



An Empirical Evaluation of the Bilateral Non-oil Export Trade Balance between Nigeria and Egypt: A Test of Marshall-Lerner Condition

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Authors' contributions

This work was carried out in collaboration between both other persons. Author OJO designed the study, performed the statistical analysis, wrote the protocol, managed the literature searches and wrote the first draft of the manuscript. Author OJI proofread the outcomes from the study. Both contributors read and approved the final manuscript.

Article Information

DOI: 10.9734/JEMT/2020/v26i930287

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Complete Peer review History: <http://www.sdiarticle4.com/review-history/60528>

Original Research Article

Received 28 June 2020
Accepted 01 September 2020
Published 13 November 2020

ABSTRACT

Bilateral trade is the exchange of goods between two nations promoting trade and investment. The two countries will reduce or eliminate tariffs, import quotas, export restraints, and other trade barriers to encourage trade and investment. The Marshall-Lerner (M-L) condition which is at the heart of the elasticities approach to the balance of Trade. The condition seeks to answer what happens to the current-account balance of a country when there is a devaluation of the currency. In this study, an empirical examination of the validation of M-L Condition was examined in the Bilateral Non-Oil Export Trade Balance between Nigeria and Egypt for the period 1980 to 2018. The distributed lag (DL) mechanism was used to estimate the short as well as the long run parameters. The results of the findings validated the M-L Condition in the trade relations with Egypt in the short and long run and that the M-L Condition is supported by data. The study amongst others recommended that for Nigeria to

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implement any devaluation policy, Nigeria must first and foremost ensure a substantial increase in her non-oil exports as against imports. This is the only way the benefits can be maximized for the country.

Keywords: Exchange rate; Marshall-Lerner condition; trade balance.

JEL Classification: F18, F31, F36 and P33.

1. INTRODUCTION

1.1 Background to the Study

The importance of international trade to a nation's economic welfare and sustainable development has been much recognised in economic literature as a necessary panacea for economic growth. Trade is based on the fact that no economy can produce all goods and services, which her people requires for their consumption largely owing to resource differences and constraints [1]. As a result, trade relationship suggests that economies need to export goods and services to other economies in order to generate revenue to finance imported goods and services, which cannot be produced domestically [2,3].

Trade is described as an engine of economic growth with tremendous benefits to all economies. Such benefits include; increased production, acquisition of new ideas and technology, poverty reduction, employment generation, among others, depending on how it is managed. Some developing economies, however, have not benefited much from global trade, arising largely from the uncompetitiveness of domestic goods and services occasioned by high tariffs, high prices relative to foreign goods, a concentration on primary products, as well as their inability to penetrate the international market [4]. All these factors as Uwakaeme [5] asserted contribute significantly to the low level of exports by developing economies in global trade market and also the failure to effectively gain from bi-lateral trade agreements with the developed economies who most of the time form bulk of their current account trade balance component.

It is sometimes observed according to Krugman and Obstfeld [6] that a country's account worsens immediately after a real currency depreciation and begins to improve only some months later. This is in tandem with the Marshall-Lerner (M-L) condition. According to the M-L condition, currency devaluation may succeed in

improving the trade balance in the long-run, if the sum of export and import elasticities become greater than unity (Bhamani-Oskooee & Wang, 2006). Policy makers closely follow this condition before making decisions. The intuition behind this elasticity approach is that due to currency devaluation, exporters have a chance to earn more money when they convert foreign exchange earnings from exports into domestic currency. At the same time, importers have to pay more in terms of domestic currency for imports. Hence, currency devaluation encourages exports and discourages imports for domestic economies. This is expected to improve the trade balance. Nevertheless, the impact of exchange rate devaluation on the balance of trade is not instantaneous [7].

Furthermore, the M-L condition suggests a specific pattern for the response of trade balance to exchange rate changes. Immediately following the devaluation of the currency, the volume of imports and exports may remain largely unchanged due partly to pre-existing trade contracts that have to be honoured. Moreover, in the short run, prices of imports become cheap and prices for export becomes cheaper to foreign buyers. This is due to consumer's search for acceptable cheaper alternatives especially when goods and services are close substitutes and no trade barriers. Over the longer term, devaluation in the exchange rate can have the desired effect of improving the Current Account Balance (CAB) of the country.

