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Devaluation and the Trade Balance: The Recent Experience of Selected African Countries

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Abstract

Structural adjustment in most developing countries has been built on the twin application of economic liberalization and currency devaluation. Since currency devaluation may create inflationary pressures even as it may provide some positive effects on a country's trade balance, the critical issue is what effects will dominate. Using a standard econometric model, we estimate these effects for a sample of 19 countries in Sub-Saharan Africa. We find that in no case did real exchange rates revert to their pre-devaluation levels, that a depreciation in the real exchange rate does improve a country's trade balance in the year of a devaluation, that there are persistent effects of such devaluations but with smaller changes over time, and that expansionary fiscal policies work to negate the beneficial effects of a devaluation on a country's trade balance. None of these findings take away from the distributional and sectoral dislocation consequences of such devaluations, an issue of ongoing concern regarding the magnitude and timing of structural adjustment programs in Sub-Saharan Africa and elsewhere.

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Introduction[1]

In the last four decades, Third World countries have lurched from one development paradigm to another: from industrialization to import substitution, to export promotion, to structural adjustment programming. Recently, Sub-Saharan Africa has increasingly embraced the latter approach, including the accompanying removal of trade restraints and currency devaluation[2].

Economic theory posits that a devaluation will likely improve a nation's trade balance. However, there are two schools of thought with divergent explanations of how this comes about. The Elasticities Approach contends that by reducing the real value of the currency, a devaluation improves the global competitiveness of a nation's tradeable goods. According to the Monetarists, devaluation exerts a negative impact on real balances, thus reducing real expenditures which force an improvement in the trade balance.

The disagreement is therefore not with the results but over the transmission mechanism[3]. A clear statement on the exact role of relative prices in transmitting the effect of a devaluation in a Sub-Saharan economy is quite important, as more and more of these countries resort to currency realignment as the key corrective policy initiative in an adjustment package, often implemented at the behest of the I.M.F.

For nineteen Sub-Saharan countries, this paper investigates the efficiency of nominal devaluations in bringing about real devaluations, and whether real devaluations improve the trade balance. The nineteen Sub-Sahara countries were: eukina Faso, Cameroon, Central African Republic, Côte d'Ivoire, Gabon, The Gambia, Ghana, Kenya, Madagascar, Mauritius, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Togo,

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[2] Until about 1980, economic policy in many Sub-Sahara Africa States contained implicit biases against agricultural production, encouraging industrialization often through imprudent spending, maintained tight import and foreign exchange controls, and permitted the overvaluation of their currency. Following a decrease in real aggregate output and rising foreign debt burdens in the 1980's, several of these nations moved to secure a sharp increases in official foreign borrowing and thus submitted themselves to structural adjustment programs at the behest of the IMF.

[3] It should be mentioned that while the channels of transmission appear to be diametrically opposed, several theoretical and empirical studies have indicated that these processes are closely integrated; see, for example, Frenkel, J.A.T., Gylfacon and J.F. Helliwell, "A Synthesis of Monetary and Keynesian Approaches to Short Run Balance of Payments Theory," *Economic Journal*, September 1980.

Zaire, and Zambia. A closely related issue is whether any improvement follows the pattern of the (much discussed but rarely observed) "J" curve, although our use of annual date is not particularly helpful in this regard.

The model employed is sufficiently general as to accommodate both schools of thought. The trade balance is regressed on domestic and foreign, income levels, government expenditures, money supply, and interest rates, as well on the real exchange rate. The presence of a real exchange rate variable endows the model with a Keynesian flavor while the foreign and domestic reading on the remaining variables reflect the "one world" assumption that is so basic to the Monetarist conceptualization of the Balance of Payments[4].

The Model

For a nominal devaluation to effect an improvement in the trade balance, it must result in a lasting real devaluation. In the post-Bretton Woods period, developing countries have seen their currency devaluations induce proportionate offsetting increases in inflation, thus moving the real exchange rate back to its original level in quick time. Worse still, repeated attempts to engineer a change in the real exchange rate eventually bring on devaluationinflation spirals[5].

The real exchange rate is calculated as the nominal exchange rate corrected for the differential of the foreign to domestic price level:

(1.) $R = Rn^* (P^* / P)$

where:

Rn = the nominal exchange rate

R = the real exchange rate

P' = the trade-weighted foreign price level

P = the domestic price level.

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[4] The Keynesian approach to analyzing the effects of a devaluation does go beyond the relative price switching effects. It encompasses the deleterious impact of excessive domestic spending and income increases on the trade balance.

[5] Using correlation analysis, Himarios (1989) has shown that for both the Bretton Woods and the post Bretton Woods period, changes in nominal exchange rate did appear to be correlated with changes in real exchange rates, thus contradicting one of the principal conclusions of the strict Purchasing Power Parity Theory.

Further for a devaluation to be effective, a nation's exports and imports must be sufficiently sensitive to relative price changes. Studies indicate that for most devaluations, a substantial portion of the real exchange rate change remains in effect for one and a half to two years. This period of time is long enough to allow a sufficiently high elasticity of demand for exports and imports to begin to affect the trade balance.

A straight forward Keynesian equation for the determination of the trade balance may be derived from the work of Kruger (1983) and expressed as follows:

(2.) $B = B (Y, Rn/P)$

where:

B = the Trade Balance

Y = Real Income

This simple expression can be expanded to include the Monetarist view of the open economy, by incorporating three assumptions suggested by Branson (1983). First that the neoclassical assumption of price and wage flexibility guarantees full employment. Next that in the global market, "the law of one price" would lead to an equalization of the domestic and foreign currency price of each good. Finally on the assumption that domestic and foreign financial assets are perfect substitutes, foreign and domestic interest rates would be equal except for anticipated exchange rate changes.

