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Effects of the African Continental Free Trade Area on Enhancing Exports and Welfare in Selected East African Community Countries

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ABSTRACT

This study assesses the effects of the African Continental Free Trade Area's (AfCFTA) and East African Community's (EAC) memberships on export promotion and household welfare using panel data (1997 to 2020). Results reveal positively significant effects of domestic investment, imports, consumption, political stability, and governance effectiveness on export growth, while the impact of regional membership on exports was inconclusive. Household welfare was positively influenced by GDP, domestic savings, trade, rule of law, and corruption control. Surprisingly, EAC membership negatively affected welfare, and AfCFTA had a negligible impact. Policy efforts should focus on domestic investment and a conducive business environment to enhance EAC export competitiveness.

KEYWORDS

Export performance; free trade area (FTA); openness; welfare improvement

I. Introduction

Regional economic blocs are posited as significant contributors to the sustained economic development of their member countries (Hayakawa and Shiino 2021; Musabanganji et al. 2019). The advantages and disadvantages of regional economic blocs on the development of free trade are the major points of focus for protagonists of free trade. With a focus on removing trade barriers that led to reducing resource waste and lowering the costs of market collapse, the regional trade agreements' (RTAs) advantages are realized through economic liberalization. Additionally, RTAs allow for an influx of capital that is predicted to lead to increasing net trade profits (Islam et al. 2024).

Countries should copiously adopt changes in the production processes, distribution systems, and processing models to reap the gains of regional economic blocs and globalization. The removal of restrictions on the output and interchange of goods and services by domestic

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suppliers, the reduction in tariff barriers, and the opening up of global trade have all made this possible. The consequence will be an expansion of domestic markets, an increase in foreign direct investment (FDI), and the adoption of cutting-edge technology which will promote exports due to the cost savings (Irwin 2024). Furthermore, it is critical to keep in mind that preferential trade agreements (PTAs) affect emerging countries' trade in both favorable and unfavorable ways (Kuenzel and Sharma 2021).

Being a potentially cost-minimizing trade diversion, RTAs can reallocate income toward wealthier individuals (Islam et al. 2024). National productive efficiency is crucial for international economic advantage (Afzal et al. 2018), reflecting a nation's global market competitiveness (Latruffe 2017). Recognizing these potential benefits, 44 of the 55 African Union (AU) members, including all East African Community (EAC) members, established the African Continental Free Trade Area (AfCFTA) in Kigali in 2018 (Songwe, Macleod, and Karingi 2021). AfCFTA holds significant potential to transform the EAC's social, economic, and developmental landscape by fostering regional integration, reducing trade barriers, and promoting intra-African trade, thereby potentially unlocking growth, employment, and poverty reduction opportunities.

While AfCFTA holds transformative potential for the African economy (Abrego et al. 2020), its specific effects on EAC export promotion and welfare improvement remain understudied. Existing AfCFTA research primarily focuses on potential macroeconomic impacts (e.g., increased trade flows, GDP growth, and job creation), neglecting distributional effects across sectors, firms, and households. Furthermore, AfCFTA's impact on multidimensional welfare (economic, social, and environmental), including poverty, inequality, and access to essential services, requires further investigation. Existing studies primarily focus on broad economic modeling and national-level analyses (Wanyonyi and Chemnyongoi 2020). A deeper understanding is needed on how AfCFTA will impact sectoral dynamics within EAC nations. Furthermore, research is limited on the distributional effects within EAC countries. Addressing these knowledge gaps is crucial for crafting targeted policies that maximize AfCFTA's positive effects on exports and welfare across the diverse economies of the EAC.

This study aims to evaluate to what extent a free trade zone in Africa will affect the selected member nations of the EAC in terms of export promotion and welfare improvement. Its specific objectives are: (1) to identify the factors that promote or hinder the promotion of exports for selected EAC member states, as well as (2) to assess the role of AfCFTA in welfare enhancement amid selected EAC partner states. The subsequent sections of this article encompass

a literature review, materials and methods, results and discussion, and a concluding section with recommendations.

II. Literature review

Theoretical foundations of free trade

This study is grounded in three key theoretical frameworks: (1) trade theory, emphasizing comparative advantage as a driver of economic gain through specialization (Somale 2021); (2) economic integration theory, exploring the progressive stages of regional integration from preferential trade agreements (PTAs) to common markets and economic unions (Kloosterman, Mamadouh, and Terhorst 2018); and (3) development theory, focusing on the relationship between economic growth fostered by trade agreements and poverty reduction (Malefane and Odhiambo 2021). The African Continental Free Trade Agreement (AfCFTA) stands as a landmark economic initiative with the high potential to boost economic expansion and intra trade among African countries, in general, and in East African Community (EAC) countries, in particular (Abrego et al. 2020). Indeed, by reducing or eliminating trade barriers, AfCFTA aims to foster regional economic integration, promote economic growth, and enhance the competitiveness of EAC countries in the global market. To fully comprehend the potential impact of AfCFTA on EAC countries, it is essential to examine the underlying theoretical framework that guides the analysis of trade agreements and regional integration initiatives.

First, trade theory, particularly the concept of comparative advantage, suggests that countries can gain from trade by specializing in the production of goods where they have a relative advantage and importing goods where they have a relative disadvantage (Shen et al. 2022). By reducing or eliminating trade barriers, AfCFTA can facilitate this specialization, allowing EAC countries to focus on producing goods where they are most efficient, leading to increased productivity, lower prices, and a wider range of goods for consumers.

Further, economic integration theory complements trade theory by examining the effects of reduced or eliminated trade barriers, progressing from PTAs to deeper integration forms (Kloosterman, Mamadouh, and Terhorst 2018). Key determinants of integration success include regional size and diversity, member economic development levels, complementary economies, and shared political commitment. The EAC, with its relatively homogeneous economies and established institutions, offers a favorable integration environment. Thus, AfCFTA can further strengthen African integration by addressing existing barriers and promoting regional cooperation (Anami 2023).

Furthermore, regional economic integration theory emphasizes factors influencing integration success, including regional size and diversity, member

development levels, and complementary economies. The EAC, with relatively homogeneous economies and established institutions, provides a favorable integration context (Anami 2023). This theory also examines the economic effects of trade barrier reduction/elimination, progressing from PTAs to deeper integration forms (Jansen, Klotz, and Virdee 2020). AfCFTA represents a significant step toward a common African market, potentially enhancing trade, investment, and growth. By removing trade barriers and promoting cooperation, AfCFTA can facilitate the movement of goods, services, capital, and labor within the EAC (Obeng-Odoom 2020).