This study unlike others [8], Danmola, Abba and Oladipo [9] and Edwards and Willcox [10] seeks to compare bilateral non oil trade balance between Nigeria and Egypt. Also, non-oil trade balance between the two countries was used, this is because reliance on oil exports which is dependent on oil quota from the Organization of Petroleum Exporting Countries (OPEC) will not reflect the effects arising from currency devaluation or appreciation. Furthermore, this study applied the DL (distributed lagged) model to find the parameter estimates and elasticities of the trade balances with respect to real

devaluation and other relevant variables. The delay in the improvement of trade balance is identified as the time lag that producers and consumers take to adjust to the new prices (Janz & Rhomberg 1973 in [11]). Above all, this study uses differentials (changes) in current account balance and real exchange rate. Arising from the aforementioned discussions, it is widely believed that currency devaluation worsens the trade balance in the short-run, but improves it in the long-run if properly managed. The above perception and the enormous depreciation of the Naira since the 1980s offers basis for an empirical examination of the M-L condition on the Nigeria's Non-Oil Export Trade Balance with Egypt both in the short run and long run.

2. LITERATURE REVIEW

The foreign-exchange rate between two currencies is the rate at which one currency will be exchanged for another. Omojinite [12] opines that exchange rate is the value of a given currency expressed as a proportion of another currency. Muriithi [13] asserted that exchange rate is among the most important prices in an open economy. It influences the flow of goods, services and capital and exerts strong pressure on the balance of payments, inflation and other macroeconomic variables. Thus, when the prices of most goods and services change, the prices are said to "rise" or "fall." For exchange rates, the terminology is different. When the exchange rate for a currency rises, so that the currency exchanges for more of other currencies, it is referred to as appreciating or "strengthening and vice versa [14]. By implication, the strengthening of one currency must mean the weakening of the other.

Interestingly, Marshall-Lerner (M-L) condition which is at the heart of the elasticities approach to the balance of payments conversations is named after two economists who discovered it independently - Alfred Marshall (1924) and Abba Lerner (1944). The condition seeks to answer the following question: when does devaluation (in fixed exchange or floating exchange rates) of the currency improve the current-account balance of a country? The traditional approach to the effects of devaluation on the balance of trade runs in terms of elasticities which is contained in the M-L which states that the sum of the elasticities of demand for a country's exports and of its demand for imports has to be greater than unity for a devaluation to have a positive effect on a country's trade balance. If the sum of these

elasticities is smaller than unity, a country can instead improve its balance of trade by revaluation [15]. The M-L condition further reiterates that a real devaluation of the currency will improve the trade balance if the sum of the elasticities (in absolute values) of the demand for imports and exports with respect to the real exchange rate is greater than one.

Applying this condition and using simple observation of the effects of currency devaluations over time, economists have developed the J-Curve Hypothesis, which says that in the short term period following currency devaluation, the balance of trade for that country will decline, but then as elasticities grow, the balance of trade will begin to improve. The graph showing this trend often looks like a "J", thus prompting economists to refer to it as the "J-Curve." This improvement in balance of trade of course occurs as a result of the competitiveness effects of currency devaluation, whereby the home country's products whose currency is devalued becomes cheaper in foreign markets in relative to foreign goods and foreign goods become more expensive in domestic markets relative to domestically produced goods. According to Obasanmi and Nedozie (2016), an ethical aspect of devaluation exists. Suppose the J-Curve was functional, the immediate expected beneficiaries of devaluation are the persons involved in import-export business that belongs to the upper echelon of the society. People who will lose are the citizens who have to purchase most foreign products. In particular the loss of devaluation is to be faced by the low income cohort of the society. So even if the J-curve exists, the currency devaluation can be challenged on ethical grounds. So the question remains: is it morally justified to depreciate the currency given the scenario stated above?

Empirically, the general observation from some studies is that the results have been mixed depending on many factors including sample periods, methodology adopted, estimation techniques, measures of volatility adopted and the countries considered (developed or developing). Some research results are consistent with the M-L Condition while others are not. Rose and Yellen [16]; and Akhtar and Malik [17], results suggested that real devaluation is likely to worsen the trade balance with USA and Germany while it has favorable impact on trade balance with UK and Japan. In the opinion of Akinlo and Odusola [18], Alemu and Jin-Sang [19], Siok and Wai (2014), Baba

and Yazici, (2016) found no evidence of the J-curve in their separate studies. Danmola, Abba and Oladipo [9] in their empirical results indicated that real domestic and real foreign incomes affect Nigeria's trade balance both in the short-run and in the long-run, but that the naira devaluation affects her trade balance only in the long-run, suggesting that the M-L condition is satisfied. The situation was different in the studies of Afolabi and Akhanolu [8] and Akinlo and Adejumo [20] as they found that exchange rate volatility has positive and significant effects on non-oil exports in the long run while the short run impact of the exchange rate volatility is statistically insignificant.

