RAE REVIEW OF APPLIED ECONOMICS
Vol. 7, No. 1-2, (January-December 2011)

IMPACT OF EXCHANGE RATE POLICY ON THE TRADE OF INDUSTRIAL PRODUCTS IN SUB-SAHARAN AFRICA FROM 1975 TO 2007

Elie Ngongang*

Abstract: The purpose of this paper is to study the potential repercussions of exchange rate policy on the trade of industrial products in Sub-Saharan African (SSA) countries. Panel data from 22 countries was used to estimate the impact of exchange rate policy on the trade of industrial products. In this respect, the effects of three indicators were analysed, namely, the effective real exchange rate (ERER) changes, real exchange rate (RER) volatility, and (model-based measures of) RER misalignment. The method of analysis consists of estimating export equations for four manufacturing sectors (chemicals, textiles, metallurgy, and wood) and two exchange rate regimes, namely, a fixed exchange rate regime represented by the 12 countries of the CFA Franc Zone (CFZ), and a second and more flexible regime, represented by 10 countries outside the CFZ. The results of the study suggest that exchange rate policy exerts a significantly positive impact on external trade performance through changes in the effective real exchange rate, and a negative impact through its misalignment. These results also reveal that it is very important to take account of the framework of economic orientations that accompany the exchange rate policies when assessing their effects on the aggregate behaviour, of the economy.

JEL Classifications: C10, C52, F31

Keywords: Exchange rate, Manufacturing Trade, Misalignment, Volatility.

1. INTRODUCTION

Despite the problems they are witnessing nowadays, many countries in Asia, Latin America, and Africa have become genuine competitors and trade partners, while taking into account the economic and industrial weight of each country. In the last two decades, the exports of industrial products have increasingly become a significant determinant of economic growth in Sub-Saharan African (SSA) countries. The diversification of external trade through the export of manufactured goods is considered an important factor in achieving durable economic growth. In other words, the expansion of industrial goods exports during the years 1965-1990 has been a contributory factor in the provision of foreign exchange to service the external debt, a situation that was more than welcomed during a period of decline on world markets of raw materials on which the exports of most countries are based.

* Faculty of Economics and Management, University of Yaoundé II, Cameroon, PO Box: 12557 Yaoundé Cameroon, E-mail: ngongother@yahoo.fr

In the first place, the value of the income elasticity of demand for manufacturing goods is higher than that for primary commodities, which means that speculation in the manufacturing sector improves the growth prospects of a country, a region or a community. Then, the price elasticity of demand, as that of supply, is higher for manufactured goods than for raw materials, which produces terms of trade stabilization effects, and consequently, a stable growth in export receipts. Lastly, according to Nishimizu et al. (1986), the prospects of dynamic productivity gains are linked to the development of the manufacturing sector and derived from economies of scale, training and learning effects, as well as existing external factors.

Exchange rate policy is widely seen as playing a central role in export promotion. According to Sekkat et al. (1998a), countries that have succeeded in developing the exports of their manufactured products have witnessed a fall in their real exchange rates (RERs), allowing them to take account of the structure of external trade in the area concerned while ensuring its regulation at the same time. According to Chavagneux (1998), it is advisable to ensure that the study of competitiveness is not distorted by the fact that prices do not evolve in the same manner in the different areas. Thus, economists compute an "effective real" exchange rate, that is, an exchange rate that also takes inflation rates of trade partners into consideration.

The sensitivity of the exports of goods and services to incentive measures linked to the RER has been highlighted by Balassa (1990) in a panel of 15 African countries, and was generally applied in a study by Reinhardt (1995) to developed and developing countries.

An exchange rate policy which facilitates export expansion can be effective only if it is consistent with monetary and fiscal policies. In many African countries, the poor management of macroeconomic and trade policies has led to the misalignment of the real exchange rate, i.e. to an overvalued RER relative to its equilibrium level. A highly misaligned RER is harmful to economic performance and to the exports of manufactured goods, insofar as it reduces the profitability of exports. All the emerging countries that have been successful in developing their economies (Southeast Asia), have maintained their RER close to its equilibrium level, while Latin American and African Countries (Monetary Union of West Africa (MUWA) and Central African Economic and Monetary Community Countries (CAEMC)) have witnessed a significant overvaluation of their RER in the last two decades (Lindauer (1994); FAO (2002)). The detrimental effect of RER misalignment has been underscored by several authors such as Edwards (1988), Edwards et al.(2001), Cottani et al. (1990), and Sfaxi (2008)), for several developing countries. But Ghura et al. (1993) have shown the negative effect of RER misalignment on exports for thirty SSA countries, including CAEMC countries.

An exchange rate policy that is inconsistent with macroeconomic and trade policies increases the variability of the RER in the long run and jeopardizes investments and the profitability of commodity exports. According to Ghura et al. (1993), there exists a negative impact of RER on several of the macroeconomic variables (GNP, total exports, etc.) of SSA countries. Its harmful effects on manufactured exports has also been established by Grobar (1993) using a control group of ten average-income countries, excluding those of Sub-Saharan Africa (SSA).

The aim of this paper is to analyze the impact of exchange rate policy on the trade of manufactured products in SSA countries. Our analysis of the link between this type of policy

and the exports of manufactured goods considers the impacts of three factors, namely, changes in the real effective exchange rates, RER volatility, and its misalignment. Moreover, previous empirical studies (Froot et al. (1989); Sapir et al. (1995); Guillaumont et al. (1997), and Guillaumont et al. (1999)) have shown that the effect of exchange rate policy varies in accordance with sectors and exchange rate regimes, and that the aggregation of several sectors and regimes leads approximately to erroneous conclusions. Analysis in this study is conducted at the sectoral level, and it distinguishes between Franc Zone countries, where the exchange rate is fixed and those countries outside the Franc Zone with flexible exchange rates. This approach is better than that taken in most previous studies such as those of Cottani et al. (1993), Ghura et al. (1993), and Sekkat et al. (1998b) which do not adopt (or adopt less) disaggregations by sector and by exchange rate regime in Africa. Exports have witnessed a considerable fall.

Our panel is composed of 22 SSA countries that were observed between 1975 and 2007: 12 of these countries are members of the Franc Zone. We classify manufactured goods exports into four categories of goods, namely, textile, chemical, metallurgical, and wood products. Thus, we attain the sensitivity of manufactured goods exports in SSA countries through incentive measures linked to the effective ERER.

The rest of the paper is organized as follows. The review of literature, presented in Section 2, consists of a summary of the main economic theories dealing with the relationship between export performance and the management of exchange rates. It also briefly presents the evolution of exchange rate regimes and the trade of manufactured goods in Africa since 1975. Given that the quality of misalignment measures is essential to the analysis of the link between exchange rate management and export performance, Section 3 is devoted to the elaboration of a reliable method for measuring the rate of this phenomenon. This method rests on an exchange rate modelling that makes a distinction between RER equilibrium movements and the misalignment caused by poorly distinguishes or obsolete macroeconomic policies. This method is tested on a panel of 22 SSA countries between 1975 and 2007. It presents the empirical analysis of the relationship between exchange rate policy and the export performances of manufactured goods. Finally, Section 4 concludes the study by drawing up a balance sheet of the main lessons of this study regarding economic policy.

2. EXCHANGE RATE POLICY AND THE EXPORTS OF MANUFACTURED GOODS: A THEORETICAL AND EMPIRICAL LITERATURE REVIEW

The main economic theories related to the link between export performance and exchange rate management, the evolution of exchange rate regimes and manufactured goods trade, and to real exchange rate misalignment, are not new in developing countries in general, and in SSA countries in particular. Indeed, there exists an abundant literature on exchange rate policies that affect export performance, and hence economic growth and development. The differences in results arrived at in different country studies depend mainly on the level of development and the structural differences in their economies. This is the reason underlying renewed research interest in this area.

2.1. Theoretical Foundations and Previous Results

The theoretical link between exchange rate management and international trade has significantly been enriched in recent decades with the contributions of Hooper et al. (1978), Cushman (1983), Caballero et al. (1989), Gagnon (1993), Dixit (1989, 1995), and Chaker et al. (2005). This relationship simultaneously concerns the impact of changes in the exchange rate and its variability. A consensus exists on the impact of exchange rate changes on trade, but the effect of its variability is still quite controversial. According to Sekkat et al. (1998a), variability is considered as being the frequent fluctuations of the exchange rate relative to its equilibrium level, and it can be classified into two categories. The first deals with frequent but non persistent fluctuations which are known as volatility. The second is concerned with less frequent but more persistent fluctuations, which are called the exchange rate. This exchange rate leaves its equilibrium level for many periods and its variability is called misalignment. In formal studies, some authors such as Clark (1973), Hooper et al. (1978), McDonald et al. (1986), Caballero et al. (1998), Caballero (1999), and Chaton (2001), associate this phenomenon with uncertainty, and assume that economic agents are risk adverse. These studies predict a negative impact of misalignment on the volume of trade. The incidence on price may be both negative and positive depending on whether exports or imports support risk.

