance. On the contrary, devaluation lead to an improvement in the trade balance of ninety per cent of the countries in the sample used by Himarios (1985).

In a subsequent study, Himarios (1989) found support for the J-curve in a sample of 15 developing countries. In contrast, mixed results are reported by Bahmani-Oskooee (1985). He finds that of the four developing countries under study, the conventional J-curve pattern is admissible only with the Thailand data. Bahmani-Oskooee and Alse (1994) employed the Engle and Granger (1987) cointegration method on data from 41 countries and found that the effect of currency depreciation on the trade balance was positive for Brazil, Costa Rica and Turkey (supporting the J-curve phenomenon) with a negative effect in the case of Ireland. For the remaining 37 countries, this effect was found to be nil. Yiheyis (2006) examined the impact of exchange rate policy on external sector performance using a sample of 20 African countries. The result shows that the contemporaneous effect of nominal devaluation is negative and hence provides support for the J-curve. Hence, the empirical evidence, needless to say, is inconclusive.

Model specification: The trade balance is conventionally measured as the total value of exports less total value of imports. We, however, use the ratio of exports to imports values in this study. The merit of this choice is that the unit of measurement becomes unimportant and the constructed variable can be conveniently interpreted as nominal or real trade balance (Bahmani-Oskooee and Brooks, 1999; Gupta-Kapoor and Ramakrishnan, 1999; Lal and Lowinger, 2001). The Real Effective Exchange Rate (REER) is used since it is not unusual for countries to have multiple trading partners.

Thus, there is a possibility that a country's currency may be appreciating with respect to some partners while depreciating against others. The reer, which is a trade weighted measure, aptly captures this notion. While the Gross Domestic Product (GDP) of individual countries is used as our measure of domestic income, we employ a single measure of world income in all four models. This was done on two grounds. First, the countries involved are small and thus are expected to respond to global developments and not vice-versa. Also, the WAMZ, when fully established, is expected to continue trading with the rest of the world and developments in economic activities in industrial countries should continue to be important. Therefore, following the received wisdom on the J-curve hypothesis, the model we specify for all countries in our sample is:

$$\ln tb_t = \alpha_0 + \alpha_1 \ln yw_t + \alpha_2 \ln y_t + \alpha_3 \ln reer_t + \mu_t \quad \alpha_1 > 0; \alpha_2; < 0 \tag{1}$$

Where:

tb_t = The trade balance
yw_t = Index of world income
gdp_t = the gross domestic product
$reer_t$ = Real effective exchange rate
u_t = Error term

From the theory, an increase in the world income is hypothesized to lead to a surge in the exports and hence the trade balance, of WAMZ countries. This suggests that the volume of exports to trading partners should increase as a consequence of higher purchasing power in these foreign economies. Therefore, an estimate of a_1 is expected to be positive. In a similar vein, the volume of imports from trading partners ought to rise with an increase in the real income of WAMZ countries. Hence, an estimate of a_2 is expected to be negative. There is however some ambiguity with respect to the estimate of a_3. The argument here is that with a real depreciation, that is a fall in real effective exchange rate, increased competitiveness results in more exports and less imports via the volume effect. The import value effect however pulls in the opposite direction since a higher reer means each unit of import becomes more valuable. This latter effect would tend to worsen the trade balance which naturally rises when the volume effect is dominant.

Turning now to investigating the responsiveness of the trade balance to changes in the real effective exchange rate, a deeper understanding entails thorough examination of the dynamic adjustment of the trade balance model specified above. Hence, in this study we deploy the Unrestricted Error Correction Model (UECM) which is in the spirit of the Autoregressive Distributed Lag (ARDL) model proposed by Pesaran *et al.* (2001). Pesaran *et al.* (2001) proposed an (ARDL) bounds testing approach to examining the existence of cointegration relationship among variables. Compared to other cointegration procedures, such as Engle and Granger (1987) and Johansen and Juselius (1990), the bounds testing approach appears to have gained popularity in recent times due to the following reasons: Both long-and short run parameters of the specified model can be estimated simultaneously. Again, the approach is applicable irrespective of the order of integration whether the variables under consideration are purely I (0), purely I (1) or fractionally integrated. Finally, this approach is more appropriate for small samples. The ARDL specification of the trade balance model estimated for each country is:

