TRADE BALANCE DETERMINANTS IN EAST AFRICAN COUNTRIES

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ABSTRACT

East African Community (EAC) countries run huge trade imbalances and have maintained it as high as five percent for many years. Many countries including those from EAC borrow to sustain their budget deficits. This borrowing raised concerns about the sustainability of these imbalances and long-term consequences. Therefore, the main objective of this paper is to examine empirically the determinants of trade balance in East African countries and propose possible trade balance deterioration remedies. The proposed trade balance model was estimated using cointegration regression under the Full Modified Least Square (FMOLS) followed by the Vector Error Correction Model (VECM). Different mixed results were obtained across countries under study. However, among all other variables, this study found Foreign Direct Investment (FDI) as the main variable of interest and probable solution in improving the trade balance of EAC countries. EAC countries should, therefore, concentrate on export-oriented development policies which focus on export-oriented manufacturing industries because large amounts of FDI flow into those areas already.

Keywords: *Trade balance, FDI, Real Exchange Rate, Investment/Saving, GDP per capita*

INTRODUCTION AND OBJECTIVE

In the last two decades, trade imbalances for East African countries have been increasing and the pattern shows a continuation of the phenomenon. Burundi has the largest imbalance followed by Rwanda and Kenya. Uganda and Tanzania have trade imbalances of less than 20 percent of the GDP (for details see Table 1 and Figure 1). East African countries like many other sub-Saharan countries depend highly on agricultural commodity exports for their growth. As a result, they suffer when commodity prices drop. However, when commodities are expensive, they can account for a larger share of exports and imports. Nwanma (2016) pointed out that, like most African economies that depend heavily on commodities' exports, Mozambique suffered from the price drops, with the government being advised to find ways to diversify the economy to rekindle its momentum. Marinkov and Burger (2005) answered on whether the poor performance of African countries can be ascribed to a dependency on primary commodity exports. They pointed out that relative to the price of manufactured goods there was a downward secular trend in less than half of the commodity prices considered; moreover, prices were highly volatile and some countries considered GDP as dependent on exports.

Table 1: Trade Balance (% of GDP) 2006-2014

Country/Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Rwanda	-12.88	-15.73	-18.89	-20.22	-19.90	-24.58	-23.43	-21.03	-21.49
Kenya	-14.46	-15.38	-17.35	-15.50	-17.44	-22.11	-20.48	-19.29	-20.52
Burundi	-29.25	-19.19	-21.42	-18.86	-20.06	-27.83	-25.50	-28.14	-22.21
Uganda	-11.83	-13.00	-13.97	-13.29	-14.09	-14.74	-14.45	-12.89	-12.67
Tanzania	-12.37	-14.08	-16.36	-11.72	-12.43	-18.21	-14.88	-16.81	-15.45

Source: Author using UNCTAD database (May 2016)

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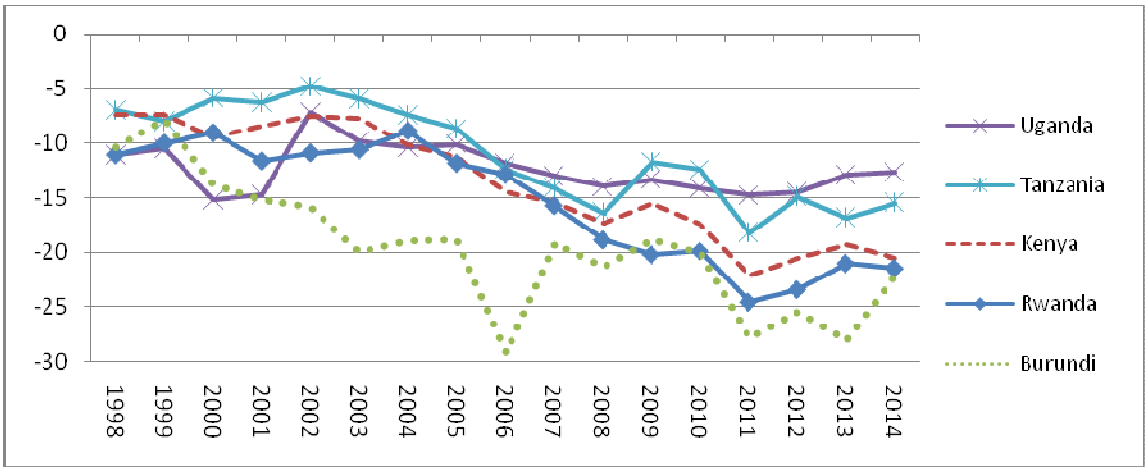
Business Management Review pp. 78-89 ISSN 0856-2253(eISSN 2546-213X)



Source: Author using UNCTAD database (May 2016)
Figure 1: Trade Balance (% of GDP) (1998-2014)

Large budget deficits can be detrimental to an economy if they continue over long periods. When this happens, current account or trade deficits may lead to the accumulation of foreign debt which has to be repaid at some point in the future. There are also possibilities of 'twin deficits', which refer to the economies that run both current account and budget deficits which require financing and, therefore, invite concerns over their sustainability. Countries with very high current account deficits also have higher fiscal deficits and the difference is statistically significant at conventional levels (Verc and Oswake, 2007).