Monetary and fiscal policy affect the trade balance and thus the framework of Equation 2 is expanded to:

(3) $B = B (R, r, r^*, Y, Y^*, G, G^*, M, M^*)$

where:

G, G* = the domestic and the foreign real government expenditure levels.

Y, Y* = the domestic and foreign real income levels

M, M* = the domestic and foreign money supply levels

r, r* = the domestic and foreign real interest rate levels.

It takes several quarters for the economy to experience the greater part of the eventual effect of a devaluation. Jung and Rhomberg (1973) and others have analyzed the lags in decision, replacement, delivery and production (see Salvatore 1993) that intervene to delay the expected increase and decrease in the volume of exports and imports

respectively[6]. In a minority of cases, these delays are sufficient to induce an initial worsening of the trade balance before there is an improvement. The phenomenon is known as the "J" curve and to measure it, an Almon Distributed Lag process is employed. Thus the actual equation to be estimated is:

$$(4.) \quad B_i = a_0 + a_1(L)R + a_2 r + a_3 r^* + a_4 Y + a_5 Y^* + a_6 G + a_7 G^* + a_8 M + a_9 M^* + e_i$$

where (L) represents the unconstrained Almon polynomial distributed lag.

The central point of investigation of the study is whether an exchange rate devaluation improves the trade balance. In our data the nominal exchange rated is measured by the units of the home currency that must be surrendered to get one unit of the foreign currency (the numeraire being the U.S. Dollar). Therefore the sign on the ai coefficient would have to be positive to demonstrate that a devaluation improves the trade balance. All of this takes for granted the fact that a nominal devaluation induces a real devaluation and that the Marshall-Learner condition is satisfied[7].

Further, since we are using annual data, the suggestion of a "J" curve may be revealed by a negative sign on the current, and possibly first lag of, the real exchange rate coefficient. This would have to be followed by a positive sign on the second lag. In addition Himarios (1989) has argued that for many countries, the nominal exchange rate is the variable examined and manipulated by the monetary authorities and thus should be the exchange rate variable in the equation to be estimated.

In his estimation Himarios regressed the ratio of the foreign or domestic prices on the nominal exchange rate and interpreted the residuals as representing all factors other than exchange rate, that help to determine relative prices. These residuals, together with the nominal exchange rate are then used to estimate the trade balance in an expression similar to Equation 3. One approximation of this procedure would be to employ the nominal and the real exchange rate in separate estimations of Equation 3.

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[6] See Salvatore (1987) for .a discussion of the issues attendant to these lags and an analysis of the manner in which they produce a J-curve.

[7] The Marshajl-Lerner condition states that the trade balance will improve following a devaluation if the sum of the elasticity of demand for exports and the elasticity of demand for imports (facing a given country) exceeds unity. Given this condition, we are accepting the considerable weight of evidence that in practice the sum of these demand elasticities exceeds one.

While both schools of thought agree in principle that the signs on domestic and foreign money supply should be negative and positive respectively, the rationale is starkly different. According to the Monetarist view, increases in the money supply propel real balances above levels considered optional by economic agents, resulting in increased expenditure out of a given income thus stimulating imports and causing the trade balance to deteriorate. For Keynesians, increases in the money supply reduce interest rates thus stimulating increased absorption which puts negative pressure on the trade balance. It is noteworthy that some economists do not agree with the inverse relationship between the money supply and the trade balance. Miles (1979) has contended that other factors may intervene to thwart this result. First, real balances constitute only a small fraction of perceived wealth, thus requiring a substantial devaluation to effect a measurable change in wealth. Worse, individuals may not perceive money to be real wealth at all.

In addition, if real expenditures are weakly sensitive to changes in real wealth, there may be only a minimal increase in expenditures even if real wealth responds vigorously to changes in real balances. In estimating Equation 3 we will experiment with two expressions for the money supply: the customary M1 or M2 and the level of high-powered money under the control of the monetary authorities.

It is customary to assume that any increase in domestic government expenditure that fails to displace an equal amount of private expenditure will increase total spending thus worsening the trade balance. Here too there is some ambiguity as the increase in government expenditure might have been complementary to some investment initiative, thus resulting in a larger output of tradeable goods. Hence although it seems logical to assume that the signs on the coefficient of G and G' are negative and positive respectively, there is some degree of uncertainty.

Rising domestic interest rates may be expected to curtail personal consumption. Another unfortunate result might be the "ratcheting up" of the cost of capital goods which may thwart government's desire for increased production of exports and import substitutes. Further for these debt-laden countries in our sample, the level of foreign interest rates helps to determine the magnitude of debt-service payments. Thus it is impossible to venture a clear-cut prediction on the sign on the interest rate coefficients.

Equally ambiguous are the signs on the real income variables. Higher income levels stimulate increased import demand as well as increased domestic production of tradeables, leaving the ultimate impact on the trade balance indeterminate.

Finally it should be noted that our approach to the search for a J-curve is but one of several methodologies employed by specialists in the field. For example Rose & Yellen (1989) investigate whether a J-curve can be detected in the U.S. trade balance, using both bilateral and aggregate trade data. Aggregate U.S trade data for a 25 year period (1960 to 1985) are used for comparison of the Rose & Yellen methodology with those of other papers on the subject. However, Rose & Yellen point out the problems with the use of aggregate data, specially in constructing proxies for foreign income and U.S. real exchange rate vis-a-vis the ROW (Rest of the World).