In addition to the theories mentioned above, development theory examines factors contributing to economic growth and poverty reduction. AfCFTA can contribute to EAC development by promoting economic growth, trade, and investment (Ajambo and Emebinah 2021). Increased economic growth can lead to higher incomes, subsequently improving social indicators such as poverty reduction, employment, education, and healthcare. Beyond these economic justifications for free trade, scholars emphasize AfCFTA's potential benefits for African nations, including increased trade (Signé and van der Ven 2019) and investment (Morgan, Farris, and Johnson 2022), improved market access (Apiko, Woolfrey, and Byiers 2020), enhanced economic diversification, and reduced poverty.

While AfCFTA offers significant opportunities, challenges such as non-tariff barriers, infrastructure bottlenecks, limited finance access, skills shortages, and institutional capacity must be addressed to realize its full potential (Pasara 2020; Simo 2020). AfCFTA, encompassing 1.3 billion people across 55 nations, represents a major economic integration initiative with the potential to enhance African economic growth. By reducing regulatory barriers and expanding market access, it is also expected to stimulate FDI (Morgan, Farris, and Johnson 2022). East Africa, the continent's fastest-growing region, is projected to experience real GDP growth from an estimated 1.5% in 2023 to 4.9% in 2024 and 5.7% in 2025 (AfDBG 2024).

In the economic domain, AfCFTA is projected to promote industrialization by expanding African markets, incentivizing manufacturing and other ventures. Lower trade costs, facilitated by AfCFTA participation, will enhance African firms' global competitiveness. Regional value chain development under AfCFTA will enable production specialization, increasing efficiency and output. Furthermore, AfCFTA is anticipated to foster export diversification, reducing African nations' commodity dependence and enhancing economic resilience (Abrego et al. 2020). In the social domain, AfCFTA has the potential to bring significant social benefits to African countries. These benefits include increased trade and investment, improved access to education and healthcare, improved gender equality, poverty reduction, employment creation, and youth employment, among others (Simo 2020).

Empirical literature related to free trade

Trade liberalization, particularly within the context of AfCFTA, has been extensively studied due to its potential to stimulate economic growth. Existing literature offers two primary perspectives. One strand of research, exemplified by recent empirical studies like Pasara (2020), posits that trade liberalization acts as a key driver of economic growth among trading partners. This perspective highlights the importance of technological advancement and innovation in shaping comparative advantage, especially for developing economies, and suggests the need for complementary policies to promote these factors within liberalized trade environments. A contrasting viewpoint, represented by studies such as Redmond and Nasir (2020) and Wang and Zhang (2021), expresses concerns about the potential negative consequences of free trade for developing economies with nascent domestic industries. These scholars argue that competition from established firms in developed economies may lead to market disruptions and job losses. Consequently, they advocate for transitional policies and support mechanisms, including temporary tariff protections, targeted subsidies, and human capital investment, to foster long-term domestic competitiveness in liberalized trade regimes.

A key challenge for AfCFTA lies in the prevalence of similar factor endowments across member states (Tröster and Janechová 2021), potentially limiting competitive pressures. However, regional value chain development and knowledge transfer facilitated by the agreement offer a potential countermeasure, enabling production specialization, diversification beyond primary commodities, and technological advancement. Furthermore, Africa's historically small share of global trade necessitates addressing structural impediments beyond tariff reduction, such as investments in infrastructure, education, and technology, to enhance competitiveness. Ultimately, AfCFTA's success hinges on fostering innovation and technological adaptation alongside trade liberalization. The IMF (2017) underscores the low volume of intra-African trade, compared to other regions, as a significant constraint on African economic development, highlighting substantial unrealized potential. Conversely, Echandi, Maliszewska, and Steenbergen (2022) project substantial AfCFTA-driven increases in FDI (111 to 159% across scenarios), wage growth (particularly for skilled female workers), and poverty reduction, contingent upon effective implementation. Realization of these benefits may be hampered by challenges such as infrastructural deficits, bureaucratic obstacles, and limited access to finance, necessitating further research to investigate these mitigating factors and inform policy responses.

Beyond comparative advantage, research explores trade liberalization's contribution to export promotion and welfare gains in Africa. Seti and Daw (2022), using a partial equilibrium (SMART) model, estimated potential trade gains for South Africa's agricultural sector under full AfCFTA tariff

liberalization at approximately USD 199 million. However, the limitations of partial equilibrium models, particularly their focus on single markets and dependence on data quality, necessitate further research employing general equilibrium models to capture broader economy-wide and distributional effects. Similarly, Shinyekwa (2020) assessed AfCFTA's impact on the EAC, suggesting that while the agreement may contribute to increased EAC-Africa trade, other factors like infrastructure and regional integration warrant further investigation. Projected tariff revenue losses within the EAC necessitate exploring alternative revenue streams. Furthermore, the study's contrasting welfare effects across EAC members (positive in Burundi and Uganda, negative elsewhere) highlight the need for further analysis considering sectoral composition, development levels, and intra-national distributional impacts for a more comprehensive understanding of AfCFTA's potential consequences.

Studies examining AfCFTA's potential trade impact in Africa offer mixed findings and methodological limitations. Edeme, Nkalu, and Iloka (2022) suggest a positive correlation between AfCFTA implementation and agricultural export development, while Geda and Yimer (2019) project a USD 13.7 billion increase in intra-African trade. However, these studies, along with others, are often constrained by reliance on historical data and assumptions about implementation effectiveness, potentially underestimating the influence of non-tariff barriers, infrastructural limitations, and heterogeneous development levels. For example, Amire and Ogunseye (2020) highlight potential positive effects on trade, sustainable development, and poverty reduction, but their limited sample size and simplified approach to poverty reduction limit generalizability.

Furthermore, the complex relationship between educational expenditure and development indicators requires further scrutiny. Simola et al. (2021) point to potential benefits for agri-food sectors and food security, but data limitations and model assumptions regarding informal sectors and farm size heterogeneity necessitate further research. The potential for food price increases to negatively impact low-income groups' affordability and the observed negative impact of AfCFTA on agricultural production growth due to tariff increases also warrant attention. Finally, research focusing on specific regions, such as Adeboje, Folawewo, and Adedokun's (2022) study on West Africa, while suggesting positive growth and employment effects, is limited by the use of pre-implementation data and a lack of analysis of the distributional effects on job creation. Overall, the literature highlights the need for more robust methodologies, comprehensive data, and detailed analyses to fully understand AfCFTA's complex and mixed impact.

