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The Role of China's Exchange Rate on the Trade Balance of Sub-Saharan Africa: a Gravity Model Approach

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Abstract

This study seeks to investigate theimpactof China'sexchange rate onthe trade balance of 41 Sub-Saharan African countries for the period from 1994 to 2016. Using an augmented gravity model, the grouped and ungrouped results of the study confirm the elasticity and absorption approaches of the trade balance. Similarly, the robustness check, by dividing the sample period into two sub-periods (2005–2016 and 1994–2004), also confirms the elasticity and absorption approaches of the trade balance.

Keywords: bilateral trade, China, SSA

JEL: F41, C23

Introduction

In the last several years, the effect of devaluation on the trade balance has been debated extensively. According to Krueger (1983), theelasticity approach to the exchange rate proposesthat iftransactions are completed at the time of depreciation or devaluation, then it leads toshort-term change in the trade balance. The trade balance initially deteriorates during the 'contract period', before imports and exports adjust.[1]

Over time, the trade balance improves, quantities respond tothe changedeffective prices, andelasticities of imports and exports increase. However, due to devaluation, the import prices increase, which leads to high domestic pricesof goods which are not traded (Williamson 1983). The effective real exchange rate rises due to the resulting overall inflation; thepotential for an increase in thetrade balance is eliminated. When the real supply of money decreases due to a devaluation (or depreciation), according to the monetary approach to the exchange rate, the phenomenon leads to an increase in the excess domestic demand for money. Inturn, hoardingand the trade balance increase.

Theoretically, currency devaluation can impact the trade balance via two channels, i.e., firstly, the currency devaluation influences the exchange rate, and secondly, it directly affects domestic absorption. Through the first channel, competitiveness improves due to a nominal devaluation, which in turn improves the trade balance and affects thereal exchange rate, i.e., the relative price. The absorption effect on devaluation is the second channel. In countries that are relatively small in size, where prices are exogenously given, wage rates and price levels are flexible in real and nominal terms, andwhere goods and assets are substitutes, the devaluation results in price level increases by the same proportion. The domestic absorption falls due to the increase inthe price level, which leads to a reduction in the real balances. In the trade literature, arguments both for and against devaluation are not uncommon.

To address this important issue, different methodologies were utilized in previous studies. However, the results were inconclusive. The results of empirical work show no clear consensus regarding the effect of exchange rates on the trade balance. By using the parameter estimates of a general macro model, Gylfason and Risager (1984, Table 3) show that in less developed countries (LDCs), devaluation improves the current accounts. By estimating price elasticities through the models of export and import demand, Bahmani-Oskooee (1986, Tables 2–8) shows that the elasticities are high enough to explain the improvement in the trade balance. Miles (1979) and Marquez (1990), on the other hand, reached the opposite conclusion.[2]

1 The unfavorable effect of devaluation on the trade balance is termed the J-Curve phenomena. Junz and Rhomberg (1973) identified that the trade balance deteriorates first, but after the passage of time it begins to improve.

2 For instance, Marquez (1990) identify that for LDCs, in order to get better results of successful devaluation; the trade elasticities (import + export price elasticities) is equal to –0.78, which is insufficient.

This paper aims to explore the changes in the bilateral trade balance of Sub-Saharan Africa (SSA) with China due to the effect of changes in the exchange rate. Furthermore, the objective of the study is to use a gravity model for grouped and ungrouped data and to identify the variables, specifically the exchange rate, which affects the trade balances of SSA countries while engaging in trade with China.

The organization of this paper is as follows. In Section 2, there is an overview of SSA – China trade relations. Section 3 contains the methodology and data. Section 4 provides the results, and Section 5 presents the conclusion.

Overview of SSA-China trade relations

Trade between China and Sub-SaharanAfrican has seen an impressive increase since 2000. Over the past decade, the economic ties between China and SSA have expanded. Between2000 and 2013, trade increased from a negligible level to more than $170 billion, which makes China a major financial and trade partner for SSA (World Bank 2015). During 2013, the total trade volume between SSA and China reached $103.17 billion which is the highest value of trade from 2000–2017 (see Fig. 3).

