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DOES INTERNATIONAL TOURISM SPUR INTERNATIONAL TRADE IN SSA COUNTRIES? A DYNAMIC PANEL DATA ANALYSIS

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Abstract

In this study, the relationship between tourism development and trade in 12 sub-Saharan African (SSA) countries is examined during the period 1995-2019. Three proxies of trade are used, namely the total trade, total exports, and total imports of goods and services to examine this linkage, thereby leading to three separate model specifications. A wide range of modern econometric techniques were also employed to examine the relationship between the various proxies of trade and tourist arrivals. These include i) cross-sectional dependence tests based on Breusch-Pagan (1980) LM, Pesaran (2004) scaled LM, Baltagi et al. (2012) bias-corrected scaled LM, and Pesaran (2004) CD; ii) a slope homogeneity test based on Pesaran and Yamagata (2008); iii) an ECM panel cointegration test based on Westerlund (2007); and iv) a heterogeneous panel causality model based on Dumitrescu and Hurlin (2012), among others. Using the dynamic ordinary least squares (DOLS) and the fully modified ordinary least squares (FMOLS), the study found that, overall, international tourism has a positive and significant impact on trade in SSA countries. This finding is also corroborated by the heterogeneous Granger causality test, which found a distinct unidirectional causal flow from international tourism arrivals to trade. The study, therefore, recommends that SSA countries should implement policies aimed at promoting international tourism in order to increase their international trade and boost their overall trade balance.

Keywords: Tourism, trade openness, Granger-causality, panel analysis, SSA

JEL Classification : C23, F13, Z32

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1. Introduction

Since the mid-1990s, tourism has increasingly become a primary contributor to sustainable economic growth and development, both internationally and in specific countries and regions, through its support to interconnectivity, efficient transport and communication infrastructure improvement, environmental protection, and livelihoods (Richardson, 2021). Tourism has been identified as one of the sustainable development goals' targets. Consequently, it has been included in: i) Sustainable development goal 8, which focuses on inclusive and sustainable economic growth; ii) Sustainable development goal 12, which focuses on sustainable consumption and production; and iii) Sustainable development goal 14, which focuses on the sustainable use of oceans and marine resources (see https://www.unwto.org/tourism-in-2030-agenda). According to ITC/UNWTO (2015), tourism development plays a critical role in maximining the contribution of trade to job creation and the achievement of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs).

Swift developments in the tourism sector has a multiplier effect on world economies, which include the increased generation of foreign currency, the creation of employment (direct and indirect), empowerment of marginalised groups (rural communities, women and youth), welfare enhancement, the creation of strong inter-sectoral linkages (including economic diversification), and the conservation of countries' environmental endowments and cultural heritages, among other benefits (United Nations World Tourism Organisation/UNWTO, 2020a; World Travel and Tourism Council/WTTC, 2020; Tang & Abosedra, 2016: 128; Brida & Risso, 2010: 16). This rapid growth in tourism in other parts of the world is a useful tool and yardstick for sub-Saharan African (SSA) countries seeking to initiate and deepen tourism development in Africa. According to the United Nations World Tourism Organisation (UNWTO) (2020a), tourism has become an increasingly important socio-economic sector in many world economies and its growth has accelerated since 2000 – growing by 7%, 6% and 4% in 2017, 2018 and 2019, respectively. Total international tourist arrivals in 2019 were 1460 million, while total international tourism receipts were US$1481 billion (UNWTO, 2020a). In the same year, international tourist arrivals and tourism receipts in Africa were 70 million and US$38.4 billion, respectively (UNWTO, 2020a). The growth in the tourism sector, particularly in SSA, has contributed to the noted improvements in the balance of payments in some countries through increased tourism receipts (UNWTO, 2020b). Explicitly, prior to 2020, tourism sector was one of the most rapidly expanding industries in SSA, complementing and in some countries replacing agriculture and extractive sectors as a key foreign exchange earner and employment creator (WTTC, 2020). However, following the Coronavirus (Covid-19) outbreak in December 2019, the total output in SSA declined by an estimated 2.4%, while regional travel and tourism declined significantly between 2019 and 2020 (UNWTO, 2020b).