When re-examining the "twin deficits" hypothesis evidence for Australia, Makin and Narayan (2013) concluded that, the relationship between any open economy's budget imbalance and its external account imbalance has major implications for macro-economic policy management. The stronger this relationship is in the short run, the less impact fiscal stimulus it has on the domestic economy due to spending leakage abroad. In the limit case of a short run one-for-one relationship between the fiscal deficit and the external deficit, fiscal stimulus is not likely to have any net impact on domestic GDP and employment. Jankovic (2015), who studied the twin deficits in the Serbian economy, pointed out that in countries where a budget deficit chronically appears and which do not have enough domestic savings to finance excessive government spending will be in a worse-off position.

Many countries including those in the EAC borrow to offset their budget deficits. When government debts are high and unsustainable, it is difficult for an economy to maintain a current account deficit and mostly trade deficits or surpluses reflect the country's international borrowing or lending profile over time. Rose (2005), who examined why countries pay their debts, pointed that debt renegotiation was associated with an economically and statistically significant decline in bilateral trade between a debtor and its creditors. The decline in bilateral trade was approximately eight percent a year and persisted for 15 years. One standout reason behind why sovereigns were reluctant to default on their external debts was their fear the negative effects that debt renegotiation had for trade.

Consider the national account (X-M) = (T-G) + (S-I) where X = exports, M = imports, T = taxes, S = private savings, (T – G) = public savings. The trade surplus (or deficit) is equal to the total national savings (or dis-savings). It is clear that state of trade balance can be affected by the status of public savings and the status of private sector (household) savings. Household saving constitute the main domestic source of funds for financing capital investment. Apergis and Tsoumas (2009) surveyed 200 papers and concluded that the overall evidence of a saving and investment relationship is weaker for developing countries than it is for richer ones, which in fact is not too surprising as it is typical of recipients of foreign aid and foreign direct investments (FDI). On the other hand, Basher and Fachin (2013) pointed that the frugal and wise use of oil revenues helped countries to muster high rates of internal savings and investments and eventually become the leading long-term economic performers whereas weak savings-investment appeared consistent with the falling public and stagnating private investment rates. Mankiw (2006) assert that the trade deficit is not a problem in itself but signals a problem of low national saving. The low

national saving was unlikely to make the trade deficit disappear, implying that domestic investment would need to fall to the low level of national saving.

Since East African countries run huge trade imbalances, which have remained at as high as five percent for many years. In consequence, EAC countries just like many others elsewhere borrow to sustain their budget deficits. This state of affairs raises concern about the sustainability of these imbalances and long-term consequences. The main objective of this paper, therefore, is to examine empirically the determinants of the trade balance in East African countries and propose possible trade balance deterioration remedies.

Empirical Reviews on Trade Balance

Osoro (2013) investigated the major determinants of trade balance using Kenya's annual data for the period 1963-2012. This study explored both the long and short run determinants of trade deficit using Johansen's co-integration approach and Error Correction Modelling (ECM). The results of the investigation indicated that the coefficients of trade balance were significant and positively correlated with budget deficits, FDI and real exchange rates. Tran and Dinh (2014) examined the effects of FDI inflows on external imbalances in developing and transition economies of Asia and found that current FDI inflows increase trade deficits, hence leading to negative consequences for the host country's macro-economic stability. However, the estimated coefficient became negative when a lag was introduced to the FDI variable, implying that FDI inflows worsened the trade balance first and then improved it.
Shah's (2015) investigation of the determinants of balance of trade of Pakistan (1975-2010) using multiple regression models for empirical assessment found that only the Pakistan Rupee exchange rate had a significant impact on the balance of trade of the country. In the meantime, money supply, foreign direct investment (FDI), gross domestic product and total domestic consumption all remained insignificant. Shawa and Shen (2013) explored the determinants of trade balance for Tanzania using the Ordinary Least Square Method (OLS) for 1980-2102. The results for this period indicated significant and positive relationships for FDI, human capital development, natural resource availability, foreign income and trade liberalisation. Negative coefficients were proved for household and government expenditures and inflation. Coefficient for real exchange rate was negative but insignificant.

Hailu (2011) studied the impact of foreign aid on the trade imbalances of sub-Saharan Africa (SSA). The study used the Generalised Method of Moments (GMM) technique to determine the impact of Official Development Assistance (ODA) on trade balance of SSA countries for a period of 1980-2007. Results showed that ODA had a positive effect on imports and negative effect on exports; however, both were statistically insignificant. Real appreciation was found to affect both imports and exports negatively. This effect was statistically significant. FDI had positive effect on both exports and imports, but only its effect on imports was statistically significant. The overall impact of FDI on balance of trade was negative, but statistically insignificant. Most of the trade deficit gears in this study, especially the FDI and other factors were insignificant, which led to a suspicion of results. As such, further research was crucial to study the role of ODA in the balance of trade.

