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Abstract.
The purpose of this study investigates the validity of the Balassa-Samuelson effect in selected African countries. The kernel of the Balassa-Samuelson (BS) effect is the relationship between productivity and real exchange rate. The study therefore, estimates the equilibrium real exchange with total factor productivity as the main explanatory variable. The results revealed that Balassa-Samuelson effect holds in the selected African countries. The results show a positive relationship between real exchange rate and productivity. An increase in total factor productivity causes real exchange rate appreciation. An improvement in productivity can cause countries to experience an increase in prices of their products relative to trading partners. The study recommends that the selected African countries should pursue policies that maintain competitive real exchange rate.

Keywords: Real Exchange Rate, Productivity, Balassa-Samuelson Effect

1. Introduction

The Balassa-Samuelson (BS) effect results from an extension of the Purchasing Power Parity (PPP). Balassa [1964] questioned the validity of the PPP as a theory that explained the determination of the equilibrium exchange rate [Moosa, 2012]. The BS postulates that differentials in labour productivity between tradable and non-tradable sectors results in fluctuations of real costs. It also results I fluctuation of relative prices and causes divergences in the real exchange rate [Asea and Mendoza, 1994]. A country with more relative productivity advantage in tradable goods than in non-tradable goods ought to possess a higher real exchange rate [Mercereau, 2003]. According to Romanov [2003], the BS effect defines volatility of real exchange rate through differences in productivity between tradable and non-tradable sectors of the economy.

The focus of the BS effect on productivity difference between the economy and its trading partners. It postulates that productivity growth is generally biased in favour of the tradable goods sector. That means economies that experience relatively more productivity than other economies tend to have higher productivity in tradable compared to the non-tradable sector. According to Montiel [2007], if there is higher productivity in the tradable sector, labour will move away from the non-tradable sector. This will increase costs in the non-tradable sector. This implies that in order sustain profitability in the non-tradable sector, a higher relative price (of non-tradable goods) will be required.

The hypothesis emerged because of the difference in productivity growth among sectors and wages that are generally less differentiated. Normally, productivity grows rapidly in the tradable goods sector than in the non-tradable goods sector. Rapid productivity growth in the tradable goods sector raises wages in all sectors. The prices of non-tradable goods relative to the prices of tradable goods increase resulting in the growth of the overall price level. Moreover, the speed of productivity is faster in developing countries because of their attempt to catch up with developed countries [Kharas, 2010].

The Balassa-Samuelson model employs the decomposition of the price level into tradable and non-tradable prices. Hence, the real exchange rate combines the real exchange rate for tradable goods and the ratio of the relative prices of tradable to non-tradable goods in two economies. Higher productivity growth in the tradable sector in one country implies that the relative non-tradable to tradable prices will increase more rapidly [Driver, Sinclair and Thoenissen, 2013].

According to Montiel [2007], agriculture and manufacturing are normally included in the tradable sector, while service sector is included in the non-tradable sector. The BS effect predicts that countries that have low productivity in the tradable compared to non-tradable goods tend to have lower prices than other countries. This is generally the case for many developing countries. This is the opposite of advanced economies, which tend to have productivity in the tradable sector. An increase in the prices of tradable goods causes a rise in the general price level (including the price of non-tradable goods). The price of non-tradable goods generally rise faster than that of tradable goods. The real exchange rate exchange rate will appreciate. Poor and low income countries tend to have low productivity in the tradable sector and this generally tend to reduce the general price level. The real exchange rate will then depreciate. This view is supported by Coudert [2004] and Martinez-Hernandez [2017]. Under the BS effect or hypothesis, higher profitability in the tradable division of rich nations raises the general level of costs and the genuine trade rates. Low efficiency in the tradable sector of poor nations is normally maintained or reduced to the general level of costs and more devaluated/deteriorated trade rates [Martinez-Hernandez, 2017].