In terms of the Travel and Tourism Competitiveness Index (TTCI) in 2019, the SSA region recorded an average of 3.1, compared to the global average of 3.8 (World Economic Forum/WEF, 2020). Significant improvements in TTCI in recent years came largely from information and communication technology readiness, international openness and price competitiveness (WEF, 2020). Tourist arrivals in Africa dropped by 68.6% in 2020 due to the Covid-19 pandemic, which caused the imposition of travel restrictions by most countries and created low traveller confidence (UNWTO, 2020b). The percentage of 'complete country shutdown' in SSA countries increased drastically from April 2020 and October 2020, reaching a peak in June 2020 before lessening in succeeding months. The tourist arrivals in SSA in 2019 declined by 1.4% and the distribution of tourist arrivals varied greatly by subregion, with Southern Africa receiving 35%, while the Eastern and Western African subregions received 30% and 35%, respectively (see Appendix 1). Total tourism receipts in the SSA region declined by 3% (UNWTO, 2020a). South Africa continued to be the largest tourist destination in the SSA region having received 10.2 million tourist arrivals and US$8.4 billion tourism receipts in 2019 (UNWTO, 2020a).

The prime international tourist source markets for SSA countries in 2019 were France, the United Kingdom (UK), the United States of America (USA), Germany, China and Portugal (UNWTO, 2020a). Whereas French tourists were particularly dominant in the Western African subregion (including the Seychelles in the Southern subregion), American, British, German, Portuguese and Chinese tourists frequented destinations in the Southern and Eastern African subregions. Tourist flows from Italy, Brazil and Russia have also increased since 2015 across the three SSA subregions (UNWTO, 2020a). Appendix 2 shows the top five tourist destinations and tourism receipts in SSA region in 2019.

Notably, tourism in SSA is very small relative to the global travel and tourism market, on the one hand, and has the potential to grow and be very competitive, on the other hand. According to World Bank (2020a) rankings, 45.8% of the region's economies are categorised as low-income economies, while 39.6% and 14.6% are classified as lower middle-income and upper middle-income economies, respectively. Unlike other regions that have a robust middle-income class, SSA is mostly composed of low-income groups of people; hence, it relies heavily on inter-regional travel and tourism (WEF, 2020). Other factors that limit intra- and inter-regional travel and tourism in the SSA region include poorly developed physical and information and technological communication infrastructure, such as air- and seaports, roads, recreation facilities, and technology, among others (WEF, 2020). Poor health facilities, a lack of human resources that meet increasingly globalised service standards, and high security risks add to the list of barriers that contribute to the region's marginalisation (WEF, 2020; Asongu and Acha-Anyi, 2019).

SSA is richly endowed with numerous tourism resources, including expansive beaches (white and black), abundant wildlife, extensive nature (mountains, vegetation and deserts), culture and adventure opportunities (Christie *et al.*, 2014). Accordingly, the region offers a wide range of tourism products such as safari, beach, nature and adventure, cultural heritage, and business tourism. Tourism development in SSA regions has varied substantially depending on (i) tourist service infrastructure, (ii) health and security facilities, and (iii) natural and cultural resource endowments. For example, in 2019, the Southern African subregion had the best tourist service infrastructure relative to the other two subregions, while the Eastern African subregion outperformed the other subregions in terms of natural resources (UNWTO, 2020a; 2020b). In 2019, the contribution of travel and tourism to employment (and gross domestic product (GDP)) in the Southern, Eastern and Western African subregions was 16% (35%), 44% (30%), and 40% (35%), respectively (UNWTO, 2020a).

While African trade in goods and services has steadily increased from 2005 to 2019, its stake in international trade has remained consistently small at 3% of global imports and exports (UNWTO, 2020c). Moreover, while the share of Africa in global trade is small, the proportion of trade in the national income of most economies in the region is relatively large, compared to other regions (UNWTO, 2020c). For instance, in 2017, the share of trade in GDP was 56% in SSA, compared to 31% in North America, and 40% in South Asia (World Bank, 2020a).

Consequently, the impact of the Covid-19 pandemic on trade in SSA is likely to be severe in the foreseeable future, with the leading fall-offs in trade expected to be in sectors with highly integrated global value chains. The trade situation in the SSA is likely to be further worsened by the pandemic since a huge share of foreign direct investment to the SSA also comes from the countries that are currently most affected by Covid-19 (UNCTAD, 2020).

