Public-Private Infrastructure Investments in COMESA

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**Abstract**

The rising levels of foreign private investment is an indication of critical role of Public-Private Investment (PPI) in advancing development objectives across developing nations. This study investigates the relationship between PPI in infrastructure and agricultural exports within 21 developing COMESA member countries over the period 2013–2023, using a panel data approach. The findings indicate a positive and statistically significant association between PPI in infrastructure and agricultural exports, with the impact being more prevalent in higher-income COMESA countries. This calls for stronger public sector involvement in lower-income nations, where private investment alone may be insufficient to drive trade and economic development. Furthermore, the study evaluates the effect of PPI in countries with varying levels of trade openness. Results suggest that infrastructure investment is effective in boosting agricultural exports among countries with lower trade openness, indicating that PPI can help offset limited access to global markets by improving domestic trade capacity. Policy recommendations focus on the importance of attracting private capital to key infrastructure sectors specifically telecommunications and transport and ensuring that export revenues are strategically reinvested in high-value, non-resource-based productive sectors. For COMESA countries such as Kenya, aligning private investment with national development priorities and improving infrastructure can unlock agricultural export potential, enhance trade competitiveness, and contribute to inclusive and sustainable economic growth across the region.

Key terms: COMESA, Public Private Partnership, foreign direct investment, agriculture, export

**1.0 Background Information**

According to the International Fund for Agricultural Development (IFAD, 2018), about 79% of the world’s poor live in rural areas where agriculture remains their core economic activity (World Bank, 2018). Living in these regions more likely increases the chances of poverty, with rural poverty rates (17.2%) more than triple those in urban settings (5.3%) (UN, 2018). In many developing nations, investing in rural infrastructure is considered important for reducing poverty. It helps connect local farmers to broader markets and reduces transaction barriers thus enabling more active and competitive roles in global commerce (World Bank, 1982; 2008; Cervantes-Godoy & Dewbre, 2010; UN, 2011; WTO, 2020). These efforts are integrated into wider export-led development agendas that seek to attract foreign direct investment to boost trade-related sectors and strengthen global market integration.

Between 2000 and 2022, global trade in goods rose by over 7% per year, hitting nearly US$ 24.9 trillion by 2022, largely due to rising prices for energy and primary commodities (WTO, 2023). Since 1995, when the WTO was formed, trade volumes and values have grown faster than global output. Developing nations now contribute around 42% of global exports, up from 37% in 2010, while developed countries' share has dropped from 66% to 53% (WTO, 2023; UNCTAD, 2023). Despite progress, Least Developed Countries (LDCs) fell short of the SDG 17.11 goal to double their export share by 2020. Global food trade has also expanded significantly, with traded calories multiplying five times and developing nations increasing their share of agricultural exports from 33% to 51%. Still, infrastructure financing gaps remain substantial. It’s estimated that developing countries require $1.8–2.3 trillion in yearly infrastructure spending by 2020. To meet future needs, emerging markets must invest 2.7% of GDP annually through 2030, and low-income countries as much as 9.8% (IMF, 2023). Studies show around 4.5% of GDP must be allocated yearly to fund basic infrastructure in energy, transport, and digital sectors (World Bank, 2023).

Multinational enterprises continue to play a dominant role in infrastructure investment across the globe (UNTT, 2013). Although Foreign Direct Investment (FDI) has generally trended downward from 2010 to 2022, developing regions including COMESA countries have experienced a 44% rise in FDI, reaching approximately US$ 916 billion in 2022. These nations have remained the leading destinations for FDI since the 1990s.

Within the framework of the post-2015 Agenda, private sector engagement has become central to advancing sustainable development goals (United Nations, 2015). At the same time, public institutions are essential in crafting investment-friendly environments and encouraging collaboration with private entities (World Bank, 2008; United Nations, 2010; UNCTAD, 2011; UNTT, 2013). To support this, the World Bank has promoted public-private collaboration through initiatives like the Public-Private Infrastructure Advisory Facility (PPIAF), which aids developing countries by providing regulatory guidance and improving governance structures.

Since 2000, private entities have committed an average of US$ 97 billion annually to infrastructure initiatives in these economies (World Bank, 2022). In 2022 alone, infrastructure investments involving private actors totaled US$ 91.7 billion across 263 ventures, representing 0.25% of the combined GDP of low- and middle-income nations, up from US$ 74.5 billion and 235 projects in 2021. These projects financed critical sectors such as energy, transport, digital communications, and water services.

For over 20 years, the Public-Private Infrastructure Advisory Facility (PPIAF) has remained the only global initiative exclusively focused on strengthening institutions to support sustainable infrastructure development through private sector collaboration. To date, it has backed nearly 1,700 projects in more than 100 nations, advancing Public-Private Partnerships (PPPs) that have helped mobilize approximately $27 billion in private investment for infrastructure. In 2018, PPIAF launched the PPP Institutions Building Program, which has enhanced the skills of public officials globally and supported the enactment of legal and regulatory frameworks for PPPs. This initiative has helped several countries such as Kenya, Ethiopia, Jordan, Guinea Bissau, Lesotho, Panama, Senegal, Peru, South Africa, Tanzania, Lao PDR, and Vietnam to develop stronger and more practical PPP pipelines. Furthermore, PPIAF’s assistance with regional PPP initiatives under the COMESA framework has provided essential guidance where national frameworks are lacking. Through providing procurement standards and institutional mechanisms, it has filled a key gap, enabling more consistent and effective implementation of cross-border infrastructure projects.