De Grauwe (1987) ascribes to misalignment an impact that may be compared to that of volatility. He finds that the impact of misalignment stems from a foreign currency undervaluation (or overvaluation) that hinders or facilitates exports, thus confirming the findings of a study by Grobar (1993). According to authors such as Baldwin et al. (1989), Dixit (1995), Froot et al. (1989), Sapir et al. (1995) and Kuikeu (2005), misalignment also affects the sensitivity of trade variables (e.g. prices and volumes, etc.) to exchange rate changes, owing to the existence of irrecoverable expenses and consumer fidelity. These impact analyses of exchange rate volatility and misalignment on the trade of manufactured goods in North American and European countries were carried out by Kasa (1992), De Grauwe (1987), Sapir et al. (1995), and Chaton (2001). Only a few studies by authors such as (Gupta et al. (1998), Medhora (1990), Grobar (1993), Barrios et al. (2003), BRI (1995), and OCDE (1995), deal with developing countries. To our knowledge, the four works available on African economies are those of Medhora (1990), Sekkat et al. (1998b), Guillaumont et al. (1999), and Kuikeu (2005).

With respect to European countries, the empirical studies dealing with the impact of volatility on the evolution of prices and trade volumes have not reached a consensus. According to Frenkel et al. (1989) and Sekkat et al. (1998a), the difficulties involved in finding an acceptable link between volatility and trade may reflect the existence of instruments likely to ensure protection against exchange rate risks or the adaptability of multinationals. These different studies are rather interested in misalignment, and they assume that the latter creates uncertainty against which no protection exists.

Analytic works in developing countries are generally interested in the volatility of trade variables, and their results are mixed. In this regard, Gupta et al. (1998), Coes (1979), and Paredes (1989) find that the link between the supply of exports and uncertainty about exchange rate movements is very weak or non-existent, respectively in India, Latin America, and Chile. Medhora (1990) concentrates on imports and exports in West Africa, but does not succeed in

finding a negative volatility effect on external trade. Grobar (1993) and Sekkat et al. (1998a) consider the role of misalignment such as it is measured by the exchange premium in the parallel market, respectively in ten average-income countries and twenty or so SSA countries. The results confirm the assumption according to which the volatility of exchange rates is detrimental to exports. Misalignment in their studies plays a secondary role in the determination of exports for piloting the exchange rate and external trade of the countries considered.

2.2. Exchange Rate Management and Trade in SSA Countries

In order to ensure the development of the production of goods for export, countries must put in place a policy that permits a relative tradeable goods price. The reforms of exchange rate policies initiated in SSA countries in the early 90's have highlighted the need for appropriate policies in this area. Specific measures adopted by countries engaged in the adjustment and structuring process and supported by investors (e.g. The World Bank, the IMF, the EEC, etc.), were oriented towards three main areas: (1) an effective and significant depreciation of the exchange rate thanks to the move towards an adjustable exchange rate regime in which the currency is devaluated over a certain period; (2) the harmonization and unification of official parallel exchange rates so as to correct for the poor resource allocation deriving from the parallel market exchange premium; and (3) according to Honohan et al. (1997), the allocation of foreign exchange by putting in place calls for tenders procedures to the highest bidder.

Table 1
Exchange Rate Regimes by Number of SSA countries

	1975	1980	1985	1990	1995	2000	2005
Pegged to the USD	10	10	8	7	7	6	4
French franc (Euro from 2000)	13	14	13	14	14	15	15
Other foreign exchange	4	5	4	0	3	2	2
SDRs	9	9	4	4	1	3	3
Other baskets	6	7	12	12	4	5	6
Administered floats	4	5	6	8	7	9	9
Independent floats	0	0	2	5	20	20	20
Total	47	50	47	50	53	49	49

Sources: Synthèse des statistiques internationales, IMF (1997), FMI (1999), FMI (2004), FMI (2006).

The new exchange rate policy reform has greatly contributed to the shift towards more flexible exchange rate regimes. According to the IMF international financial statistics (Table 1 above), the number of African countries with independent floats witnessed an increase from 0 to 20 over the 1975-2000 period. The Democratic Republic of the Congo and South Africa were the first SSA countries to adopt independent float regimes between 1980 and 1985, followed by a few Anglophone West African countries (Ghana, Nigeria, and Gambia). This increase in the number of flexible exchange rate regimes was considerably offset by the reduction in the number of currencies pegged to SDRs, the US dollar, and other composite currency baskets. Out of the 10 countries with a currency pegged to the US dollar in 1980, four have shifted to floating exchange rates. The number of countries indexed to the SDRs has fallen from 9 to 2 in 2005. However, the countries whose currencies are linked to the French franc (and hence to the Euro nowadays) have remained in the Franc Zone or more precisely the CFA Franc Zone.

Table 2
Average Share of Manufactured Goods in Total Exports (%)

	Countries	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005
Currency area							
Franc Zone	Benin	5.23	6.16	7.00	8.13	8.15	8.18
	Burkina Faso	5.51	5.75	5.24	6.30	6.19	6.32
	Cameroon	2.62	2.76	2,77	2.63	6.7	7.7
	Congo	5.99	5.98	8.60	20.90	21.11	22.00
	Côte d'Ivoire	6.00	6.12	7.64	10.44	10.36	11.31
	Gabon	6.97	7.11	8.20	12.10	13.01	13.70
	Mali	10.23	10.46	12.40	22.80	23.91	24.21
	Niger	11.07	11.19	11.96	23.0	23.10	25.8
	Senegal	11.80	12.62	14.20	12.50	14.15	15.62
	Togo	9.77	10.54	4.70	7.86	8.88	9.89
	CAR	10.1	12.9	6.8	8.9	10,2	12.4
	Chad	6.0	8.8	10.6	24.3	23.8	25.2
Off-Franc zone	Ghana	5.51	5.65	8.77	18.26	23.12	28.60
	Kenya	17.11	17.18	14.50	18.58	16.90	14.67
	Madagascar	7.01	7.14	9.70	18.00	20.09	24.13
	Malawi	7.41	7.98	4.86	7.00	9.70	10.80
	Mauritius	31.61	32.35	59.47	67.62	70.12	73.23
	Nigeria	0.40	0.43	1.47	2.00	3.30	4.9
	Uganda	9.9	10.10	9.12	12.12	13.33	15.67
	Tanzania	12.00	11.19	10.40	13.73	10.00	9.11
	Zambia	3.16	3.24	3.99	4.48	6.12	7.12
	Zimbabwe	30.21	30.43	28.20	32.00	34.10	33.11

Source: Synthèse des statistiques de la Banque Mondiale, 1975, 2000, 2003, 2006, 2007.

In 2005, the world exports of industrial products by region were oriented by the evolution of relative prices and by the structures by product of regional exports. As in 2004, the largest increase in the value of exports was recorded by the Middle East, followed by Africa. These exports had a large proportion of manufacturing and of extractive industries products.

Table 2 above presents the movements of the share of manufacturing products in total exports from 1975 to 2005. This share is quite low in SSA countries, despite the remarkable progress made in some countries of the region. The countries most affected by this evolution are Gabon, Cameroon, and the Congo in the Franc Zone[1], and Ghana, Nigeria, and Zambia in off-Franc Zone countries. However, these countries recorded a constant increase in their shares of manufacturing exports. Thanks to its policy of industrial free zones, Mauritius is a good example of a country that has succeeded in developing its manufacturing exports. The latter have risen to more than three fourths of the country's total exports between 2000 and 2005. In contrast, countries such as Kenya, which is the hub of East Africa, and even Tanzania and Zimbabwe, whose export performances were quite good during the 1990-95 period, have not succeeded in maintaining a sustainable increase in their manufacturing exports. Overall, off-Franc Zone countries have witnessed a net improvement in manufacturing export performance as compared to Franc Zone countries.

The industrial sector in these economies is endowed with significant mining resources (oil, natural gas, bauxite, cobalt, nickel, iron, etc.), and agricultural commodities (bananas, cocoa,

tea, palm oil, cotton, wood, etc). These industries are essentially located in coastal areas to facilitate the exportation of commodities.

Textiles are increasingly becoming the most advanced sector in the development of manufactured exports. This sector employs more unskilled labour, hires more job seekers in urban areas, and is present in most SSA countries. Among these countries, Mali, Senegal, Tanzania, and Madagascar, including Mauritius of course, are witnessing the largest increase in textiles exports, and they are followed by Malawi, Kenya, and Uganda (FMI, 2001).

2.3. Measuring the Real Exchange Rate (RER)

Several previous empirical studies such as those of (Sekkat et al. (1998a), Coudert et al. (2003), Chaker et al. (2005), Bauer et al. (2006)), have favoured to three techniques for measuring the misalignment of real exchange rates. The first technique uses the concept of purchasing power parity (PPP), i.e. the ratio of the PPP-based exchange rate to the effective exchange rate. The second assumes that the parallel market exchange premium to a large extent reflects the misalignment of the exchange rate, as well as other exchange market distortions. The third method posits that exchange rate misalignment may be precisely assessed relative to its equilibrium level, by resorting to an explicit model for computing the exchange rate, which takes lags into account for economic policy reasons.