In the same vein, existing research on AfCFTA's potential impacts presents a spectrum of projected outcomes and methodological challenges. Country-specific studies (e.g., Bayale, Ibrahim, and Atta-Mensah 2022) reveal diverse projections, ranging from trade expansion and welfare gains to revenue losses

and distributional concerns. Regional analyses (e.g., Abrego et al. 2020), while estimating welfare gains, acknowledge inherent model limitations and generalizability issues. These studies collectively underscore the need for more robust research that addresses methodological weaknesses, incorporates real-world complexities, and provides a perceptive understanding of AfCFTA's heterogeneous impacts across African contexts, particularly concerning export performance and welfare enhancement within regional economic communities like the EAC. Although the broader trade liberalization literature, from classical theory (Heckscher 1919; Ohlin 1933) to contemporary empirical analyses (Mhonyera et al. 2023; Pasara 2020; Rosenfeld, Mota, and Pereira 2024), generally supports a positive trade-growth nexus, significant knowledge gaps regarding AfCFTA persist. While some studies (e.g., Amire and Ogunseye 2020; Echandi, Maliszewska, and Steenbergen 2022) project positive outcomes, others (e.g., Redmond and Nasir 2020) express concerns about sectoral impacts, inequality, and revenue implications. Methodological limitations, including reliance on historical data and regional specificity, necessitate further research that addresses the complexities of AfCFTA implementation and its diverse effects across its member states (Simola et al. 2021).

A comprehensive understanding requires examining intra-national distributional effects, the interplay of tariff structures and production, and mechanisms for inclusive benefit-sharing (Simola et al. 2021). This study aims to address these gaps by investigating AfCFTA's impact on export performance and welfare distribution within the EAC, exploring the interplay between the newly implemented AfCFTA and the established EAC, and particularly addressing the counterintuitive negative association between EAC membership and household welfare. We also call for future disaggregated research to better understand the insignificant effects of some economic factors and EAC membership on export performance.

III. Materials and methods

Source of data and study variables

This study investigates the relationship between trade agreements, export promotion, and household welfare within the EAC, focusing on Burundi, Kenya, Rwanda, Tanzania, and Uganda, and using World Development Indicators (WDI) data. The EAC's established regional economic bloc, coupled with the recent AfCFTA implementation, provides a valuable framework for examining the impact of both mature and emerging trade initiatives. Diverse economic structures within the EAC allow for analysis of varied effects across development levels. This research offers policy recommendations relevant to the EAC and provides a comparative benchmark for future studies on regional integration. In summary, the EAC's unique characteristics offer

a strategically important context for analyzing the complex interplay between trade agreements, economic activity, and household well-being.

The data span was restricted to the years 1997 to 2020, determined by the availability of comprehensive data encompassing all selected EAC countries for the entire timeframe. This led to the formation of a panel dataset with 24 time periods ($T = 24$) and 5 countries ($N = 5$), T being greater than N. This raised the issue of whether to qualify this set as short or long panel data. According to Hsiao (2022), a panel dataset is considered short if T is relatively small, typically less than 30, and N is relatively large, exceeding 30. Conversely, a panel dataset is considered long if T is relatively large, typically exceeding 50, and N is relatively small, less than 30. In the context of the given panel dataset with 24 time periods and 5 countries, the T-dimension falls within the range typically associated with short panels, while the N-dimension is relatively small. This suggests that the dataset could be classified as a short panel.

The primary independent variable of this study is a dummy variable representing the start of the creation of a continental trade bloc for the whole of Africa, which takes the value 1 since the year of AfCFTA ratification/implementation, and 0 for the whole period before. Exports and household expenditures (a proximate indicator of welfare status) are the dependent variables. The control variables include gross domestic product (GDP), openness (exports as a percentage of GDP), domestic savings, and foreign direct investment, as well as a dummy that reflects EAC membership for a particular year. If country *i* is an EAC member for the year *t*, the dummy equals 1; otherwise, it takes the value of 0.

We intended to include the GINI coefficient (inequality measure) and transport infrastructure, but these variables do have not sufficient observations either for all selected countries or for the period of study. For the multiple membership of a country to regional blocs, the variable was dropped from the estimated model because of collinearity. The definitions of the study variables are provided in Table 1.

The expected signs of the study variables for both export performance and welfare improvement (consumption) are outlined in Table A1 of the online Appendix. The analysis anticipates a positive relationship between export performance and variables such as GDP, FDI, infrastructure, stability, corruption control, rule of law, business environment, electricity, government policies, and regional economic bloc memberships. Conversely, variables like inflation, unemployment, and oil prices are expected to have a negative impact on export performance. For welfare improvement (consumption), the study posits positive associations with variables like GDP, FDI, infrastructure, stability, corruption control, rule of law, business environment, electricity, government policies, and regional economic bloc memberships. Conversely,

Table 1. Definition of the study variables.