**Objective and hypothesis**

Previous studies have consistently demonstrated that infrastructure development plays a crucial role in facilitating international trade flows (e.g., Limão & Venables, 2001; Nordås & Piermartini, 2004; Yeaple & Golub, 2007). Building on this body of work, the current study explores the increasing relevance of public-private partnerships (PPPs) in the context of trade enhancement. Specifically, it examines how collaborative investments between public entities and private stakeholders in infrastructure relate to agricultural export performance across developing nations. The research evaluates whether such joint investments have a measurable and positive association with agricultural export volumes. Using data from 20 COMESA member countries covering the period from 2013 to 2023, the study analyzes nearly all PPP infrastructure investment projects recorded in the World Bank’s Private Participation in Infrastructure Project Database representing about 99% of such documented initiatives within the region (World Bank, 2023).

The structure of the paper is as follows: Section 2 provides a review of existing studies focusing on the association between trade and infrastructure investment. Section 3 delivers a descriptive summary of data obtained from the World Bank’s repository on public-private infrastructure projects. Section 4 details the methodological framework, beginning with an overview of the selected COMESA countries and then outlining the estimation techniques and methods used to verify robustness. Section 5 presents the key empirical results and provides an interpretative discussion. Finally, Section 6 concludes by mentioning the study’s main policy implications.

**2.0 Literature Review**

Previous studies on the relationship between trade and investment explore whether Foreign Direct Investment (FDI) serves to complement or replace international trade. Complementarity typically emerges in the case of vertical FDI, where multinational enterprises divide production stages among different countries. On the other hand, horizontal FDI, where companies replicate similar operations in various nations, tends to act as a trade substitute. The former is more common between industrialized and developing economies, whereas the latter is prevalent among developed countries (Fontagné, 1999; Magalhães & Africano, 2007).

The direction of causality between trade flows and investment is a critical concept. While both are seen as interdependent, several studies argue that capital inflows usually precede trade expansion (Liu et al., 2001; Alguacil et al., 2002; Pacheco-López, 2005; Pramadhani et al., 2007). In contrast, Bezuidenhout and Naudé (2008) posits that trade can serve as a driver of increased private sector investment. Aizenman and Noy (2005) propose a mutual causality, where both trade and investment influence each other without a clear unidirectional relationship.

Other researchers have taken a sector-specific perspective to investigate investment patterns. Swenson (2004) assessed private investment across different product categories and industries, concluding that the investment–trade relationship shifts depending on the granularity of analysis. At broader aggregation levels, the two are often complementary, whereas they appear to substitute one another when analyzed at narrower, more specific levels.

Furtan and Holzman (2004), along with Rakotoarisoa (2011), explored the dynamics within the agricultural sector. Their studies, focusing on Canada and Sub-Saharan Africa respectively, revealed that private capital in agriculture is positively associated with increased trade in food commodities. Meanwhile, Aizenman and Noy (2005) and Ghosh (2007) call for further exploration into how infrastructure investment factors into these dynamics especially in the production phase.

Research by Nordås and Piermartini (2004) demonstrates that infrastructure quality plays a critical role in enabling trade, as better transport and logistical frameworks reduce transaction costs. Yeaple and Golub (2007), analyzing infrastructure across ten industrial sectors, emphasize that improved infrastructure encourages global specialization and cross-border commerce. Mbekeani (2010) draws attention to Africa’s underperformance in trade logistics, attributing it to deficient infrastructure and weak transportation systems. He recommends that the continent look toward models from regions like Asia, the United States, and Latin America.

In many cases, prior literature views domestic infrastructure as a key component of trade-related costs, which directly affect trade volumes (Hoekman & Nicita, 2011). Structural improvements—both in physical infrastructure and in regulatory practices—can significantly enhance a country's export potential. This has been found to matter more in North-South trade contexts than traditional tariff reductions (Kyvik & Piermartini, 2004; Portugal-Perez & Wilson, 2012; Francois et al., 2013). Furthermore, Behar et al. (2011) observe that countries with larger markets experience more trade benefits from reduced logistical costs, as evidenced by higher trade elasticities.

**3.0 Public-Private Investment Projects in Infrastructure in Sub-Saharan Countries**

Private sector-led foreign investment in COMESA nations has gained momentum in recent years. However, the UNCTAD World Investment Report 2023 indicates that Africa experienced a substantial 47% drop in the overall value of international project finance agreements. Furthermore, the share of Foreign Direct Investment (FDI) in Sub-Saharan Africa’s GDP declined from 3.7% in 2021 to just 1.7% in 2022 (World Bank, 2022).

While the continent’s portion of global FDI inflows increased to 5.2% up from 4.1% in 2020, this growth was largely attributed to a singular intra-company financial restructuring in South Africa, which accounted for nearly 45% of the total inflows in 2021. When this transaction is excluded, the underlying FDI trend in Africa aligns more closely with those observed across other developing regions.