Previous empirical studies that have been conducted on tourism in the SSA region can be encapsulated into three clusters. The first cluster of studies focused on the relationship between tourism development and economic growth. These studies include Nyasha *et al.* (2020), Odhiambo and Nyasha (2020), Novelli (2016), Christie *et al.* (2014), Odhiambo (2012; 2011), among others. The second cluster of studies focused on the relationship between tourism and poverty extenuation in the SSA region. Studies included in this category comprise those conducted by Folarin and Adeniyi (2020), Toerien (2020), and Ajogbeye *et al.* (2017). The third cluster comprises very few empirical studies which examined the relationship between tourism and financial development in SSA (see, for example, Musakwa & Odhiambo, 2021).

In light of the above discussions, the current study attempts to examine the relationship between tourism development and trade in 12 SSA countries during the period from 1995 to 2019. The study was motivated by the need to promote sustainable tourism development, as well as trade and international cooperation in an interdependent world. Hence, the findings of this study are anticipated to inform policy makers on the nature of the relationship between tourism and trade and thus guide policy formulation and prioritisation in the SSA region. This study differs fundamentally from previous studies in various ways. First, three proxies of trade are used to examine the relationship between tourist arrivals and international trade, thereby leading to three separate model specifications. These include: i) the total volume of exports plus imports, ii) the total volume of exports of goods and services, and iii) the total volume of imports of goods and services. Secondly, a wide range of modern econometric techniques are used to examine this linkage. These include i) the cross-sectional dependence tests, such as Breusch-Pagan (1980) LM, Pesaran (2004) scaled LM, Baltagi, Feng and Kao (2012) bias-corrected scaled LM, and Pesaran (2004) CD; ii) the slope homogeneity test based on Pesaran and Yamagata (2008); iii) the second-generation unit root tests based on Bai and Ng (PANIC) and Pesaran (CIPS); iv) the ECM panel cointegration test based on Westerlund (2007); iv) the dynamic ordinary least squares (DOLS); v) the Fully-Modified OLS (FMOLS); and vi) the heterogeneous panel Granger-causality based on Dumitrescu and Hurlin (2012), among others. To our knowledge, this study may be the first of its kind to examine in detail the nexus between international tourism and international trade in SSA countries using modern econometric techniques.

The remainder of the study is organised as follows: In Section 2, the literature on the relationship between tourism and trade is reviewed. This is followed by Section 3, which deals with the methodology and estimation techniques. Section 4 is aimed at presenting the empirical analysis and the discussion of the results, while Section 5 concludes the study.

2. Literature review

From a theoretical perspective, the development and advancement in trade and economic growth theories in the 18th and 19th centuries explicitly excluded issues of tourism. However, the connection between international travel and trade is simple. For instance, there are several motivations for international travel, which include pleasure, adventure, curiosity, business, visiting friends and relatives, education, and sporting and recreation (Kulendran & Wilson, 2000). Tourism, in general terms, is trade (UNWTO, 2018). In other words, it concerns the buying and selling of services and goods, with payment being made by a buyer (the tourist) to a seller or provider of the product. According to the UNWTO (2018), tourism is an export sector, which makes a significant contribution to the national output, foreign exchange earnings, government revenue, employment opportunities, infrastructural development, cultural exchange, environmental and wildlife conservation, and welfare enhancement of a country. Regarding employment creation, as well as trade and welfare enhancement, tourism offers boundless opportunities for small and medium enterprise development, particularly in marginalised communities and social groups, such as women and youth (UNWTO, 2020).

It follows that tourism, trade, trade openness and economic growth are intertwined and have micro and macro social, cultural and economic implications. By definition, tourism is a social, cultural and economic activity, which involves the mobility of people to countries and places outside their usual environment for either personal, business or professional purposes (UNWTO, 2018). These travellers are called visitors, which may be either tourists or excursionists; residents or non-residents. More so, tourism could lessen trade costs since tourism and trade use common infrastructure in addition to (i) the dissemination of either new or correct information about markets by visitors, and (ii) reducing cultural variations between societies (Santana-Gallego *et al.,* 2016).

From an empirical perspective, literature relating to the relationship between tourism and trade, both impact and causality, has been evolving concurrently. Among the studies that examined the impact of tourism on trade are Chaisumpunsakul and Pholphirul (2018) for Thailand, El-Sahli (2018) for non-OECD and European countries, and Brau and Pinna (2013) for European Union countries. Of these studies, there is overwhelming evidence of a positive impact of tourism on trade, except for El-Sahli (2018), who found no relationship between the aggregated tourism and trade variables.