Compared to the European Union and the United States, the SSA-China trade is growing much faster. By surpassing the United States, China became SSA's largest trading partner in 2009.[3] Similarly, in 2013, SSA's trade with China accounted for 22% of SSA's total trade with the rest of the world. As far as China's development financing and foreign investments are concerned, the official data isnot very encouraging, but trade with SSA has grown rapidly.

Commodities dominated SSA's trade with China. The bulk of SSA's exports to China, including oil, metals, and gas, are sourced from a few countries, although SSA's exports are even more concentrated in commodities to the major emerging market economies, as well as the EU (European Union), and the USA. In contrast, China's exports to SSA are diverse. About 1/3 consist of capital goods, including telecommunications equipment, factory machinery, generators, and vehicles. Manufacturing and consumer goods account for the remainder, which are nearly three times as large as imports from the EU and USA.

Fig. 1 shows the top five countries from which SSA imported goods in 2017. In this regard, China is the leading countries with around $37.39 billion exports to SSA. Similarly, Fig. 2 shows the top five countries to which SSA exported goods in 2017. China is the second largest importer of SSA's goods. The total value of trade volume between the two blocks is exhibited in Fig. 3. It can be seen that trade flow has increased from 2000 to 2017. In 2000, the trade volume was $4.09 billion. The volume reached to $55.90 billions. From 2014 to 2016, the trade volume has been declined. It is due to the weak commodity prices since 2014, which have greatly impacted the value of African exports to China, even while Chinese exports to Africa remained steady.

3 Global Economic Prospects, World Bank (2015).

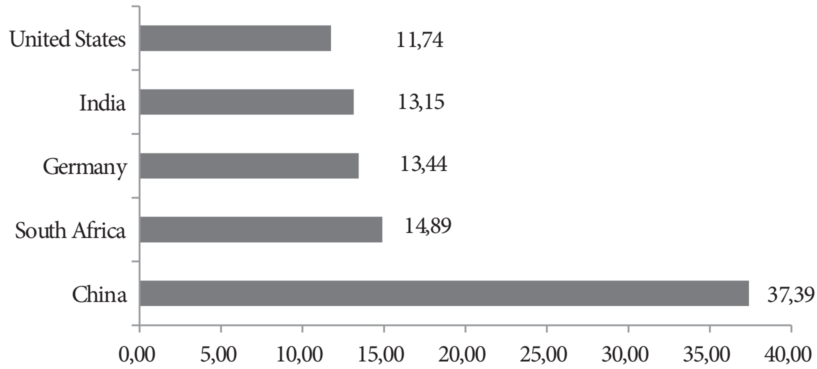

Figure 1. Top five countries from which SSA imported goods in 2017 (billion USD)
Source: authors' calcutaions, World Integrated Trade Solution

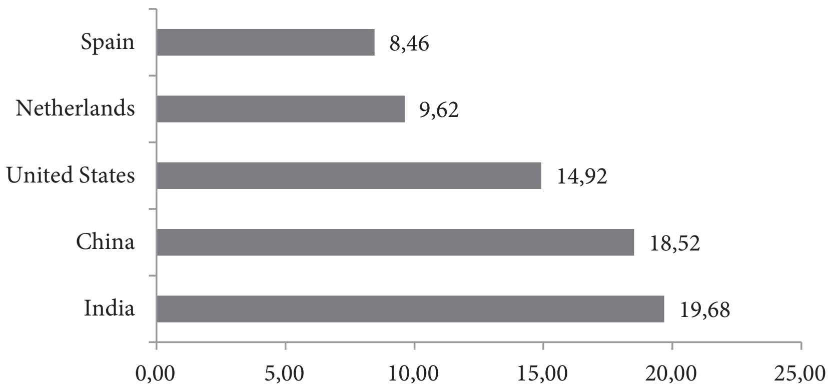

Figure 2. Top five countries to which SSA exported goods in 2017 (billion USD)
Source: authors' calcutaions, World Integrated Trade Solution