Variable	Definition	Source*
Exports	Exports of goods and services of country *j* during the year *t* (constant 2015 US $)	WB – WDI
Consumption	Household consumption of country *j* during the year *t* (constant 2015 US$)	WB – WDI
Gross Domestic Product	Gross domestic product of country *j* during the year *t* (constant 2015 US$)	WB – WDI
Imports	Imports of goods and services of country *j* during the year *t* (constant 2015 US$)	WB – WDI
Foreign Direct Investment	Net foreign direct investments of country *j* during the year *t* (constant 2015 US$)	WB – WDI
Gross Capital Formation	Gross capital formation of country *j* during the year *t* (constant 2015 US$)	WB – WDI
Gross Domestic Savings	Gross domestic savings of country *j* during the year *t* (current US$)	WB – WDI
Consumer Price Index	Consumer price index of country *j* during the year *t* (100 in 2010)	WB – WDI
Population	Total population of a country *j* during the year *t*	WB – WDI
Infrastructure	Government expenditure for infrastructure development in USD for a country *j* during the year *t*. This was measured by the Logistics Performance Index (LPI).	WB – WDI
Stability	Political stability measured by the percentile rank of a country *j* during the year *t*	WB – WDI
Corruption control	Level of corruption control measured by the percentile rank of a country *j* during the year *t*	WB – WDI
Rule of law	Level of the rule of law of a country *j* during the year *t*	WB – WDI
Business	Time required to start a business (number of days) in country *j* during the year *t*	WB – WDI
Electricity	Percentage of the population that has access to electricity in country *j* during the year *t*	WB – WDI
Government	Government effectiveness (percentile rank) for country *j* during the year *t*	WB – WDI
Inflation	Inflation rate, annual % change of CPI of a country *j* during the year *t*	WB – WDI
Unemployment	Overall unemployment rate of a country *j* during the year *t*	WB – WDI
Oil price	Oil price in USD on a domestic market of a country *j* during the year *t*	WB – WDI
FTA memberships (RECs)	Number of memberships of country *j* to regional economic blocs	Fanta (2021)
Dummy D1 (EAC)	A dummy variable ($D_1 = 1$ if country *j* is an EAC member during the year *t*, 0 if otherwise). For example, D1 = 0 before 2007 and D1 = 1 since 2007 for Rwanda.	Masinde and Omolo (2017)
Dummy D2 (AfCFTA)	A dummy variable ($D_2 = 1$ if AfCFTA is already initiated for the year *t*, 0 if otherwise)	

Notes: *WB stands for World Bank; WDI stands for World Development Indicators.

variables like inflation, unemployment, and oil prices are expected to have a negative influence on consumption. Furthermore, Table A2 of the online Appendix presents the interrelationships among the quantitative research variables.

Specification of the empirical model

A panel econometric model was adopted in the estimation process to capture the effects of both individual and temporal variations. Panel models are beneficial in the field of economics. They make it possible to quantify and detect effects more accurately, to reduce bias, and to select subject-specific factors that take heterogeneity into account. Additionally, panel models enable

the use of more insightful data, which increases variability, decreases collinearity, increases degree of freedom, and increases efficiency (Gujarati 2021). We selected this model to take delight in the advantages of panel econometric models, allowing the measure of dynamics of the phenomenon under investigation, among others (Hsiao 2022). The empirical model was specified following Equation 1.

$$Y_{jt} = \alpha + \delta_j T_{ij} + \beta_j X_{kjt} + \eta_j + \upsilon_{jt} \tag{1}$$

where Y_{jt} is the dependent variable (exports or household consumption), X_{kjt} are the independent variables, α is a constant, β_i (a vector) and δ_i (a vector) are the coefficients, i denotes the number of covariates (independent variables of primary interest), k is the number of independent variables, j denotes a country, t is time, and $u_{jt} = \eta_j + \upsilon_{jt}$ shows the components of the common fixed-effects of the disturbance error.

Household consumption expenditure serves as a valuable indicator of welfare due to its ability to capture living standards (Zhu et al. 2021). A higher expenditure reflects a household's capacity to access a wider range of goods and services, directly impacting their quality of life (Diamond and Moretti 2021). These data are also relatively easy to collect through household surveys, making it a readily available metric for researchers and policymakers (Wongmonta 2022). By tracking trends in consumption expenditure over time, it becomes possible to assess changes in a population's welfare and evaluate the effectiveness of policies aimed at improving living standards (Goerlich 2024). However, it is crucial to acknowledge the limitations of this measure, as it does not account for the quality of goods purchased nor the distribution of resources within a household (Neri 2021). Additionally, non-material aspects of well-being, such as access to healthcare and education, remain outside the scope of consumption expenditure data.

Method of data analysis

In light of the particular configuration of our panel data, characterized by a preponderance of time periods (T) relative to the number of countries (N), several key considerations emerge for our subsequent analysis. In short panels, the limited number of periods can exacerbate the impact of serial correlation, making it a crucial concern for model specification and estimation (Adedoyin et al. 2021). Heterogeneity, on the other hand, occurs when the relationship between the variables differs across cross-sectional units, violating the assumption of homogeneity that underpins traditional estimation methods. Following Elzaki (2023), we observed that Equation (1) can be estimated using one of the three alternative methods to panel analysis, namely the pooled ordinary least

squares (POLS) approach, fixed effects (FE) estimation method, and random effects (RE) estimation method.

Before any econometric estimation, preliminary tests for homoscedasticity (homogeneity of variance) and cross-sectional dependence (CD) were conducted to address potential econometric concerns specific to panel data (see Pesaran 2021). Moreover, the normality of the residuals was assessed through tests for skewness, kurtosis, and the Jarque-Bera test for overall normality (Kim 2021).

Following the initial diagnostic tests, a battery of econometric tests was employed to ascertain the most suitable model specification (POLS, FE, or RE) for the analysis. This selection aligns with established practices for small panel data estimations, where the number of time periods (T) and countries (N) are both less than 25 (Ceesay and Moussa 2022). In our investigation, we employed a battery of tests to assess the potential presence of endogeneity, including the F-statistic, the Breusch-Pagan Lagrange multiplier (LM) test (Guastadisegni et al. 2022), and the Hausman test (Patrick 2021). This approach aimed to achieve a robust understanding of whether the explanatory variables suffer from endogeneity bias. This approach is particularly advantageous for two reasons. Firstly, it accommodates the presence of unit root issues within the food security indicators. Secondly, it effectively captures the potential for heterogeneity across the data, acknowledging the existence of challenging cross-sectional differences among the countries.

Building upon the POLS model as the baseline, this study also employed the instrumental variables-generalized method of moments (IV-GMM) estimation to mitigate potential endogeneity biases. Drawing upon the Keynesian theory of income and expenditure (Soekirman 2024), which posits that national output (GDP) is a function of consumption, investment, government expenditures, exports, and imports, this study accounts for these relationships while analyzing the data. Specifically, the study mainly examined how these determinants influence GDP and subsequently analyzed the impact of GDP on both consumption and export performance.

IV. Results and discussion

Presentation of the results

Table 2 presents descriptive statistics for the study variables, encompassing GDP, consumption, FDI, exports, imports, gross capital formation (GCF), gross domestic savings, population, consumer price index (CPI), and governance indicators (political stability, corruption control, rule of law, regulatory quality, and business start days). The reported statistics include the number of observations, mean, standard deviation, and minimum and maximum values for each variable. The observed large standard deviations across most variables

Table 2. Description of the study variables.