Kollmann (1998) used a two-country real Business Cycle Model (RBC) to study quantitatively the dynamics of the US trade balance for the 1975-1991 period. These factors of total factor productivity included government consumption and the average tax rates. The model suggested that US productivity shocks were the dominant source of movements in the US trade balance. Baharumshah (2001) attempted to identify the major economic factors that influence the trade balances of Malaysia and Thailand with the US and Japan using unrestricted VAR model quarterly frequency data from 1980 to 1996. Results indicated a stable long-run relationship between trade balance and three macro variables of exchange rate, domestic income and foreign income. The real effective exchange rate was found to be an important variable in the trade balance equation and devaluation improved the trade balances of both economies in the long-run.

Chiu and Sun (2016), on their part, wanted to know whether higher savings rate improves a country's trade imbalance using data for 76 countries for the period of 1975-2010 by examining the relationship between trade balance, savings rate, and real exchange rate. They employed the Panel Smooth Transition Regression (PSTR) model. Their results indicated that countries with a savings rate of above the threshold of 14.8 percent can improve their trade balance by increasing the savings rate or depreciating their currency. In the presence of economic boom, its investment rises faster than its savings and, therefore, its current account surplus falls (deficit increases). During a recession, investments fall faster than savings and thus the current surplus increases (deficit declines). During economic expansions, the aggregate demand (including that of imports) increases and falls during recession (CBO,

2000). If savings are less than investments, then an economy needs to import resources to finance its investments beyond the level of capital.

Kodongo and Ojah (2013) analysed the inter-temporal causal relationships between the real exchange rate and trade balance and cross-border capital flows in Africa. Their Findings supported the classical balance of trade theoretical view whereby the net effect of depreciation of the domestic currency is an improvement in the domestic country's balance of payments position in the short-run. Xing (2012) concluded that a real appreciation of the Yuan would negatively affect both the processing imports and the exports. Specifically, a 10 percent real appreciation of the Yuan would reduce not only China's processing exports by 9.1 percent but also its processing imports by five percent. However, Wang *et al.* (2012) concluded with empirical evidence that the real appreciation of Yuan had no overall long-run impact on China's trade balance. Therefore, it is important to determine the effect of the real exchange rate on East African countries' trade as its case might be different from the one obtaining in the Chinese context. Table 2 presents a summary of previous studies on trade balance determinants:

Table 2: Literature Contributions on Trade Balance Determinants

Studies	Data and Methodology	Variables	Results
Osoro (2013)	Kenya Annual data (1963-2012) using Johansen Cointegration Approach and ECM	Trade balance (DV), FDI, REER[2], Budget deficit (BUD)	FDI (+) RRE (+) BUD (+)
Tran and Dinh (2014)	1991-2011 annual data for 15 Asian countries using panel data estimation	Trade balance (DV), FDI inflows, REER, Domestic Absorption (DA) and Manufacturing Productivity (MA)	FDI (-) FDI_{t-1} (+) REER (-) DA (+) MA (+)
Hailu (2011)	SSA annual data (1980-2007) using Generalized Method of Moments (GMM) technique	Trade balance (DV), FDI inflow, REER, ODA[3], GNID, GNIF	FDI (-), REER (-), ODA (-), GNID[4] (+) GNIF[5] (-) all were insignificant
Shah (2015)	Pakistan annual data (1975-2010) using multiple regression models	Trade balance (DV), FDI, EXR[6], Money supply, GDP and Total Domestic Consumption (TDC)	FDI (-) insig EXR (+) sig MS (+) insig GDP (+) insig TDC (-) insig
Shawa and Shen (2013)	Tanzania annual data (1980-2012) using OLS technique	Trade balance (DV), FDI, HCD[7], NRA, World income (WY), TLB[8], Household expenditure (HEXP), GEXP[9], REER	FDI (+), HCD (+), HCD (+), NRA (+), WY (+), HEXP (-), GEXP (-), INFL (-), REER (-) insig
Kollmann (1998)	US and other G7 quarterly data (1975-1991) using two country real business cycle model (RBC)	Trade balance (DV), Total productivity, government consumption, tax rates	US productivity shocks were the dominant source of movement in US trade balance

[2] Real Effective Exchange Rate (REER)
[3] Official Development Assistance (ODA)
[4] Gross National Income per capita (GNID)
[5] World Income, proxy of the Gross National income per capita of the World (GNIF)
[6] Exchange Rate (EXR)
[7] Human Capital Development (HCD)
[8] Trade Liberalisation (TBL)
[9] Government expenditure (GEXP)