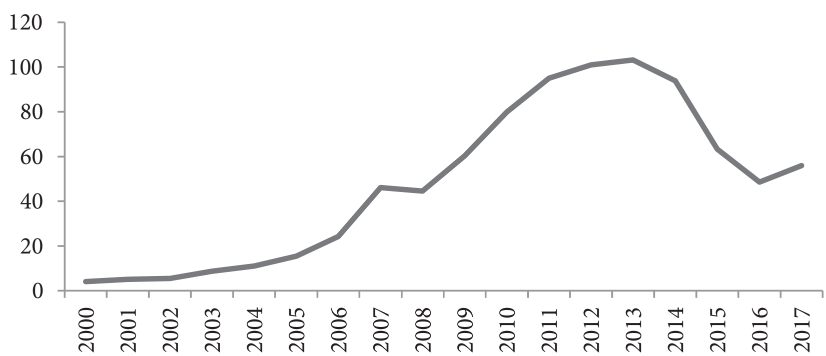

Figure 3. Trade flow between SSA and China from 2000–2017
Source: authors' calcutaions, World Integrated Trade Solution

Data and methodology

Theoretical framework

Anderson (1979), Linneman (1966), Poyhonen (1963), and Tinbergen (1962) are the pioneers of the Gravity Model of trade, whichas in former approaches, may also be represented inthe reduced form of a 4-equation partial equilibrium model of export supply and import demand. The basic form of the gravity model expresses bilateral trade between two countries as a function of their respective sizes (in terms of income or population) and the geographical distance between them (which serves as a proxy for the transportation costs).

To estimate the trade balance function for SSA, we rely on the gravity model specified by Anderson & Wincoop (2003), Matyas (1997), and Deardorff (1997). Trade flow is a function of a country's income (GDPs), distance, and population. The relative priceis expressed in a common currency, which is the country's export price relative to the foreign price of related goods. The real effective exchange rate rises due to the rise in the price level, which affects the trade.

The essential idea of this approach is that the "*absolute size*" of countries with regards to the populations and incomes is not so important in bilateral trade; rather, the "*relative size*" determines import demand and export supply. Bahmani-Oskooee (1991; 2001) argues that trade balance can be interpreted as a nominal exchange rate or a real exchange rate because the modelis unit free. Moreover, it helps to identify the specific causes of bilateral trade imbalances. The models presented as follows:

$$\mathrm{TB}_{ij} = \beta_0 + \beta_1\mathrm{RGDP}_{ij} + \beta_2\mathrm{RGDPPC}_{ij} + \beta_3\mathrm{RER}_{ij} + \beta_4\mathrm{D}_{ij} + \mu_i \tag{1}$$

To simplify, the time subscript '*t*' is excluded from the model. The subscript '*i*' denotes the SSA countries and '*j*' represents China; TB_{ij} is the ratio of export to import; RGDP is the ratio of relative GDPs; RGDPPC is the relative per capita GDP ratio; RER is the relative exchange rate; and D is the distance between the capitals of country *i* and *j*used as a proxy for transport costs. To put together the absorption, elasticity, and monetary approaches, the vectors of the four independent variables should be consideredin order to identify their impact on the trade balance. The variables are defined as follows;

$$TB_{ij} = X_{ij}^{s} \Big/ M_{ij}^{d} \tag{2}$$

where X_{ij}^{s} is the export supply of country *i* to its partner*j*; similarly, M_{ij}^{d} is the demand for import by country *i* from partner *j*.

$$RGDP_{ij} = {GDP_i}/{GDP_j} \tag{3}$$

In equation (3), GDP_i and GDP_j represent the gross domestic products of country *i* and country *j*. Similarly,

$$RGDPPC_{ij} = {GDPPC_i}/{GDPPC_j} \tag{4}$$

In equation (4), $GDPPC_i$ and $GDPPC_j$ represent the per capita GDPs of country *i* and country *j*.

$$EXR_{ij} = {1}/{ER_{ij}} * {P_i}/{P_j} \tag{5}$$

Where ER_{ij} is the exchange rate between country *i* and *j*, while P_i and P_j are the consumer price indices of the countries.

Data

To assess the impact of China on the trade balance of 41 SSA countries, the data with its sources are given in Table 1.