Variable	Obs.	Mean	Std. Dev.	Min	Max
GDP	120	24,283,220,730.67	22,072,118,677.55	1,902,330,564.07	84,125,098,675.53
Consumption	120	20,473,196,165.05	18,535,032,240.64	1,441,939,950.09	75,169,061,865.72
FDI	120	439,569,180.14	509,075,062.62	−475,191.31	2,087,261,309.72
Exports	120	3,606,784,991.99	3,464,742,377.55	56,513,315.55	10,845,332,283.79
Imports	120	5,330,757,487.55	5,181,727,262.31	50,194,319,32	18,993,074,547.97
Gross capital formation	120	5,376,064,224.43	5,713,132,146.03	128,696,125.12	22,547,182,316.18
Population	120	26,990,173	16,210,784	5,923,862	61,704,518
Consumer price index	120	99.49	50.29	28.98	200.23
Political stability	120	20.36	13.13	0.53	52.83
Corruption control	120	27.63	18.82	0.95	75.48
Rule of law	120	30.84	14.78	2.99	61.54
Regulatory quality	120	35.09	13.74	6.52	60.10
Business start (days)	120	22.94	12.52	4	60
Electricity	120	17.73	14.95	1.03	71.49
Government	120	28.67	16.86	.34	63.46
FTA memberships (RECs)	120	2.60	.803	2	4
Infrastructure	120	4.565	5.038	1.61	16.492
Inflation	120	7.68	5.504	−2.815	31.11
Unemployment	120	4.609	3.603	1.027	11.928
Oil price	120	1.051	.198	.56	1.73

Table 3. Results from unit root analysis at the level.

	Levin, Lin, and Chu (LLC)			Breitung		
Variable	T-statistic	p-value	Statistical decision	lambda	p-value	Statistical decision
Consumption	−1.5868	0.1339	NS	3.577	0.9998	NS
GDP	−2.6071	0.0065	S	5.7567	1	NS
GCF	−2.2262	0.0461	S	3.6349	0.9999	NS
Exports	−4.9198	0	S	2.1436	0.984	NS
Imports	−3.0491	0.0153	S	2.5995	0.9953	NS
CPI	2.2287	0.9997	NS	6.4219	1	NS
Population	−2.612	0.0049	S	7.6679	1	NS
Reg_quality	−3.143	0.5573	NS	−2.6407	0.0041	S
Electricity	2.0969	1	NS	3.4028	0.9997	NS
Government	−2.9928	0.4425	NS	−2.599	0.0047	S
LPI	−7.3245	0.0001	S	−4.7009	0	S
Inflation	−7.429	0.0004	S	−1.4658	0.0713	NS
Unemployment	−2.5314	0.5135	NS	−0.4059	0.3424	NS
Oil price	−3.9934	0.6501	NS	−4.6431	0	S
Business	−3.9056	0.1645	NS	−2.0346	0.0209	S
Rule of law	−2.1664	0.7507	NS	−2.4553	0.007	S

Notes: S = stationary; NS = non-stationary.

indicate substantial cross-national heterogeneity, potentially violating the assumption of homoscedasticity. Log transformation of the data is therefore considered as a potential remedy to stabilize variance and improve normality for subsequent statistical analysis.

Table 3 presents the results of the unit root analysis at level, revealing mixed stationarity properties among the investigated variables. Utilizing the Levin, Lin, and Chu (LLC) test, GDP, GCF, exports, imports, population, infrastructure index, and inflation are found to be stationary at level. Conversely, consumption, CPI, regulatory quality index, electricity production, government effectiveness index, unemployment rate, oil price, business environment index, and rule of law index exhibit non-stationarity at level. The Breitung-Im, Pesaran, and Shin (Breitung) test offers a different perspective, indicating stationarity at level for regulatory

Table 4. Results from the unit root analysis at first difference.

Variable	Levin, Lin, and Chu (LLC) T-statistic	p-value	Statistical decision	Breitung lambda	p-value	Statistical decision
ΔConsumption	−8.4709	0.0004	S	−4.772	0	S
ΔGDP	–	–	–	−2.6618	0.0039	S
ΔGCF	–	–	–	−4.6417	0	S
ΔExports	–	–	–	−4.0371	0	S
ΔImports	–	–	–	−3.609	0.0002	S
ΔCPI	−6.0579	0.007	S	−3.0192	0.0013	S
ΔPopulation	–	–	–	−1.0168	0.1546	S
ΔReg_quality	−9.6419	0.0008	S	–	–	–
ΔElectricity	−8.8633	0	S	−7.1678	0	S
ΔGovernment	−11.1999	0	S	–	–	–
ΔInflation	−7.429	0.0004	S	−2.7523	0	S
ΔUnemployment	−6.0474	0.0018	S	−6.6439	0	S
ΔOil price	−3.9934	0.6501	NS	–	–	–
ΔBusiness	−6.0316	0.0568	NS	–	–	–
ΔRule of law	−7.1965	0.6227	NS	–	–	–

Notes: S = stationary; NS = non-stationary; Δ stands for the first difference. The level of significance is 5%.

quality, government effectiveness, infrastructure, oil price, business start-up rate, and rule of law indices, thus highlighting the potential influence of test selection on unit root determination. Consistent with the LLC results, all other variables remain non-stationary at level according to the Breitung test.

Given that both the LLC t-statistic and the Breitung lambda statistic identified as non-stationarity in the levels of consumption, CPI, regulatory quality, electricity production, government effectiveness, unemployment rate, business environment, and rule of law, these variables were subjected to further unit root analysis at the first difference. As reported in Table 4, all variables except oil price, business start-up rate, and the rule of law index achieved stationarity at the first difference.

Table 5 presents the results of model comparison tests conducted to determine the most appropriate specification for regressions utilizing consumption and exports as dependent variables. The findings indicate that the POLS model outperforms the least squares dummy variables (LSDV1 and LSDV3) and RE models for both dependent variables. These results suggest that the POLS model provides a more efficient and statistically robust estimation approach for analyzing these specific relationships within the given dataset.

Table 6 presents the POLS estimation results, identifying GCF, gross domestic savings, imports, consumption, political stability, rule of law, access to electricity, and government effectiveness as significant drivers of export performance. Conversely, GDP, FDI, CPI, population, corruption control, regulatory quality, business start-up rates, inflation, oil price, unemployment, infrastructure development, and REC membership are not significantly associated with export performance. While inflation and oil price exhibit negative (insignificant) effects, and unemployment and infrastructure demonstrate positive (insignificant) effects, on export performance, these relationships are not statistically significant. EAC membership also shows a positive but insignificant effect, while AfCFTA

Table 5. Comparison of the model tests.