To minimize measurement problems, Rose and Yellen use bilateral trade data with other members of the Group of Seven (Japan, Canada, Germany, France, U.K. & Italy) in their analysis. Further, rather than annual data, they use monthly data from the IMF bilateral export and import series. They model the trade balance as a linear function of domestic GNP, foreign GNP, and the real exchange rate. Real exchange rate is defined as the the log of the product of nominal bilateral exchange rate, foreign GNP deflator and the inverse of the U.S. GNP deflator. Their results indicate that there is no statistically reliable evidence of the existence of a J-curve in the U.S. trade data.

Analysis of the Raw Data

Table lA and 1B provides a comparison between the nominal and the real exchange rate (as calculated in Equation 1) for both the flexible and fixed rate periods. A few general observations are in order. The table makes obvious the sizeable nominal exchange rate depreciations carried out in the flexible rate period.

Second, the percentage changes in the real exchange rate are generally smaller in the fixed rate period than in the post Bretton Woods era, with Mauritius, Sierra Leone, Rwanda, Gambia, Niger, Burkina Faso being the exceptions. Further, this increased real exchange rate volatility has divergent signs across countries, being represented as a depreciation in 11 cases (Madagascar, Cameroon, Burkina Faso, Mauritius, Zaire, Tanzania, Nigeria, Zambia, Ghana, Gambia and Kenya) and as an appreciation in 8 cases (Côte d'Ivoire, Gabon, Togo, Niger, Senegal, Sierra Leone, Rwanda, Gambia). Finally, a comparison of the percentage changes in nominal and real exchange rates (columns 5 & 7) suggests that the real exchange rate did a better job of tracking the nominal exchange rate in the fixed period than in the flexible rate period.

Table 2A and 28 provides some basis for assessing the extent to which a nominal devaluation reduces the real rate of exchange and further affords some insight into the longevity of this reduction. Column 4 shows the actual nominal devaluation. Columns 5

to 7 measures the percentage change in the real exchange rate one, two, and three years later, from what it was in the year of the devaluation. For example, Zaire devalued her currency by 203 percent in 1967 leading to a 138.69$ real devaluation at the end of the first year. By the end of 3 years only 126.12% of the real devaluation was left leading to a 37.88% slippage (column 8) by the end of 3 years.

Nominal devaluation was successful in lowering the real exchange rate below pre-devaluation levels to every case except Nigeria in 1971 (column 4). The last column indicates the degree of slippage or the extent to which the real exchange rate climbed back to pre-devaluation levels. In every country except Niger and Ghana, the degree of slippage was significantly smaller in the fixed exchange rate period than in the flexible rate period. However, there is not a single case where the real exchange rate climbed back above pre-devaluation levels. A major part of the real devaluation (slippage of less than 20%) remain in effect for as long as three years in 26 of the 38 episodes.

As tempting as it may be, one must avoid drawing hard conclusions from these two tables for several reasons. First,the data on 38 selected devaluations is too limited a basis upon which to make authoritative pronouncements. Second, while attempts have been made to glean patterns from these tables, it is clear that there are enough counter patterns cutting across exchange rate regimes and countries to question, if not invalidate, any ad hoc rule.

Finally, it must be emphasized that this is a preliminary analysis of raw data with no account taken of the response of prices, wages, and macroeconomic policy to the devaluations. Accordingly, while this examination provides a clear answer as to whether a nominal devaluation continues to affect-the real exchange rate two or three later, it reveals nothing else. We turn therefore, to an analysis of the regression results.

Table 1A
Nominal and Real Exchange rates 1960-1989
Francophone Africa Countries

Country	Exchange Rate Regime	Years	Nominal Exchange Rate	Percent Change in Nominal Exchange Rate	Real Exchange Rate	Percent Change in Real Exchange Rate
Madagascar	FIXED	1964	245.01		533.46	
		1967	245.42	0.17	519.71	-2.58
	FLEX1BLE	1968	247.41		516.39	
		1989	1532.54	519.43	914.81	77.15
Côte d'Ivoire	FIXED	1960	245.13		450.63	
		1967	245.42	0.12	389.78	-13.5
	FLEXIBLE	1968	247.41		382.05	
		1969	289.40	16.97	272.21	-28.75
Central African Republic	FIXED	1960	245.13		0.00	
		1967	245.42	0.12	0.00	NA
	FLEXIBLE	1968	247.41		0.00	
		1989	289.40	16.97	341.93	NA
Cameroon	FIXED	1960	245.13		NA	
		1967	245.42	0.12	NA	NA
	FLEXIBLE	1968	247.41		141.60	
		1989	289.40	16.97	253.69	79.16
Gabon	FIXED	1962	245.01		473.67	
		1967	245.42	0.17	417.63	-11.93
	FLEXIBLE	1968	247.41		421.45	
		1989	289.40	16.97	309.62	-26.53
Togo	FIXED	19	247.59		313.61	
		1967	245.42	-0.88	319.34	1.33
	FLEXIBLE	1968	247.41		328.56	
		1989	289.40	16.97	304.82	-7.23
Niger	FIXED	1963	247.10		392.67	
		1967	245.42	-0.68	354.98	-9.6
	FLEXIBLE	1968	247.41		376.79	
		1989	289.40	16.97	363.67	-3.48
Burkina Faso	FIXED	1960	245.13		353.31	
		1967	245.42	0.12	296.70	-16.02
	FLEXIBLE	1968	247.41		307.74	
		1989	289.40	16.97	320.02	3.99
Senegal	FIXED	1960	NA		NA	
		1967	245.42		389.78	
	FLEXIBLE	1968	247.41		402.65	
		1989	289.40	16.97	313.32	-22.19