Chaisumpunsakul and Pholphirul (2018) analysed the relationship between international trade and international tourism demand in Thailand. Applying both Tobit and system GMM models to a dataset of 207 trade partnership countries of Thailand, the study found that the degree of trade openness was positively associated with international tourism demand. Explicitly, a 1% rise in trade/GDP contributed nearly 0.046% of short-term foreign tourism demand and 0.807% of long-term tourism demand in the country under study. Moreover, the import volume from origin countries' tourists to Thailand also improved the short-term tourism demand by 0.029% and the long-term tourism demand by 0.592% in Thailand. In another study, Brau and Pinna (2013) examined the relationship between international tourist arrivals and exports using a sample of 25 European Union countries for the period 1998-2008. Using the gravity equation model to perform a panel data analysis, the authors found that tourism can promote exports in the countries under study. Leitão (2010) examined the determinants of international tourism demand in Portugal using tourist inflow data for the period 1995-2006. By estimating both static and dynamic panel demand models for tourism in Portugal, the results show that trade has a positive impact on tourism demand in Portugal. Aradhyula and Tronstad (2003) analysed the impact of tourist and business venture visits on cross-border trade in Sonora, Mexico. The authors used cross-sectional data of a sample of 70 Arizona agribusiness firms for the period spanning from 1994 to 1997. The results show that Arizona agribusiness proprietors will be more likely to trade in Sonora by up to 51.5% if the individuals have made a business venture visit to Sonora.

El-Sahli (2018) examined the relationship between trade and tourist flows using data that extend between 1995 and 2013 drawn from non-OECD and European exporters. Employing both panel and cross-sectional methodologies, the author found that, on the whole, tourism has no impact on the exports of non-OECD and European exporters. However, the results further show that an increase in the number of inbound tourists is complemented by an increase in the exports of the more differentiated products, namely, processed food products and some consumer goods with an elasticity of less than 0.97. For non-OECD exporters, the impact only applies for South–North exports.

There is also growing literature that explored the direction of causality between tourism and trade. The empirical evidence advocates both forms of channels, in other words, tourism leads trade, trade leads tourism, or bidirectional. These studies include Ozcan (2016) for Mediterranean countries, Surugiu and Surugiu (2011) for Romania, and Kadir and Yusoff (2010) for Malaysia. Ozcan (2016) analysed the causal relationship between international trade and tourism arrivals using annual time-series data from 16 Mediterranean countries covering the period 1995-2013. By employing panel Granger-causality tests, the study found that in Albania, France, Italy and Tunisia, causality flows from tourism arrivals to exports. The study also found that in Egypt, Greece, Morocco and Tunisia, exports Granger-cause tourism arrivals. The results further indicate that there is a bidirectional causality for Tunisia. Overall group results show that exports Granger-cause tourism arrivals. Surugiu and Surugiu (2011) investigated the causality between tourism exports and trade openness using data from Romania covering the period 1990-2009. Applying a vector error correction model, the results indicate one-way Granger causality, running from trade openness to tourism exports. Kadir and Yusoff (2010) examined the causality relationship between international tourism receipts, exports, imports and total trade using quarterly data from Malaysia from 1995:1 to 2006:4. The study found that there is a unidirectional causality from exports, imports and total trade to international tourism receipts.

Apart from the above-mentioned studies, there is another cluster of studies that analysed both the impact and causal relationship between tourism and trade. These studies include Kumar *et al.* (2019) for the USA, Fernandes *et al*. (2019) for Brazil, and Suresh and Tiwari (2018) for India, among others. Kumar *et al.* (2019) examined the relationship between international trade, economic growth and international tourism using USA monthly data spanning from