For a more precise appreciation of the importance of real exchange adjustments, and their eventual misalignment, we have followed Sekkat et al. (1998a) by determining a series of exchange rates for several SSA countries. The effective real exchange rate (ERER) is defined as the ratio of the price of tradeable goods to (the price of) non tradeable goods. However, when the ERER falls (or increases), the ERER appreciates (or depreciates). For a given country, the ERER is determined as follows:

$$\log \mathrm{ERER} = \sum_{i=1}^{N} W_i \log\left(\frac{\mathrm{BNER}_i \mathrm{CWPI}_i}{\mathrm{CPIC}}\right) \quad (1)$$

Where:

W_i = The weight of country i in the exports of the country concerned;

BNER_i = Bilateral nominal exchange rate (BNER) vis-à-vis country i;

CWPI_i = The home country's wholesale price index i (CWPIi).

CPIC = The consumer price index of the country (CPIC) concerned;

N = The number of trade partners.

This measurement method has the advantage of taking account of the country's wholesale price (CWPI_i) in tradeable goods, and the consumer price of the country concerned (CPIC), which also represents tradeable and non tradeable goods and services. Equation (1) is assessed using data from the 13 major trade partners of that country (N=13) [2]. The weight of country i in the exports of the country concerned (W_i) represents the average share of partner i in the exports of that country between 1985 and 2005. The bilateral exchange rates and price indexes are drawn from the (Bank of Central African States (BCAS), Bank of West Central African States

(BWCAS) statistical reports, and the International Financial Statistics (IFS). The weights are determined from AFRISTAT (2005). The ERER is determined yearly and monthly, and this calculation permits, for a given year, to determine volatility as the standard deviation of monthly changes.

Exchange rate misalignment measured by the exchange premium of the parallel market, exchange rate volatility, and the statistical means of effective real exchange rates in Franc Zone and off-Franc Zone countries are presented in Table 3 over six successive periods of five effective years. In the case of Franc Zone countries, the ERER maintained its stability over the 1975-1995 period. Moreover, the RER appreciated during this period in the whole Zone. However, these countries went through a depreciation of nearly 25%, which could have been the consequence of the CFA franc devaluation in January 14, 1994.

On the other hand, in off-CFAF Zone countries, a general trend in ERER appreciation was observed up to the 90's. However, the adoption of flexible exchange rate regimes helped these countries succeed in depreciating their real exchange rates between 1985 and 1990. On the average, the ERER depreciated by more than 50% relative to the preceding period.

A considerable devaluation and the adoption of floating exchange rate regimes led off-CFA Zone countries to an effective depreciation ranging from more than 300% to 1200% during the 1985-1990 period from Tanzania to Ghana through Nigeria. This situation also drove these countries to rationing by implementing control mechanisms. The parallel market exchange premium derives from the exchange control system put in place by many SSA States for exchange rationing, owing to the scarcity of, and lack of access to, foreign exchange by the private sector.

In view of the fact that foreign exchange demand depends on the official exchange rate, which is rationed under its equilibrium level, this lack of flexibility leads to an overvaluation of the real exchange rate (RER). The more the RER is undervalued, the more exchange controls are strengthened, and the less the parallel market exchange premium is high, and vice versa.

Table 3
Measure of the Evolution of Effective Real Exchange Rates (ERER) from 1975 to 2005 for Franc Zone and off-Franc Zone Countries

	1975-1980	1980-1985	1985-1990	1990 -1995	1995-2000	2000-2005
Effective real exchange rate (1975-1980 = 100)						
Franc Zone	100	95.4	100.7	98.9	129.8	131.0
Off-Franc Zone	100	96.9	93.5	143.9	178.1	180.2
Parallel market premium (in %)						
Franc Zone	- 0.7	0.6	2.8	0.8	3.1	2.9
Off-Franc Zone	40.0	87.7	88.9	44.1	17.7	14.9
Volatility of ERER						
Franc Zone	2.41	2.30	2.8	2.25	1.78	1.48
Off-Franc Zone	2.17	2.20	2.6	4.31	5.71	4.48

Sources: Our calculations, using BEAC (2005), BCEAO (2005), World Bank (1997-1998, 2004, 2005), and AFRISTAT Reports (2005)

Thus the parallel market exchange premium can be considered as an approximate measure of RER misalignment, even though this premium is under the influence of other exchange market distortions (Sekkat et al. (1998a); Pinto (1989)).

Table 3 also shows the average level of the RER misalignment measure (where the parallel market rate is calculated as the standard deviation of the official rate) for Franc Zone and off-Franc Zone countries. The parallel market premium in the Franc Zone is close to zero on the average over the whole period, and is almost uniform from one country to another. On the other hand, this premium is very large over the whole period and shows a significant real exchange rate misalignment in off- Franc Zone countries.

Reforms regarding the control of enterprises by the States play quite a positive role, insofar as parallel market premiums witnessed a substantial erosion between 1985 and 1995, thus indicating that this initiative aimed at correcting for RER misalignment. In countries such as Ghana and Tanzania, misalignment displayed the highest parallel market premiums, but during the 1990/1995 period, the continuation of RER depreciation policy led to a substantial reduction in the parallel market premium.

Besides these harmful RER misalignment effects, an increase in its volatility has a negative impact on macroeconomic performance, and notably on exports. This volatility stems from economic, macroeconomic, trade and exchange rate policies that are inconsistent with one another. Thus, to measure RER volatility, we use the standard deviations of monthly changes in effective real exchange rates. The six-year averages of this volatility measure are presented in Table 3 for Franc Zone and off-Franc Zone countries.

Table 3 shows that volatility is relatively low and decreasing in Franc Zone countries. On the other hand, the other SSA countries experienced a continued rise in RER volatility, which between 1995 and 2005, was thrice higher than in Franc Zone countries. This finding is consistent with those of previous studies by Savvides (1996) and Gankou (1996). This increase in volatility in off-Franc Zone countries might be due to the move towards more flexible exchange rate mechanisms during the 1990-1995 period, and to the internal inconsistencies of macroeconomic policies, which were not able to put stable economic conditions in place. The sharp jump in the volatility of the real effective exchange rate observed in Table 3 between 1990 -1995 indicates the competiveness of countries belonging to one currency area relative to another (see Off-franc zone); this competiveness increases from 1990, and it may be explained by the rise in the real effective exchange rate.

To obtain a reliable RER misalignment measure, an explicit model was used to evaluate RER standard deviations relative to its equilibrium values. This is the model developed by Edwards (1988), and revisited by Elbadawi et al. (1994), Elbadawi (1995), Hinkle et al. (1995), Hinkle et al. (1999) and Montiel (1999). It has the advantage of distinguishing between two basic causes of RER variations, namely: (1) variations in the internal or external fundamentals that generate RER equilibrium fluctuations. These variations, which may be changes in exogenous variables, do not derive from a policy that may be related to international transfers, trade conditions, technical progress, etc., or from trade policy changes; (2) poor internal policies, which are likely to result in a significant misalignment (domestic credit, trade, protectionist policies, etc.).

In estimating the impact of these factors on the RER, we again used an empirical model similar to the one proposed by Cottani et al. (1990), Ghura et al. (1993), Devarajan (1997), and Sekkat et al. (1998a). Based on prior research, we assume that for each country i, the RER is calculated according to the following equation:

$$\log\left(ERER_{i,t}\right) = \alpha_i + \alpha_1 \log\left(\frac{PX}{PM}\right)_{i,t} + \alpha_2 \log\left(\frac{Z}{X+M}\right)_{i,t} + \alpha_3\left(\frac{E}{M}\right)_{i,t} + \alpha_4\, EDC_{i,t} + \alpha_5\, \Delta ONER_{i,t} + \alpha_6 t + v_{i,t} \quad (2)$$

Where:

ERER = Effective real exchange rate (ERER), determined by Equation (1);

PX/PM = Terms of trade, given by the ratio of exports price to imports price (in CFAF);

Z/(X+M) = Indicator of external openness, determined GDP over the sum of exports(X) plus imports (M);

E/M = Net capital inflows (changes in net assets in terms of foreign exchange, minus the current account balance, E) divided by GDP;

EDC = Excess domestic credit (EDC), which is the difference between domestic credit growth, and real GDP growth;

ΔONER = Changes in the official nominal exchange rate (ONER) (in %);

t = time trend;

ν = independently distributed random variable.

Thus, it was assumed that, an increase in the terms of trade generates an appreciation of equilibrium RER, insofar as the latter has positive effects on the current account balance, for the revenue effect exceeds the substitution effect, in spite of the transfer mechanisms, which unintentionally conceal revenue sources, and make beneficiaries loose the vital information on the durability of this revenue (Collier (2003); and Kuikeu (2005)).

The coefficient associated with PX/PM should be negative in the RER equation. The openness indicator determines the impact of external trade policy (customs tariffs on imports control of charges) on the RER. Moreover, we assume that a restriction in openness generates a reduction in the relative price of tradeable goods relative to non tradeable goods, which leads to an appreciation of equilibrium RER. Similarly, the inflow of more substantial amounts of capital generates a slowdown in the demand for tradeable and non tradeable goods. Thus, non tradeable goods prices witness a more significant increase with the appreciation of the RER, which is a necessary source of the reorientations of domestic resources towards the production of non tradeable goods, in order to respond to a stronger demand.

The modification of the official nominal exchange rate is introduced in the regression to take account of the important and temporary effect of devaluation on the RER owing to price rigidity. Then, the creation of domestic credit entails or triggers inflation, and hence RER appreciation by increasing the price of non tradeable goods (Edwards et al. (2003). Finally, we introduce in the regression, a time trend to take account of the effect of technical progress on

the prices of tradeable and non tradeable goods, following Balassa (1964), and Egert et al. (2003).