measured by the reciprocal of one country's price level against another. Haskio (2002) observed that the Purchasing Power Parity is predicated on the law of one price which holds that identical goods should cost the same in all countries, assuming transportation costs are eliminated and tariffs and quota restrictions are removed. Arising from this, the impact of the currency's devaluation on the current account can be assessed by considering the price sensitivity of imports and exports. Therefore, the theoretical understanding of this study is derived from the works of both Alfred Marshall (1923) and Abba Lerner (1944) which supports the Purchasing Power Parity.

3. RESEARCH METHODS

3.1 Theoretical Framework

The Purchasing Power Parity Theory (PPPT) constitutes one of the fundamental building blocks in modeling modern theories of exchange rate and trade balance determination. According to Rogoff [21], the theory, in its modern state is

Applying and extending Rose and Yellen [22] and Rose [16] which incorporated the gaps in the Standard Trade Model and the Extended Trade Model, where P (export price in domestic currency), P* (import price in foreign currency), e (the domestic price of a unit of foreign exchange), eP* (import price in domestic currency) and E were denoted as the real exchange rate. Thus, the real Current Account Balance (CAB) can be deduced as:

$$X = f(E, Y^*) \tag{3.1}$$

$$M = f(E, Y) \tag{3.2}$$

$$CAB = X - M = f(E, Y^*) - f(E, Y) \tag{3.3}$$

Where

E	=	Exchange Rate
X	=	Export
M	=	Import
CAB	=	Current Account Balance
Y*	=	Real Income of the importing economy
Y	=	Real Income of the exporting economy

The partial derivative of the real current account balance with respect to devaluation is given as:

$$\delta CAB / \delta E = \delta X / \delta E - \delta M / \delta E - M > \text{ or } < 0 \tag{3.4}$$

It can be shown that if CAB = 0, equation, then (3.4) will be reduced to the M-L Condition.

3.2 Model Specifications

Theoretically, as Rose and Yellen [22] opined, the ML Condition suggests that the partial derivative, $\partial T^B_{jt} / \partial Q^R_{jt}$ will be negative in the short-run and positive in the long-run.

Where;

∂T^B_{jt}	=	The partial derivative of non-oil trade balance,
∂Q^R_{jt}	=	The partial derivative of real bilateral effective exchange rate,

Therefore, based on equation (3.4), to measure the elasticity of the current account balance with respect to the real exchange rate, real income in the exporting economy and real income in the importing economy, the model as developed by Rose and Yellen [22] can be expressed as:

$$CAB_{it} = \alpha_1 + \alpha_2 E_{ij} + \alpha_3 Y_{it} + \alpha_4 Y^*_t + u_t \quad (3.5a)$$

Since the research is focused on Non-Oil Export Trade Balance, CAB_{it} in Equation (3.5a) is replaced by Nigeria Non-Oil Trade Balance given as

$$NOXTB_{ij} = \alpha_1 + \alpha_2 E_{ij} + \alpha_3 Y_{it} + \alpha_4 Y^*_t + u_t \quad (3.5b)$$

Where:

α_1	=	Constant term
$\alpha_2 - \alpha_4$	=	Measures the elasticity of the trade balance with respect to the real exchange rate, real income in the exporting economy, and real income in the importing economy.
$NOXTB_{ij}$	=	Non Oil Export Trade Balance between Nigeria and Egypt.
E_{ij}	=	Exchange rate between Nigeria and Egypt.
Y_{it}	=	Real income of Nigeria at time 't',
Y^*_t	=	Real income of Egypt at time 't'
u_t	=	Error term

According to Akonji, Wakili and Sakiru [23] by the time exchange rate is to be determined, goods already in transit and under contract have been purchased, creating a situation leading to time lag on the impact of exchange rate determination changes. Introducing such time lag (distributed lagged) effect into the model as reflected in equation 3.5b, the study has the following as the models for the study.

$$NOXTB_{ij} = \alpha_1 + \alpha_2 E_{t-1} + \alpha_3 Y_{t-1} + \alpha_4 Y^*_{t-1} + z_t \quad (3.6)$$