Model comparison	POLS vs LSDV 1⁎		POLS vs LSDV 3		LSDV 1 vs LSDV3		Breusch and Pagan (POLS vs RE) ⁑		Hausman (FE vs RE) ⁂	
Model test comparison when Dependent is Consumption										
Test and p-value	F (2,58)	Prob > F	F (21, 39)	Prob > F	F (21, 37)	Prob > F	chibar2(01)	Prob > chibar2	chi2	Prob>chi2
	1.04	0.3587	1.15	0.3463	1.19	0.3133	0	1	2.12	0.998
Best model	POLS		POLS		LSDV1		POLS		RE	
Model test comparison when Dependent is Exports										
Test and p-value	0.36	0.7012	2.28	0.0129	2.19	0.0181	0	1	0.64	1
Best model	POLS		LSDV3		LSDV3		POLS		RE	

Notes: POLS stands for pooled ordinary least squares while LSDV means least squares dummy variable; ⁑ RE stands for random effects; ⁂ FE stands for fixed effects.

Table 6. Comparative analysis of the pooled ordinary least squares (POLS), random effects (RE), and fixed effects (FE) estimations for welfare improvement among selected East African community (EAC) countries.

	POLS estimations				RE estimations				FE estimations			
dexports	Coef.	St.Err.	p-value	Sig	Coef.	St.Err.	p-value	Sig	Coef.	St.Err.	p-value	Sig
dgdp	0.931	0.78	0.237		0.931	0.78	0.232		0.995	0.794	0.215	
dfdi	0.005	0.018	0.794		0.005	0.018	0.793		0.006	0.018	0.75	
dgcf	-0.433	0.196	0.031	**	-0.433	0.196	0.027	**	-0.457	0.203	0.028	**
dgds	0.189	0.057	0.001	***	0.189	0.057	0.001	***	0.19	0.057	0.002	***
dimports	0.569	0.182	0.003	***	0.569	0.182	0.002	***	0.565	0.186	0.004	***
dconsumption	-1.044	0.303	0.001	***	-1.044	0.303	0.001	***	-1.084	0.31	0.001	***
dcpi	-0.003	0.004	0.378		-0.003	0.004	0.374		-0.003	0.004	0.39	
dpopulation	2.087	4.052	0.608		2.087	4.052	0.607		2.017	4.808	0.676	
dstability	0.005	0.003	0.085	*	0.005	0.003	0.079	*	0.005	0.003	0.094	*
druleoflaw	0.008	0.003	0.016	**	0.008	0.003	0.014	**	0.008	0.003	0.014	**
dcorruption_control	-0.003	0.003	0.315		-0.003	0.003	0.311		-0.004	0.003	0.29	
dreg_quality	-0.002	0.004	0.671		-0.002	0.004	0.67		-0.002	0.004	0.63	
dbusiness	0.002	0.003	0.459		0.002	0.003	0.456		0.002	0.003	0.573	
delectricity	0.006	0.003	0.071	*	0.006	0.003	0.066	*	0.006	0.004	0.074	*
dgovernment	-0.006	0.003	0.031	**	-0.006	0.003	0.027	**	-0.006	0.003	0.042	**
dinflation	0.001	0.003	0.728		0.001	0.003	0.727		0.001	0.003	0.776	
doilprice	0.034	0.059	0.569		0.034	0.059	0.567		0.041	0.06	0.497	
dUnempl	-0.021	0.03	0.481		-0.021	0.03	0.479		-0.018	0.03	0.543	
LPI	-0.004	0.003	0.16		-0.004	0.003	0.155		-0.002	0.004	0.64	
recs	0.002	0.019	0.926		0.002	0.019	0.925		0	.	.	
D1 (EAC)	0.003	0.044	0.946		0.003	0.044	0.946		0.003	0.045	0.955	
D2 (AfCFTA)	-0.029	0.038	0.454		-0.029	0.038	0.451		-0.028	0.039	0.471	
Constant	0.013	0.16	0.936		0.013	0.16	0.936		0.011	0.148	0.943	
R-squared	0.467	Obs	83		R-squared	0.467	Obs	83	R-squared	0.445	Obs	83
F-test	2.386	Prob > F	0.004		Chi-square	52.503	Prob > chi2	0	F-test	2.213	Prob > F	0.007

Note: *** p<.01, ** p<.05, and * p<.1.

membership unexpectedly presents a negative, albeit insignificant, association with export performance, warranting further investigation. For comparative purposes and robustness checks, and acknowledging the inherent limitations of the POLS model, FE and RE estimations are also included in Table 6.

Table 7 presents the POLS estimation results for the determinants of household welfare. GDP, gross domestic savings, imports, exports, rule of law, corruption control, and government effectiveness are all found to be positively and significantly associated with household welfare. However, a counterintuitive negative and statistically significant relationship is observed between EAC membership and household welfare, while AfCFTA membership exhibits a positive, albeit statistically insignificant, effect. These findings are specific to the selected EAC countries and require careful interpretation. The negative EAC membership association warrants further investigation. Potential explanations grounded in economic theory include short-run adjustment costs from trade agreements, uneven benefit distribution, policy deficiencies within member states, and data limitations. Market disruption from EAC trade flows, potentially leading to temporary job losses and income reductions for less competitive domestic producers, is one possibility. Furthermore, the benefits of trade agreements may accrue disproportionately to larger producers, disadvantaging vulnerable populations. Inadequate support programs or infrastructural deficits could amplify these negative impacts. Data limitations may also contribute. Future research employing extended time series data, disaggregated analysis, and a more comprehensive variable set is recommended. For comparative and robustness purposes, and in recognition of the inherent limitations of the POLS model, FE and RE estimations are also presented in Table 7.