Using a panel of 22 SSA countries, Equation (2) is estimated over the 1975-2007 period[3]. In our estimation, we follow Sekkat et al, (1998a) in giving preference to a fixed effects specification rather than to an error components model specification. Moreover, a specification with time trend coefficients specific to each country in the sample is statistically preferable. The results of this estimation (by resorting to the White estimator in order to correct the bias due to heteroscedasticity) are summarized in equation (3) below [4].

$$\log(F_{i,t}) = \underset{(5.68)}{-0.43}\log\left(\frac{PX}{PM}\right)_{i,t} \underset{(3.98)}{-0.39}\log\left(\frac{Z}{X+M}\right)_{i,t} \underset{(1.07)}{-0.33}\left(\frac{E}{M}\right)_{i,t} \underset{(3.34)}{-0.14}EDC_{i,t} + \underset{(1.29)}{0.44}\Delta ONER_{i,t} + \sum_{i=1}^{22} a_{i,t} \quad (3)$$

F = 28.88; Hausman test = 318.7; No obs = 542; Adjusted R^2 = 0.7, $\sum_{i=1}^{22} a_{i,t}$ = error term for the set of 22 countries retained in the simple used in the regression model.

This estimated regression largely explains the changes observed in real exchange rates, insofar as RER volatility is quite significant in the case of African countries.

Furthermore, the increase in net capital inflows, the improvement in terms of trade, controlled trade policies, and the expression of domestic credit present the characteristics of the effect expected from RER depreciation, and they are statistically significant. We may note that in most cases, the time trend shows a noticeable RER depreciation, which is opposite to the Balassa-Samuelson effect (1964). This may be explained in most cases by the weakness of overall factor productivity (Latreille et al. 1997).

The misalignment of the RER emanating from economic policies may be determined from Equation (3) as the result of three factors: (1) a high external debt; (2) a significant expansion of domestic credit; and (3), an excessive protectionism (EP) or an economic contraction.

Economic contraction generates an increase in Z/X+M relative to the normal trends of the economy. RER misalignment deriving from excessive protectionism (EP) can be measured by the ratio of Z/X+M over the average of three inferior values (i = 1, 2, 3) over the observation period Equation 4):

$$EP = \frac{\left(\frac{Z}{X+M}\right)}{1/3\left(\sum \min\left(\frac{Z}{X+M}\right)\right)} \quad (4)$$

The external debt is sustainable when it does not exceed $(\theta - \rho)\varphi$, where θ is the long-term growth rate, ρ the real external interest rate, and φ, the desired external debt stock expressed, according to Sekkat et al. (1998b), as a function of GDP. On a purely empirical level, if $\theta > \rho$, the positive values of E/M (indebtness) are considered as being sustainable, and the negative values (net credit) also are so by definition. On the other hand, if $\theta < \rho$, the positive values of E/M are considered as being unsustainable, and during these years, the country is heavily indebted. But, if we consider the assumption of Guillaumont et al. (1994, 1996) according to which a sustainable debt implies a rise in equilibrium RER, this does not entail its misalignment. Thus, over the years in question, E/M is fixed at zero in the RER misalignment equation.

On the other hand, an unsustainable debt leads to RER misalignment, and it is integrated by the value of E/M. The equation of the measure of the net capital inflows contribution to RER misalignment (CM) is defined as follows:

$$CM = 0 \text{ if } \theta > \rho \text{ and } CM = E/M \text{ if } \theta < \rho \text{ and } E/M > 0 \quad (5)$$

In this regard, we assume that an expansion of domestic credit that generates RER misalignment is produced during the years in which excess domestic credit values (EDC= Excess domestic credit) are positive. In years during which (EDC) values are lower or equal to zero, the variable measuring the contribution of macroeconomic imbalances to misalignment (EDCM) is set at zero. From the coefficients estimates of Equation (3) above, we reduce the incidence measuring the RER misalignment linked to economic policies (IMEP) as follows:

$$IMEP_{i,t} = e^{-MM_{i,t}} - 1 \quad (6)$$

Where:

$$MM = -0.39EP_{i,t} - 0.33CM_{i,t} - 0.14EDCM_{i,t} \quad (7)$$

and MM = misalignment measure

The results obtained by the estimations of RER misalignment for Franc Zone and off-Zone countries are presented in the following figures:

Figure 1: RER Misalignment for CFAF Zone Countries

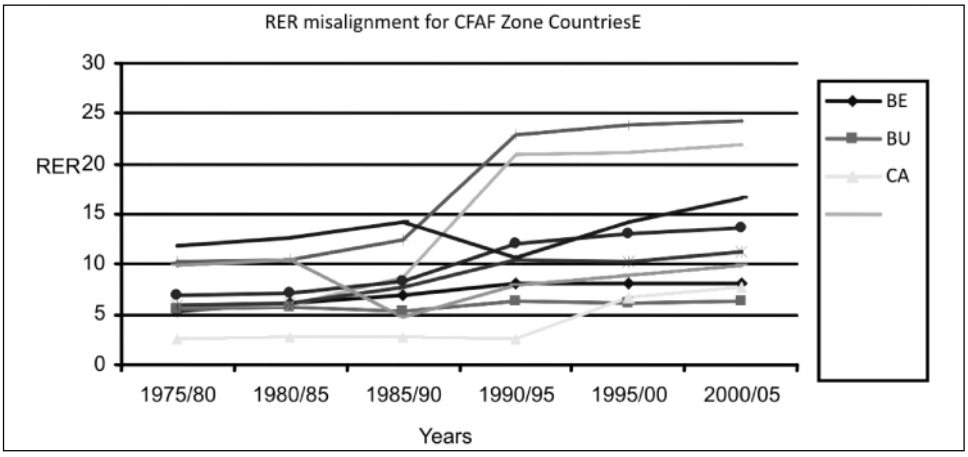
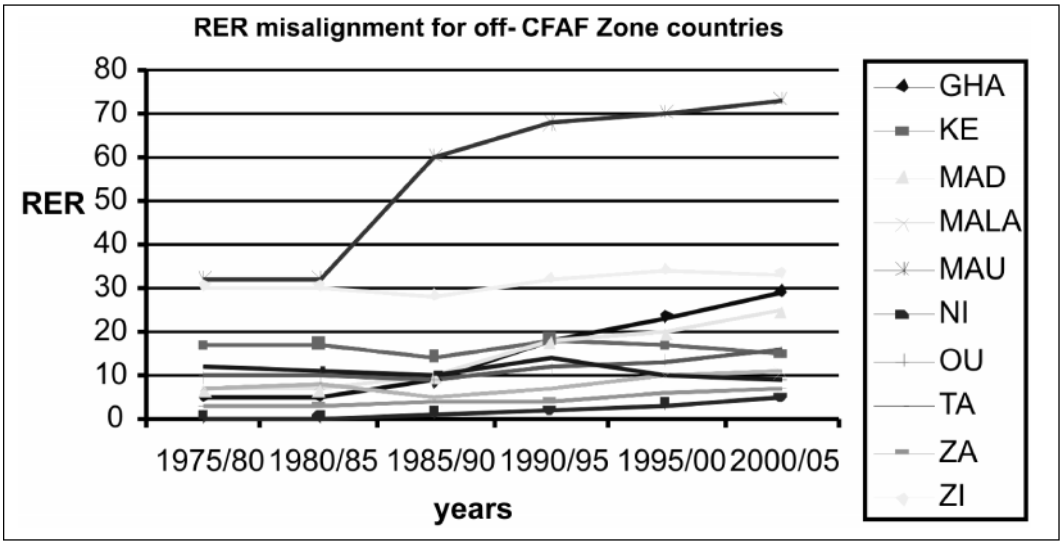


Figure 2: RER Misalignment for off-CFAF Zone Countries



As concerns the CFAF Zone, we note an increase in the RER of 17% on the average for the set of these countries over the period considered. This explains the significance of relative price distortions in the economy over quite a long period, and their unsustainable and harmful effects to the sectoral allocation of resources, and according to Guillaumont et al. (1994), to the productive capacity of the country's export-oriented sectors.

Countries that recorded the highest RER misalignments are Nigeria, Kenya, Malawi, and Tanzania, followed by francophone countries, which may be classified into two groups: Cameroon, the Congo, and Côte d'Ivoire for the first group, and Senegal, Gabon, Burkina Faso, and Niger for the second one, with a more or less overvalued RER, despite their membership in the Franc Zone and its discipline as regards monetary policy.

In SSA off-Franc Zone countries, the misalignment index shows increasing RER overvaluation over the 1980-1990 period. This situation is due, among other things, to the loans contracted following the debt crisis. RER overvaluation is notably observed in Nigeria, Kenya, and Tanzania, with a rate higher than 50%. Real depreciation between 1985 and 1995 led to trend reversals in other countries such as Ghana, Mauritius, and Malawi. Mauritius witnessed the largest currency depreciation, as shown by in Figure 2.