Baharumshah (2001)	Malaysia, Thailand, US and Japan quarterly data (1980) using times series VECM	EXR, domestic and foreign income	Depreciation of the ASEAN currencies caused trade balance to improve.
Ng et al. (2008)	Malaysia annual data (1955-2006) using unit root tests, cointegration technique, Engle-Granger test, VECM and impulse response analysis	Trade balance (DV), Trade balance, REER, domestic income (Y) and foreign income (Y*). All were lagged once.	TB_{t-1}(-) $REER_{t-1}$(+) Y_{t-1}(-) Y^*_{t-1}(+)
Chiu and Sun (2016)	Annual data (1975-2010) for 76 countries using panel smooth transition regression (PSTR) model	Trade balance (DV), REER and savings rate.	REER (-) Savings rate (+)

Source: Author (2016) using different studies

Standard Trade Balance Model

This study follows similar method of the trade balance theory as that employed in different studies such as Baharumshah's (2001) and Gomez and Alvarez-Ude's (2006). The proposed model starts with the equilibrium goods market in an open economy and can be represented by the following equations:

$$Y = C(Y - T) + I(Y, r) + G - IM(Y, \varepsilon) + X(Y^*, \varepsilon) \quad (1)$$
$$\quad + \quad + - \quad + - \quad + +$$

Where Y represents total domestic income, C is the consumer spending, and T represents income tax, I is the investment, r is the interest rate, G represents government spending and ε represents real exchange rate. IM represents import, X represents export, Y^* represents foreign income and (Y-T) is the disposable income $(Y-T)$. Higher disposable income implies higher consumer spending and, therefore, boosts total domestic income, hence a positive relationship is expected between total domestic income and consumer spending. Investment (I) is a function of total income and interest rate and higher investment resulting from higher total personal income and, thus, a positive relationship occurs between investment and total income. Lower interest rate would reduce cost for capital and attract more investors whereas higher interest rate decreases total domestic investment.

Real exchange rate, ε is given by (EP*) / P where P^* and P represent foreign price level (P^*) and domestic price levels, respectively, whereas E is the nominal exchange rate defined as the number of units of domestic currency exchanges for one unit of foreign currency. Import (IM) is influenced by domestic income or output (Y). Higher domestic income leads to high imports, hence a positive relationship. However, imports have a negative relationship with total domestic income and the quantity depends on the real exchange rate (ε). Higher real exchange rates lead to lower quantities of imports due to foreign goods being relatively more expensive.

Export (X) depends on the foreign income (Y^*) and real exchange rate (ε). Higher foreign income leads to an increase in foreign demand for all goods and services as a result of soaring exports. On the other hand, an increase in real exchange rate, the relative price of foreign goods in terms of domestic goods, also leads to an increase in export. Hence, a positive relationship exists between trade balance and foreign income as well as the real exchange rate.

Consider the net export formula:

$$NX = X - IM \quad (2)$$

By substituting the functions of export and import into equation (2), it shows

$$NX = X(Y^*, \varepsilon) - IM(Y, \varepsilon) \quad (3)$$

Substituting equation (14) into equation (16) will lead to:

$$NX = X(Y^*, EP^*/P) - IM(Y, EP^*/P) \quad (4)$$

Assume EP*/P is stationary, we can rewrite the equation (4) as

$$NX = NX(Y, Y^*, \varepsilon) \quad (5)$$

Therefore, equation (5) expresses the balance of trade as a function of the levels of domestic and foreign income and the real exchange rate and can be simplified as

$$\ln TB_t = \alpha_0 + \alpha_1 \ln Y_t + \alpha_2 \ln Y_t^* + \alpha_3 \ln RER_t + u_t \quad (6)$$

Where ln represents natural logarithm, u_t is assumed to be a white-noise process, and trade balance, TB_t is represented as the ratio of exports to imports which allows all variables to be explained in logarithm form and makes no need for appropriate price index to explain the trade balance in real terms.

Modification of Standard Trade Balance Model

With reference to literature reviews some important and potential variables are introduced in the standard Trade Balance (TB) model above to capture its domestic and foreign effects considerably. Because inward FDI directly affects the export capacity by increasing the factor supply and indirectly raises the productivity of the domestic capital stock, the FDI variable is incorporated in the standard trade balance model. Both inward foreign direct investment (IFDI) and stock of foreign direct investment (SFDI) are considered to be important variables for East African countries.

Some studies which also included FDI in their model are those by Osoro (2013), Tran and Dinh (2014) and Shah (2015). From the perspective of classical theories, investment and saving capacity of the economy potentially impact the trade balance of a country and, therefore, I-S is also incorporated in the model. In the domestic income part of the model, income per capital (PGDP) is also introduced to capture the relationship between the general welfare and trade balance.