Table 1B
Nominal And Real Exchange Rates 1960-1989
Other African Countries

Country	Exchange Rate Regime	Years	Nominal Exchange Rate	Percent Change in Exchange Rate	Real Exchange Rate	Percent Change in Exchange Rate
Mauritius	FLEXIBLE	1960	4.77		10.47	
		1973	5.74	20.38	12.00	18.82
	FLEXIBLE	1974	5.68		11.33	
		1989	15.00	164.13	12.97	14.47
Zaire	FIXED	1963	0.17		36.06	
		1975	0.50	203.03	23.39	-35.14
	FLEXIBLE	1976	0.86		23.31	
		1989	454.62	52701.51	47.00	103.52
Tanzania	FIXED	1965	7.14		53.23	
		1972	7.14	0.00	33.62	-36.84
	FLEXIBLE	1973	6.90		33.43	
		1989	192.30	2686.96	72.35	116.42
Nigeria	FIXED	1960	0.71		3.13	
		1973	0.65789	-7.9	2.16	-30.99
	FLEXIBLE	1974	0.62		2.13	
		1989	7.65	1141.62	3.44	61.50
Sierra Leone	FIXED	1960	0.71		7.30	
		1970	0.84	17.13	6.78	-7.12
	FLEXIBLE	1971	0.78		6.57	
		1989	65.36	8241.99	6.53	-0.61
Zambia	FIXED	1960	0.71		2.41	
		1975	0.64	-9.91	1.87	-22.41
	FLEXIBLE	1976	0.79		2.04	
		1989	21.6497	2628.72	3.07	50.49
Rwanda	FIXED	1966	100.00		154.84	
		1982	92.84	-7.16	102.81	-33.60
	FLEXIBLE	1983	98.54		103.64	
		1989	77.62	-21.23	78.77	-24.00
Ghana	FIXED	1964	0.71		91.33	
		1982	2.75	285.15	9.15	-89.96
	FLEXIBLE	1983	30.00		45.34	
		1989	303.03	910.00	114.97	153.57
Gambia	FIXED	1961	1.78		3.06	
		1970	2.09	17.28	3.75	22.55
	FLEXIBLE	1971	1.96		3.53	
		1989	8.31532	324.50	3.86	9.35
Kenya	FIXED	1960	7.14		15.23	
		1974	7.14	0.00	15.16	-0.46
	FLEXIBLE	1975	8.26		16.07	
		1989	21.60	161.50	18.06	12.38

Source: Computed from IMF IFS Data Tapes

Table 2A
The Relation Between Nominal And Real Devaluation 1960-1989
Francophone Africa Countries

Country	Year	Exchange Rate Regime	Nominal Devaluation (%) (t)	Real Devaluation (%) After: (one year) (t+1)	(two years) (t+2)	(three years) (t+3)	Total Slippage (Percent)
Madagascar	1969	FIXED	12.33	12.45	12.20	12.07	-2.1
	1984	FLEXIBLE	33.70	30.35	25.74	22.95	-31.9
Côte d'Ivoire	1969	FIXED	12.33	11.67	12.26	12.77	3.60
	1983	FLEXIBLE	24.12	23.71	23.16	20.96	-13.1
Central African Republic	1969	FIXED	12.33	12.81	12.55	12.39	0.43
	1983	FLEXIBLE	24.12	24.09	21.71	20.63	-14.43
Cameroon	1969	FIXED	12.33	12.01	11.98	11.53	-6.09
	1983	FLEXIBLE	24.12	22.21	21.81	19.67	-18.48
Gabon	1969	FIXED	12.33	12.29	12.23	12.37	0.34
	1983	FLEXIBLE	24.12	23.36	21.65	19.78	-18.02
Togo	1969	FIXED	12.33	12.25	11.89	11.53	-6.47
	1983	FLEXIBLE	24.12	25.64	25.97	24.22	0.41
Niger	1969	FIXED	12.33	12.70	12.56	12.01	-2.6
	1983	FLEXIBLE	24.12	22.81	22.89	22.97	-4.3
Burkina Faso	1969	FIXED	12.33	12.54	12.67	13.65	10.75
	1983	FLEXIBLE	24.12	23.58	21.94	21.87	-9.35
Senegal	1969	FIXED	12.33	12.31	12.13	12.32	-0.03
	1983	FLEXIBLE	24.12	22.12	19.48	17.78	-26.32

Source: Computed from IMF IFS Data Tapes

Table 2B
The Relation Between Nominal And Real Devaluation 1960-1989
Other Africa Countries

Country	Year	Exchange Rate Regime	Nominal Devaluation (%) (t)	Real Devaluation (%) After: (one year) (t+1)	(two years) (t+2)	(three years) (t+3)	Total Slippage
Mauritius	1967	FIXED	15.95 *	15.29	15.54	15.82	-0.85
	1981	FLEXIBLE	31.84 *	29.15	27.95	26.66	-16.26
Zaire	1967	FIXED	203.03	138.69	135.12	126.12	-37.88
	1983	FLEXIBLE	424.19	285.48	229.40	151.82	-64.21
Tanzania	1975	FIXED	15.69	15.42	14.64	14.13	-9.99
	1986	FLEXIBLE	213.47	168.45	133.55	109.51	-48.7
Nigeria	1971	FIXED	-7.9	-8.06	-8.63	-8.8	11.51
	1966	FLEXIBLE	231.81	215.86	162.40	113.26	-51.14
Sierra Leone	1967	FIXED	15.95	16.34	16.17	15.97	0.17
	1986	FLEXIBLE	107.50	57.71	21.24	16.46	-84.69
Zambia	1976	FIXED	23.29	20.61	19.05	19.56	-16.04
	1985	FLEXIBLE	159.00	101.84	73.01	48.83	-69.29
Rwanda	1966	FIXED	100.00	98.84	98.22	101.55	1.55
	1984	FLEXIBLE	5.91	5.78	5.67	5.59	-5.39
Ghana	1975	FIXED	139.13	101.47	77.18	38.89	-72.05
	1986	FLEXIBLE	50.05	36.72	29.07	24.36	-51.33
Gambia	1967	FIXED	15.95	15.75	15.57	16.43	2.99
	1986	FLEXIBLE	114.54	95.14	88.60	85.85	-25.05
Keyna	1974	FIXED	3.52	3.23	3.03	2.80	-20.35
	1981	FLEXIBLE	35.91	30.42	27.61	25.67	-28.52