Table 1. Description and source of variables.

Indicators / Variables	Source
Gross Domestic Product constant at 2010 $	WDI
Per capita GDP constant 2010	WDI
Consumer Price Index	WDI
Exchange Rate	WDI
Distance	www.timeanddate.com
Bilateral Import and Export	China Statistical Yearbook

Source: The data is sourced from World Bank, China Statistical Yearbook, and www.timeanddate.com

Estimation techniques

To estimate the trade relationships and trade effects for a particular period, classic gravity models normally use cross-sectional data. This studyuses paneldata methodology. The advantages of this method are that it cancapture the effect of time-invariant variables and country-specific effects. Similarly, the method monitors trade partners' individual effects, captures important relationships between variables over time, and avoids estimation bias.

In comparison with the random and fixed-effects models that are not restricted, the pooled model is restricted and assumes that countries are homogeneous. When it is necessary to control for omitted variables that are constant over time but differ between countries, the fixed-effects model is desirable. Since fixed-effects consider heterogeneity and individual country effects, it gives better estimates than the pooled model. On the other hand, no individual country effects are assumed in the random-effects model. To test this assumption and to compare the fixed and random effects estimates of coefficients, the Hausman (1978) test is employed. The Hausman test specifies whetherthe explanatory variables are correlated with specific effects or not. The Hausman test makes sure a model is selected that has consistent results. Random effects are not correlated with the explanatory variables, which is the main assumption in the random-effects estimation. The fixed-effects model is feasible if the p-value is significant, i.e., < 5%. On the other hand, if it is greater than 5%, then the most appropriate model is the random-effects model.

Empirical results

Specifications for Different Groups of Countries from 1994–2016

Table 2 presents the results of our estimation of the 41 SSA countries with their trade partner, China. For all groups of countries, the pooled OLS, fixed-effects, and random-effects models are estimated. The Hausman test suggests that fixed-effects estimation is the proper strategy for all of the specifications (for all the groups). Following economic theories, all the variables, including the intercept, are significant with correct signs. We use robust method, i.e., White’s heteroscedasticity-corrected covariance matrix estimator. Without altering the estimates of the slope coefficients, the method allows standard errors to be improved.[4]

The slope coefficients are considered to remains the same for all countries while the intercept terms β_0 are considered to be country-specific in the model. Regarding the global sample ***(the group of SSA countries excluding Somalia, Djibouti, South Sudan, and Eritrea, for which the data are not available***), the coefficient of relative GDP (*RGDP*) is highly significant and positive (4.44). It means that when the GDP of China increases relatively more than that of SSA, the trade balance of SSA deteriorates. This implies that China’s exports and production capability increase at a higher rate than those of SSA. The situation adversely affects the trade balance of SSA, because China exports more to SSA or imports less from SSA. Similarly, for the sub-group of ***oil-producing countries,*** the coefficient of relative GDP (*RGDP*) is insignificant (1.34) and positive. This implies that China’s GDP does not affect the trade balance of SSA’s oil-pro-

4 The SE (β) s should be estimated in a manner that may not alter the estimates of the slope coefficients because heteroscedasticity causes problems with standard errors but does not cause problem forthe coefficients.

ducing countries. The regression results for the third sub-group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of relative GDP (*RGDP*) is significant at the 1% level of significance and positive (4.79). This implies that when China's GDP increases comparatively more than that of SSA, the trade balance of SSA deteriorates.

Similarly, for the ***global sample,*** the coefficient of the relative RGDPPC is highly significant and negative (–3.98), as expected. A higher relative per capita GDP (RGDPPC) means a higher absorption capacity of the country since per capita GDP determinescountry's absorption capacity. This means that China imports more from SSA due to theincrease in absorption capacity. This, in turn,supports the *Linder hypothesis*[5] in the case of SSA. Similarly, for the sub-group of ***oil-producing countries,*** the coefficient of relative GDP (*RGDP*) is significant at 10% and negative (–1.99). This implies that anincrease in China's per capita GDP tends to increase the export volume of oil-producing countries. The regression results for the third sub-group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of the relative per capita GDP (*RGDPPC*) is significant and negative (–4.24). The increase in China's per capita GDP reduces the ratio of RGDPPC and improves the trade balance of the third group of SSA countries.