In 2022, disparities in private investment inflows emerged based on countries’ income categories. Least developed and landlocked states witnessed a reduction in private capital, whereas emerging regions such as Asia and Latin America drew the bulk of developing-country FDI, receiving 55% and 37% of the total in 2023, respectively (UNCTAD, 2023).

*Figure 1: Public-private investment projects in infrastructure in sub-Saharan countries*

Source: Own Compilation

Reflecting broader FDI patterns, public-private infrastructure investment in Sub-Saharan Africa reached a high of approximately $1.12 billion in 2018, before declining to around $666.46 million by 2022 (World Bank, 2023). A significant portion of these investments was directed toward upper-middle-income nations, with Southern Africa receiving the largest share. Major economies, including Nigeria ($5.3 billion), South Africa ($4.4 billion), and Kenya emerged as top recipients. This shows investor preference for more developed and stable markets. Importantly, between 2013 and 2023, more than 50% of public-private infrastructure commitments targeted the energy sector. This is a strategic priority in regional development (see Figure 1).

Central Africa East Africa Southern Africa

2022

2021

2019 2020

2018

2017

2016

2015

2014

2013

-5000

45000

40000

35000

30000

25000

20000

15000

10000

5000

0

*Figure 2: Foreign direct investment flows to COMESA member states (2013, 2022)*

Source: UNCTAD's World Investment Report 2023

**4.0 Empirical Framework**

**4.1 Study Sample Description**

This study focuses on 21 developing nations within the COMESA bloc. It covers diverse per capita income levels, from least developed to upper-middle-income and located across four broad regional groupings: North Africa, the Near East, Sub-Saharan Africa, and Southern Africa. To address the research objectives, we begin by assessing the agricultural export performance of each country. Due to the economic diversity among these nations, we account for the role of trade in each economy using a trade openness indicator. This metric which is defined as the ratio of a country’s total trade (exports plus imports of goods and services) to its Gross Domestic Product (GDP) will be used as a measure of how integrated or dependent a country is on international trade.

The underlying hypothesis suggests that, between two countries with comparable trade volumes, the one whose exports and imports are concentrated in higher value-added sectors and form a larger share of GDP is generally less trade-dependent than one focused on lower value-added goods.

To statistically assess the variation in trade openness, the Wilcoxon-Mann-Whitney test is applied, which is suitable for comparing independent non-parametric samples. The timeframe for the analysis ranges from 2013 to 2023. For analytical clarity, the dataset is divided into two primary segments, Sub-sample 1 and Sub-samples 2 & 3, based on whether a country’s trade openness ratio lies above or below a specific threshold. This threshold, set at the median value of trade openness between 2015 and 2020, is established at 65.7% (World Bank, 2022).

**TABLE 1**

|  |  |
| --- | --- |
| Trade openness lower than median (65.7 %) (Sub-sample 1) | Trade openness higher than median (65.7 %)(Sub-sample 2&3) |
| Burundi | Kenya |
| Comoros | Madagascar |
| Democratic Republic of Congo | Rwanda |
| Eritrea | Zambia |
| Eswatini | Zimbabwe |
| Ethiopia | Djibouti |
| Libya | Egypt |
| Malawi | Mauritius |
| Somalia | Seychelles |
| Sudan | Tunisia |
| Uganda |   |

Table 1: Grouping COMESA developing countries based on their level of trade openness

Source: Own Compilation, Data source: World Bank

We focus on three key outcome variables: GDP per capita, the volume of public-private infrastructure investment, and agricultural trade. To evaluate differences across groups, we apply the Wilcoxon-Mann-Whitney test, which assesses the null hypothesis (H₀) that sub-sample 1 and sub-samples 2 & 3 originate from the same distribution for each selected variable. The procedure begins by ranking all observations from both groups combined, sorting them in ascending order based on the target variable’s value and assigning ranks accordingly. Once ranked, the test statistic is derived by calculating the sum of ranks for each group using the standard formulas as outlined below:

$$T1=\sum\_{t=1}^{n1}Ri1$$

$$T2=\sum\_{t=1}^{n2}Ri2$$

 ------------------------------------------------------(1)

In the equations above:

T1 represents the rank sum of sub-sample 1,

R1i denotes the ranks of the individual countries within sub-sample 1,

n1 indicates the sample size of sub-sample 1,

T2 signifies the rank sum of sub-sample 2 & 3,

R2i stands for the ranks of the individual countries within sub-sample 2 & 3,

n2 represents the sample size of sub-sample 2 & 3.

Third, the Mann-Whitney test statistics, denoted as U₁ and U₂, are computed from the previously obtained rank sums using the following standard formulas. The smaller of the two values (U₁ or U₂) is then used to evaluate statistical significance, as it provides the test statistic for determining whether differences between the groups are meaningful.

$$U1=T1-\frac{n1(n1+1)}{2}$$

$U2=T2-\frac{n2(n2+1)}{2}$ ------------------------------------------(2)

Where,

U1 represents the Mann-Whitney statistic in sub-sample 1,

n1 denotes the sample size of sub-sample 1,

T1 signifies the rank sum of sub-sample 1,

U2 indicates the Mann-Whitney statistic in sub-sample 2,

n2 stands for the sample size of sub-sample 2,

T2 represents the rank sum of sub-sample 2.