Furthermore, the POLS model serves as a baseline model, and the study employed IV-GMM estimation to address the potential endogeneity concerns in the analysis. On the one hand, macroeconomic factors significantly influence both household consumption and export performance within select EAC countries. Household consumption is positively influenced by GDP growth, corruption control, and infrastructure, but negatively impacted by inflation and unemployment. Counterintuitively, EAC membership correlates negatively with household welfare, while AfCFTA participation shows a positive, though not statistically significant, association. On the other hand, export performance is positively associated with rule of law but negatively with unemployment. While EAC membership shows a marginally positive, statistically insignificant, influence on exports, AfCFTA participation exhibits a negative, also statistically insignificant, impact. These findings suggest a complex relationship between regional integration and economic outcomes, particularly export performance, requiring further investigation.

Table 8 presents the results of the IV-GMM estimation conducted for both the consumption and export performance models. This technique was employed to address potential endogeneity issues and provide more robust

Table 7. Comparative analysis of the pooled ordinary least squares (POLS), random effects (RE), and fixed effects (FE) estimations for welfare improvement among selected East African Community (EAC) countries.

	POLS estimations				RE estimations				FE estimations			
dconsumption	Coef.	Std.Err.	p-value	Sig	Coef.	Std.Err.	p-value	Sig	Coef.	Std.Err.	p-value	Sig
dgdp	0.604	0.297	0.046	**	0.604	0.297	0.042	**	0.626	0.299	0.04	**
dfdi	0.009	0.007	0.177		0.009	0.007	0.171		0.01	0.007	0.152	
dgcf	−0.081	0.079	0.31		−0.081	0.079	0.306		−0.095	0.08	0.243	
dgds	0.065	0.023	0.006	***	0.065	0.023	0.004	***	0.065	0.023	0.006	***
dimports	0.289	0.067	0	***	0.289	0.067	0	***	0.279	0.068	0	***
dexports	−0.158	0.046	0.001	***	−0.158	0.046	0.001	***	−0.161	0.046	0.001	***
dcpi	0.001	0.001	0.706		0.001	0.001	0.705		0.001	0.001	0.712	
dpopulation	−0.271	1.581	0.864		−0.271	1.581	0.864		−0.493	1.852	0.791	
dstability	0.001	0.001	0.603		0.001	0.001	0.601		0.001	0.001	0.631	
druleoflaw	0.002	0.001	0.08	*	0.002	0.001	0.075	*	0.003	0.001	0.052	*
dcorruption_control	−0.004	0.001	0.004	***	−0.004	0.001	0.003	***	−0.004	0.001	0.004	***
dreg_quality	0.002	0.002	0.13		0.002	0.002	0.125		0.002	0.002	0.198	
dbusiness	0.001	0.001	0.484		0.001	0.001	0.481		0	0.001	0.705	
delectricity	0.001	0.001	0.359		0.001	0.001	0.355		0.001	0.001	0.356	
dgovernment	−0.003	0.001	0.029	**	−0.003	0.001	0.025	**	−0.002	0.001	0.047	**
dinflation	−0.002	0.001	0.178		−0.002	0.001	0.173		−0.002	0.001	0.161	
doilprice	−0.01	0.023	0.656		−0.01	0.023	0.654		−0.004	0.023	0.859	
dUnempl	0.009	0.012	0.455		0.009	0.012	0.452		0.01	0.012	0.396	
LPI	−0.002	0.001	0.115		−0.002	0.001	0.11		0	0.002	0.859	
RECs	−0.011	0.007	0.134		−0.011	0.007	0.129		0	.	.	
D1 (EAC)	−0.039	0.017	0.023	**	−0.039	0.017	0.019	**	−0.037	0.017	0.029	**
D2 (AfCFTA)	0.007	0.015	0.636		0.007	0.015	0.634		0.007	0.015	0.636	
Constant	0.082	0.061	0.188		0.082	0.061	0.183		0.054	0.057	0.345	
R-squared	0.641	Obs	83		R-squared	0.641	Obs	83	R-squared	0.633	Obs	83
F-test	4.877	Prob > F	0		Chi-square	107.29	Prob > chi2	0	F-test	4.759	Prob > F	0

Note: Significance levels at *** $p < .01$, ** $p < .05$, and * $p < .1$.

Table 8. Instrumental variables-generalized method of moments (IV-GMM) estimation.

	IV-GMM estimation of consumption				IV-GMM estimation of export performance			
	Coef.	Std.Err.	p-value	Sig	Coef.	Std.Err.	p-value	Sig
dgdp	2.489	0.363	0.000	***	0.671	1.012	0.507	
dcpi	0.003	0.001	0.065	*	−0.005	0.003	0.127	
dpopulation	−0.896	1.249	0.473		1.335	3.698	0.718	
dstability	−0.001	0.001	0.173		0.004	0.003	0.191	
druleoflaw	−0.001	0.001	0.244		0.008	0.003	0.012	**
dcorruption_control	−0.004	0.001	0.000	***	−0.002	0.003	0.518	
dreg_quality	0.002	0.002	0.252		−0.004	0.003	0.146	
dbusiness	0.000	0.001	0.504		0.002	0.002	0.394	
delectricity	−0.002	0.001	0.203		0.005	0.003	0.117	
dgovernment	−0.001	0.001	0.669		0.000	0.003	0.978	
dinflation	−0.002	0.001	0.079	*	0.001	0.002	0.710	
doilprice	−0.013	0.023	0.585		0.052	0.060	0.385	
dUnempl	0.027	0.011	0.016	**	−0.049	0.018	0.006	***
LPI	0.003	0.001	0.007	***	−0.001	0.002	0.768	
RECs	−0.006	0.009	0.491		0.008	0.015	0.614	
D1	−0.046	0.019	0.019	**	0.02	0.030	0.515	
D2	0.022	0.013	0.083	*	−0.011	0.029	0.700	
Constant	−0.029	0.056	0.598		−0.036	0.139	0.796	
Observations		83				83		
Chi-square (Chi2)		68.600				66.598		
Prob > Chi2		0.000				0.000		

Note: Significance levels at ***$p < .01$, **$p < .05$, and *$p < .1$.

estimates of the impact of various factors on household consumption and export activity.

Discussion of the main findings

The results of this study highlight the potential benefits of FTAs, such as AfCFTA, in promoting export growth and enhancing consumer welfare in EAC member countries. However, it also acknowledges the potential for trade diversion, where trade between member countries shifts away from nonmember countries, potentially negating the benefits of trade creation. There is no doubt that free trade is very important in promoting exports and improving consumer life conditions. It enables economic growth through specialization, for which the ultimate result is improved welfare (Melitz and Redding 2021). The increased capital inflows, rising net trade gains (Islam et al. 2024), and superior capacity for a country to produce goods and services (Latruffe 2017) are considered the primary drivers of economic growth for members of a regional economic cooperation.