Source: Computed from IMF IFS Data Tapes

Empirical Results

Equation 4 was estimated three times. First in its original form for each country, using all variables for which data was available. This preserves its monetarist character[8]. These results are presented in Table 3. Given the relatively large number of coefficients in equation 4, it was felt that there was a need to "test down" to avoid having too many variables being insignificant in a "T" test. In turn two approaches to testing down were adopted. In the first (table 4) , along with the real exchange rate, the only independent variables retained were the domestic ones. In the second (table 5), both domestic and foreign variables were eligible for inclusion, as we discarded variables that were least significant in the original test. In both of these regressions, first and second lags of the real exchange rate were also used, in addition to real exchange rate.

[8] Data for U.S.A are used as proxies for the "foreign" variables employed. The U.S.A is not necessarily the principal trading partner of most sub-sahara Africa countries. This choice was the result of data limitations. The I.F.S. does not list data for the U.S. over the entire sample period on either of the two variables used to represent Government Spending (lines 82 or 91F). Hence, Foreign Government Spending was omitted from Equation 4 and the estimation.

Table 3
Regression Results

Country	R^2	A_0	LAGREX	OWNGDP	USGDP	Own Real Int . Rate	U.S. Real Int. Rate	Own MS	US MS	Own Gov.Exp.	U.S Gov.Exp
Côte d'Ivoire	0.9523	-2802.48 (-4.687)	7.11874 (10.077)	-0.94921 (-2.158)	-0.37189 (-0.838)	-487.346 (-0.331)	-1325.88 (-0.849)	-3.63 (-2.158)	2.95 (0.168)		
The Gambia	0.8136	-101.482	32.58907 (4.359)	0.17811 (2.203)	-0.07438			-0.67 (1.525)	0.29 (1.159)		
Tanzania	0.8869	1701.191 (-1.204)	-22.13991 (-1.614)	0.01238 (1.338)	0.63822 (1.503)	857.8368 (0.598)	-2582.359 (-1.693)	0.01 (0.584)	-7.68 (-2.188)		
Gabon	0.9525	1321.087 (2.971)	-0.76071 (-1.785)	0.2698 (2.374)	1.76422 (8.092)	1828.924 (0.932)	-2973.969 (-2.256)	5.88 (2.867)	-12.00 (-9.634)		
Senegal	0.9455	334.5239 (1.398)	0.1886 (0.853)	0.48365 (1.146)	-0.37243 (-3.311)	-534.6761 (-0.834)	-1143.923 (-2.162)	0.39 (0.313)	0.39 (0.418)		
Rwanda	0.8034	78.75121 (0.352)	-0.07887 (0.056)	-0.26605 (-0.228)	-0.05681 (-0.639)	-189.4425 (-0.599)	50.728 (0.127)	7.02 (0.618)	-0.02 (-0.033)		
Sierra Leone	0.8505	4.57139 (0.019)	20.96149 (1.294)	-0.29336 (-2.452)	0.13046 (0.796)	19.87396 (0.224)	-286.201 (-0.834)	1.85 (2.887)	-0.99 (-0.825)	-0.44 (-1.249)	7.89 (0.052)
Zambia	0.7441	-2632.449 (-3.559)	389.991 (1.814)	-0.02894 (-0.152)	-1.1236 (-2.202)	449.3577 (0.540)	6155.01 (2.812)	1.34 (1.768)	9.97 (2.487)	-1.06 (-3.634)	
Niger	0.7887	-378.459 (-1.625)	0.87388 (3.729)	-0.17066 (-0.556)	-0.02964 (-0.256)	-63.61062 (-0.115)	7172.8371 (0.290)	-1.43 (-0.467)	0.47 (0.750)		
Mauritius	0.8396	-213.974 (-1.442)	15.13043 (2.325)	-3.06032 (0.288)	-0.17736 (-3.407)	-122.3197 (-0.580)	-153.827 (-0.432)	-0.07 (-1.205)	1.47 (4.252)		
Madagascar	0.7338	-4.75989 (-0.014)	0.63172 (1.654)	0.01033 (0.136)	-0.37429 (-1.979)	279.6596 (0.346)	-2517.458 (-2.635)	0.33 (0.355)	1.45 (1.521)		
Kenya	0.8978	-2102.656 (-2.750)	103.5409 (2.923)	7.905236 (0.096)	-0.32794 (-1.508)	1973.969 (1.797)	-727.7887 (-0.380)	0.14 (2.278)	0.31 (0.159)	0.05 (-1.799)	-0.16 (-0.237)
Ghana	0.4841	-612.8256 (-1.502)	1.06163 (0.841)	-9.84828 (-0.439)	-0.3411 (-1.360)	-0.8104 (-0.065)	1541.456 (1.382)	2.87 (0.156)	3.36 (1.700)	-1.81 (-1.041)	-0.34 (-0.602)
Zaire	0.3264	-73.19707 (-0.250)	3.18107 (0.452)	-7.06885 (-0.118)	0.42835 (1.014)			-1.20 (-0.005)	1.73 (-0.575)		
Togo	0.5064	-410.01 (-1.412)	0.95688 (2.652)	-0.25447 (-0.116)	-0.16115 (-0.651)	501.9296 (0.540)	337.574 (0.459)	2.77 (0.887)	0.62 (0.615)		
Cameroon	0.9822	-2121.77	2.05503 (4.159)	-0.74909 (-4.423)	0.29126 (2.175)	-132.5 (-0.087)	766.01 (1.161)	2.06 (2.131)	3.42 (2.974)	0.08 (-6.201)	0.02 (6.201)
Nigeria	0.6620	-7546.44 (-0.571)	2110 (0.408)	-0.05048 (-0.113)	-17.18 (-1.291)	-7498.36 (-0.653)	60359.34 (1.862)	1.98 (1.099)	66.60 (1.770)	0.55 (2.001)	13.04 (-0.785)
Central African Republic	0.9425	-86.03 (-1.183)	0.14793 (2.450)	-0.45714 (-1.183)	0.05234 (1.581)	232.173 (0.675)	3.274 (0.026)	0.82 (0.404)	-0.24 (-1.576)		0.01 (0.011)
Burkina Faso	0.9799	-38.34 (-0.249)	0.3497 (2.528)	-1.36 (-2.312)	0.12154 (1.439)	-605.36 (-1.546)	90.26 (0.266)	2.89 (0.738)	-0.35 (-0.796)	0.00 (-1.046)	0.09 (0.577)