Therefore, equation (6) above can be re-written as:

$$\ln TB_t = \alpha_0 + \alpha_1 \ln IFDI_t + \alpha_2 \ln SFDI_t + \alpha_3 \ln RER_t + \alpha_4 \ln IS_t + \alpha_5 \ln PGDP_t + u_t \quad (7)$$

Depending on the country and level of FDI, both coefficients under study are expected to be positive or negative. When positive, the implication is that the export-oriented FDI whereas the negative sign reflects a country's trade balance deterioration. Under the classical theory, the sign of α_5 could be either positive or negative. When negative this means that an increase in per capita income increases the imports volume. And when positive this means that an increase in the income reflects an increase in the production of import-substituted goods. The Marshall-Lerner Theory holds that when α_3 is positive it indicates that depreciation leads to improvement of trade balance for any economy; on the contrary, the appreciation leads to the deterioration of the trade balance. Coefficient for investment and savings relationship is also expected to be negative or positive.

The trade balance data as a ratio of exports to imports was obtained from the UNCTAD database; the per capita income in US dollars was retrieved from IMF World economic outlook database (WEOD); and the real exchange rate expressed in respective national currency against the US dollar was retrieved from the IMF via the International Financial Statistics (IFS) database. Investment to saving relationship is expressed as the ratio of total country investment to gross domestic savings expressed in the percentage of GDP and all obtained from WEOD. Both inflow and stock FDI data are expressed in percentage of GDP and also retrieved from the UNCTAD database. Data for all variables are yearly covering the period from 1980 to 2014 and later transformed to natural logarithms.

Before testing the proposed trade balance model, the Augmented Dickey-Fuller (ADF) method was carried out to test the stationarity of the data and, thereafter, a cointegration analysis was performed to check for long run relationship among the variables. Estimates for the model carried out followed by the vector error correction model (VECM).

ADF Test Results for Trade Balance Model

The Augmented Dickey-Fuller results in Table 3 suggest that the null hypothesis of the presence of unit root in all variables at levels could not be rejected, thus indicating that the variables are not stationary at the levels. However, when the variables are first differenced the null hypothesis of the unit root in each of the series was rejected at one percent (1%) significance level, indicating that all the variables are stationary at first difference.

Table 3: ADF Results (t-statistic values at levels and intercept only)

Country	LNTB	LNIFDI	LNSFDI	LNRER	LNIS	LNPGDP
Burundi	-1.047777	-3.746785	-1.648365	-1.792013	-2.720122	0.443751

Kenya	-0.840659	-4.720150	-2.686611	-1.744856	-1.559477	0.642767
Rwanda	-1.427706	-3.126516	0.270388	-3.808546	-2.045116	-0.453355
Tanzania	-1.386007	-4.538931	-1.675481	-4.321618	-2.593397	-1.217248
Uganda	-2.941087	-1.7010683	-3.935670	-1.631633	-2.018996	0.489257

Co-integration Test Results

Both trace and Max-eigenvalue tests for Burundi, Kenya and Uganda indicate the presence of 2 cointegrating equations at five percent significance level and, therefore, demonstrating that all the variables under study have a long-term relationship in those countries. For Rwanda and Tanzania, both trace test and Max-eigenvalue test indicate a presence of 3 cointegrating equations at the 0.05 significance level. This shows that all the variables have a long-term relationship. Table 4 presents the details:

Table 4: Cointegration Test Results for all Variables

Country	Ho	Trace Statistics	Max-eigenvalue test	No. of CE
Burundi	r = 0 r = 1	144.2618 (0.0000*) 84.03833 (0.0024*)	60.22349 (0.0001*) 36.74581 (0.0221*)	Trace: 2 Max-eigen : 2
Kenya	r = 0 r = 1	132.3382 (0.0000*) 76.58959 (0.0130*)	55.74866 (0.0004*) 34.26891 (0.0449*)	Trace: 2 Max-eigen : 2
Rwanda	r = 0 r = 1 r = 2	200.2579 (0.0000*) 126.1501 (0.0000*) 73.06716 (0.0000*)	74.10779 (0.0000*) 53.08295 (0.0001*) 36.53976 (0.0027*)	Trace: 3 Max-eigen : 3
Tanzania	r = 0 r = 1 r = 2	196.8672 (0.0000*) 125.9974 (0.0000*) 79.63746 (0.0004*)	70.86977 (0.0000*) 46.35995 (0.0001*) 25.99647 (0.0095*)	Trace: 3 Max-eigen : 3
Uganda	r = 0 r = 1	65.86477 (0.0000*) 46.35995 (0.0010*)	23.06757 (0.03875*) 20.33477 (0.02600*)	Trace: 2 Max-eigen : 2