January 1999 to February 2018. Employing the wavelet-based analysis to capture the time–frequency-based lead–lag dynamics of this nexus, the authors found that increasing trade leads to higher tourist receipts. Causality results indicate that trade leads tourism in the USA. Fernandes *et al*. (2019) examined the causality between tourism openness, trade openness and currency-purchasing power in Brazil. Employing both VECM and Grange-causality approaches on Brazilian data stretching from 1995 to 2015, the study found evidence that supports a unidirectional causality from trade openness to tourism openness, and from currency-purchasing power to tourism openness. Santana-Gallego *et al*. (2016) investigated the relationship between international trade and tourism flows using a cross-section of 195 countries in 2012. The authors applied the HRM model, which extends the classical gravity equation of trade. In the analysis, tourism was found to have a significant positive impact on trade. Explicitly, a 1% increase in tourist arrivals increased the probability of exporting by 1.25% and raised the volume of exports by 9%. Furthermore, the results provide evidence consistent with a bidirectional relationship between trade and tourism flows. Lee (2012) studied the relationship between international trade and international tourism in Singapore using annual time-series data from 1980 to 2007. They found evidence that support growth-led tourism, tourism-led imports and export-led tourism in the short run. The results also show that imports have positive effects on economic growth in the long run. The author further found that international tourism Granger-causes imports in the short run. Santana-Gallego *et al*. (2011) studied the relationship between international tourism and trade in OECD countries. Applying dynamic heterogeneous panel data techniques, the study found that inbound tourism can promote international trade and that international trade encourages tourist arrivals and departures. The study further shows that the potential complementary relationship between tourism and trade enhances business opportunities.

Regarding causality, evidence consistent with a long-term bidirectional relationship between tourism and trade was found. Fry *et al.* (2010) investigated the impact and causality between inbound tourism and trade for South Africa for the period 1992-2007. The empirical investigation was split into two analyses. First, the authors explored the relationship between the variables using a panel dataset, which includes monthly tourism and trade data of 40 countries with South Africa. Secondly, the authors used time-series data to analyse South Africa's 10 main tourism and trade partners individually, namely Germany, the UK, the USA, France, Netherlands, Argentina, Japan, Australia, Botswana and Mozambique. The results show a positive long-term relationship and a two-way causality between tourist arrivals and trade in South Africa. Wong and Tang (2010) explored the causality relationships between tourist arrivals and trade openness for each of Singapore's top five trading partners, namely Malaysia, China, the USA, Japan and South Korea. The study shows that there is a bidirectional causality between tourist arrivals and openness to merchandise trade, and that trade openness to services trade Granger-causes openness to merchandise trade. In addition, the study found that an increase in tourism activities could also encourage the host country to open itself to more international trade.

Table 1 gives a summary of empirical studies on the tourism-trade nexus.

Table 1. Summary of previous empirical studies on tourism-trade nexus

Author(s) & year	Study country/region	Study period	Methodology applied	Key variables	Findings
Empirical studies on the impact of tourism on trade					
Chaisumpunsakul and Pholphirul (2018)	Thailand	1998-2010	Panel data model Tobit model System GMM	International tourism Trade openness	Positive relationship
Brau and Pinna (2013)	25 European countries	1998–2009	Panel data analysis Gravity equation model	International tourist arrivals Exports	Positive relationship
Leitão (2010)	Portugal	1995-2006	Gravity model Panel data model Tobit model System GMM	Tourist arrivals Bilateral trade	Positive relationship
Aradhyula and Tronstad (2003)	Mexico	1994-1997	Cross-sectional data Simultaneous bivariate qualitative choice model	Tourist visits Trade	Positive relationship
El-Sahli (2018)	non-OECD and European exporters	1995-2013	Panel data set Cross-sectional analysis	Tourist visits Exports	No relationship
Empirical studies on the causal relationship between tourism and trade					
Ozcan (2016)	16 Mediterranean countries	1995-2013	Panel Granger-causality analysis	International trade Tourism	Exports → tourism
Surugiu and Surugiu (2011)	Romania	1990-2009	VECM Granger causality test	Tourism exports Trade openness	Trade openness → tourism exports
Kadir and Yusoff (2010)	Mayaysia	1995:1- 2006:4	Quarterly time-series data Granger causality test	International tourism receipts Total trade (Exports, imports)	Exports → tourism receipts Imports → tourism receipts Total trade → tourism receipts
Empirical studies on the impact and causal relationship between tourism and trade					
Kumar *et al.* (2019)	United States of America	January 1999-February 2018	Rolling correlation analysis Wavelet-based approach	Trade International tourism Economic growth	Positive relationship Trade → tourism
Fernandes *et al.* (2019)	Brazil	1995-2015	VECM Granger-causality test	Tourism openness Trade openness	Positive relationship