Table 2 displays the findings, with each column representing one of the three selected target variables. The first, fourth, and seventh columns indicate the number of observations, while the second, fifth, and eighth columns report the corresponding rank sums. Columns three, six, and nine show the Z-statistics derived from the Mann-Whitney test. The rows distinguish between sub-samples: the first row corresponds to countries with trade openness below the median threshold (sub-sample 1), the second to those above the threshold (sub-samples 2 and 3), and the third represents the overall sample. The dataset includes 52 countries spanning the years 1995 to 2011, yielding a total of 824 observations. The cumulative rank sum equals 391,170, calculated using the formula N × (N + 1) / 2. Note that due to missing data in some variables, the rank sum in row three is lower than 391,170 in certain cases.

**TABLE 2**

|  |  |  |  |
| --- | --- | --- | --- |
|   | GDP per capita | Public-private investment in infrastructure | Agricultural exports |
|   | No of obs. | Rank sum | Z | No of obs. | Rank sum | Z | No of obs. | Rank sum | Z |
|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Sub-sample 1: Trade openness lower than median (65.7 %) | 412 | 205,540 |   | 380 | 171,254 |   | 520 | 214,523 |   |
| Sub-sample 2&3: Trade openness higher than median (65.7 %) | 412 | 185,420 |   | 340 | 108,524 |   | 420 | 131,254 |   |
| Whole sample | 824 | 390960 |   | 720 | 279778 | 0 | 940 | 345777 | 0 |
|   |   |   | 2.62\*\* |   |   | 9.71\*\*\* |   |   | 11.55\*\*\* |
|   | Note: \*, \*\*, \*\*\* denote statistical significance level at 10 %, 5 % and 1 % |   |   |   |   |
|   |   |   |   |   |
|   |   |   |   |   |

*Table 2: Wilcoxon-Mann-Whitney test results*

Source: Own compilation, data source world bank

The analysis begins with testing the null hypothesis (H0) that GDP per capita is similar between developing countries in sub-sample 1 and those in sub-samples 2 and 3. The rank sum for sub-sample 1 is higher than that of sub-sample 2&3, revealing a statistically significant difference. This outcome suggests that GDP per capita is generally greater in nations with lower trade openness, reinforcing the earlier-stated hypothesis: economies with higher GDP per capita, typically driven by high-value sectors, demonstrate lower dependence on global trade, as reflected in their lower trade openness scores.

A similar pattern is observed for the other key variables, public-private infrastructure investment and agricultural exports. In each case, the rank sum for sub-sample 1 exceeds that of sub-sample 2&3, with the differences being statistically significant. This indicates that countries with lower trade openness are associated with reduced levels of infrastructure investment and agricultural export performance. Therefore, it can be concluded that, on average, developing economies with lower trade openness tend to register lower GDP per capita, receive less public-private infrastructure funding, and maintain a higher agricultural export-to-GDP share. This distinction is supported by a trend analysis of agricultural exports: between 2013 and 2022, countries in sub-sample 1 saw their agricultural exports grow from $3.7 billion to $4.5 billion. Over the same timeframe, exports from countries in sub-samples 2&3 expanded substantially, reaching $31 billion by 2022. Prominent contributors to this export growth include Egypt, Kenya, Ethiopia, Zambia, and Uganda.

**4.2 Methodology**

A wide range of empirical studies has explored the direction and dynamics of the causal link between investment and trade. Some researchers employ country-specific time series data and apply Granger causality tests to determine whether FDI precedes export performance or whether the causality is reversed (see Alguacil et al., 2002; Pramadhani et al., 2007). Other scholars adopt gravity models to study bilateral trade, incorporating determinants such as population size, GDP, foreign direct investment, trade barriers, and geographical distance (Magalhães & Africano, 2007; Bezuidenhout & Naudé, 2008). Further analyses have extended the investigation using panel data methods to evaluate the relationship between investment and trade across countries (Gyfalson, 1999; Furtan & Holzman, 2004; Ghosh, 2007).

In this study, we compile a panel dataset of COMESA countries, all considered developing economies, covering the years 2013 to 2023. The unit of observation is a country-year, with the number of observations ranging between 405 and 512 due to the presence of missing values. Guided by prior literature suggesting that private investment often leads trade flows (e.g., Liu et al., 2001; Alguacil et al., 2002; Pacheco-López, 2005; Pramadhani et al., 2007), we structure our model accordingly.

In our analysis, agricultural exports are designated as the dependent variable, while public-private infrastructure investment is among the key explanatory variables. We test the hypothesis that greater infrastructure investment is positively associated with increased agricultural export performance. To deepen our analysis, we further disaggregate infrastructure investment into three sectors: telecommunications, energy, and transport, to identify whether specific sectors exert a stronger influence on exports.