There are many studies which investigate the BS effect in advanced and developing economies [such as Drine and Rault, 2002; Gubler and Sax 2011]. Some other studies [such as Kakkar and Yan] computed the resulting real exchange rate misalignment. Others went further to test the effect of misalignment on economic performance [Sallenave, 2010; Viera and MacDonald, 2012]. These previous studies examined the BS effect using inappropriate measure of technology or productivity. Relative GDP was used in many of these studies to proxy productivity and technology. The problem with relative GDP is that an increase in this variable should not necessarily be interpreted as a measure of technology.

Hence, it is important to use an appropriate measure of technology or total factor productivity. Contrary to previous studies, this study test the Balassa-Samuelson effect using a different and appropriate proxy for total factor productivity or technology. This study computes total factor productivity by using the Cobb-Douglas production function. In line with Tintin [2009], total factor productivity (TFP) computed using the Cobb-Douglas production function is a better representation of productivity or technology. This was supported by Eita, Khumalo and Choga [2019] who computed productivity using the production function for African countries. The rest of the study is organised as follows. Section 2 presents the literature review. Sections 3 presents the methodology. Sections 4 presents the empirical results, while the conclusion and recommendations are presented in Section 5.

2. Literature review

2.1 Introduction

This section presents the theoretical foundations and empirical literature related to the Balassa-Samuelson effect. The empirical literature includes studies from developed and developing countries.

2.2. The Balassa-Samuelson Model

The Balassa-Samuelson model hypothesises that higher productivity differential in production of tradable goods between countries causes great differences in wages and in the prices of services. It also account for the pronounced differences between the purchasing power parity and equilibrium real exchange rate. The Balassa-Samuelson model is based on productivity differentials influencing the domestic relative price of non-tradable goods while divergences from PPP display disparities in the relative price of non-tradable goods [Asea and Corden, 1994]. Asea and Corden [1994] provided an overview of the Balassa-Samuelson model as follows. The Balassa-Samuelson model comprises of a small open economy consisting of capital and labour to produce tradable goods (T) which are priced in the world markets and non-tradable goods (NT) priced in the domestic market. Perfect mobility is presumed for capital and labour across all domestic sectors while labour is presumed to be immobile between countries and capital is not restricted internationally. The model also assumes that there is full employment in the economy. The model is presented as follows.

$$L = L_T + L_N \tag{1}$$

Where the labour in the tradable sector is represented by L_T, while L_N is labour in the non-tradable sectors. To produce tradable and non-tradable goods, inputs of capital (K_T, K_N) and labour (L_T, L_N) are necessary. Linear homogenous functions describe technology in each sector:

$$Y_T = \theta_T K_T^{\beta T} L_T^{\alpha T} \equiv \theta_T L_T f(k_T) \quad \text{and} \quad Y_N = \theta_N K_N^{\beta N} L_N^{\alpha N} \equiv \theta_N L_N f(k_N) \tag{2}$$

Where Y_T, Y_N represent the output in the tradable and non-tradable sectors while $k_T \equiv K_T / L_T$ and $k_N \equiv K_N / L_N$ and θ_T, θ_N are stochastic productivity parameters.

The world interest rate i is used as given. The presence of perfect competition equates the world interest rate to the value of the marginal product of capital in each sector:

$$i = \theta_T \beta_T k_T^{(\beta T - 1)} \quad \text{and} \quad i = s\theta_N \beta_N k_N^{(\beta_N - 1)} \tag{3}$$

Where $s = P^N / P^T$ is the relative price of non-tradable goods (the real exchange rate).

$i = \theta_T \beta_T k_T^{(\beta T - 1)}$ determines capital-labour in tradable goods sector (k_T). The two factors of production are utilised to obtain the factor price frontier by maximising profit $(F(K, L) - wL - rk)$ which in turn creates factor demand function in each sector. The notion of linear homogeneity allows the wage rate in the tradable sector to be represented by:

$$\begin{aligned} w &= \theta_T [f(k_T) - f'(k_T) k_T] \\ &= \theta_T (1 - \beta_T) k_T^{\beta T} \end{aligned} \tag{4}$$