The coefficient of the real exchange rate (*RER*) is positive for all the sample of countries. The positive signis in line with the *theoretical* expectation. For all the three groups of countries, the coefficients are significant. The more the *RERij* index increases, the more there is a depreciation of SSA currencies with respect to China's currency; hence, the coefficient of the real exchange rate (*RERij*) is positive. This improves their trade balance (*TBij*) because the export competitiveness of SSA increases.

Specifications for Different Groups of Countries from 1994–2004

Table 3 presents the estimation results for the trade balance of the 41 SSA countries' with their trade partner China for the period of *1994 to 2004* (the first eleven years in our sample). For all groups of the countries, the pooled OLS, fixed-effects, and random-effects models are estimated. The Hausman test suggests that fixed-effects estimation is the proper strategy for all of the specifications (for all the groups). Following economic theory, all the variables have correct signs. We use a robust method, i.e., White's heteroscedasticity-corrected covariance matrix estimator. Without altering the estimates of the slope coefficients, the method allows standard errors to be improved.

The slope coefficients are considered to remain the same for all countries while the intercept term β_0 is considered being country-specific in the model. Regarding

5 The Linder hypothesis states that if per capita income is similar in two countries, the demand structure will be similar.

the global, the coefficient of relative GDP (*RGDP*) is highly significant and positive (9.22). It means that when China's GDP increases relatively more than that of SSA, the trade balance of SSA deteriorates for the period *1994 to 2004*. This implies that China's export and production capability increase at a higher rate than that of SSA. The situation adversely affects the trade balance of SSA because China exports more to SSA or imports less from SSA. Similarly, for the sub-group of ***oil-producing countries,*** the coefficient of RGDP is insignificant (0.79) and positive. This implies that China's GDP does not affect the trade balance of the oil-producing countries of SSA. The regression results for the third group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of RGDP is significant at the 1% level of significance and positive (9.06). This implies that when the GDP of China increases comparatively more than that of SSA, the trade balance of SSA deteriorates.

Similarly, forthe ***global sample,*** the coefficient of the relative per capita GDP (RGDPPC) is highly significant and negative (–8.04), as expected. The higher RGDPPC means higher absorption capacity of the country since per capita GDP determines the absorption capacity of a country. This means that China imports more from SSA due to increased absorption capacity. Similarly, in the sub-group of ***oil-producing countries,*** the coefficient of relative GDP (*RGDPPC*) is insignificant and negative (–4.26), which implies that an increase or decrease in China's per capita GDP has no impact on the trade balance of oil-producing countries. The regression results for the third sub-group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of the RGDPPC is significant and negative (–7.78). The increase in China's per capita GDP reduces the ratio of RGDPPC and improves the trade balance of SSA countries for the third group of countries.

The coefficient of the real exchange rate (*RER*) is positive and insignificant for the whole sample and for the 3rd group of countries for the period *1994 to 2004*. However, its value is positive and significant for the oil-producing countries. The positive sign is in line with the *theoretical* expectation. The more the index of *RERij* increases, the more there is a depreciation of the currencies of oil-producing countries with respect to the currency of their partner, China; hence, the coefficient of the real exchange rate (*RERij*) is positive. This improves the trade balance (*TBij*) because the export competitiveness of oil-producing countries increases.

Specifications for Different Groups of Countries from 2005–2016

Table 4 presents the trade balance equation resultsfor SSA countries for the period *2005 to 2016* (the last 12 years in our sample). For all country groups, the pooled OLS, fixed-effects, and random-effects models are estimated. The Hausman test suggests that fixed-effects estimation is the proper strategy for all of the specifications (for all groups). We use a robust method, i.e., White's heteroscedasticity-corrected covariance matrix estimator.