In Franc Zone countries, an opposite trend to the one observed in off-zone countries was noted. Estimated RER misalignment was specifically higher than 25% at the beginning of the mid -70's. The RER witnessed a fall between 1980 and 1985. Then, misalignment increased during the 1995-1995 and 2000-2005 periods, after witnessing an appreciable fall over the 1995-2000 period. Overvaluation was comparatively higher in Cameroon, Gabon, the Congo, Togo, and Senegal. However, the off-Franc Zone countries made considerable progress despite the unequal reduction in RER overvaluation beginning in 1996. But the RER in Franc Zone countries converged to a misalignment level of about 16%. This misalignment correction was

mainly due to the CFAF devaluation, which came into force throughout all CFAF Zone countries in January 1994.

3. METHODOLOGY AND ECONOMETRIC ANALYSIS

The relation between exchange rate management and external trade variables has been presented through a synthesis of theories and induced empirical results. Concerning the volume of exports, an exchange rate appreciation effect, a rise in volatility or misalignment may be explored in spite of the negative direction of the sign. With this in mind, the object of this section is to examine the existence of these effects in the context of SSA countries. However, we assume that the exporting country is small relative to the market for manufacturing goods. Then, we start from the existence of a relation between export volume, and exchange rate variables. Lastly, this relation is expressed as follows:

$$\log X = a_0 + a_1 \log AVM / GDP + a_2 \log ERER + a_3 \log VERER + a_4 \log MM + \xi \quad (8)$$

Where:

X = ratio of exports in value terms of sector i to the value of GDP X/GDP) [5];

AVMGDP = ratio of value-added (AVMGDP) in value terms of the manufacturing sector to GDP in value terms;

ERER = effective real exchange rate (ERER);

VERER = volatility of the effective real exchange rate (VERER);

MM = misalignment measure;

ξ = error term.

On the basis of the preceding literature review, and notably Grobar's (1993) study, we can draw from it a formal exports supply model for African countries using Equation (8) specification. This equation is obviously a basic specific equation. We can also introduce a technical capacity constraint measure in this specification. Thus, estimations will be carried out with a variable leading to an insignificant coefficient, and its rejection will not change the results in any manner[6].

The expected signs of the coefficients of Equation (8) are: a1, a2>0 and a3 and a4<0. To avoid problems linked with country size, we use the ratio of exports to GDP as the dependent variable. Parameter a is positive, insofar as an expansion of the value-added of the manufacturing sector may be associated with growth in exports in individual sectors.

The factors which determine the level of exports and which depend on the exchange rate concern the remaining variables; insofar as the depreciation of the currency (i.e. an increase in the RER) should promote exports, that is, a2 > 0. Finally, given the fact that the volatility and misalignment of exchange rates are harmful to exports, a3 and a4 are negative, a priori.

In Equation (8), we expect misalignment to have a negative impact on exports in spite of control the effect of the exchange rate level. In fact, some authors such as Sekkat et al. (1998a) and Grobar (1993) show that in the presence of adjustment costs, exports are a function of both the ongoing and future levels of exchange rates, but not a function of the previous level. Thus, the level of misalignment is used by economic agents as an indicator of the future evolution of

exchange rates. This indicator therefore affects the level of exports regardless of the ongoing exchange rate level.

The specification of Equation (8) is estimated by using panel data. The series of Value-Added and GDP are drawn from the BCAS, BWCAS, AFRISTAT and the United Nations. Exports data series include textiles, chemicals, metals and wood from 1975 to 2007.

The effective real exchange rate is defined according to Equation (1). It is determined on the yearly and monthly bases. The monthly basis is used to determine volatility for a given year, as the standard deviation of monthly changes; for the standard deviation measure yields good results as do the more complex measures given by Kenen et al. (1986).

The estimation involves three alternative exchange rate misalignment measures. These are: the parallel market premium, which is drawn from the World Currency Yearbook (2001); then follows the measure linked to purchasing power parity (PPP) theory, which is drawn from the Wold Tables and expressed as the ratio of GDP calculated in terms of PPP to the observed GDP in CFA francs for a given country; and finally, in order to avoid the controversy involved in PPP-based misalignment measures, the third measure considered rests on the estimation of a formal equilibrium exchange rate model (see section 2.3 above).

The sample comprises data for 22 SSA countries, of which 12 are Franc Zone members such as Benin, Burkina Faso, Cameroon, Chad, the Congo, Côte d'Ivoire, Gabon, Mali, Niger, the Central African Republic (CAR), Senegal, and Togo, and in which the exchange rate was pegged to the French franc, and hence to the Euro nowadays. The other 10 countries are not members of the Franc Zone, and they have flexible exchange rate regimes. They are: Ghana, Kenya, Madagascar, Malawi, Mauritius, Nigeria, Tanzania, Uganda, Zambia, and Zimbabwe. The period of the study during which times-series data were available include the years between 1975 and 2007.

3.1. Discussion of the Results

Assuming that all the slopes are equal for the Franc and off-Franc Zones, Equation (8) is estimated. Moreover, given the fixed effects, constraints may vary from one country to another. The results of the study are presented in Table 4 (4.1, 4.2, and 4.3). These results are broken down into four parts, each of which shows one of the three misalignment measures. Following the fixed effects tests, different constraints are introduced in the regressions according to country.

In general, we may note that the overall quality of R^2 adjustment is quite weak[7]. The significance of exchange rate coefficients depends on the sector. They are significant for textiles, metals and wood with all alignment measures. As to volatility coefficients, none of them is significant.

As concerns misalignment (M), the measure of the parallel market premium yields unsatisfactory results as compared to the two others, for the coefficients of this premium are never significant in this study. However, those obtained from the PPP-based measure and the misalignment model, are significant and negative for metals, textile, and wood products. In addition, they are not significant for the two sectors.

Table 4.1
Results of the Parallel Market Premium as a Measure of Misalignment. The Franc Zone and off-Franc Zone Slopes are assumed to be Equal

	Sectors			
Variables	Textiles	Chemicals	Metals	Wood
AVMGDP	0.68**	-0.16	0.38	0.31
	(1.80)	(-0.30)	(0.61)	(0.92)
TCRE	1.76*	1.09	1.53*	1.57*
	(4.20)	(1.27)	(3.81)	(3.77)
VTCRE	-0.09	-0.00	0.11	0.08
	(-0.51)	(-0.02)	(0.83)	(0.73)
M	0.58	0.50	-0.15	0.51
	(1.28)	(0.72)	(-0.29)	-0.65
	0.00	0.00	0.00	0.00
F Contraint	2.72*	1.78	0.56	0.63
Fixed effect	38.27*	34.06*	40.11*	37.68*

Notes: $\bar{R}^2$ is derived from R^2. The fixed effect provides the test-statistic for the non –existence of a fixed effect. The degrees of freedom range from 10 to 175. The F-statistic provides the equality of slopes for the Franc and off-Franc Zone. Degrees of freedom range from 4 to 156. The t-statistics figure between parentheses. *significant at the 5% level; ** significant at the 1% level.

Table 4.2
Results of a Misalignment Measure Based on Purchasing Power Parity (PPP). Franc Zone and off-Franc Zone Slopes are assumed to be Equal

	Sectors			
Variables	Produits textiles	Chemicals	Metals	Wood
AVMGDP	0.26**	-0.29	0.17**	0.20**
	(1.77)	(1.57)	(1.64)	(1.67)
TCRE	1.31*	0.67	1.40*	1.47*
	(3.12)	(1.45)	(3.98)	(3.28)
VTCRE	-0.07	-0.00	0.06	0.05
	(-0.54)	(-0.08)	(0.49)	(0.55)
M	-1.80	0.08	-3.75*	-3.18*
	(-1.21)	(0.04)	(-2.66)	(-2.57)
	0.02	0.00	0.08	0.07
F Contraint	2.58*	1.53	7.15*	6.69*
Fixed effect	26.66*	24.36*	41.07*	39.69*

Notes: $\bar{R}^2$ is derived from R^2. The fixed effect provides the test-statistic of the non-existence of a fixed effect. The degrees of freedom range from 10 to 144. The F-statistic provides for the equality of slopes for the Franc and off-Franc Zone. Degrees of freedom range from 4 to135. The t-statistics figure between parentheses. *significant at the 5% level; ** significant at the 10% level

Table 4.3
Results of the Misalignment Measure based on Purchasing Power Parity (PPP).
Franc Zone and off-Franc Zone Slopes are assumed to be Equal

	Sectors			
Variables	textiles	Chemicals	Metals	Wood
AVMGDP	0.08	0.08	- 0.22**	- 0.21**
	(1.52)	(0.38)	(-1.91)	(-1.98)
TCRE	1.87*	0.69	0.58**	0.57**
	(2.70)	(1.57)	(1.93)	(1.97)
VTCRE	0.07	-0.04	0.16	0.14
	(0.47)	(-0.28)	(1.17)	(1.21)
M	-3.18	-0.97	-3.61*	-3.72*
	(-3.13)	(-0.74)	(-4.11)	(-4.24)
$\bar{R}^2$	0.09	0.01	0.13	0.12
F Contraint	3.18*	4.25*	0.76	0.73
Fixed effect	44.48*	33.96*	99.97*	101.22*

Notes: $\bar{R}^2$ is derived from R^2. The fixed effect provides the test-statistic of the non-existence of a fixed effect. The degrees of freedom range from 10 to 124. The F-statistic provides for the equality of slopes for the Franc and off-Franc Zone. Degrees of freedom range from 4 to 94. The t-statistics figure between parentheses. *significant at the 5% level; ** significant at the 10% level

The poor quality of the above results may derive from the fact that the equality of slopes between the Franc and off-Franc Zones' slope is imposed. But this hypothesis is not accepted by the data. This leads us to carry out an analysis that consists in finding a difference in slopes between the two zones: a distinct equation is therefore estimated for each zone, and we present their estimation results in Table 5 (5.1, 5.2, and 5.3).