Our model also incorporates control variables previously recognized in the literature (Model 1). These include: (a) the nominal annual exchange rate, as explored by Furtan and Holzman (2004), Hacker and Hatemi (2004), and Ali et al. (2014); (b) GDP per capita of the exporting country, following Ghosh (2007); and (c) the average GDP per capita for Africa, consistent with Samad et al. (2009). All variables are transformed using natural logarithms to ensure consistency and interpretability. The baseline estimation model (Model 1) is expressed as follows:

L\_Agri\_Xu = αo + α1 L\_PPI\_infrait + α2 L\_XRTit + α3 L\_GDP\_capit + α4 WGDPit + £it where,

i = 1…20 COMESA countries;

t = 1…10 years (period 2013-2023);

L\_Agri\_Xu = Logarithm of agricultural output/exports, country i, year t;

α1 L\_PPI\_infrait = = Logarithm public-private investment in infrastructure, country i, year t;

α2 L\_XRTit = Logarithm nominal annual exchange rate, country i, year t

α3 L\_GDP\_capit = Logarithm GDP per capita, country i, year t;

α4 AGDPit = Logarithm average Africa GDP per capita, year t;

£it = is the error term;

To ensure the robustness of the baseline Model 1, we apply four complementary techniques:

* Fixed Effects Adjustment (Models 2 and 3): We introduce country-specific fixed effects to control for inherent characteristics of COMESA member states, such as whether a country is landlocked or an oil exporter. These fixed effects help isolate the impact of unobservable heterogeneity across countries.
* Inclusion of Additional Controls (Models 4–6): In Model 4, we incorporate macroeconomic control variables including inflation rates and income growth volatility, as suggested by Ghosh (2007). Model 5 extends the analysis by integrating institutional quality indicators, specifically general government final consumption expenditure (Gyfalson, 1999) and political regime characteristics (Aizenman & Noy, 2005; Ghosh, 2007). Model 6 adds agriculture-specific variables such as agriculture value added and agricultural gross production value per capita, further refining the model’s explanatory power.
* Trade Openness Dummy Variable (Model 7): Based on the statistically significant differences identified in the prior section, Model 7 includes a binary dummy variable to distinguish between countries with low trade openness (sub-sample 1) and those with high trade openness (sub-sample 2).
* Sub-Sample Estimation: Finally, we re-estimate the baseline Model 1 separately for sub-sample 1 and sub-sample 2. This allows for a comparative assessment of the determinants of agricultural exports across countries with differing levels of trade openness.

To mitigate potential estimation biases arising from serial correlation and heteroskedasticity in our panel data analysis, we implemented two diagnostic tests. First, we employed the Wooldridge test for autocorrelation in panel data (Wooldridge, 2002), which indicated the presence of serial correlation in the error terms. Second, we applied the Wald test for groupwise heteroskedasticity (Fox, 1997), the results of which confirmed the presence of heteroskedasticity across panels. In response to these issues, we adopted the Panel-Corrected Standard Errors (PCSE) estimation technique, as proposed by Beck and Katz (1995). This approach accounts for both heteroskedasticity and contemporaneous correlation across cross-sectional units, thereby enhancing the robustness and reliability of our coefficient estimates.

**5.0 Results and Discussion**

The results of the baseline Model 1, as presented in the first column of Table 3, reveal a positive and statistically significant coefficient for public-private investment in infrastructure. This finding shows that public-private partnerships (PPPs) in infrastructure development positively influence agricultural export performance among COMESA member states. These results are consistent with prior empirical evidence establishing a linkage between foreign direct investment (FDI) and trade (Fontagné, 1999; Alguacil et al., 2002). Given that the model is estimated in logarithmic form, the coefficient can be interpreted as an elasticity: a 1% increase in public-private infrastructure investment is associated with a 0.09% increase in agricultural exports. However, it is important to note that this coefficient is the smallest among the explanatory variables, which may be attributed to the cross-cutting nature of infrastructure investments that impact multiple sectors indirectly rather than being directly targeted at agriculture.

GDP per capita variables demonstrate the highest estimated coefficients among the predictors, indicating that income levels exert a stronger influence on agricultural export performance within the COMESA region. In particular, increases in Africa’s average GDP per capita are associated with enhanced agricultural exports among COMESA member states which is the economic interdependencies across countries within the continent. Furthermore, the positive and statistically significant coefficient of national GDP per capita reinforces the concept that rising domestic incomes support export growth, likely through increased productivity and investment capacity.

Furthermore, the coefficient for the exchange rate variable is positive and significant, suggesting that currency depreciation contributes to improved agricultural export performance. This result supports the theoretical expectation that a weaker domestic currency enhances export competitiveness by making local goods more affordable to foreign buyers. These findings align with the conclusions of Aizenman and Noy (2005) and Furtan and Holzman (2004), who also identified positive relationships between exchange rate adjustments and export expansion.