Where $f''(k) < 0$ is an increasing function of k, meaning that $i = f'(k)$ is a decreasing function of W and i therefore decrease to the factor price frontier, a downward locus on the (w, i) plane with parameter k. Solving for k_T from ($i = s\theta_N \beta_N k_N^{(\beta N - 1)}$) and substituting in ($w = \theta_T (1 - \beta_T)(\theta_T \beta_T / i)^{\frac{\beta_T}{1-\beta_T}}$) yields the wage equation:

$$w = (1 - \beta_T)(\theta_T \beta_{T/i})^{\frac{\beta T}{1-\beta_T}} \tag{5}$$

In a small economy, the determination of the wage (W) is reliant on factor productivity in tradable sector. The capital-labour ratio as derived from $i = s\theta_N \beta_N k_N^{(\beta_N - 1)}$ and results in:

$$k_N = (s\theta_N \beta_N / i)^{\frac{1}{1-\beta_N}} \tag{6}$$

For perfect competition in the non-tradable sector, the following condition should hold:

$$s = \theta_N f(k_N) = ik_N + w \tag{7}$$

From ($Y_N = \theta_N K_N^{\beta N} L_N^{\alpha N} \equiv \theta_N L_N f(k_N)$, $w = \theta_T (1 - \beta_T)(\theta_T \beta_T / i)^{\frac{\beta_T}{1-\beta_T}}$ and $k_N = (s\theta_N \beta_N / i)^{\frac{1}{1-\beta_N}}$) for given i the relative price of non-tradable goods is:

$$\hat{s} = \alpha N \hat{w} - \hat{\theta}_N \tag{8}$$

$$s = \frac{\alpha N}{\alpha T}\hat{\theta}_T - \hat{\theta}_N \qquad (9)$$

Where a hat signals the rate of percentage change. The relative price of non-tradable goods is dependent on the productivity differential in the tradable and non-tradable sectors.

Although the Balassa-Samuelson theory is employed to decipher economic issues by economists and policymakers, it is not without weaknesses. Bergin et al [2004] cited that productivity gains were not only limited to manufactured goods but included gains from information technology and retail as assumed by the theory. The theory also overlooks services such as information sectors that are now becoming increasingly tradable due to technological advancements. Genius and Tzouvelekas [2008] remonstrated the neglect of time-specific factors that potentially influenced the relationship between productivity and real exchange rates. They further mentioned that the assumption of unobservable country-specific factors impartially influencing the projected connection between labour productivity and real exchange rates was restrictive. However, the Balassa-Samuelson theory remains a popular choice amongst economists and policymakers to interpret various applied economic issues.

2.2. Empirical Literature

There is an extensive literature on the Balassa-Samuelson effect or hypothesis. There is a group of empirical studies conducted in developed economies. Ito, Isard and Symansky [1999] investigated the Balassa-Samuelson hypothesis in high-growth Asian countries. A generally pronounced Balassa-Samuelson effect was observed in Japan, Korea, and Taiwan. The study further suggested that the validity of Balassa-Samuelson hypothesis to an economy depended on the stage of development of that economy. The hypothesis is particularly suited for a rapidly expanding under resourced open economy. The expansion must entail a move from an industrial structure and export composition. However, a growing economy does not imply applicability of the Balassa-Samuelson if the economy has recently emerged from the primary goods exporter or planned economy phase.

Macdonald and Ricci [2001] investigated the impact of the distribution sector on the real exchange rate, including the Balassa-Samuelson effect and other macroeconomic variables such interest rates, size of net foreign assets to GDP ratios for ten developed countries (Belgium, Denmark, Finland, France, Italy, Japan, Norway, Sweden, Germany and USA). A panel dynamic ordinary least squares estimator was employed to estimate long-run coefficients. The results revealed growth in productivity and competitiveness of the distribution sector caused an appreciation of the real exchange rate. Using ARDL estimation technique, Chowdhury [2011] also found evidence of the Balassa-Samuelson effect in Australia for the period 1990-2003. Égert et al [2002] investigated the Balassa-Samuelson effect in nine Central and Eastern European countries. Panel cointegration techniques were employed and evidence of internal transmission mechanism was found. It was attributed to non-tradable inflation in the open sector because of productivity growth. The results indicated that an increase in productivity causes real exchange rate to appreciate. Kakkar and Yan [2012] examined the Balassa-Samuelson effect for six Asian economies. The results indicated further that there was real exchange rate misalignment. The real exchange rate was misaligned.