Regarding the global group, the coefficient of relative GDP (*RGDP*) is highly significant and positive, which implies that in the 3rd sample period (2005 to 2016), when China's GDP increases relatively more than that of SSA, SSA's trade balance deteriorates. The results in the 3rd sample period confirm the results of our estimation for the full period (1994–2016). This implies that China's export and production capability increase at a higher rate than that of SSA. The situation adversely affects the trade balance of SSA, because China exports more to SSA or imports less from SSA. Similarly, in thesub-group of ***oil-producing countries,*** the coefficient of relative GDP (*RGDP*) is significant at 5% and positive. This implies that China's GDP has affected the trade balance of SSA's oil-producing countries in the last decade. The regression results for the third sub-group of countries ***(SSA countries excluding the oil-producing countries)*** indicate that the coefficient of relative GDP (*RGDP*) is insignificant. This implies that the GDP of China has no impact on the trade balance of SSA.

Similarly, for the ***global sample,*** the coefficient of the RGDPPC is highly significant and negative (–1.25) for the period from *2005 to 2016*. This indicates that in that period, China's per capita GDP improved and she imported more from SSA. Similarly, for the sub-group of ***oil-producing countries,*** the coefficient of RGDPPC is significant at 10% and negative (–2.71), implying that an increase in China's per capita GDP tends to increase the export volume of oil-producing countries. The regression results for the third sub-group of countries ***(SSA countries excluding oil-producing countries)*** indicate that the coefficient of the relative per capita GDP (*RGDPPC*) is negative (–0.85) but insignificant. The per capita GDP for the third sub-group between 2005 and 2016 has no impacts on the trade balance of SSA.

Between 2005 and 2016, the coefficients of the real exchange rate (*RER*) are positive for all groups of countries. The positive sign is in line with the *theoretical* expectation. For all the three groups of countries, the coefficients are significant. The more the index of *RERij* increases, the more SSA currencies depreciate with respect to the currency of their partner, China; hence, the coefficient of the real exchange rate (*RERij*) is positive. This improves the trade balance (*TBij*) because SSA's export competitiveness increases.

Table 2. Dependent Variable lnTB (1994–2016)

Explanatory Variables	Group-I SSA Countries (excluding Eritrea, South Djibouti, Sudan, and Somalia)			Group-II Oil-producing countries of SSA (Angola, Nigeria, Congo Rep., and Sudan)			Group-III SSA Countries excludingoil-producing countries		
	POLS	*FE*	*RE*	*POLS*	*FE*	*RE*	*POLS*	*FE*	*RE*
lnRGDP	0.66*** (0.09)	4.44*** (1.17)	1.07 (0.22)***	1.33*** (0.12)	1.34 (1.66)	1.33*** (0.12)	0.70*** (0.06)	4.79*** (1.27)	1.07*** (0.24)
lnRGDPPC	−0.06 (0.06)	−3.98*** (0.92)	−1.32*** (0.19)	−0.74*** (0.38)	−1.99* (1.18)	−0.74** (0.38)	−0.23** (0.09)	−4.24*** (1.01)	−1.32*** (0.20)
lnEXR	0.03 (0.04)	1.08*** (0.36)	0.32** (0.12)	1.04 (0.18)	1.02*** (0.36)	1.04*** (0.18)	0.01 (0.04)	1.04** (.45)	0.27** (0.13)
lnDIS	−1.06* (0.57)	–	−3.79* (2.31)	−16.16*** (2.65)	–	−16.16*** (2.65)	−1.27** (0.58)	–	−4.05* (2.36)
Cons	7.92* (5.28)	15.56** (6.36)	33.75* (21.34)	−150.14*** (24.05)	1.03 (6.44)	−150.14*** (24.05)	−9.85* (5.46)	17.95** (7.33)	−35.96 * (21.85)
No. of observations	943	943	943	92	92	92	851	851	851
Hausman test	457.43***			46.27***			156.12***		

Notes: Robust standard errors are in parentheses. ***, ** and * indicate that the coefficient is significantly different from zero at the 1%, 5% and 10% levels, respectively.

Source: The data is sourced from World Bank, China Statistical Yearbook, and www.timeanddate.com.