**TABLE 3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | Model 1 Total investment | Model 1 Investment by sector | Model 2 | Model 3 |
| PPI\_infra | 0.09\*\*\* (0.11) |   | 0.08\*\*\* (0.01) | 0.08\*\*\* (0.21) |
| PPI\_Telecommunications |   | 0.19\*\*\* (0.05) |   |   |
| PPI\_Energy |   | 0.10\*\* (0.14) |   |   |
| PPI\_Transport |   | 0.10\* (0.03) |   |   |
| XRT | 0.12\*\*\* (0.21) | 0.14\*\*\* (0.07) | 0.14\*\*\* (0.12) | 0.21\*\*\* (0.04) |
| GDP\_cap | 0.32\*\*\* (0.04) | 0.70\*\*\* (0.20) | 0.28\*\*\* (0.05) | 0.38\*\*\* (0.03) |
| AGDP\_capita | 0.56\*\*\* (0.15) | 0.08 (0.28) | 0.81\*\*\* (0.18) | 0.58\*\*\* (0.25) |
| Petrol\_export |   |   | 0.48\*\*\* (0.17) | 0.89\*\*\* (0.13) |
| Access to the sea |   |   |   | 0.95\*\*\* (0.21) |
| Intercept | 1.9\* (1.30) | 4.02\*\*\* (1.02) | 1.70 (1.17) | 1.80 (1.31) |
| N | 421 | 180 | 521 | 521 |
| R2 | 0.96 | 0.94 | 0.89 | 0.93 |
| Note: \*, \*\*, \*\*\* shows significant statistical levels at 10 %, 5 % and 1 % respectively. The figures in parentheses represent coefficients of standard errors. |
|

*Table 3: Findings from the baseline Model 1, Model 2, and Model 3 are derived from a dataset encompassing 21 COMESA countries during the period from 2013 to 2023.*

Source: Own Compilation

In the second column of Table 3, the results of Model 1, disaggregating public-private investments by sector, are presented. The findings show that sector-specific investments in telecommunications, energy, and transportation each exert a positive and statistically significant influence on agricultural exports. Among the three sectors, telecommunications investment demonstrates the highest elasticity representing the important role of information access and communication infrastructure in promoting economic development. This observation aligns with previous studies (Dholakia and Harlam, 1994; Hudson, 2013). The effects of energy and transport investments are comparable which implies that both are essential but exert relatively similar magnitudes of influence on export performance.

It is important to note that the number of observations declines when disaggregating public-private investments by sector, with only 180 observations available compared to 421 in the aggregated investment analysis. However, focusing specifically on energy and telecommunications investments increases the number of observations by 113 which further reinforces the robustness of the higher elasticity observed for telecommunications investment relative to energy investment.

Columns 3 and 4 of Table 3 present the results from Models 2 and 3, which incorporate country-specific dummy variables. The introduction of these fixed effects does not alter the conclusions derived from the baseline model. The positive and statistically significant association between public-private infrastructure investment and agricultural exports remains intact across both models. Moreover, both dummy variables, representing oil-exporting status and sea access, are themselves positive and statistically significant. This implies that, on average, agricultural exports are lower in oil-exporting countries (3 out of 21 COMESA states) compared to non-oil-exporters. Similarly, countries with access to seaports (12 out of 21) exhibit higher agricultural export capacity than landlocked nations showing the role of geographic accessibility in trade performance.

Table 4 summarizes the results from Models 4, 5, and 6, which incorporate additional control variables. Despite a reduction in the number of observations due to data limitations, the coefficient on public-private infrastructure investment remains positive and statistically significant across all models. This consistency reinforces the reliability of the baseline findings and suggests that the positive impact of infrastructure investment on agricultural exports is robust to alternative model specifications and the inclusion of additional explanatory factors.

**TABLE 4**

|  |  |  |
| --- | --- | --- |
|   | Dependent variable: **Agricultural exports**  |   |
|   | Model 4 | Model 5 | Model 6 |
| PPI\_infra | 0.09\*\*\* (0.02) | 0.08\*\*\* (0.02) | 0.12\*\*\* (0.03) |
| XRT | 0.07\*\*\* (0.02) | 0.08\*\*\* (0.02) | 0.15\*\*\* (0.03) |
| GDP\_capita | 0.51\*\*\* (0.05) | 0.51\*\*\* (0.06) |   |
| AGDP\_capita | 0.51\*\* (0.21) | 0.61\*\*\* (0.21) | 0.57\*\*\* (0.16) |
| Inflation | 0.06\* (0.03) |   |   |
| Volatility | -0.07 (0.04) |   |   |
| Gov\_expenditure |   | -0.09 (0.11) |   |
| Democracy |   | 0.23 (0.17) |   |
| Agri\_sector |   |   | -0.72\*\*\* (0.07) |
| Agri\_prod\_capita |   |   | 0.18\*\* (0.04) |
| Intercept | 2.21\* (1.33) | 2.21\* (1.28) | 5.80\*\*\* (1.28) |
| N | 412 | 412 | 408 |
| R2 | 0.93 | 0.93 | 0.96 |
| Note: \*, \*\*, \*\*\* shows significant statistical levels at 5 %, 1 % and 0.1 %. The figures in parentheses represent coefficients of standard errors. |
|  |

*Table 4: Results from Model 4, Model 5, and Model 6 are presented, comprising a sample of 21 countries during the period 2013-2023.*

Source Own Compilation

When comparing Models 4, 5, and 6, Model 6 has the highest elasticity for public-private investment in infrastructure. This outcome is partly attributable to the exclusion of GDP per capita from Model 6, given its high correlation with agricultural sector variables. The omission mitigates potential multicollinearity and amplifies the relative effect of public-private investment, thereby explaining the comparatively higher coefficient observed in this model. Across all three models, income-related variables consistently display the highest estimated coefficients which is an indication of their dominant role in influencing agricultural export performance. Meanwhile, the exchange rate variable remains positive and statistically significant throughout, reinforcing its critical role in enhancing export competitiveness.