$$\begin{aligned}\Delta \ln tb_t &= \alpha_0 + \alpha_1 \ln tb_{t-1} + \alpha_2 \ln yw_{t-1} + \alpha_3 \ln gdp_{t-1} + \alpha_4 \ln reer_{t-1} \\ &+ \sum_{i=1}^{p} \alpha_{5i} \Delta \ln tb_{t-i} + \sum_{i=1}^{q} \alpha_{6i} \Delta \ln yw_{t-i} + \sum_{i=1}^{r} \alpha_{7i} \Delta \ln gdp_{t-i} + \sum_{i=1}^{s} \alpha_{8i} \Delta \ln reer_{t-i} + \varepsilon_t\end{aligned} \tag{2}$$

The first step in the (ARDL) bounds testing procedure is to first estimate equation (2) by Ordinary Least Square method and then conduct an F-test for the joint significance of the coefficients of the lagged level of the variables with the aim of testing for the existence of long run relationship among the variables in the model.

For Eq. 2:

$$\text{Ho: } a_1 = a_2 = a_3 = a_4 = 0 \text{ against } H_1: a_1 \neq a_2 \neq a_3 \neq a_4 \neq 0$$

Consequently, the computed F-statistic is then compared to the non-standard critical bounds values reported by Pesaran *et al.* (2001). There are a number of possibilities which are considered in turn. If the computed F-statistic exceeds the critical upper bounds value, then the null hypothesis of no cointegration is rejected. If the computed F-statistic falls below the critical lower bounds value, then the null hypothesis of no cointegration is not rejected. But when the computed F-statistic falls between the critical lower and upper bounds values, then the knowledge of integration of the variables under consideration is required, or else, no conclusion can be reached about cointegration status.

Data definition and study scope: With the aim of investigating the trade balance effects of devaluation in the WAMZ, this study shall employ quarterly data covering the period from 1980Q1 to 2007Q4 for The Gambia, Ghana, Nigeria and Sierra Leone. The variables employed in this study include: Trade balance, real effective exchange rates, world income and domestic income. All variables are sourced from International Financial Statistics and expressed in their natural log form.

We use quarterly data spanning the period 1980Q1 to 2007Q4 sourced primarily from the International Monetary Fund's International Financial Statistics CD-ROM 2007. Since the data are chiefly available at annual frequency, we follow the store and fetch procedure for changing data frequency from annual to quarterly in E-views. Due to the unavailability of data over most of the sample period Guinea had to be dropped in our investigation. Details on variable names, construction and definition are provided in Appendix.

EMPIRICAL RESULTS

The unit root test results, reported in Table 1, show that domestic income, the real effective exchange rate, world income and the trade balance are all stationary on differencing once. This suggests a need to examine the existence or otherwise of some pattern of long-run association among these variables. It has been argued, in the time-series literature, that there is a possibility that some linear combination of non- stationary variables may be mean-reverting.

With a view to examining this cointegrating relationship we deploy the bounds testing approach (Table 2) (Pesaran *et al.*, 2001). From the results, cointegration is found for all countries but Sierra Leone. Hence, we resort to the Engle-Granger technique with a view to ascertaining if there are joint movements of these variables in the case of Sierra Leone. It is clear from Table 2 that cointegration exists among the variables of the model.

Our overarching objective in this study is to investigate the existence of the J-Curve effect for the WAMZ countries. Thus, considerable emphasis is placed on interpreting the signs of the real effective exchange rate coefficients in all the individual country models. Following a real devaluation, an initial worsening of a country's real trade balance followed by an improvement would suffice to confirm J-Curve effects. We return to this issue only after the domestic and foreign income variables are queried with regard their consistency with a priori expectations.