Table 5.1
Results with the Parallel Market Premium as a Misalignment Measure

	Sectors			
Equations	textiles	Chemicals	Metals	Wood
Off-Franc Zone equations				
AVMGDP	0.18	-0.23	0.46	0.44
	(0.26)	(-0.35)	(0.57)	(0.63)
TCRE	2.36**	1.86*	1.59*	1.61*
	(3.57)	(3.46)	(2.62)	(2.68)
VTCRE	-0.55*	-0.39**	0.10	0.13
	(-2.51)	(-1.78)	(0.44)	(0.46)
M	1.02	1.09**	0.02	0.03
	(1.60)	(1.79)	(0.07)	(0.08)
$\bar{R}^2$	0.26	0.10	0.06	0.07
F Constraint	36.61*	19.80*	29.05*	28.71*
Fixed effect				
Franc Zone equations				
AVMGDP				

table 5.1 contd

	Sectors			
Equations	textiles	Chemicals	Metals	Wood
	0.54	-0.58	0.13	0.12
TCRE	(0.93)	(-0.80)	(0.20)	(0.23)
	1.04	-0.82	1.36	1.38
VTCRE	(1.12)	(-0.54)	(1.42)	(1.44)
	0.27	0.32	0.10	0.12
M	(1.40)	(0.95)	(0.60)	(0.56)
	-6.3	9.11	-8.20	-7.76
$\bar{R}^2$	(-2.11)	(1.05)	(-1.68)	(-1.73)
F Contraint	0.00	0.00	0.00	0.00
Fixed effect	20.61*	32.33*	18.16*	17.18*

Notes: $\bar{R}^2$ is derived from R^2. The fixed effect provides the test-statistic of the non –existence of a fixed effect. The degrees of freedom range from (4 to 72) for the off-CFAF Zone equation and (5 to 90) for that of the CFAF Zone The t-statistics figure between parentheses. M is determined as follows: 100+ he parallel market premium (in %). *significant at the 5% level; ** significant at the 10% level.

Table 5.2
Results with a PPP-based Misalignment Measure

	Sectors			
Equations	Produits textiles	Chemicals	Metals	Wood
Off-Franc zone Equations				
AVMGDP	0.32*	0.40	0.68*	0.71*
	(1.71)	(2.82)	(6.10)	(5.30)
TCRE	1.31*	0.98*	1.32*	1.41*
	(2.73)	(2.31)	(3.14)	(3.17)
VTCRE	- 0.46*	-0.32	0.06	0.07
	(-2.21)	(-1.64)	(0.29)	(0.25)
M	-3.26	-1.09	-2.37	-2.27
	(-1.16)	(-0.49)	(-1.34)	(-1.38)
$\bar{R}^2$	0.19	0.17	0.46	0.40
Fixed Effect	28.47*	25.77*	23.62*	24.75*
Franc Zone equations				
AVMGDP	0.54	-0.58	- 0.31*	- 0.34*
	(0.93)	(-0.80)	(-2.00)	(-2.20)
TCRE	1.04	-0.82	0.62	0.61
	(1.12)	(-0.54)	(0.60)	(0.58)
VTCRE	0.27	0.32	0.05	0.03
	(1.40)	-0.95	(0.22)	(0.24)
M	-6.30	9.11	- 4.32**	- 4.62**
	(-2.11)	(1.05)	(-1.93)	(-1.87)
$\bar{R}^2$	0.00	0.00	0.00	0.00
Fixed Effect	20.61*	32.33*	7.28*	8.18*

Notes: $\bar{R}^2$ is derived from adjusted R^2. The fixed effect provides the test-statistic of the non – existence of a fixed effect. The degrees of freedom range from (4 to 89) for the off-CFAF Zone equation and (5 to 70) for that of the CFAF Zone. The t-statistics figure between parentheses. *significant at the 5% level; ** significant at the 10% level. M is determined as follows:

Table 5.3
Results with a Misalignment Measure Based on the Equilibrium Exchange Rate Model

	Sectors			
Equations	textiles	Chemicals	Metals	Wood
Off- Franc zone Equations				
AVMGDP	0.12	0.08	-0.00	-0.00
	(0.48)	(-0.40)	(-0.03)	(-0.04)
TCRE	0.88*	0.29*	0.72*	0.81*
	(2.62)	(1.06)	(3.20)	(3.12)
VTCRE	-0.22	0.01	0.07	0.09
	(-1.00)	(0.03)	(0.52)	(0.62)
M	-3.64*	-5.71*	-4.14*	-3.92*
	(-2.87)	(-6.46)	(-4.50)	(-3.83)
$\bar{R}^2$	0.21	0.37	0.31	0.33
Effet fixe	55.76*	28.06*	113.23*	104.78*
Franc Zone equations				
AVMGDP	-0.02	-0.05	0.33*	0.28*
	(-0.07)	(-0.18)	(-2.04)	(-2.23)
TCRE	0.44	0.60	-0.32	-0.30
	(1.91)	(0.46)	(-0.40)	(-0.34)
VTCRE	0.38**	0.11	0.17	0.15
	(1.92)	(0.36)	(0.77)	-0.82
M	-1.42	3.69**	-4.26*	- 3.78*
	(-1.07)	(1.75)	(-2.84)	(-2.78)
$\bar{R}^2$	0.00	0.01	0.01	0.01
Fixed Effect	30.08*	34.09*	31.18*	29.98*

Notes: $\bar{R}^2$ is derived from adjusted. The fixed effect provides the test-statistic of the non – existence of a fixed effect. The degrees of freedom range from (4 to 69) for the off-CFAF Zone Equation and (5 to 100) for that of the CFAF Zone. The t-statistics figure between parentheses. *significant at the 5% level; ** significant at the 10% level. M is determined as indicate the equation (6).

It is necessary to take into account of the fixed effects in both zones. When a slope difference exists, the estimation of Equation (8) indicates a very significant improvement in the overall quality of the off-Franc Zone adjustment. The quality of adjustment in the Franc Zone does not go through any modification. It still remains weak, as the estimation results: the coefficients of the effective real exchange rate are never significant, but sometimes, volatility displays a positive and significant signal. This low variability may be explained by the fixed exchange rate regime in existence in the CFAF Zone.

As to the off-Franc Zone countries, the comparison of estimation results with those of other analytic works carried out in African countries (Balassa (1990); Cottani et al. (1990); Ghura et al. (1993); and Sekkat et al. (1998a)), shows that the quality of adjustment is quite good, and it deserves an interpretation.

The results show that real exchange rate coefficients are always significant: they have positive signs, and range from 1.59 to 2.36 in value. Volatility appears to have a detrimental effect on trade in two sectors (textiles and metals). On the other hand, the misalignment coefficient is also significant for chemical products. It shows a sign opposite to the one expected. Thus, exports in this sector have access to the parallel exchange market, an

assumption that is not very convincing when one realizes that these products are seldom sold in the underground market.

Considering the results arrived at for the misalignment measure based on purchasing power parity (PPP), we note that exchange rate coefficients are positive and significant in all sectors, and their values are quite high. Volatility presents a negative and significant coefficient for the chemicals and textiles sectors. Lastly, misalignment does not have a significant negative impact.

When we measure the model-based misalignment, the overall quality of adjustment is good. The coefficients of the effective real exchange rate are significantly positive for the sectors of wood, textiles and metallurgical products, and significantly negative for the other sectors. However, their coefficient values are also quite high, ranging between 3.5 and 5.7 and exceeding those of the real exchange rate. An increase in misalignment seems to have a more significant negative impact on manufacturing exports than an appreciation of the equilibrium exchange rate. The coefficients of volatility are insignificant.

The combination of the results of Tables 4.1 and 4.3 permits the observation of the interesting behaviour of these variables. In the first place, the behaviour of the real exchange rate is an important vector of manufacturing exports in the different Zones. Then, despite the fact that volatility may be detrimental in some cases, this effect does resist to the alternative speculations of the export supply function. Lastly, the existence of a significant exchange rate misalignment effect on manufacturing exports is introduced to the analysis.

The absolute value of the exchange rate coefficients ranges from 0.81 to 2.36. In other terms, a 1% change in the real exchange rate corresponds to an increase of 0.81% to 2.36% depending on the share of exports of a given sector in GDP.

African exporters, like most exporters in developing countries, are sensitive to stimulation measures. Depreciation generates improved export efficiency and performance. However, the absolute values of these coefficients are inferior to the ones arrived at in emerging countries (Southeast and East Asia, Brazil, India, etc.), according to previous studies by Sekkat et al. (1998a). Thus, the simultaneous analysis of the impacts of exchange rate misalignment and volatility is of a very important research interest, since it permits not to limit the analysis solely on the incidence volatility and shows the detrimental effect of volatility on African external trade.