Turning to the macroeconomic stability variables in Model 4, the inflation coefficient yields an unexpected result: it is both positive and statistically significant. This contradicts the theoretical expectation that inflation would undermine export performance. A subsequent correlation analysis reveals a negative relationship between inflation and agricultural exports, consistent with earlier literature. For instance, Ghosh (2007) finds that inflation adversely affects trade openness, while Gyfalson (1999) links inflation to declining exports as a share of GDP. The divergence between the observed regression coefficient and simple correlation may suggest underlying structural effects or omitted variables that warrant further investigation.

In contrast, the coefficient for income growth volatility is negative but statistically insignificant. This aligns with Ghosh (2007), who also reported an indirect and statistically non-significant relationship between income volatility and trade. The implication is that while income instability may deter trade activity in theory, its measurable impact, at least within the COMESA context, appears limited in statistical terms.

In Model 5, which focuses on institutional quality, the results do not demonstrate a statistically significant relationship between institutional quality and trade. Specifically, the coefficients for general government final consumption expenditure and the democracy index are both statistically insignificant. These findings are consistent with prior studies that failed to establish a direct link between institutional quality and trade flows (Aizenman and Noy, 2005; Ghosh, 2007). However, this contrasts with Rodrik (1998), who posits that strong institutions positively influence export performance by reducing transaction costs and enhancing policy credibility.

Model 6 yields several important insights. First, the coefficient for agricultural value added is negative and statistically significant, and notably, it exhibits the largest absolute coefficient in the model. This suggests that increases in agricultural value added are associated with declines in agricultural exports. This counterintuitive finding aligns with the observed negative correlation between GDP per capita and agricultural value added. As incomes rise, economies tend to reallocate resources from low-productivity sectors such as agriculture toward higher-value and more technologically intensive sectors, thereby diminishing agriculture’s share of GDP and, by extension, its export contribution.

This observation presents a challenge to dependency theory, which posits that revenues from agricultural exports can be used to finance industrial imports and promote diversification. However, Gyfalson (1999) contends that excessive reliance on agriculture can ultimately inhibit export growth, especially under liberalized trade regimes. Agricultural sectors in developing countries often do not capitalize on skilled labor or advanced technology, two critical components for export competitiveness in manufacturing. Bertola and Ocampo (2012) provide supporting evidence from Latin America, where agricultural export booms failed to translate into sustained economic transformation due to underinvestment in non-resource-based, value-added sectors.

Second, as expected, the coefficient for agricultural gross production value per capita is positive and statistically significant, indicating that greater agricultural output leads to higher levels of agricultural exports. This result is intuitive and highlights the supply-side foundation of export performance within the COMESA bloc.

Building upon the heterogeneity in trade openness discussed in Section 4.1, we segmented the sample into three groups based on their degree of trade openness, as shown in Table 1. Table 5 presents the results of Model 1 applied to these sub-samples:

* Sub-sample 1: 11 countries with low trade openness
* Sub-sample 2: 5 countries with moderate trade openness
* Sub-sample 3: 5 countries with high trade openness

In Model 7 (Table 5, Column 2), we introduced a trade openness dummy variable coded as 1 for countries in sub-samples 2 and 3, and 0 otherwise. The subsequent columns present the disaggregated analysis of Model 1 applied separately to sub-sample 1 (Column 3) and the combined sub-samples 2 and 3 (Column 4). This allows for an evaluation of how the relationship between public-private infrastructure investment and agricultural exports varies with different levels of trade integration.

**TABLE 5**

|  |  |  |
| --- | --- | --- |
|   | Dependent variable: Agricultural exports  |   |
|   | Model 7 | Model 1 Sub-sample 1 | Model 1 Sub-sample 2 &3 |
| IPP\_Infrastructure | 0.05\*\* (0.03) | 0.18\*\*\* (0.03) | 0.05\* (0.02) |
| XRT | 0.08\*\*\* (0.03) | 0.03 (0.03) | 0.18\*\*\* (0.04) |
| GDP\_capita | 0.41\*\*\* (0.04) | 0.17\*\* (0.06) | 0.43\*\*\* (0.08) |
| AGDP\_capita | 0.71\*\*\* (0.21) | 1.40\*\*\* (0.18) | 0.14 (0.25) |
| Trade openness | -1.01\*\*\* (0.07) |   |   |
| Intercept | 4.67\*\* (1.34) | 1.96 (1.43) | 5.68\*\*\* (1.04) |
| N | 511 | 412 | 405 |
| R2 | 0.91 | 0.92 | 0.95 |

*Table 5: Results from Model 7, consisting of a sample of 21 countries during the period 2013-2023, are compared with the results of the baseline Model 1, conducted separately on sub-sample 1 and sub-sample 2 & 3, over the same period.*

Source: Own Compilation

As indicated in Table 5, the results from Model 7 closely mirror those of Model 1. The coefficient associated with public-private investment in infrastructure remains positive and statistically significant which further confirms the consistent role of such investment in enhancing agricultural exports. However, the coefficient for the trade openness dummy variable, capturing countries in sub-samples 2 and 3 (i.e., those with moderate to high trade openness), is negative and statistically significant. This implies that, on average, agricultural exports are lower in countries with greater trade openness compared to those with lower openness (sub-sample 1). This finding corroborates the earlier results from the Wilcoxon-Mann-Whitney test discussed in Section 4.1, which indicated significant differences in export performance based on trade openness classification.