Sallenave [2010] investigated the Balassa-Samuelson effect in a study about the growth effects of real effective exchange rate misalignments for the G20 countries. Similarly, Vieira and MacDonald [2012] studied the impact of real exchange rate misalignment on long-run growth for a set of ninety countries with adjustments for the Balassa-Samuelson effect by using real GDP per capita to account for the Balassa-Samuelson effect. They found that exchange rate misalignment impacted economic growth.

Egert et al [2002] explored the hypothesis in the Czech Republic, Hungary, Poland, Slovakia and Slovenia using time series and panel cointegration approaches. The results of the study presented a good application of the hypothesis in these transition economies for the period of 1991Q1 to 2001Q2. However, the study found that productivity growth did not entirely lead to price increments because of the construction of the CPI indexes. DeLoach [2001] conducted a study to uncover evidence in support of the Balassa-Samuelson hypothesis. The results revealed a relationship consistent with the Balassa-Samuelson hypothesis, that of a significant long-run relationship between the relative price of non-tradable goods and real output.

Drine and Rault [2002] conducted an empirical investigation and tested the validity of the Balassa-Samuelson effect or hypothesis in six Asian countries. A panel data cointegration procedure developed by Pedroni [2000, 2004] was used and further compared to the traditional Johansen cointegration test. A long-run relationship between real exchange rate and productivity differential was observed under the traditional time series model. However, advanced dynamic panel techniques showed contrary results. This was attributed to the absence of a positive long-run relationship between productivity differential and relative prices.

Tintin [2009] investigated the Balassa-Samuelson hypothesis in ten OECD countries for the period 1975 and 2007. A country-specific analysis was conducted through the Johansen cointegration techniques and findings suggested that the BS hypothesis was valid in OECD countries. Gubler and Sax [2011] investigated the robustness of the Balassa-Samuelson hypothesis for panel of OECD countries for the period of 1970 to 2008. The real exchange rate was conditioned on the measures of productivity for both the tradable and the non-tradable sector in addition to control variables such as the terms of trade and government spending share. The DOLS model specifications and the between-dimension group-mean panel FMOLS estimator from Pedroni [2001] were employed. The study did not find evidence of the Balassa-Samuelsson hypothesis.

There is also an extensive empirical literature on the relationship between real exchange rate in developing and emerging economies. Choudhri and Khan [2005] tested for the Balassa-Samuelson in sixteen developing countries including African countries such as Kenya, Morocco, South Africa and Cameroon. The study showed that traded-nontraded productivity differentials were vital because they impact relative price of nontraded goods, and that the relative price applied a substantial effect on the real exchange rate. Likewise, the terms of trade influence the real exchange rate.

Omojimite and Oriavwote [2012] examined the relationship between the Naira real exchange rate and macroeconomic performance and the Balassa-Samuelson hypothesis in Nigeria. The time series data covered the period 1970 to 2009 and the Johansen cointegration procedure was employed. The parsimonious error correction model (ECM) results revealed a negative sign and a statistically significant one period lag value of technological productivity. These results therefore implied the existence of the Balassa-Samuelson hypothesis in Nigeria. Increase in productivity causes real exchange rate appreciation in Nigeria.

Tica and Družić [2006] investigated the Harrod-Balassa-Samuelson (HBS) effect on fifty-eight empirical papers. The evidence supported the HBS model, these results were influenced by the types of tests applied and set of investigated countries. Funda, Lukinić, Ljubaj [2007] examined the Balassa-Samuelson effect in Croatia for the period 1998 Q1 to 2006 Q3. No evidence of the Balassa-Samuelson effect in Croatia was found.