Apriori expectations: α_2 and $\alpha_3 < 0$, $\alpha_4 > 0$

Stating equation 3.6 from origin, therefore

$$NOXTB_{ij} = \beta_1 E_{t-1} + \beta_2 Y_{t-1} + \beta_3 Y^*_{t-1} + y_t \quad (3.7)$$

Apriori expectations: β_1 and $\beta_2 < 0$, $\beta_3 > 0$

Since, the study attempts to compare Nigeria's Non-Oil Export Trade Balance (NOXTB) with Egypt, equations 3.6 and 3.7 are adopted and modified as follows:

Short Run Distributed Lag Model of Bilateral trade between Nigeria and Egypt

$$NOXTB_{NEgy} = \alpha_1 + \alpha_2 E_{N/EEt-1} + \alpha_3 Y_{t-1} + \alpha_4 Y^*_{Egyt-1} + k_t \quad (3.8a)$$

Apriori expectations: α_2 and $\alpha_3 < 0$, $\alpha_4 > 0$

Where:

$NOXTB_{NEgy}$	=	Non-Oil Export Trade Balance between Nigeria and Egypt.
$E_{N/EEt-1}$	=	Exchange rate between Nigeria and Egypt
Y_{t-1}	=	Real income of Nigeria
Y^*_{Egyt-1}	=	Real income of Egypt
k_t	=	Error term
α_1	=	Constant term
$\alpha_2 \alpha_3 \& \alpha_4$	=	Measures of Coefficients of identified variables.

Long-Run Distributed Model of bilateral trade between Nigeria and Egypt

$$NOXTB_{NEgy} = \beta_1 E_{N/EEt-1} + \beta_2 Y_{t-1} + \beta_3 Y^*_{Egyt-1} + k_t \quad (3.8b)$$

Where, β_1, β_2 & β_3 = Measures of Coefficients of identified variables

Apriori expectations: β_1 and $\beta_2 < 0, \beta_3 > 0$

3.3 The Estimation Techniques

For the purpose of the empirical analysis of the data collected, the Ordinary Least Square (OLS) was used to estimate the distributed lagged equation. The regression analysis will be used to determine the direction and magnitude of the regressors on the regressands and the test of the M-L Condition. Secondary data were collected from various issues of the World Development Index, Federal Ministry Industries Trade and Investment, Central Bank [24] of Nigeria Statistical Bulletins for the period of 1981-2019.

4. DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Results of Short Run and Long Run Regression

In Table 1, the short run result shows that the independent variables explain 73% systematic variation in the dependent variable Non oil Export trade balance between Nigeria and Egypt ($NOXTB_{NEgy}$), while 27% is unexplained. This is validated by the \bar{R}^2 of 69%, while 31% is unexplained after adjustment for degree of freedom. This suggests that the multi-regression data fits the lines. The DW statistic was 1.946350 implying that there is no serial autocorrelation in the estimated model. The probability (F- Stat) suggests that the model is statistically significant at 5% since its prob value is 0.00000 which is less than 0.05. With the coefficient of the constant as -1.462774, it implies that when all the independent variables are held constant, $NOXTB_{NEgy}$ will decrease by -1.462774 units. Under the t-statistic, and using the *rule of thumb*, the exchange rate between Nigeria and Egypt ($E_{N/EEt-1}$) and Income of importing country (Y_{t-1}) are individually significant since the absolute value is greater than '2' while income of Egypt (Y^*_{Egyt-1}) was not individually statistically significant.

From the co-efficients of the independent variables, all conformed to the *theoretical* expectations. Exchange rate between Nigeria

and Egypt ($E_{N/EEt-1}$), Real income of Nigeria (Y_{t-1}) and Real income of Egypt (Y^*_{Egyt-1}). The result of $E_{N/EGPt-1}$, indicates that a unit devaluation in exchange rate increases the $NOXTB_{NEgy}$ by approximately 0.041169 units. A unit decrease in domestic income (Y_{t-1}) increases $NOXTB_{NEgy}$ by approximately 3.06 units. In the same vein, a unit increase in Real income of Egypt (Y^*_{Egyt-1}) increases the $NOXTB_{NEgy}$ by approximately 1.10 units.

The implications of this result is that in the short run the M-L condition is confirmed this is because the ML condition assumes that a devaluation in currency will make the trade balance to decrease in the short run. This also confirms the apriori sign where exchange rate coefficient ($E_{N/EEt-1}$) has a negative sign. This confirms finding of Akinlo and Adejumo [20] who found an empirical evidence in favour of the short-run deterioration of the trade balance as implied by the M-L Condition amongst some selected trading partners in Sub-Sahara Africa.