Moreover, in spite of the fact that some studies such as those by Grobar (1990), and Medhora (1990) have found a lower negative effect of volatility on trade, we arrive at the same result as Sekkat et al. (1998a) according to which, there exists a significant and potential misalignment effect on manufacturing exports in Sub-Saharan Africa in particular, and in developing countries in general. The misalignment coefficient is always negative, which means that exchange rate overvaluation in SSA countries in the last decade has led these countries to incur substantial export revenue losses, and to take advantage of the opportunities available in international markets in a durable manner.

The average level of export ratios in off-CFAF Zone countries range from 1.01%, 1.21%, 1.27%, to 1.86%, respectively for the four industrial export sectors of chemicals, metallurgy, wood and textiles during the study period.

In the absence of RER overvaluation, export ratios should reach 2.6% for textiles, 0.80% for chemicals, 0.70% for metallurgical products, and 0.90% for wood products. With this in mind, the output share of these four industrial export sectors combined could account for 4.2% in GDP, versus the observed average level of 1.80% of GDP. This means that, the estimated reduction in the export potential due to the overvaluation of the real exchange rate alone caused a 1.7% GDP gap in off-CFAF Zone countries.

On the other hand, if we assume that the overvaluation of the real exchange rate is corrected by depreciation, we may introduce the direct impact of the real exchange rate on export ratios. According to the estimation results of the elasticity of export ratios relative to changes in RER, a real depreciation of 25% may entail an increase of 0.8% of GDP in the export ratio of the four industrial sectors combined. Thus, by appreciating the direct assessment of RER misalignment to 2.5% of GDP, we realize that the net flows of private and official capital towards the SSA economies represent about 0.8% of GDP from 1985 to 2000. From these estimates, we can infer that poor exchange rate policy management alone caused the revenue loss in manufacturing exports mentioned above, which represent a quarter the capital flows towards these countries.

Finally, this figure probably underestimates the overall harmful impact of RER misalignment on manufacturing exports. A better export performance should incite manufacturing productivity through training and learning effects, an efficient allocation of production factors, and scale economies, given an increase in market size. As a consequence, when driven by exports, a better export performance may generate growth in the manufacturing sector, with effects induced positively by an increase in size as a percentage of GDP. The export potential will thus be boosted.

4. CONCLUSION

The objective of this study was to empirically investigate the impact of exchange rate policy on the trade of industrial products in SSA countries over the 1975-2007; the study showed that exchange rate policy has a significant influence on the export performance of industrial goods of these countries. Effective real exchange rate changes have a significant and positive impact on industrial exports, while the impact of exchange rate misalignment was negative.

Moreover, our results indicate differentiated industrial goods sensitivity to exchanges in the explanatory variables of the model between the France zone and the other SSA countries. Our estimations suggest that a formalization of exchange rate behavior is necessary for a better assessment of the impact of misalignment on trade. However, the parallel market exchange premium does not permit to detect this incidence in the case of SSA countries, owing to the fact that it also reflects other exchange market distortions besides overvaluation.

Our results confirm the observation according to which in SSA countries, the explanation of the opposite effects of exchange rate volatility and misalignment rests on the availability to exporters of effective and affordable instruments of protection against the risks caused by exchange rate volatility. It is not possible however, to cover the risks caused by misalignment.

Furthermore, the results of the study show that exchange rate overvaluation in SSA countries hinders exporters penetration into international markets however, countries that have succeeded

in developing industrial goods trade, as for instance, Mauritius, Tunisia, Nigeria and Kenya have implemented policies that have resulted in a trend towards real exchange rate overvaluation. Ineffective exchange rate policies may generate a vicious circle since poor export performance limits the financial possibilities for importing industrial goods and future productive capacity. This situation is detrimental to exports and economic growth. A cautious exchange rate policy is necessary and indispensable for boosting exports in SSA countries, and hence for the economic growth and development of this region.

Notes

1. All of central Africa countries
2. We are dealing with countries whose statistical data actually indicate that they are in partnership with 13 or less countries. We have selected those which had 13 in some (countries) simply for the sake of coherence. In some cases, the CWPIi series were not available, and they were replaced by the CPIC.
3. The 22 countries are: Benin, Burkina Faso, Chad, Cameroon, Congo, Ivory Cost, Gabon, Ghana, Kenya, Madagascar, Malawi, Mali, Maurice, Nigeria, Niger, Senegal, Togo, Central Africa Republic (RCA), Tanzania, Uganda, Zambia and Zimbabwe.
4. The estimated equation is not dynamic. This does not necessarily imply perfect price flexibility. In addition, misalignment may occur regardless of price dynamics. In fact, an overvaluation can be due to unsustainable level fundamentals which are not necessarily corrected by price flexibility.
5. By measuring variables in this way, we follow the current practice in the literature (see Grobar, 1993). Moreover, the fact that X and AVMGDP are measured in a similar way eliminates eventual biases caused by changes in deflators.
6. The omission of certain variables is due to the fact that in preliminary estimations of the original regression model used in the study, these variables yielded insignificant coefficients, and for that reason they were discarded from the model.
7. The total quality of adjustment () is poor and this result is due to the fact that the quality of the slopes linked to the Franc Zone and Off Franc Zone sectors is imposed. The significance of the coefficients of the exchange rate therefore depends on the sector.

References

AFRISTAT, (2005), Un Exemple de coopération et de partenariat statistique en Afrique au Sud du Sahara, Paris, IRD.

Balassa B., (1990), "Incentive Policies and Export Performance in Sub-Saharan Africa", World Development, 18: 383-391.

Balassa B., (1964), "The Purchasing Power Parity Doctrine: a Reappraisal", Journal of Political Economy, 72: 584-596.

Baldwin, R. and Krugman, P., (1989), "Persistent Trade Effects of Large Exchange Rate Shocks", Quarterly Journal of Economics, 104: 653-654.

Banque Mondiale, (1975), Rapport sur le développement dans le monde. Washington, DC. : Banque Internationale pour la Reconstruction et le Développement.

Banque Mondiale, (2000), L'Afrique peut-elle revendiquer sa place dans le 21èeme siècle?. Washington, D.C. : Document de travail.

Banque Mondiale, (2003), Rapport sur le développement dans le monde. Washington, D.C.: ICE information.

Banque Mondiale, (2006), "Promouvoir de la croissance et l'emploi par la diversification productive et la compétitivité," In Banque Mondiale (ed) 2006, Mémorandum économique sur le Royaume du Maroc, Washington, D.C. : ICE information.

Banque Mondiale, (2007), Rapport sur le développement dans le monde 2007 de la Banque mondiale. Washington, D.C.: ICE information.

Bauer, C. and Bernhard, H., (2006), "Monetary and Exchange Rate Stability at the EU Mediterranean Borders", Revue économique, 57: 899-918.

Barrios, V. E. and Blanco, J. M., (2003), "The Effectiveness of Bank Capital Adequacy Regulation: A Theoretical and Empirical Approach", Journal of Banking and Finance, 27: 35-58.

BEAC, (2005), Etudes et statistiques, CNUCED: Rapport d'investissement dans le Monde.

BCEAO, (2005), Etudes et statistiques. Abidjan, Rapport annuel.

BRI, (1995), Financial Structure and the Monetary Policy Transmission Mechanism. Bâle, C.B. 394.

Caballero, R. J. and Corbo, V., (1989), "How does Uncertainty about the Real Exchange Rate Affect Exports", Working Paper, 221.

Caballero, R. and Engel, E., (1998), "Nonlinear Aggregate Investment Dynamics: Theory and Evidence", NBER Working Paper, 6420.

Caballero, R., (1999), Aggregate Investment. In John Williamson (ed) 1981, Exchange Rate Rules: Theories, Performance, and Prospects of the Crawling Pep, New-York City: St- Martin's Press.

Chaker, A. et Haïthem, S., (2005), "Régime de change et croissance économique : une investigation empirique", Economie internationale, 104 : 97-134.

Chaton, C., (2001), "Décisions d'investissement et de démantèlement sous incertitude: une application au secteur électrique" Economies et Prévisions, 149 : 15-28.

Chavagneux, C., (1998), "Peut-on maîtriser la mondialisation ? Une introduction aux approches d'économie politique internationale", Economie et Société, 34 : 25-68.

Clark, P., (1973), "Uncertainty, Exchange Risk and the level of International Trade", Western Economic Journal, 11: 302-313.

Collier, P., (2003), Primary Commodity Dependence and Africa's Future. Washington, D.C.: World Bank.

Coes, D., (1979), The Crawling peg and Exchange Rate Uncertainty, Mimeno.

Cottani, J. A., Cavallo, D. F. and Khan, M.S., (1990), "Real Exchange Rate Behavior and Economic Performance in LDCs", Economic Development and Cultural Change, 39: 61-76.

Cottani, J. and Cavallo, D., (1993), "Financial reform and liberalization", In Dornbusch, R. (ed), Policy Making in the Open Economy: Consepts and Case Studies en Economic Performance, World Bank: Oxford University Press.

Coudert, V., (2003), "Comment définir un taux de changes d'équilibre pour les pays émergents ? ", Economie Internationale, 77: 45-65.

Coudert V., Benassy A. et Boone L., (2003), Les taux d'intérêt. Paris, Collection repères, Editions de la Découverte.

Cushman, D. O., (1983), "The Effects of Real Exchange Rate Risk on International Trade", Journal of International Economics, 15: 45-63.