This study investigates factors influencing export performance in select EAC countries, recognizing its importance as a key indicator of economic health and competitiveness (Hajighasemi et al. 2022). While unemployment, infrastructure, inflation, and oil prices proved statistically insignificant, the established positive correlation between GDP and export propensity (Olyanga et al. 2022) suggests that larger economies with diversified production bases benefit from economies of scale and enhanced export competitiveness. The complex interplay between imports

and exports, potentially leading to both trade creation and diversion (Cherif and Hasanov 2024), necessitates careful consideration of import composition and its interaction with domestic production. Political stability and a strong rule of law are crucial for attracting FDI and fostering predictable business environments, while instability and weak legal frameworks are detrimental to trade (Kanike 2023). Notably, AfCFTA's intended positive impact on EAC export performance remains statistically insignificant (Turkson et al. 2023), possibly due to implementation challenges and adaptation lags (Pananond, Gereffi, and Pedersen 2020). Further research focusing on specific product categories, trade patterns, and implementation effectiveness is essential for a comprehensive understanding of AfCFTA's true impact.

The authors' decision to incorporate inflation rate, oil price, unemployment rate, and infrastructure (LPI) data as determinants of export performance in EAC countries presents a unique perspective. However, the statistically insignificant findings for these variables raise pertinent questions. The negative, albeit insignificant, effect of inflation, which typically diminishes export competitiveness by increasing production costs (Sumiyati 2020), may be attributable to the specific composition of EAC exports, potentially comprising goods less sensitive to inflation, or effective exchange rate management mitigating inflationary pressures. Similarly, the insignificant impact of oil prices, generally associated with increased transportation costs and hindered exports (Akinsola and Odhiambo 2020), warrants further investigation. Possible explanations include the EAC's export sector's lower reliance on oil-intensive transport or a study timeframe that did not capture substantial oil price volatility.

The statistically insignificant, yet positive, effects of unemployment and infrastructure on EAC export performance also warrant consideration. While a readily available workforce (low unemployment) could intuitively benefit exports (Fajgelbaum 2020), the insignificant result suggests potential complexities. A skills mismatch, where the unemployed lack skills relevant to export-oriented industries, or low labor intensity in EAC exports, could explain this finding. Similarly, although a robust infrastructure (high LPI) is generally expected to facilitate exports by improving logistics (Martí and Puertas 2017), uneven infrastructural development across the EAC, with deficiencies in key areas like ports or border crossings, could negate the overall positive effects. Data limitations may also contribute to this finding, potentially obscuring the impact of infrastructure on specific export sectors.

It is important to emphasize that these findings likely reflect complex relationships that require further investigation. Further research is necessary to pinpoint the reasons behind these findings. A more detailed analysis that considers specific product categories, existing trade patterns within the EAC, and the effectiveness of AfCFTA implementation efforts is crucial for a clearer

understanding of the agreement's true impact on export performance and welfare improvement.

V. Conclusion

Summary of key findings

The empirical analysis presented in this study has shed light on the intricate relationship between various economic factors and export promotion within the East African Community (EAC) and the diversified impact of trade liberalization and economic integration on household welfare. The analysis revealed positive associations between export performance and investment (gross capital formation and domestic savings), imports, consumption, political stability (rule of law), and government effectiveness, suggesting that higher investment, international trade engagement (imports and consumption), political stability, and effective governance contribute to stronger export performance. Counterintuitively, GDP, FDI, and infrastructure development (LPI), despite theoretically positive relationships with export propensity, showed statistically insignificant correlations. Further investigation is required to elucidate these unexpected findings within the EAC context.

This study's core finding challenges established theory by revealing statistically insignificant relationships between EAC export performance and key macroeconomic variables (inflation, oil price, unemployment, and infrastructure development), contradicting conventional economic wisdom. These unexpected results necessitate further investigation of EAC-specific dynamics. Regarding regional integration, the positive, yet insignificant, association between EAC membership and export performance, contrasted with the insignificant negative correlation with AfCFTA membership, requires further research to understand the complex interplay between regional integration and trade.

Furthermore, the study identified statistically significant positive relationships between household welfare and national GDP, domestic savings, international trade participation, rule of law, corruption control, and government effectiveness, suggesting the importance of these factors for household well-being. However, the counterintuitive negative association between EAC membership and household welfare, alongside the insignificant positive effect of AfCFTA membership, necessitates further research to explain these unexpected results. The study's EAC focus limits generalizability, requiring future research to explore external validity. Acknowledging potential omitted variable bias, the authors recommend incorporating additional variables, employing advanced econometrics, and utilizing qualitative research to investigate the

complex interplay between trade agreements, economic activity, and household well-being.

Policy implications

Addressing existing knowledge gaps regarding AfCFTA's sectoral and distributional impacts within EAC countries necessitates a more insightful policy approach. Specifically, policy interventions should target both sectoral development and diversification, moving beyond broad economic modeling to analyze AfCFTA's influence on specific industries. Furthermore, promoting inclusive participation is crucial, requiring initiatives that address potential challenges faced by small and medium-sized enterprises (SMEs) to ensure widespread economic welfare and mitigate potentially negative distributional effects. Focusing on these key areas – sectoral development, diversification, and inclusive participation – will enable EAC countries to leverage AfCFTA for maximized export growth and improved welfare across a broader range of economic actors.

Recommendations for future research

This study reveals counterintuitive findings that challenge prevailing assumptions about factors influencing export performance in the EAC, notably the insignificance of inflation, oil prices, unemployment, and infrastructure. Future research should employ disaggregated analyses – examining product-level exports, labor market dynamics, infrastructure heterogeneity, and AfCFTA impacts – to uncover nuanced mechanisms and inform more effective regional trade and development policies.

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No potential conflict of interest was reported by the author(s).

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Aristide Maniriho contributed to the study's conception and design. Material preparation, data collection, and analysis were performed by Aristide Maniriho, Jonas Barayandema, and Pascal Kayisire. The first draft of the manuscript was written by Aristide Maniriho and Jonas Barayandema. Aristide Maniriho, Jonas Barayandema, and Pascal Kayisire commented on the draft versions of the manuscript, and they have read and approved the final manuscript. Finally, Aristide Maniriho worked on the reviewers' comments.

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