				Currency-purchasing power	Trade openness → tourism openness
Lee (2012)	Singapore	1980-2007	Annual time-series data ARDL bounds test Granger-causality test	Exports Imports International tourism Economic growth	Exports and tourism are positively related International tourism → imports (in the short run)
Khan *et al.* (2005)	Singapore	-	Time-series data Granger-causality test	Tourist arrivals Trade	Positive relationship Tourist arrivals →trade
Kulendran and Wilson (2000)	Australia	1982:1-1997:4	Quarterly time-series data OLS Granger causality test	International trade International travel	Positive relationship International trade → international travel
Suresh and Tiwari (2018)	India	1991-2012	Granger-causality test	International tourism Trade Economic growth	Positive relationship Tourism ↔ trade
Santana-Gallego *et al.* (2016)	195 countries	2012	HRM Gravity model Cross-sectional data Granger-causality test	International trade Tourism flows	Positive relationship Tourism ↔ trade
Santana-Gallego *et al.* (2011)	OECD countries	1980-2006	Panel data PMG and MG estimators Granger causality test	International tourism Trade	Positive relationship Tourism ↔ trade
Wong and Tang (2010)	Singapore	1986:1-2008:2	Quarterly time-series data Granger causality test	International visitor arrivals Merchandise trade	Positive relationship International visitor arrivals ↔ openness to merchandise trade
Fry *et al.* (2010)	South Africa	1992-2007	Panel data Time-series Cointegration tests Granger causality test Block exogeneity tests	Tourist arrivals Trade	Positive relationship Tourist arrivals ↔ trade
Katircioglu (2009)	Cyprus	1960-2005	Annual time-series Cointegration tests	Tourist arrivals Real exports	Positive relationship International trade →

			Granger causality test	Real imports	tourist arrivals

3. Methodology

The following panel model can be used to examine the impact of tourist arrivals on the various proxies of trade used in this study.

$$Trade_{\mathrm{it}} = \gamma_{\mathrm{it}} + \delta_{it} + \beta_{1i} Tour_{itj} + \beta_{2i} y_{it} + \beta_{3i} Inv_{it} + \beta_{4i} Gov_{it} + \beta_{4iF} FD_{it} + \mu_{it} \qquad (1)$$

Where i = 1, . . . , N represents the cross-sectional observation.

t = 1, . . . , T refers to the time period.

Trade = Trade measured by three proxies, namely:

Trade 1 – Exports + Imports/GDP = Model 1

Trade 2 – Exports/GDP = Model 2

Tarde 3 – Imports /GDP = Model 2

y = Real GDP per capita

Inv = Investment

Gov = Government consumption expenditure

FD = Financial development

Tour = Tourism development

$\delta_{it} and \ \beta_{1i}$= Country specific effects and deterministic trend effects, respectively.

μ_{it} = Error term expected to be normally and identically distributed with zero mean and constant variance.

Three proxies have been used to measure international trade, namely i) Trade 1 (total trade), which is derived from the ratio of trade to gross domestic product (GDP); ii) Trade 2 (total exports), which is measured by the ratio of exports to GDP; and iii) Trade 3 (total imports), which is derived from the ratio of imports to GDP. The choice of these proxies was motivated by previous studies (see, for example, Zahonogo, 2016). The proxy used for tourism development, on the other hand, was measured by the number of international tourism arrivals. This is consistent with previous studies, such as Sequeira and Nunes (2008), Asongu and Odhiambo (2019) and Asongu *et al.* (2019), among others. The definitions of the remaining variables are presented in Table 2.

Table 2: Data source and definitions of variables[3].

Variable		Definitions of variable (Measurement)	Source
Tourism arrivals	Tour	Number of tourist arrivals	WDI
Trade	Trade 1 Trade 2 Trade 3	Exports +Exports/GDP Exports /GDP Imports /GDP	WDI
Economic growth	y	Real GDP per capita	WDI
Investment	Inv	Gross fixed capita formation	WDI
Government consumption expenditure	Gov	Total government consumption expenditure	WDI
Financial development	FD	M2/GDP	WDI

WDI: World Bank Development Indicators of the World Bank.

In accordance with previous studies, the above model can be estimated using two dynamic panel data techniques, namely the Dynamic Ordinary Least Squares (DOLS) and Fully Modified Ordinary Least Squares (FMOLS). The advantages of using these techniques have been discussed extensively in the literature. DOLS and FMOLS estimators account for correlation and the endogeneity problems in the panel data analysis. DOLS, for example, can correct endogeneity, simultaneity and serial correlation problems associated with many models through the use of differenced leads and lags (see also Maji *et al*., 2019). Consequently, it is possible to generate an unbiased estimator of long-run estimates. The main difference between DOLS and FMOLS is largely based on the way the autocorrelation is corrected in the regression. While the FMOLS adjusts for autocorrelation by taking into account the possible correlation between the error term and the first differences of the regressors, as well as the presence of a constant, the DOLS allows for more lagged and lead variables in the regression (see also Bellocchi *et al*., 2021).