Table 3. Dependent Variable lnTB (1994–2004)

Explanatory Variables	Group-I SSA Countries (excluding Eritrea, South Djibouti, Sudan, and Somalia)			Group-II Oil-producing countries of SSA (Angola, Nigeria, Congo Rep., Sudan)			Group-III SSA Countries excluding oil-producing countries		
	POLS	*FE*	*RE*	*POLS*	*FE*	*RE*	*POLS*	*FE*	*RE*
lnRGDP	0.58*** (0.08)	9.22*** (1.51)	0.79*** (0.26)	2.06 (0.24) ***	0.79 (8.38)	2.06*** (0.24)	0.60*** (0.09)	9.06 (1.57) ***	0.79*** (0.28)
lnRGDPPC	−0.59*** (0.15)	−8.04*** (1.26)	−0.64 (0.32)**	−3.44 (0.97)***	−4.26 (5.80)	−3.44 (0.97) ***	−0.42*** (0.15)	−7.78*** (1.32)	−0.55* (0.34)
lnEXR	0.10 * (0.06)	0.40 (0.32)	0.17 (0.16)	1.11 (0.36)	0.33*** (0.63)	1.11 (0.36) ***	0.09* (0.06)	0.36* (0.37)	0.15 (0.17)
lnDIS	−0.06 (0.57)	–	−2.15 (2.55)	−24.86*** (4.88)	–	−24.86*** (4.88)	−0.27 (0.89)	–	−2.09 (2.64)
Cons	0.53 (7.94)	44.49*** (8.53)	−18.88 (23.56)	−233.58*** (44.28)	1.73 (34.19)	−233.58*** (44.28)	−1.49 (8.27)	44.80*** (9.18)	−18.36 (24.40)
No. of observations	451	451	451	44	44	44	407	407	407
Hausman test	52.70***			7.69**			41.67***		

Notes: Robust standard errors are in parentheses. ***, ** and * indicate that the coefficient is significantly different from zero at the 1%, 5% and 10% levels, respectively.
Source: The data is sourced from World Bank, China Statistical Yearbook, and www.timeanddate.com.

Table 4. Dependent Variable lnTB (2005–2016)

Explanatory Variables	Group-I SSA Countries (excluding Eritrea, Djibouti, South Sudan, and Somalia)			Group-II Oil-producing countries of SSA (Angola, Nigeria, Congo Rep., Sudan)			Group-III SSA Countries excluding oil-producing countries		
	POLS	*FE*	*RE*	*POLS*	*FE*	*RE*	*POLS*	*FE*	*RE*
lnRGDP	0.73*** (0.07)	1.48*** (2.59)	.799*** (.23)	1.20*** (0.10)	5.40** (1.20)	1.20*** (0.09)	0.81*** (.07)	0.76 (2.99)	0.81 (0.28) ***
lnRGDPPC	−0.18 (0.13)	−1.25*** (2.00)	−0.61** (0.25)	−2.83*** (0.54)	−2.71* (1.04)	−2.83*** (0.95)	−0.40*** (0.13)	−0.85 (2.36)	−0.07* (0.50)
lnEXR	0.03 (0.05)	1.24** (0.60)	0.18 (0.15)	0.78*** (0.15)	1.80* (0.72)	0.78*** (0.18)	0.01 (0.05)	1.08* (0.66)	0.12 (0.17)
lnDIS	−1.45** (0.72)	–	−2.32 (2.33)	−8.60*** (2.72)	–	−8.60** (4.24)	−1.78** (0.74)	–	−2.61* (1.52)
Cons	−10.81 (6.68)*	−0.22 (13.86)	−19.96 (21.52)	−79.37*** (25.04)	15.54* (6.61)	−79.37** (39.62)	−13.65** (6.86)	−3.79 (16.76)	−22.60* (14.50)
No. of observations	492	492	492	48	48	48	444	444	444
Hausman test	13.57***			34.57***			8.92**		

Notes: Robust standard errors are in parentheses. ***, ** and * indicate that the coefficient is significantly different from zero at the 1%, 5% and 10% levels, respectively.
Source: The data is sourced from World Bank, China Statistical Yearbook, and www.timeanddate.com.