De Grauwe, P., (1987), "International Trade and Economic Growth in the European Monetary System", European Economic Review, 31: 389-398.

Devarajan, S., (1997), "Real Exchange Rate Misalignment in the CFA zone", Journal of African Economies, 1: 35-53.

Dixit, A., (1989), "Hysteresis, Import Penetration and Exchange Rate Pass-through", Quarterly Journal of Economics, 104: 205-228.

Dixit, A.K., (1995), "Irreversible Investment with Uncertainty and Scale Economies", Journal of Economic Dynamics and Control, 19: 327-350.

Edwards, S., (1990), "The Sequencing of Economic Reform: Analytical Issues and Lessons from Latin American Experience", The World Economies, 13: 1-14.

Edwards, S., (1988), Exchange Rate Misalignment in Developing Countries. Baltimore, The Johns Hopkins University Press.

Edwards, S. and Savastano, M. A., (2001), "Exchange Rate in Emerging Economies: What Do We Know? What Do We Need to Know?", In Anne O Krueger (ed), Economic Policy Reforms: The Second Stage, Chicago: University of Chicago Press.

Edwards, S. and Magendzo, I. I., (2003), "Dollarization, Inflation and Growth", NBER Working Paper, Series 8671.

Egert, B. Drime, I., Kirsten, L. and Rault, C., (2003), "The Balassa-Samuelson Effect in Central and Eastern Europe: Myth or Reality? With Kirsten Lommatzsch", Journal of Comparative Economics, 31: 552-572.

Elbadawi, I. A. and Soto R., (1994), "Capital Flows and Equilibrium Real Exchange Rates in Chile", Policy Research Working Paper, 1306.

Elbadawi, I. A., (1995), The Impact of Regional Trade/Monetary Schemes on Intra-Sub-Saharan African Trade. Nairobi, Unpublished Mimeo, AERC.

FMI, (2006), Etude sur les indicateurs statistiques, Washington, D.C.

FAO, (2002), Rapport sur les marchés des produits 2001-2002, Rome, Archives de documents de la FAO.

FMI, (2004), Exchange Arrangements and Foreign Exchange Markets: Developments and Issues. Washington, D.C.: World Economic Financial Survey.

FMI, (2001). Exchange Rate Arrangements and Currency Convertibility: Developments and Issues. Washington, D.C.: World Economic Financial Surveys.

FMI, (1999), Exchange Rate Arrangements and Currency Convertibility: Developments and Issues. Washington, D.C.: World Economic Financial Surveys.

Froot, K. A. and Klemperer, P. D., (1989), "Exchange Rate Pass-through when Market Share Matters", American Economic Review, 79: 269-287.

Frenkel, L. A. and Goldstein, M., (1989), "Exchange Rate Volatility and Misalignment: Evaluating some Proposals for Reform", National bureau of Economic Research Working Paper, 2894.

Gagnon, J. E., (1993), "Exchange Rate Variability and the Level of International Trade", Journal of International Economics, 45: 269-287.

Gankou, J. M., (1996), Les Déterminants de l'investissement au Cameroun. Genève, Editions Presse Universitaire de New Châtel.

Ghura, D. and Grennes, T. J., (1993), "The Real Exchange Rate and Macroeconomic Performance in sub-Saharan Africa", Journal of Development Economics, 42: 155-179.

Grobar, L. M., (1993), "The Effect of Real Exchange Rate Uncertainty on LDC Manufactured Exports", Journal of Development Economics, 41: 367-376.

Guillaumont, P. et Guillaumont, S. J., (1994), Zone franc et développement africain, Paris, Editions, Economica.

Guillaumont, P. et Guillaumont S. J., (1996), Ajustement et développement: l'expérience des pays ACP. Paris, Economica.

Guillaumont, P. et Guillaumont, S. J., (1997), "De l'effectivité de la dévaluation des francs CFA : quelques enseignements tirés du Cameroun et de la Côte d'Ivoire", Revue Economique, 48 : 451-460.

Guillaumont, P. et Guillaumont, S. J., (1998), Stratégies de développement comparées, zone franc et hors zone franc. Paris, éditions, Economica.

Guillaumont, P., Guillaumont S. J., and Varoudakis, A., (1999), "Economic Policy Reform and Growth Prospects in Emerging African Economies", Working Paper, 145.

Gupta, S., Hamid D. and Alonso-Terme, R., (1998), Does Corruption Affect Income Inequality and Poverty?. Washington, D.C.: Fiscal Affairs Department.

Hinkle, L. E., Devarajan, and Shantayanan, (1995), "The CFA Franc Parity Change: an opportunity to restore growth and reduce poverty", Africa Spectrum, 29: 131-151.

Hinkle, L.E. and Montiel, P. J., (1999), Exchange Rate Misalignment: Concepts and Measurement for Developing Countries. New-York, World Bank.

Hooper, P.and Kohlhagen, S., (1978), "The Effect of Exchange Rate Uncertainty on the Prices and Volume of International Trade", Journal of International Economics, 8: 483 -511.

Honohan, P. and O'Connell, S. A., (1997), "Contrasting Monetary Regimes in Africa", Working Paper, series 97.

IMF, (1997), Exchange Rate Arrangements and Economic Performance in Developing Countries, in Ch. 4 , World Economic Outlook.

Kasa, K., (1992), "Adjustment Costs and Pricing-To-market: Theory and Evidence", Journal of International Economics, 2: 1-30.

Kenen, P. B. and Rodrik, D., (1986), "Measuring and Analyzing the Effects of Short-term Volatility in Real Exchange Trade", Review of Economics and Statistics, 68: 311-315.

Kuikeu, O., (2005), Mésalignement du taux de change, facteur explicatif de la structure des exportations des économies africaines au sud du Sahara ? Cas des Pays Africains membres de la Zone Franc (PAZF). Pau : CATT-Université de Pau et des pays de l'Adour-France.

Latreille, T. et Varoudakis, A., (1997), "Les facteurs structurels de la compétitivité manufacturière: une analyse en données de panel pour le Sénégal", Revue économique 48 : 471- 480.

Lindauer, D. L. and Velenchik, A. D., (1994), "Can African Labor compete?" In Lindauer D. L. et Roemer M. (eds), Asia and Africa: Legacies and opportunities in Development, San Franscisco, Institute for Contemporary Studies Press.

McDonald, R. and Siegel, D., (1986), "The Value of Waiting to Invest", Quarterly Journal of Economics, 10: 707-28.

Medhora, R., (1990), "The Effect of Exchange Rate Variability on Trade: the case of West African Monetary Union's imports", World Development, 18: 313-324.

Montiel, P. J., (1999b), "The Long Run Equilibrium Real Exchange Rate: Conceptual issues and Empirical Research" In Hinkle L. E. and Montiel, P. J. (ed), Exchange Rate Misalignment: Concepts and Measurement for Developing Countries, Washington, D.C.: World Bank Research Publication.

Nishimizu, M. and Robinson, S., (1986), "Productivity Growth in Manufacturing", In Chenery, H., Robinson S. and Syrquin M., (ed), Industrialization and Growth: a Comparative Study, Oxford, Oxford University Press.

OCDE, (1995), "Asset Prices and Monetary Policy", Working Paper.

OCDE, (2001), Annuaire Statistique des Investisseurs, Belgique, Presse Académique.

Paredes, C., (1989), Exchange Rate Regimes, the Real Exchange Rate and Export Performance in Latin America. Washington, D.C.: Bookings Discussion Paper in International Economics.

Pinto, B., (1989), "Black Market Premia, Exchange Rate Unification, and Inflation in Sub-Saharan Africa", The World Bank Economic Review, 3: 321-338.

Reinhardt, C., (1995), "Devaluation, Relative Prices and International Trade", IMF Staff Paper, 42: 290-315.

Samuelson, P. A., (1964), "Theoretical Notes on Trade Problems", Review of Economics and Statistics, 46: 20-41.

Sapir, A. and. Sekkat, K., (1995), "Exchange Rate Regimes and Trade Prices: Does the EMS matter?", Journal of International Economics, 4: 75-95.

Savvides, A., (1996), "CFA Franc Zone Membership and Exchange Rate Volatility", Journal of African economics, 5: 52-68.

Sekkat, K. and Varoudakis A., (1998a), "Politique de change et exportations de produits manufactures en Afrique subsaharienne", Revue d'économie de Développement, 2 : 55-89.

Sekkat, K. and Varoudakis A., (1998b), "Exchange Rate Management and Manufactured Exports in Sub-Saharan Africa", Technical Paper, 134.

Sfaxi, H. B., (2008), "Choix des politiques de change dans les pays en développement: Etude de la compétitivité de la Tunisie", PanoEconomicus, 3 : 353-367.

World Bank, (1997), World Development Indicators. Washington, D.C: International Bank for Reconstruction and Development.

World Bank, (1998), Global Economic Prospects. Washington, D.C.: The World Bank.

World Bank, (2004), Doing Business in 2004. Oxford, Oxford University Press.

World Bank, (2005), Summary of South Africa Investment Climate Assessment, Private Sector Unit, Africa Region. Washington , D.C.: World Bank Group.

World Currency Yearbook, (2001), Currency Data & intelligence Inc.. New-York, IMF ises.