Heterogenous Granger Causality

The heterogeneous panel Granger non-causality estimator based on Dumitrescu and Hurlin (2012) is used in this study to examine the casual relationship between tourist arrivals and the three proxies of trade. The Dumitrescu and Hurlin (D-H) method has been found to be more

[3] The countries covered in this study include: Burkina Faso, Burundi, Central African Republic, Sudan, Chad, Congo, Dem. Rep., Mali, Togo, Uganda, Gambia, The, Niger, and Guinea.

reliable, especially when there is cross-sectional dependence in the data used (see also Sun *et al*., 2020). Unlike other tests, the D-H technique considers the CSD ratio and accounts for the time dimension and size of cross-section relative to each other. The Dumitrescu and Hurlin (D-H) panel Granger non-causality model can be expressed as follows:

$$y_{it} = \alpha_i + \sum_{k=1}^{K} \delta_i^k \, y_{i(t-k)} + \sum_{k=1}^{K} \beta_i^k \, x_{i(t-k)} + \varepsilon_{i,t} \qquad (2)$$

Where:

y and x refer to stationary variables observed for N individuals on T periods.

T = time dimension, i.e. t = 1……………..T.

i = individuals, i.e., i = 1…………………………N.

Based on Equation 2, the null hypothesis of no causality for each panel group (i.e., H_0: $\beta_i = 0$, $i = 1, 2 \ldots \ldots \ldots \ldots, N$) is tested against the alternative hypothesis of causality between the variables within the panel group for each country (i.e., H_1: $\beta_i = 0, i = 1, 2, \ldots \ldots \ldots \ldots., N;\ \beta_i \neq 0$; i = N_1 + 1, N_1 + 2, …………., N).

4. Empirical Analysis

Cross-Sectional Dependence and Slope Homogeneity Test

Four cross-sectional dependence tests have been used in this study to test the presence of cross-sectional dependence in our estimation. These tests include i) Breusch-Pagan (1980) LM; ii) Pesaran (2004) scaled LM; iii) Baltagi, Feng and Kao (2012) bias-corrected scaled LM; and iv) Pesaran (2004) CD. The results of cross-sectional dependence tests based on these tests are reported in Table 3.

Table 3: Cross-sectional dependence tests

	Cross-sectional dependence results			
Series	**Breusch-Pagan LM**	**Pesaran scaled LM**	**Bias-corrected scaled LM**	**Pesaran CD**
Tour	864.8191*** (0.0000)	69.52828*** (0.0000)	69.27828*** (0.0000)	26.68072*** (0.0000)
Trade 1	279.5872 (0.0000)	18.59038 (0.0000)	18.34038 (0.0000)	6.613968 (0.0000)
Trade 2	213.1478 (0.0000)	12.80757 (0.0000)	12.55757 (0.0000)	1.688463 (0.0913
Trade 3	267.8848 (0.0000)	17.57182 (0.0000)	17.32182 (0.0000)	6.885202 (0.0000)
y	657.9505 (0.0000)	51.52268 (0.0000)	51.27268 (0.0000)	10.17362 (0.0000)
Inv	278.0073 (0.0000)	18.45287 (0.0000)	18.20287 (0.0000)	9.675954 (0.0000)
Gov	271.2644 (0.0000)	17.86598 (0.0000)	17.61598 (0.0000)	-1.699968 (0.0891)
FD	698.7895 (0.0000)	55.07726 (0.0000)	54.82726 (0.0000)	25.14528 (0.0000)

As shown in Table 3, the null hypothesis of no cross-sectional dependence across the countries has been largely rejected by all the tests, which implies that there is cross-sectional dependence among the countries under study. This suggests that an economic shock in one of these countries is likely to be transmitted to other countries due to factors, such as economic integration and globalisation.

Apart from the cross-sectional dependence test, it is also important to test whether the slope of the coefficients of our cross-sections are homogeneous or heterogeneous in the long run. For this purpose, Pesaran and Yamagata (2008), which has been found to be valid when the panels have a large N and T, has been used (see also Dong *et al*., 2018). The null hypothesis for slope homogeneity assumes that the slope coefficients of the models are homogenous, while the alternative hypothesis assumes that the slope coefficients are not homogeneous (in other words, that they are heterogeneous). The results of the slope homogeneity tests are reported in Table 4.