Table 3 show that for all countries except for Tanzania and Gabon, all of the coefficients on the real exchange rate lagged one period are positive. Encouragingly, more than half of them are significant at the 5% level. Taken together, this suggests that within a year of its implementation, a devaluation works to improve the trade balance. In the case of Gabon, the lagged real exchange rate is significant at the 5% level, while for Tanzania it is not.

To capture the effect of the real exchange rate on the trade balance over time, a contemporaneous and two lags of the real exchange rate are employed. By an overwhelming margin, the sign on each period's real exchange rate coefficient is positive. Further, while many of these estimates of the real exchange rate are not significant at the 5% level, in those cases where they are significant, the expected positive sign obtains in all but one case.

In two countries, Madagascar and Cote d' Ivoire, real devaluation gives a strong positive boost to the trade balance as measured by all three period coefficients[9]. In only one country, Zaire, does it seem that the initial improvement in the trade balance is negated by the second and third period following devaluation. This finding is not particularly surprising since in our sample, Zaire experienced one of the highest rates of inflation in the 1960-90 period. An interesting finding is that the coefficient for the third period is more likely to be larger and more significant than for the first period. This supports the view that changes in relative prices strongly affect the trade balance well into the future.

As for a possible "J" curve effect, while the coefficient on the contemporary real exchange rate is negative in seven countries, their coefficient is positive on both lagged real exchange rates in only for cases: Ghana, Senegal, Mauritius and Tanzania. However, only in the case of Tanzania are the coefficients sufficiently robust to support the view that an initial worsening of the trade balance in the year of a devaluation is followed by an improvement in the second and third year.

Another striking result is the absence of any clear pattern for our nine Francophone countries which maintained identical exchange rates throughout the period. In four of these countries: Madagascar, Cote d'Ivoire, Burkina Faso, and Togo the expected positive coefficient obtains for the real exchange rate for all three time periods, even though some of them are statistically insignificant. For the other five countries there is no particular pattern to the signs on the real exchange rate coefficients.

[9] Madagascar represents a special case. It was part of the Francophone group that kept their currencies tied to the French franc. Madagascar broke this tie in 1982 and large devaluations followed. All this occurred in an environment of high inflation.