The long run estimates shows that the independent variables explain 88% systematic variation of the dependent variable; Non oil Export Trade Balance between Nigeria and Egypt ($NOXTB_{NEgy}$), while 12% is unexplained. This is validated by the adjusted R of 87%, while 13% is unexplained after adjustment for degree of freedom. The DW statistic value was 1.903729 implying that there is no serial autocorrelation in the estimated model. The probability (F- Stat) suggests that the model is statistically significant at 5% since its prob value is 0.00000 which is less than 0.05. Under the t-statistic, and using the *rule of thumb*, the exchange rate between Nigeria and Egypt ($E_{N/EEt-1}$) and real income of Egypt (Y^*_{Egyt-1}) were individually statistically significant since the absolute value is greater than '2' and the prob value results, while Income of importing country (Y_{t-1}) was not individually statistically significant.

The co-efficients of the independent variables, Real income of Nigeria (Y_{t-1}) and Real income of Egypt (Y^*_{Egyt-1}) conformed to the *theoretical* expectations. While Exchange rate between

Table 1. Summary of short run and long run regression results for bilateral trade between Nigeria and Egypt model

Independent Variable	Short Run Estimation	Long Run Estimation
Constant	-1.462774 (-7.500252)	-
$E_{N/EEt-1}$	-0.041169 (-4.340118) [0.002]	0.049737 (2.334107) [0.0265]
Y_{t-1}	-3.06E-06 (-2.556490) [0.0168]	-2.76E-06 (1.001106) [0.3248]
Y^*_{Egyt-1}	-1.10E-06 (1.185422) [0.2466]	0.212544 (4.895496) [0.0001]
R^2	0.733949	0.882489
\bar{R}^2	0.693018	0.870738
F-statistic	17.93140 [0.00000]	75.09833 [0.00000]
D Watson Statistic	1.946350	1.903729

Source: Author's Compilation from Regression Output 2020

Nigeria and Egypt ($E_{N/EEt-1}$) did not conform on the long run. The co-efficient of $E_{N/EEt-1}$ shows that there is direct relationship between $NOXTB_{NEgy}$ and $E_{N/EEt-1}$. In other words, a unit appreciation in exchange rate increases the $NOXTB_{NEgy}$ by approximately 0.049737 units and vice versa reflecting a direct relationship. An inverse relationship exist in the relationship between Y_{t-1} and $NOXTB_{NEgy}$, thus, a unit decrease in domestic income (Y_{t-1}) increases $NOXTB_{NEgy}$ by approximately 2.76 units. Finally, there exists a positive relationship between Real income of Egypt (Y^*_{Egyt-1}) and the $NOXTB_{NEgy}$, which implies that a unit increase in Real income of Egypt (Y^*_{Egyt-1}) increases the $NOXTB_{NEgy}$ by approximately 0.212544 units.

The implication of this result is that there exists a confirmation of the M-L condition in Nigeria – Egypt trade relation. This is in line with the research findings of Edwards and Willcox [10] that exchange rate induces an inelastic and significant relation on trade balance in the long run. Thus, the null hypothesis is rejected while the alternate hypothesis is accepted that there exists an M-L phenomenon in the non-oil export trade balance between Nigeria and Egypt in the long run.

4.2 Implication of Results

The implications from the findings are in three folds:

- The validation of the M-L Condition in the trade relations with Egypt in the short run

might be because of the low volume of trade transactions between them.

- The results revealed that both countries may have most of their major trading partners outside the shores of Africa.
- It shows also that the volume and value of trade transactions that exists amongst them is not significant.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study analyzed how devaluation of exchange rate improves the net trade balance between Nigeria and Egypt. The empirical results presented in this study showed that devaluation of exchange rate is very important to encourage exports. The ML Condition was validated in the trade relations with Egypt in the short and long run probably because of the low volume of trade transactions between them and per capital income of both countries under review. It is also concluded from the results that other macroeconomic variables used were also significant. The higher income level of Egypt may have led to improvement in the trade balance of domestic country.

5.2 Recommendations

The study recommended as follows:

- (a) Exportable products should not only be primary products but should include other products that Nigeria has comparative advantage over. This is because the low volume of trade between these countries can be attributed to similarities of products being exported.
- (b) There should be a conscious efforts to boast exportable non oil commodities.
- (c) For Nigeria to implement any devaluation policy, she must first and foremost ensure a substantial increase in her non oil exports as against imports. This is the only way the benefits can be maximized for the country.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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