Conclusion

The analysis shows that despite an unfavorable trade balance position, the economies of SSA in recent years have streng then ed their macroeconomic structure and growth. In the popular gravity model, the factors that determine trade flow also impact the trade balance. The determining factors of SSA's trade balance include the relative absorption capacity in terms of the relative per capita GDP of China to SSA countries and the relative size of countries in terms oftheir relative GDP. The trade balance is also determined by traditional variables like the import-weighted distance of the partners and the real exchange rate. Here, rather than absolute distance in the gravity model, the import-weighted distance proxy for transportation cost is more appropriate. A static cross-country analysis for the bilateral trade balance of SSA countries with China was our main objective for this study.

A fixed-effects estimator was used in our analysis. A static panel data analysis technique was applied for SSA countries' trade with China for the periods 1994–2016, 1994–2004, and 2005–2016. The appropriate model for the study is a fixed-effects model specified by the Hausman test.

The empirical analysis of the study shows that the coefficient of RGDP*ij* (relative GDP) is significant and positive forgroup-I and group-III for the periods 1994–2016 and 1994–2004. Similarly, the results are significant for the period from 2005–2016 for group-I and group-II, implying that with an increase in the relative GDP of China, the trade balance of SSA deteriorates.

On the other hand, the coefficient of RGDPPC*ij* is significant and negative for all groups of countries for the period 1994–2016. However, in the period 1994–2004, the value of RGDPPC*ij* is insignificant for group-II countries. Similarly, for the period 2005–2016, the value is significant for group-III countries. However, for group-III countries, the value is significant and negative in all sample periods, implying that an improvement in China'sabsorption capacity induces it to import more from SSA.

Similarly, the coefficients of *RERij* indicate it is significant and positive for group-II and group-III countries for all the three periods. Similarly, the value of *RERij* is significant for the group-I countries in the periods 1994–2016 and 2005–2016; however, the value remains insignificant for the period 1994–2016. Overall, the results of *RERij* shows that appreciation in the Chinese currencyimproves the export performance of SSA and hence improves the trade balance (*TBij*). This implies a positive sign of the coefficient of thereal exchange rate (*RERij*).

The empirical analysis of the study gives some useful insight into the trade balance of SSA. A static panel data analysis was applied to investigate time-invariant, country-specific effects, as well as the cross-country variations in trade balances with heterogeneous economies and the important factors that significantly affect the trade balance of SSA.

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Appendix

List of the Sub-Saharan African countries used in this study

S. No	Country	S. No	Country
1	Angola	22	Madagascar
2	Benin	23	Malawi
3	Burkina Faso	24	Mali
4	Burundi	25	Mauritania
5	Cabo Verde	26	Mauritius
6	Cameroon	27	Mozambique
7	Central African Republic	28	Namibia
8	Chad	29	Niger
9	Comoros	30	Nigeria
10	Congo, Dem. Rep.	31	Rwanda
11	Congo, Rep.	32	Sao Tome and Principe
12	Cote d'Ivoire	33	Senegal
13	Ethiopia	34	Sierra Leone
14	Gabon	35	South Africa
15	Gambia, The	36	Sudan
16	Ghana	37	Tanzania
17	Guinea	38	Togo
18	Guinea-Bissau	39	Uganda
19	Kenya	40	Zambia
20	Lesotho	41	Zimbabwe
21	Liberia		

Streszczenie

Rola kursu walutowego Chin w bilansie handlowym państw Afryki Subsaharyjskiej: zastosowanie modelu grawitacyjnego

Niniejsze opracowanie prezentuje rezultaty badania wpływu kursu walutowego Chin na bilans handlowy 41 państw Afryki Subsaharyjskiej w latach 1994–2016. Przy zastosowaniu rozszerzonego modelu grawitacyjnego, pogrupowane i niepogrupowane wyniki badania potwierdzają słuszność podejścia elastycznościowego i absorpcyjnego do bilansu handlowego. Podobnie test wrażliwości, dokonany poprzez podział analizowanego okresu na dwa podokresy (2005–2016 i 1994–2004), potwierdza słuszność podejścia elastycznościowego i absorpcyjnego do bilansu handlowego.

Słowa kluczowe: handel dwustronny, Chiny, ASS