Table 4
Regression Results Using Only Domestic Variables

Country	R^2	A_0	REX	LAGREX	LAG2 REX	Own GDP	OWN MS	Own R.In.R.	Own G.Exp.
Madagascar	0.7000	-1105.21	0.89	0.54	0.92	-0.004	-2.06	-254.87	
		(-0.459)	(2.130)	(1.220)	(2.190)	(-0.080)	(-2.410)	(0.300)	
Côte d'Ivoire	0.9600	-3370.83	1.62	4.75	2.88	-0.85	3.81	326.85	
		(-9.930)	(1.790)	(4.140)	(3.370)	(-3.380)	(3.000)	(0.280)	
Mauritius	0.6000	-339.92	-16.15	14.75	24.46	0.004	-0.09	0.86	
		(-1.480)	(-1.470)	(1.550)	(2.500)	(0.390)	(-0.940)	(0.010)	
Sierra Leone	0.8300	-31.77	10.47	15.35	-22.15	-0.16	1.22	11.45	-0.41
		(-0.340)	(1.040)	(1.280)	(-1.780)	(-1.780)	(2.750)	(0.570)	(-3.310)
Niger	0.8900	-651.34	1.16	-0.56	1.11	-0.56	3.6	293.99	
		(-5.220)	(4.410)	(-1.570)	(3.950)	(-2.580)	(2.050)	(0.786)	
Gambia	0.8600	-266.4	10.15	36.34	31.16	7.13	-0.67	133.94	
		(-7.050)	(1.370)	(4.340)	(3.820)	(0.010)	(1.660)	(2.130)	
Rwanda	0.7600	-168.21	0.95	0.38	0.55	-1.39	0.01	-437.63	
		(-0.680)	(0.640)	(0.250)	(0.470)	(-1.990)	(0.910)	(-1.260)	
Nigeria	0.1200	6547.03	731.14	-4138.1	2087.99	-0.05	0.07	-464.62	
		(0.600)	(0.340)	(-0.630)	(0.360)	(-0.140)	(0.040)	(-0.330)	
Togo	0.6000	-418.25	1	9.28	0.11	0.36	-2.12	361.24	
		(-1.970)	(2.010)	(0.020)	(0.220)	(0.400)	(-0.730)	(0.440)	
Zaire	0.2200	321.74	8.93	-4.71	8.43	0.008	-0.04		
		(1.370)	(1.290)	(-0.580)	(-1.160)	(1.660)	(-1.670)		
Ghana	0.3600	24.46	-0.13	1.93	0.07	-0.004	0.47	-9.81	0.00
		(0.410)	(-0.080)	(1.420)	(0.060)	(-0.220)	(0.080)	(-1.220)	(-0.035)
Kenya	0.9000	-2914.01	19.56	50.94	79.24	-0.004	0.05	######	-0.02
		(-6.730)	(0.630)	(1.240)	(2.240)	(-0.500)	(1.100)	(2.590)	(-0.740)
Senegal	0.7900	-199.21	-0.39	0.42	0.7	-0.31	-0.48	-222.88	
		(-0.530)	(-0.940)	(0.730)	(1.050)	(-0.620)	(-0.210)	(-0.182)	
Gabon	0.8900	1115.04	-0.33	1.09	-5.24	0.83	1.61	######	
		(1.450)	(-0.300)	(0.660)	(-4.320)	(4.390)	(0.490)	(1.240)	
Cameroon	0.7700	-427.44	0.65	-0.7	1.22	-0.21	0.51	-249.26	
		(-0.790)	(0.530)	(-0.460)	(1.080)	(-1.410)	(0.320)	(-0.080)	
Central African Republic	0.8700	-47.39	0.05	0.14	-0.1	-0.39	1.27	126.61	
		(-0.800)	(0.560)	(0.140)	(-1.230)	(-0.870)	(0.590)	(0.470)	
Tanzania	0.6200	-504.27	-11.73	11.45	10.32	0.009	0.02		0.05
		(-2.770)	(-1.830)	(1.440)	(1.830)	(2.810)	(0.810)		(-3.330)
Zambia	0.5600	-824.76	-45.78	257.96	-267.89		1.08	######	-0.82
		(-3.430)	(-0.485)	(1.130)	(-0.880)		(1.090)	(1.800)	(-2.040)
Burkina Faso	0.9700	-78.97	0.37	0.13	0.11	-78.97	-0.004	-598.32	
		(-1.360)	(4.280)	(1.290)	(1.060)	(-1.360)	(-0.003)	(-3.440)	

Table 5
Regression Results Using Selected Foreign and Domestic Variables

Country	R^2	A_0	REX	LAGREX	LAG2 REX	Own GDP	Foreign GDP	OWN MS	For. MS	Own Real Int.Rate	Foreign Int.Rate
Madagascar	0.8000	-66.81	0.35	0.39	0.29		-0.3		0.86		-2512.41
		(-0.350)	(0.170)	(1.100)	(0.830)		(-2.390)		(0.900)		p-2.93
Côte d'Ivoire	0.9600	-3701.3	1.68	4.77	2.87	-0.86		3.83	-0.08		
		(-13.150)	(1.780)	(4.060)	(2.500)	(-2.250)		(2.870)	(-0.060)		
Mauritius	0.7500	-432.82	-7.46	17.45	21.94	0.002	-0.29	-0.01	1.80		
		(-3.900)	(-0.840)	(2.260)	(2.760)	(0.330)	(-4.640)	(-0.150)	(3.410)		
Sierra Leone	0.8400	17.12	13.69	5.64	-18.05	-0.16	0.11	1.21	-0.54		
		(0.180)	(1.150)	(0.430)	(-1.290)	(-1.990)	(0.610)	(2.960)	(-0.440)		
Niger	0.8900	541.46	1.02	-0.35	0.82	-0.55		2.45	0.12		
		(-7.140)	(3.800)	(-0.960)	(2.740)	(-2.560)		(1.210)	(1.030)		
The Gambia	0.8600	-68.91	17.29	24.17	-3.75	0.19	-0.07				
		(-1.230)	(2.520)	(3.720)	(-0.300)	(1.970)	(-2.830)				
Rwanda	0.8000	111.44	-0.09	-0.42	0.35		-0.07	0.01		-114.98	
		(0.500)	(-0.070)	(-0.330)	(0.330)		(-2.790)	(0.680)		(-0.360)	
Nigeria	0.2300	-20961	1559.21	-8293.35	10055.04		4.56	-0.48			53694.85
		(-1.350)	(0.850)	(-1.400)	(1.640)		(0.880)	(-1.390)			(1.580)
Togo	0.5900	-410.34	0.88	0.06	0.19			-0.99		373.18	
		(-2.000)	(2.300)	(0.120)	(0.430)			(-1.800)		(0.470)	
Zaire	0.2400	115.78	6.55	2.8	-5.43		0.18		-0.57		
		(0.520)	(0.940)	(-0.370)	(-0.600)		(0.300)		(-0.130)		
Ghana	0.3100	-95	-2.01	1.42	-0.34		-0.21		1.42		1168.17
		(-0.420)	(-1.680)	(1.020)	(-0.260)		(-0.760)		(0.730)		(1.030)
Kenya	0.9100	-2659.19	36.17	54.71	57.62		-0.26	0.11		1530.45	
		(-7.260)	(1.200)	(1.470)	(1.670)		(-1.640)	(1.890)		(2.290)	
Senegal	0.9500	245.94	-0.18	0.29	0.08		-0.34				
		(2.020)	(-0.850)	(1.030)	(1.280)		(-3.690)				
Gabon	0.9400	1737.03	-0.65	0.08	-1.49	0.42	1.52		-10.33		
		(5.390)	(-0.770)	(0.070)	(-0.990)	(2.510)	(2.790)		(3.010)		
Cameroon	0.8000	-1568.78	0.92	0.58	1.01	0.49			2.81		
		(-1.720)	(0.940)	(0.330)	(1.000)	(-1.790)			(1.260)		
Central African Republic	0.8900	-44.76	0.06	0.13	-0.06	-0.45	0.05		-0.15		
		(-1.390)	(1.030)	(1.450)	(0.600)	(-1.930)	(1.690)		(-0.990)		
Tanzania	0.9100	1287.86	-5.89	-11.49	8.01	0.02	0.35		-5.34		-1598.36
		(1.630)	(-0.840)	(1.150)	(1.260)	(2.690)	(0.250)		(-1.970)		(-1.560)
Zambia	0.7900	-1932.59	17.92	502.17	-289.12		-0.94	2.04	7.58		5990.85
		(-2.480)	(0.320)	(3.500)	(-1.200)		(-1.660)	(2.970)	(1.460)		(3.530)
Burkina Faso	0.9800	-82.79	0.34	0.14	0.09	-1.1	0.06			-684.52	
		(-1.960)	(4.260)	(1.500)	(0.940)	(-3.440)	(1.360)			(-3.710)	