Suleiman and Muhammad [2011] conducted a study estimating the long run effects of real oil price on real exchange rate by means of the Johansen procedure from 1980 to 2010 in Nigeria. The empirical analysis examined the effect of oil price fluctuations and productivity differentials (embodies the Balassa-Samuelson) on the real effective exchange. The resulted suggested that real oil price had a significant positive effect on the real exchange rate in the long run whilst productivity differentials had a significant negative influence on the real exchange rate. The productivity differentials were expressed against the trading partners of Nigeria. Contrary to Omojimite and Oriavwote's [2012] results, this study found no evidence of the Balassa-Samuelson effect in Nigeria shown by the negative and significant coefficient on the productivity differential. The appreciation of the real exchange rate was attributed to improvements in oil prices, not the Balassa Samuelson effect.

There is a group of studies which use a combination of developed and developing countries to test for Balassa-Samuelson effect. Bahmani-Oskooee and Nasir [2001] estimated a random coefficients model permitting country and time-specific productivity effects. They employed an analytic framework expressing an individual country's productivity and real exchange rates relative to the United States (US). The study was for the period 1965 to1992 and results revealed an invalid Balassa-Samuelson hypothesis for most African countries and some Latin American countries while it was valid for OECD countries and Asia. In an analysis of the long-run determination of exchange rates using sectoral data in twenty-four developing countries and fourteen OECD economies, Giacomelli [1998] found results in support of the Balassa-Samuelson effect. While Faria and León-Ledesma's [2003] revealed results unsupportive of the Balassa-Samuelson effect in the long run between two countries (the UK and US, German and Japan and Japan and the US). Genius and Tzouvelekas [2008] tested for the Balassa-Samuelson hypothesis on fifty-nine industrialised and developing countries (including African countries such as Rwanda and Ivory Coast amongst others). Results of the study revealed that the hypothesis was invalid in most African countries and some Latin American countries. They hypothesis held for OECD countries and Asia.

Based on the empirical inconclusiveness established in previous studies, this study investigated the Balassa-Samuelson effect in five African countries. A review of the empirical studies from both developed, emerging and developing economies most of them did not use proper proxies of technology or productivity. Most of these studies used relative real GDP or real GDP growth as a measure of productivity. Contrary to these previous research, this study computes total factor productivity using the Cobb-Douglass production function as an appropriate measure of productivity.

3. Methodology

3.1. Model Specification

Following an extensive review of the literature, the empirical model is expressed as follows:

$$re_{it} = \alpha_0 + \alpha_1 pr + \alpha_2 tt + \alpha_3 fa + \varepsilon_t \quad (10)$$

Where *re* is real exchange rate, *pr* is productivity, *tt* is terms of trade and *fa* is net foreign assets. The weighted average of a country's currency relative to basket of major currencies as a proxy for *re*. An increase in *re* is appreciation while a decrease will be interpreted as depreciation. An increase in productivity is expected to lead to real exchange rate appreciation. The variable of interest, *pr* captures the Balassa-Samuelson effect, which hypothesises that rapid economic growth is associated with real exchange rate appreciation because of differential productivity growth between tradable and non-tradable sectors. Tintin (2009) argues that total factor productivity is a better proxy for technology.

The effect of terms of trade on real exchange rate is ambiguous due to income and substitution effects. If income effect dominates, a rise in terms of trade permits an expansion of absorption and consequently an appreciation of the real exchange rate. However, if the substitution effect dominates, an increase in terms of trade causes real exchange rate depreciation. According to Lane and Milesi-Ferretti [2000], net foreign assets are generally taken as cumulative current account of net capital transfers. The transfers are adjusted in order to take into account of capital gains and losses that result from inward and outward foreign direct investment. This also include portfolio equity holdings. The effect of this variable is expected to be positive. According to Bleaney and Tian [2014], the real exchange rate will appreciate if there is an increase in net foreign asset.