* Denotes rejection of the hypothesis at the 0.05 level

Estimation Results for Trade Model

For Burundi results show that the coefficient of IFDI is negative and significant. Both coefficients of RER and PGDP are not only significant but also positively related to trade balance. However, the rest of the variables (IS and SFDI) are negative and insignificant. All the variables for Kenya happened to be significant with a positive relationship with trade balance (TB) except SFDI which is negative. For Rwanda, coefficients of three variables (IFDI, SFDI and PGDP) are all positive and statistically significant whereas those of RER and IS do not significantly contribute to changes in trade balance. For Tanzania, both coefficients of IFDI and SFDI are negative and significant; those of RER, IS and PGDP are positive and also significant. Coefficient of RER is positive albeit insignificant. For Uganda both coefficients of RER and PGDP are positive and significant but the rest are insignificant. Table 5 presents the details:

Table 5: Regression Estimates Results (TB as Dependent Variable)

Country	LNIFDI	LNSFDI	LNRER	LNIS	LNPGDP	Constant
Burundi	-0.56729** (-1.989799)	-0.085033 (-0.083115)	0.240024** (1.973629)	-0.076892 (-0.887775)	0.452695** (2.687690)	-3.8165** (-2.035149

Kenya	0.052339**	-0.75026**	0.423225***	0.218920**	0.723398***	-2.779***
	(2.972265)	(-2.052625)	(3.603385)	(2.746347)	(3.975749)	(-2.27312)
Rwanda	0.068643**	0.235754**	-0.163476	0.018425	0.283948**	1.642854
	(3.373212)	(2.261147)	(-1.317049)	(0.166920)	(2.178768)	(1.548335)
Tanzania	-0.26191**	-0.43955**	0.243940	0.441382**	0.019661**	-5.927721
	(-1.581617)	(-2.961584)	(1.659805)	(0.0119)	(2.520509)	(-1.81073)
Uganda	0.167778	-0.115474	0.108708**	0.072449	0.260003**	0.440919
	(0.644083)	(-0.257295)	(2.213154)	(0.272779)	(3.657157)	(0.082475)

Notes: *** and ** indicates the 1% and 5% significance levels respectively and t-values are in parentheses.

Therefore, long-run equilibrium relations of trade balance with other variables can be represented by the following equations:

$$\text{BUR: } \ln TB_t = -0.57\ln IFDI_t - 0.08\ln SFDI_t + 0.24\ln RER_t - 0.08\ln IS_t + 0.45\ln PGDP_t - 3.82 + u_t \quad (8)$$

$$\text{KEN: } \ln TB_t = 0.05\ln IFDI_t - 0.75\ln SFDI_t + 0.42\ln RER_t + 0.22\ln IS_t + 0.72\ln PGDP_t - 2.78 + u_t \quad (9)$$

$$\text{RWA: } \ln TB_t = 0.07\ln IFDI_t + 0.24\ln SFDI_t - 0.16\ln RER_t + 0.02\ln IS_t + 0.28\ln PGDP_t + 1.64 + u_t \quad (10)$$

$$\text{TZA: } \ln TB_t = -0.26\ln IFDI_t - 0.44\ln SFDI_t + 0.24\ln RER_t + 0.44\ln IS_t + 0.02\ln PGDP_t - 5.92 + u_t \quad (11)$$

$$\text{UGN: } \ln TB_t = 0.17\ln IFDI_t - 0.11\ln SFDI_t + 0.11\ln RER_t + 0.07\ln IS_t + 0.26\ln PGDP_t + 0.44 + u_t \quad (12)$$

Vector Error Correction Model (VECM)

According to Granger representation theorem, when the variables are co-integrated, there must be an error correction model (ECM) that describes the short-run dynamics or adjustments of the co-integrated variables towards their long-run equilibrium values. Therefore, error correction models for six variables which are trade balance (TB), inward FDI (IFDI), stock FDI (SFDI), real exchange rate (RER), investment to savings ratio (IS) and per capita GDP (PGDP) can be represented as follows:

$$\Delta LNTB_t = \alpha_0 + \delta ECT_{t-1} + \sum_{j=1}^{p} \alpha_{1j} \Delta LNTB_{t-j} + \sum_{j=1}^{p} \alpha_{2j} \Delta LNIFDI_{t-j} + \sum_{j=1}^{p} \alpha_{3j} \Delta LNSFDI_{t-j} + \sum_{j=1}^{p} \alpha_{4j} \Delta LNRER_{t-j} + \sum_{j=1}^{p} \alpha_{5j} \Delta LNIS_{t-j} + \sum_{j=1}^{p} \alpha_{6j} \Delta LNPGDP_{t-j} + \varepsilon_t \quad (13)$$

Where, ECT_{t-1} is lagged error correction term and is the residual from the co-integrating regression equation that measures the speed of adjustment to long run equilibrium. To restore equilibrium, the sign of the coefficient of the error correction term (δ) should be negative ($\delta < 0$) and coefficients of the first differenced lagged variables measure the short-run effect of the variables. For Burundi ECM results show that the error correction term (ECT_{t-1}) is negative and significant. This implies that disequilibrium created in previous period will be corrected in the successive period. The coefficients of first differenced lagged variables for RER and PGDP are also significant; however, the Wald coefficients restriction test further found them to be insignificant in relation to trade balance *(TB)* in the short-run. Table 6 shows the details:

Table 6: Burundi VECM (Dependent Variable ΔTB_t)

Vector Error Correction Model				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.35526	0.16401	-2.16606	0.04810
$\Delta LNIFDI_{t-1}$	0.00185	0.22407	0.00824	0.99350
$\Delta LNTB_{t-1}$	0.02019	0.03828	0.52754	0.60610

$\Delta LNSFDI_{t-1}$	0.06131	0.08393	0.73044	0.47720
$\Delta LNRER_{t-1}$	1.94447	0.86891	2.23783	0.04200
$\Delta LNIS_{t-1}$	-0.14904	0.08933	-1.66834	0.11750
$\Delta PGDP_{t-1}$	2.78316	0.90141	3.08756	0.00800
C	-0.20816	0.11095	-1.87626	0.08160

For Kenya, the results for ECM presented in Table 7 have trade balance *(TB)* as a dependent variable. The results show that the error correction term (ECT_{t-1}) is negative and significant. This implies that disequilibrium created in the previous period will be corrected in the successive period. The coefficients of the first differenced lagged variables for TB, SFDI, RER and IS are also significant though the Wald coefficients restriction test found them to be insignificant in relation to trade balance *(TB)* in the short-run.

Table 7: Kenya VECM (Dependent Variable ΔTBt)

Vector Error Correction Model				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.80225	0.17479	-4.58974	0.00010
$\Delta LNIFDI_{t-1}$	0.13182	0.16891	0.78038	0.44350
$\Delta LNTB_{t-1}$	0.07293	0.03008	2.42507	0.02400
$\Delta LNSFDI_{t-1}$	0.78122	0.39852	1.96034	0.06270
$\Delta LNRER_{t-1}$	-0.54586	0.26292	-2.07619	0.04980
$\Delta LNIS_{t-1}$	0.65075	0.32361	2.01090	0.05670
$\Delta PGDP_{t-1}$	0.62371	0.46773	1.33349	0.19600
C	0.04116	0.03909	1.05295	0.30380

For Rwanda the results presented in Table 8 shows that the error correction term (ECT_{t-1}) is negative and significant. This implies that there is a long-run causality relationship and the disequilibrium created in previous period gets corrected in the successive period. The coefficients of all the first differenced lagged variables are insignificant. This implies that trade balance *(TB)* is insignificantly related to all the variables in the short-run causality as further confirmed by the Wald coefficients restriction test.

Table 8: Rwanda VECM (Dependent Variable ΔTB_t)

Vector Error Correction Model				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.08738	0.09693	-2.90148	0.00660
$\Delta LNIFDI_{t-1}$	-0.70480	0.43692	-1.61312	0.13500
$\Delta LNTB_{t-1}$	-0.90568	0.68829	-1.31583	0.21500
$\Delta LNSFDI_{t-1}$	-0.02941	0.08021	-0.36665	0.72080
$\Delta LNRER_{t-1}$	0.50661	0.38925	1.30151	0.21970
$\Delta LNIS_{t-1}$	1.19657	1.01440	1.17958	0.26310
$\Delta PGDP_{t-1}$	-0.17982	0.38548	-0.46649	0.65000
C	0.21172	0.83513	0.25351	0.80450

Table 9: Tanzania VECM (Dependent Variable ΔTBt)

Vector Error Correction Model				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.14833	0.15014	2.32192	0.00260
$\Delta LNIFDI_{t-1}$	0.28338	0.36424	0.77798	0.45050
$\Delta LNTB_{t-1}$	-0.04561	0.06394	-0.71324	0.48830
$\Delta LNSFDI_{t-1}$	0.68504	0.54699	1.25239	0.23250
$\Delta LNRER_{t-1}$	-1.53879	1.32517	-1.16120	0.26640
$\Delta LNIS_{t-1}$	0.27357	0.34944	0.78287	0.44770
$\Delta PGDP_{t-1}$	-1.97910	1.14861	-1.72304	0.10860
C	0.24964	0.16752	1.49021	0.16000

For Tanzania, results presented in Table 9 show that the error correction term *(ECT_{t-1})* is negative and significant. This implies that there is long-run causality relationship and the disequilibrium created in previous period gets corrected in the successive periods. The coefficients of all the first differenced lagged variables are insignificant. This implies that the trade balance *(TB)* is not significantly related to all those variables in the short-run causality as further confirmed by the Wald coefficients restriction test. Similar results were obtained for Uganda as Table 10 illustrates:

Table 10: Uganda VECM (Dependent Variable ΔTB_t)