The results in Table 3 show that foreign income has the expected positive sign and is significant in all countries. This outcome fits the view that demand is the key driving force with respect to imports and exports (Onofowora, 2003). In a similar vein and in line with the "demand as driver" view, domestic income is negatively and significantly related to the trade balance in Ghana. In The Gambia and Nigeria, however, domestic income appears to be positively associated with the trade balance. A plausible explanation is that increased productivity leads to domestic output outstripping

Table 1: Augmented dickey-fuller unit root test reslults

	Gambia				Ghana			
	Level		1st Diff		Level		1st Diff	
Variable	Drift	Drift and trend	Drift	Drift and trend	Drift	Drift and trend	Drift	Drift and trend
Ipi	-1.683	-2.578	-3.162	-3.368	-1.684	-2.579	-3.162	-3.368
reer	-0.182	-1.871	-2.71	-2.835	-4.056	-3.135	-4.173	-4.822
rgdp	-2.701	-2.066	-2.072	-2.695	-0.973	-1.943	-9.3	-9.314
Rxm	-1.346	-4.669	-6.776	-6.79	-0.841	-4.882	-5.495	-5.46
	Nigeria				Sierra Leone			
	Level		1st Diff		Level		1st Diff	
Variable	Drift	Drift and trend	Drift	Drift and trend	Drift	Drift and trend	Drift	Drift and trend
Ipi	-1.683	-2.578	-3.162	-3.368	-1.683	-2.578	-3.162	-3.368
reer	-1.793	-1.87	-5.305	-5.321	-1.516	-2.538	-3.163	-3.12
rgdp	-0.222	-2.367	-3.202	-2.902	-2.523	0.456	-2.978	-5.213
Rxm	0.043	-2.659	-3.402	-3.683	-0.787	-1.327	-7.153	-7.095

The critical values for the model with a drift term at the 1, 5 and 10% levels of significance are -4.059, -3.458 and -3.155 in that order. For the model which includes a drift and trend, the correspondiug critical values are -3.501,-2.893 and -2.583 in that order

Table 2: The bounds (Cointegration) test

Lags	Gambia	Ghana	Nigeria	Sierra Leone
1	9.774***	5.185**	3.858	1.592
2	5.005***	4.431**	4.338	1.382
3	4.260	3.373	4.142	1.170
4	2.837	2.539	4.856**	1.502

The asymptotic critical value bounds are obtained from Table C1 (iii) case III: Unrestricted intercept and no trend (Pesaran *et al*., 2001). For k = 3, the lower bound I (0) = 3.23 and upper bound I (1) = 4.35 at 5% significance level. The lag structure was selected based on the Akaike Information Criterion. *** (**) Denotes the rejection of the null hypothesis at 1 (5%) significance level

domestic consumption hence requiring higher exports to dispose of some of this surplus. This is essentially a supply-side argument which is not only consistent with the potential effects from productivity improvements but also in line with the notion of substantial increase in the production of import-competing goods (Rose, 1990; Wilson, 2001).

We return now to the crux of the study. The standard view, ubiquitous in the literature, is that the signs of the coefficients on the real effective exchange rate should switch from an initial negative (say at lower lags) to an eventual positive (at relatively higher lags) for the J-Curve effects to be confirmed. Interestingly, we find such evidence only in the case of Nigeria. This coefficient which is negative (-0.098) four quarters following real devaluation turns positive (0.329) after an additional four quarters. The converse is found for The Gambia and Ghana where initial improvements in the trade balance in response to real devaluation is followed by deteriorations in later periods. In these cases, devaluation seems to embody some degree of risk with regard external sector performance. This "good news- bad news" cycle appears to occur at lower lags for The Gambia compared to Ghana. The speed of adjustment to the steady state after any disequilibrium is thus higher in the case of the former as about 30% of any distortion is corrected in the next quarter. This is about 6% age points higher than in Ghana.