3.2 Data description

The study uses annual data for the period 1991 to 2016. Five African countries are in included in the study. These are Democratic Republic of Congo, Mauritius, Morocco, South Africa and Tunisia obtained from Quantec database. The data in Quantec are sourced from the IMF's International Financial Statistics, World Bank Development Indicators, central banks and statistics organisations of individual countries. The sample period and the countries were selected on the basis of consistent data availability. Real effective exchange rate, terms of trade, net foreign assets, labour, capital are directly available in the Quantec database. Total factor productivity is computed using the Cobb-Douglass production function as previously explained. It is computed as follows:

$$y = AK^{\delta}L^{\gamma}$$

$$A = \frac{y}{K^{\delta}L^{\gamma}} \quad (11)$$

where *y, A, K, L,* $\boldsymbol{\delta}, \boldsymbol{\gamma}$ are total output, technology, labour, capital, output elasticities of capital, output elasticities of labour. Total factor productivity is taken as an appropriate proxy for technology.

3.3 Estimation Technique

The Fully Modified OLS Model

The fully modified ordinary least squares (FMOLS) is employed to estimate the equilibrium real exchange rate (BS effect). The FMOLS estimator was developed to estimate directly cointegrating relationships. This is done through making adjustment to the traditional ordinary least squares. It corrects for endogeneity and serial correlation that normally occurs when using the traditional ordinary least squares. Previous studies confirmed that FMOLS is superior compared to other methods of estimating cointegrating relations. Studies such as Cappucio and Lubian [1992] and Hagreaves [1993] as well as Phillips [1995] confirmed the advantages of FMOLS in estimating cointegrating relations and correcting serial correlations and endogeneity. Maddala and Kim [1998] outlined the course of the FMOLS. It is important to have cointegration before estimation of the long and short run empirical results. It is important to mention that the use of FMOLS suggest or implies that it is not necessary to the short run or error correction model.

Unit root test

It is important to mention to mention that the univariate characteristics of the data is the first step before estimation of the empirical model. This involves panel unit root test. The study uses the Levin, Lin and Chu test (LLC Test), Im, Pesaran and Shin test (IPS) to test for unit root**.** Detailed discussion of these panel unit tests is not available due to space limitation, but can be obtained from the authors on request. If variables are nonstationary, it is important to test whether they are cointegrated. This study uses Kao test in order to establish if there is cointegration.

The Kao Cointegration Test

This study applies Chaiboonsri et al [2010] to test for panel cointegration. The variables as presented in equation (10) are assumed to be nonstationary. The detailed discussion of Kao cointegration are presented here because of space limitation, but can be obtained from the authors on request.

If there is cointegration, the real exchange rate model as presented in equation (10), will be estimated. The FMOLS as proposed by Hansen and Phillips [1990] is estimated and it provides proper cointegration results that corrects for endogeneity and serial correlation.

4. Estimation Results

This section presents the empirical results of the stationarity tests, the real exchange rate cointegration test, long-run coefficient, Fully Modified OLS Estimates (FMOLS) and real exchange rate misalignment and macroeconomic performance estimation.

Panel Unit Root (Stationarity) Tests

The variables were subjected to the LLC and the IPS stationarity tests. The results for panel unit roots are not presented here because of space limitation, but can be obtained from the authors on request. The results show that some variables are stationary while other are nonstationary. Since majority of the variables are nonstationary, it is decided that the next step should be to test for cointegration. Since there is cointegration, the next step is to estimated long run results using FMOLS.

Cointegration Test Results

Table 1 presents the Kao panel cointegration test results. The decision rule of this test is rejecting the null hypothesis of no cointegration when the probability value is less than 5%. The results in this study are consistent with this rule therefore there is cointegration amongst the variables.

Table 1. Kao Cointegration Test Results.

Cointegration test	t-statistic	Probability
Kao Test	-4.050	0.000*

The ADF is the residual-based ADF statistic. The null hypothesis is no cointegration. * Indicates that the estimated parameters are significant at the 5% level.

Long-run coefficient

The results in Table 1 indicates the presence of a cointegration relationship amongst the variables. The FMOLS is applied to estimate the long run *re* model. The results are presented in Table 2.

Table 2. FMOLS long run - estimation results.