Vector Error Correction Model				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.05317	0.16516	3.35411	0.00828
$\Delta LNIFDI_{t-1}$	0.31171	0.40067	0.85578	0.49555
$\Delta LNTB_{t-1}$	-0.05017	0.07034	-0.78456	0.53713
$\Delta LNSFDI_{t-1}$	0.75355	0.60169	1.37763	0.25575
$\Delta LNRER_{t-1}$	-1.69267	1.45769	-1.27732	0.29304
$\Delta LNIS_{t-1}$	0.30092	0.38438	0.86116	0.49247
$\Delta PGDP_{t-1}$	-2.17701	1.26347	-1.89535	0.11946
C	0.27460	0.18427	1.63923	0.17600

Summary of Results

Fully modified least squares (FMOLS) estimates were carried out and different results were obtained from one country to another. Burundi's results show that the coefficient of IFDI is negative and significant. Both coefficients of RER and PGDP are also significant but positively related to trade balance; however, the rest of the variables (IS and SFDI) are negative and insignificant. All the variables for Kenya happened to be significant with a positive relationship with trade balance (TB) except the SFDI which is negative. This is supported by Osoro (2003) who specifically studied the trade balance of Kenya.

In Rwanda, coefficients of three variables (IFDI, SFDI and PGDP) are positive and statistically significant whereas those of RER and IS insignificantly contributed to the changes in trade balance. In Tanzania, both coefficients of IFDI and SFDI are negative and significant whereas those of RER, IS and PGDP are positive and also significant. The coefficient of RER is positive though insignificant. These results contradict those of Shawa and Shen (2013) who specifically researched on the Tanzania trade balance using the Ordinary Least Square (OLS) technique for model estimation. For Uganda both coefficients of RER and PGDP are positive and significant but the rest are insignificant. When coefficients of similar variables are compared, only the per capita GDP is positive and statistically significant with Kenya having the highest magnitude effect compared to other EAC countries. Therefore, a unit increase in individual incomes increases the trade balance ratio (exports/imports) and, thus, improves trade deficit across all East African countries. Similar results for GDP were presented by Shah (2015).
The real exchange rates coefficients of Burundi, Kenya and Uganda are positive and significant. The positive sign on the RER variable means that devaluation of currency causes an improvement in trade balance in the long-run. Similar findings were also reported by Osoro (2013) and Ng *et al*. (2008). However, the results are incongruent with those by Tran and Dinh (2014) and Chiu and Sun (2016) who found negative and significant relationship between real exchange rate and trade balance. Tanzanian RER coefficient is also positive but insignificant. Only Rwanda's RER has a negative coefficient though an insignificant one. Similar outcomes were reported by Hailu (2011) and Shawa and Shen (2013).

Both the inflow FDI and stock FDI coefficients for Kenya, Rwanda and Tanzania are statistically significant but they display different signs. The positive signs for Kenya and Rwanda imply that the increases in inflow FDI motivates investors to increase the production of import substitutes, thus reducing the general imports which, in turn, improves the trade balance. For Burundi only the coefficient of inflow FDI is significant and negative, thus indicating that the inflow FDI to Burundi compounds the trade balance. For Tanzania both inflow FDI and stock FDI worsen the trade balance whereas for Rwanda the opposite is true.

Policy Implications

Among all other variables, this study found FDI as the main variable of interest and probable solution in trying to improve the trade balance of the EAC countries. Because EAC countries are categorised as either poor or developing nations or small emerging developing nations, they should concentrate on export-oriented development policies. Policies to attract FDI should be more focused on export-oriented manufacturing industries.

Since the agriculture sector employs more people than any other sector in most of the EAC countries the inflow of FDI to agricultural activities should also be revived because only small amounts of FDI have been attracted so far to this crucial sector. Attraction of FDI to the agriculture sector can result in the improvement of welfare for many people and in the long-run can improve the trade balance as the results of this study have confirmed. Hoekman and Shepherd (2016) have pointed out that economic performance of services sectors in East African Community (EAC) countries has a rather direct impact on the productivity of firms and their export performance in the agricultural and manufacturing sectors. Therefore, the services sector also seems promising and efforts to attract inflow FDI will be vital for the development of EAC economies. Generally, EAC countries have good and potential investment climate but the region has to tackle the challenges as in other sub-Saharan African countries.

When researchers suggest how to improve the trade balance of a certain country, most of them comment and focus on the application of the devaluation policies and mechanism. Although the application of devaluation policies in Burundi, Kenya and Uganda are likely to improve the trade balance, this paper does not approve devaluation as an effective strategy for reducing the imbalances between exports and imports. Instead, countries' policies must focus on reducing imported products which are either available in the respective countries or can be substituted in one way or another within the East African region.

Limitations and Future Studies

This study is limited to the trade balance perspective and, thus, does not veer into the details of each suggested model factor. Determinants of each individual factor may be studied in the future to assess the different variations which may or may not affect the trade performance in the East African Community as a bloc.

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