Further, disaggregating the analysis by sub-sample (columns 3 and 4 of Table 5) reveals no substantive changes in the direction or significance of the coefficients, despite the reduced sample size (N = 405). All primary explanatory variables, including public-private investment in infrastructure, maintain positive and statistically significant coefficients across both sub-sample regressions.

A comparison between sub-sample results reveals two key important details:

1. The coefficient for public-private infrastructure investment is larger in sub-sample 1 (low trade openness) compared to sub-sample 2&3. This suggests that the marginal impact of infrastructure investment on agricultural exports is more pronounced in countries with lower trade openness, many of which are also relatively higher-income within the COMESA region. This aligns with the conclusions of Portugal-Perez and Wilson (2012), who found that the export-enhancing effects of infrastructure investment are amplified in countries with higher GDP levels. This may also help explain the tendency for private investment to concentrate in more economically developed or stable economies.
2. The coefficient for GDP per capita is higher in sub-sample 2&3, implying that increases in income have a greater effect on agricultural export performance in lower-income countries compared to middle- or upper-income ones. This finding suggests that economic development in less developed countries may disproportionately benefit the agricultural export sector, possibly due to structural shifts or export-oriented agricultural policies.

Finally, while continental GDP per capita remains positive and statistically significant in sub-sample 1, it loses significance in sub-sample 2&3. This implies that regional (continental) demand dynamics may not significantly influence agricultural exports from more open economies within COMESA. One possible interpretation is that countries in sub-sample 2&3 are more integrated into global markets and thus less dependent on intra-African trade. In contrast, countries in sub-sample 1, typically with limited global market access, may rely more on regional demand, but still lack sufficient export capacity to fully capitalize on such opportunities.

**6.0 Conclusion**

The growing role of the private sector in developing economies such as within the COMESA region, continues to be important in achieving broader development objectives. Among the most promising avenues for this engagement is through public-private investment in infrastructure, which has the potential to serve as a catalyst for boosting trade, especially agricultural exports, thereby advancing critical development strategies.

This study examined the relationship between public-private infrastructure investment and agricultural exports across 21 developing COMESA member countries over the period 2013–2023, employing a panel data approach. The objective was to assess whether such investments positively influence agricultural trade flows. Our empirical results support the hypothesized relationship and lead to three key conclusions:

First, the study establishes that public-private investment in infrastructure exerts a significant and positive effect on agricultural exports across the COMESA region. The robustness of this relationship holds across various model specifications. This finding reinforces the essential role of the private sector in contributing to development especially through the facilitation of agricultural trade. Importantly, the analysis identifies sectoral differences in the effectiveness of infrastructure investments. Most importantly, telecommunications infrastructure emerges as a critical determinant of export performance. This suggests that COMESA member states should prioritize investments in digital and communication infrastructure as part of a targeted strategy to stimulate agricultural trade.

Second, the effect of public-private infrastructure investment is found to be heterogeneous across income levels. Specifically, the magnitude of the investment’s impact on agricultural exports is greater in higher-income COMESA countries compared to lower-income counterparts. This disparity is an indication of a pattern of private investment preference for relatively wealthier economies, likely due to better institutional environments, higher returns, and robust market infrastructure. Conversely, least developed countries (LDCs) within COMESA attract limited private investment, less than 20% of that observed in more economically advanced developing nations. As a result, these LDCs are unable to fully capitalize on the export-enhancing benefits of infrastructure development. Addressing this investment gap is imperative. Development policy must therefore focus on incentivizing and de-risking public-private investment in infrastructure for LDCs. This includes strengthening public sector capacity to attract private capital and investing in complementary initiatives, such as farmer empowerment, educational access, asset accumulation, and institutional development, to enhance the inclusiveness and sustainability of export-led growth strategies.

Third, the findings reveal a complex relationship between trade openness, agricultural export performance, and structural transformation. While trade liberalization is commonly regarded as a pathway to economic growth and poverty alleviation, its developmental benefits are contingent upon the strategic reinvestment of export earnings into high-value and non-resource-dependent sectors. The analysis shows that as agriculture’s share in GDP declines, a sign of economic diversification, agricultural export capacity tends to rise. This shows that the ability of the private sector to contribute meaningfully to national development depends not only on export performance but also on how countries allocate the returns from trade. Promoting structural transformation through investment in technology, human capital, and industrialization is essential to ensuring that trade contributes to long-term inclusive growth.

In sum, public-private investment in infrastructure holds potential promise for enhancing agricultural exports and promoting trade-driven development in the COMESA region. However, the impact is uneven across countries, influenced by differences in income levels, investment climates, and structural economic characteristics. For the private sector to effectively support national development objectives, especially in the least developed COMESA countries, policy must aim to create enabling environments that attract and retain investment, foster productivity, and ensure that the gains from trade are equitably distributed and strategically reinvested.

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