Dependent variable: *re*

Explanatory Variables	Coefficients
pr	0.138 (0.094)*
tt	-0.665 (0.001)*
fa	-0.001 (0.542)
R-squared	0.920
S.E. of regression	0.200

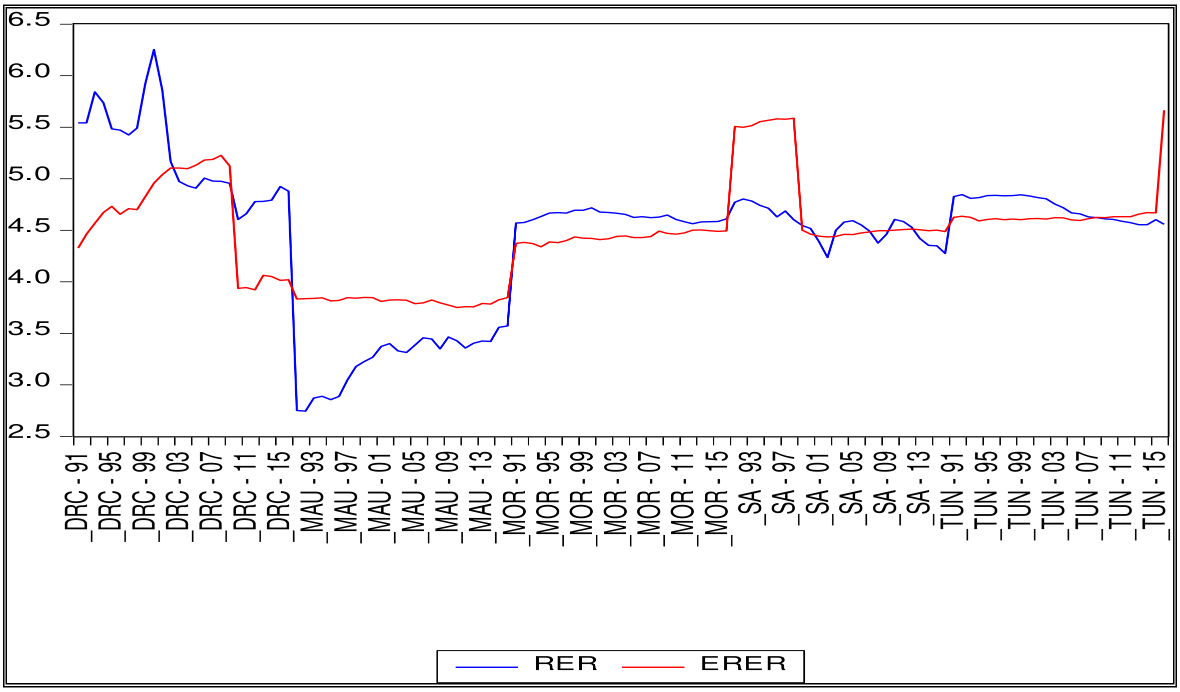
*p-values are in parentheses (); *10 % statistically significant level; **5 % statistically significant level; ***1 % statistically significant level. An earlier version of these results in Table 2 was presented by Eita, Khumalo and Choga (2019).

Table 2 presents the long-run coefficients results of the FMOLS estimator. The results reveal that *pr* is statistically significant and consistent with economic theory. The variable *tt* is statistically significant and consistent with economic theory. The variable *fa* is not statistically significant and is in defiance of economic theory.

A 1% increase in *pr* will appreciate the real exchange rate by 0.1% thereby indicating a positive relationship between the two variables as stipulated by economic theory. This indicates that there is evidence of BS effect in these countries. A 1% increase in *tt* will cause the real exchange rate to depreciate by 0.7%.

5.2 Real exchange rate misalignment

The real exchange rate misalignment is presented in Figure 1. Figure 1 shows that there were more periods where the real exchange rate was undervalued. This is when compared to periods when the real exchange rate was overvalued. Overvaluation is not appropriate because it has a negative effect on economic growth. This suggests that countries should come up with policies that minimise overvaluation of real exchange rate. This is supported by Gylfason [2002] who argues that overvaluation worsen the trade balance. It also causes speculative attacks, increased foreign debt, and discourages foreign direct investment.