Table 3: Parsimonious real trade balance model results for the WAMZ countries

	The Gambia	Ghana	Nigeria	Sierra leone
Constants	-0.089 (-1.339)	-0.151***(-4.371)	-0.079***(-4.183)	-0.103(-1.661)
Dlrxm(-1)	0.217**(2.343)	0.705***(8.167)	0.618***(7.637)	0.264**(2.602)
Dlrxm(-2)	-		0.157**(2.262)	0.206*(1.908)
Dlrxm(-4)	-	-0.199*(-1.929)	-0.504***(-6.120)	-
Dlrxm(-5)	-	0.316***(2.873)	0.345***(4.402)	-
Dlrxm(-6)	-	-0.173**(-2.124)		-
Dlrxm(-8)	-	-	-0.119*(-1.710)	-
Dlipi(-1)	-	-	5.307***(3.247)	-
Dlipi(-4)	-	8.192***(2.776)	-8.038***(-3.788)	-
Dlipi(-5)	-	-	1.091***(5.244)	-
Dlipi(-7)	-	-	-	-1.778**(2.315)
Dlipi(-8)	-	-	-	2.317***(2.775)
Dlreer(-1)	4.035*(1.807)	0.252(0.894)	-	-
Dlreer(-2)	-2.511 (-1.115)	-	-	-
Dlreer(-4)	-	0.602*(1.961)	-0.098(-1.017)	-
Dlreer(-6)	-	-0.440**(-2.020)		-
Dlreer(-8)	-	-	0.329***(3.297)	-
Dlrgdp(-1)	1.504***(-4.345)	-0.739*(-1.846)	-	-
Dlrgdp(-2)	1.029***(2.844)	-	-	-
Dlrdgp(-4)	-	-1.158***(-3.007)	-	-
Dlrgdp(-5)	-	-	3.090***(3.544)	-
Dlrgdp(-8)	-	-	-	-0.602 (-1.166)
Ecmgambia	-0.295***(-4.169)	-	-	-
Ecmghana	-	-0.239***(-5.048)	-	-
Ecmnigeria	-	-	-0.090***(-2.769)	-
Ecmsierraleone	-	-		-0.119***(-3.067)
R-Squared	0.311	0.600	0.708	0.250
Adj R-Squared	0.267	0.549	0.665	0.196
Durbin-Watson	2.022	2.046	1.736	1.879
F-Statistics	7.062	11.630	16.537	4.163

***(**) and * represent significance at the 1 (5) and 10% levels in that order. The t-values are given in parenthesis

All real effective exchange rate dynamics appear to provide little or no useful information for trade balance movements in Sierra Leone. This lack of evidence of a J-Curve pattern is, however, not unusual in the literature on the subject matter. In sum, therefore, we find evidence in favour of the J-Curve pattern only in one case. Some kind of "inverted-J" is found in the case of The Gambia and Ghana while no clear pattern emerges for Sierra Leone.

CONCLUSION

An attempt was made in this study to query the existence or otherwise of a J-Curve, that is an initial deterioration and later improvement in the trade balance following a depreciation of the exchange rate, in four WAMZ countries: namely The Gambia, Ghana, Nigeria and Sierra Leone. We use quarterly data and a relatively recent approach to cointegration in capturing the impact of devaluation on the trade balance.

Our results indicate that cointegration exists among the trade balance, foreign income, the real effective exchange rate and domestic income in all countries. More importantly, for these countries the pattern of the short-run dynamics varies markedly across countries. Thus, our results seem to support the J-Curve pattern only in the case of Nigeria with Sierra Leone displaying the obverse.

What should be of interest to policymakers in these countries is whether the potential gains from regional economic integration are more than offset by disparities that may emanate from the emergence of potential winners and losers from such agreement. The differential impact, of this policy of real depreciation, across countries implies that appropriate and better policy coordination among these countries is necessary for ease of collective action and hence sustenance of the trading bloc. Such policies should engender incentives that are compatible with the growth and developmental objectives of member states.