The coefficient on the real money supply variable is mixed, with a slight majority of these countries having a positive sign. This somewhat unexpected result parallels the finding of Himarios (1989). He sites several possible reasons. First that in the context of import and currency restrictions, only a small percentage of any increase in the money supply is likely to leak out in the form of external deficit. Thus the brunt of any monetary expansion is borne by increases in domestic prices and output. He further implies that the positive coefficient would be consistent with a true monetary experiment, i.e. an exogenous one time change in the domestic source component of the (monetary) base. To the extent that increases in the money supply merely constitute validations of past increases in wages and prices, they do not necessarily increase aggregate demand, thus having no predictable effect on the trade balance. Further, we must air the oft-repeated view that in LDC's with open economies and significant external debt, the money supply and the rate of interest merely respond to conditions in world credit markets, and are thus endogenous variables.

Neither "interest rate" variables appears to play a major role in determining the trade balance. In Table 4 where only domestic variables are include in the regression, the domestic interest rate is significant in only 4 countries with conflicting signs. In Table 5 when the most important variables are include in the regression, interest rates were chosen for only four countries. Among them, the interest rate variable was significant in three, with two having the expected negative sign. This general ambiguity extends to most of the other non-exchange rate variables, with the exception of domestic government expenditure. Although data availability allowed the inclusion of this variable for only six countries, the expected negative sign was observed for all, with four being significant at the five% level. This is very strong support for the view that increased government expenditure has a substantial adverse effect on the trade balance.

Summary and Conclusions

The primary focus of this paper was an investigation into whether devaluations as deliberate policy initiatives serve to bolster the trade balance, and if so, whether the transmission mechanism is more consistent with the Elasticities or the Monetarist view of a devaluation.

We specified an estimating equation that was sufficiently broad as to encompass both approaches: the Keynesian view that a devaluation induces a switch in the relative price of tradeable to non-tradeable goods which ultimately improves the trade balance; and the monetarist view that it is the resulting reduction in real balances and hence expenditures that strengthens the trade balance.

An econometric analysis of annual data for nineteen Sub-Sahara African countries was carried out. They were: Bukino Faso, Cameroon, Central African Republic, Côte d'Ivoire, Gabon, The Gambia, Ghana, Kenya, Madagascar, Mauritius, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Togo, Zaire,and Zambia. our analysis leads to seven conclusions.

First, there was not a single case where the real exchange rate climbed back above pre-devaluation levels. A major part of the real devaluation. remained in effect for as long as three years in 26 of the 38 episodes. However, the degree of slippage was significantly smaller in the fixed exchange rate period than in the post Bretton Woods era.

Second, there was overwhelming evidence (seventeen of nineteen countries) that a real exchange rate depreciation did improve a country's trade balance in the year of the devaluation.

Third, the devaluation's influence on the trade balance carried forward to subsequent years although this did not always indicate a continuing improvement.

Fourth, for two countries there was some indication of a Jcurve, in that for the first year after the devaluation, the real exchange rate was helping to worsen the trade balance, whereas in the two subsequent years it worked to improve the trade balance. However as measured by the level of significance of the "T" statistics, the evidence is sufficiently compelling only in the case of Tanzania.

Fifth, while some of the other variables were significant at the five percent level, the signs presented a less than clearcut picture on the other aspects of the monetarist scenario.

Sixth, there were as many differences in the response to exchange rate depreciation among out seven Francophone countries (which kept their exchange rate in lock step, but were not homogenous in terms of public policy and the sustained level of domestic inflation), as there were between the non-Francophone group.

Seventh, the results of this study lend strong support to the view that expansionary fiscal policies work to negate the beneficial effects of a devaluation upon the trade balance.

Overall, the paper supports the view that devaluations improve the trade balance, bolsters the Elasticities contention that a nominal devaluation does bring about a switch on relative prices, and finally, sheds no light on the putative centrality of the role of the resulting reduction in real expenditures as emphasized by the Monetarist approach.

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