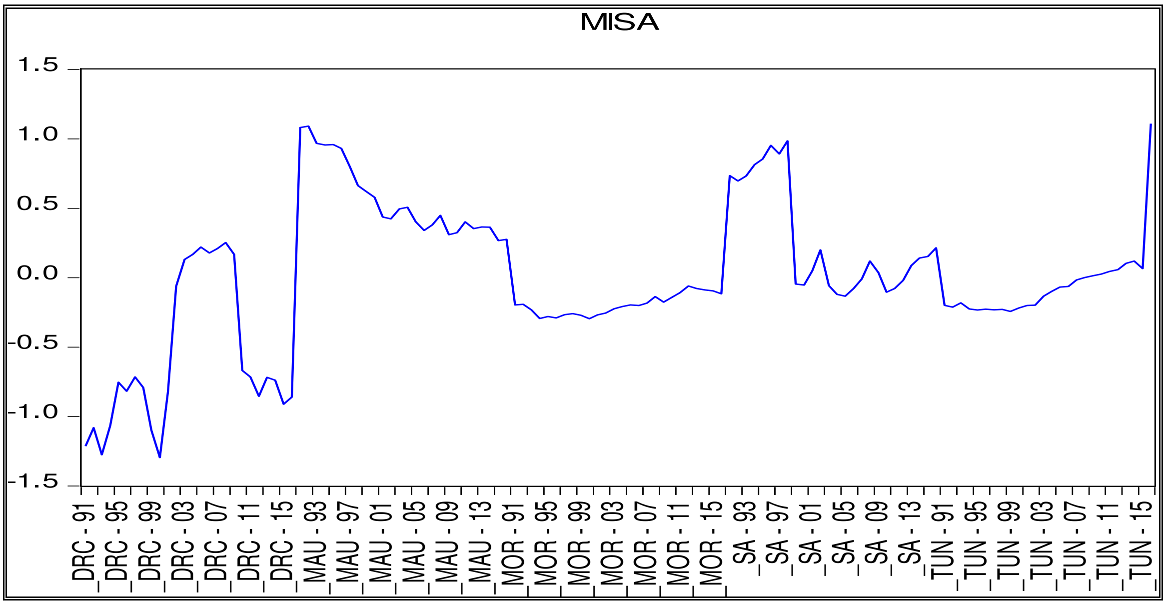


Note: DRC, MAU, MOR,SA,TUN denote Democratic Republic of Congo, Morocco, South Africa and Tunisia

ERER is the equilibrium real exchange rate and RER is the actual real exchange rate.

The earlier version of this Figure was presented in Eita, Khumalo and Choga [2019].

Fig. 1. Actual and equilibrium real exchange rate



Note: MISA denotes real exchange rate misalignment.

DRC, MAU, MOR, SA,TUN denote Democratic Republic of Congo, Morocco, South Africa and Tunisia.

The earlier version of this Figure was presented in Eita, Khumalo and Choga [2019].

Figure 2. Real exchange rate misalignment

7. Conclusion

The study investigates whether the Balassa-Samuelson effect or hypothesis holds for selected African countries. If the hypothesis holds, then there should be a positive relationship between real exchange rate and productivity. This study differs from previous studies in the sense that it uses appropriate measure of productivity. It computed productivity using the Cobb-Douglass production function. The Balassa-Samuelson effect was tested for 5 selected African countries. The countries are Democratic Republic of Congo, Mauritius, Morocco, South Africa and Tunisia. The relationship between total factor productivity and the real exchange rate is positive. This confirms the validity of the Balassa-Samuelson effect. An increase in productivity in these economies is associated an appreciation of the real exchange rate in these selected economies.

Undervaluation of the real exchange rate is appropriate for promoting economic growth and development in the selected African countries. These countries need to pursue economic policies in order to promote development and competitiveness of the economy. These countries should come up with policies that help to achieve and maintain a competitive exchange rate.

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