APPENDIX

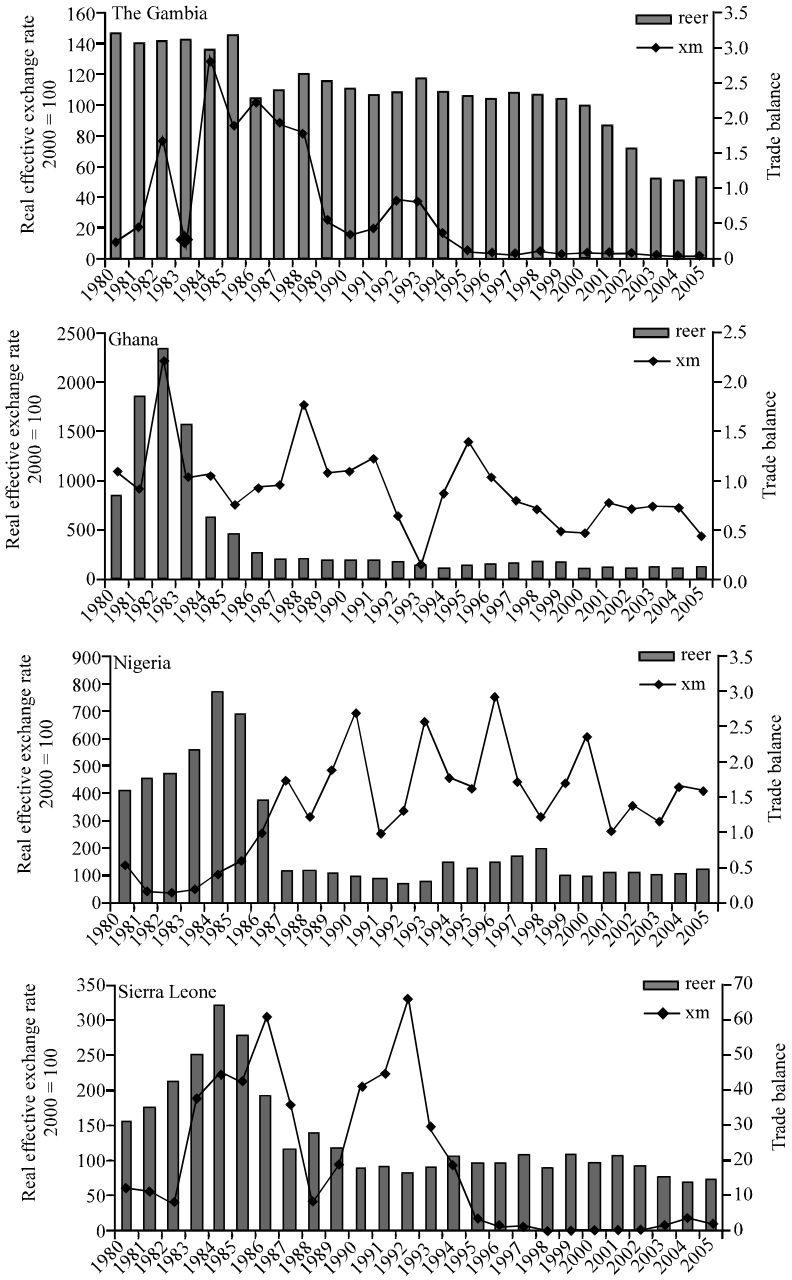

Fig. A: Real effective exchange rate and the trade balance in WAMZ countries (1980-2005)

Table A: Variable definitions

Variables	Abbreviation	Definition
World income	lipi	Industrial production index from indnstrial countries (2000 =100)
Domestic income	lrgdp	Real gross domestic product in each of the four country's local currency unit
Exchange rates	lreer	Real effective exchange rate index (2000 = 100) of each of the four countries
Trade balance	lrxm	Real Trade Balance of each of the four counties

The four WAMZ countries iucluded in our analysis are The Gambia, Ghana, Nigeria and Sierra Leone

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