Table 4: Slope homogeneity tests

	Slope homogeneity results			
	Δ	**p-value**	**Δadj**	**p-value**
Model 1 (Trade 1)	9.676	0.000	11.403	0.000
Model 2 (Trade 2)	9.990	0.000	11.773	0.000
Model 3 (Trade 3)	8.593	0.000	10.127	0.000

The results of slope homogeneity reported in Table 4 show that the null hypothesis of slope homogeneity has been rejected at the 1% level of significance in favour of the alternative hypothesis, which states that the slope coefficients of the models are heterogeneous. This finding has been confirmed by the delta (Δ) and adj (Δ) tests. This, therefore, implies that there is heterogeneity across the panels used in this study which, therefore, shows the presence of country-specific heterogeneity in all three models used in this study.

Second-generation panel unit root tests

Since the cross-sectional dependence has been found to exist among the panel units included in this study, the next step is to conduct unit root tests using the second-generation panel unit root tests. Unlike the first-generation unit root tests, the second-generation unit root tests account for the cross-sectional dependence in the series. For this purpose, the study uses two second-generation unit root tests, namely i) Bai and Ng's (2004) Panel Analysis of Non-stationarity in Idiosyncratic and Common Components (PANIC) test; and ii) Pesaran's (2007) Cross-sectionally Augmented IPS (CIPS) panel unit root test. The results of the second-generation panel unit root tests are reported in Table 5.

Table 5: The results of second-generation panel unit root tests

	Bai and Ng – PANIC		**Pesaran – CIPS**	
	Level	**First Difference**	**Level**	**First Difference**
Tour	1.03973	-2.26746**	-1.55928	-4.39379***
Trade1	-0.65783	-2.16081**	-1.71883	-5.39708***
Trade2	-0.07564	-2.63185***	-1.42940	-4.62313***
Trade3	1.50717	-2.29079**	-1.19279	-5.10184***
y	0.93244	-1.91702*	-1.48974	-4.41003***

Inv	-0.76821	-2.70314***	-0.75035	-4.72924***
Gov	-0.66731	-2.33224**	-1.39465	-3.51303***
FD	-1.17642	-2.36138**	-1.47748	-3.22490***

Note: ** and*** indicate rejection of the respective null hypothesis at the 5% and 1% significance levels, respectively.

The results of the unit root tests reported in Table 5 show that all the variables used in this study are integrated of order one [i.e. I(1)] based on the second generation unit root tests. This finding is supported by the Bai and Ng (PANIC) and Pesaran (CIPS) statistics, which have been found to be statistically insignificant in all the variables in levels, but statistically significant after first difference.

Panel Cointegration Test

Given the presence of cross-sectional dependence, the traditional panel cointegration techniques, such as Pedroni, Kao, Fischer, etc., are not sufficient. Consequently, Westerlund (2007) cointegration test was employed alongside the Pedroni residual cointegration test to test the existence of the cointegration relationship among the variable included in Models 1, 2 and 3. Given the weaknesses associated with previous residual-based cointegration tests, Westerlund (2007) developed four panel cointegration tests based on structural rather than residual dynamics; hence, they do not impose any common-factor restriction (see Persyn & Westerlund, 2008). The Westerlund (2007) approach tests the null hypothesis of no cointegration by inferring whether the error-correction term in a panel error-correction model is equal to zero (Persyn & Westerlund, 2008: 232). The results of the Pedroni (2004) and Westerlund (2007) cointegration tests are reported in Tables 6 and 7, respectively.

Table 6: Pedroni panel cointegration results

	Model 1		Model 2		Model 3	
	Statistic	**Probability**	**Statistic**	**Probability**	**Statistic**	**Probability**
Pedroni panel cointegration test – within dimension						
Panel v-Statistic	3.593032	0.0002	3.157547	0.0008	0.026124	0.4896
Panel rho-Statistic	-0.860054	0.1949	-0.621316	0.2672	-1.559885	0.0594
Panel PP-Statistic	-8.924515	0.0000	-5.275454	0.0000	-7.481926	0.0000
Panel ADF-Statistic	-10.69648	0.0000	-5.936023	0.0000	-7.461734	0.0000
Pedroni panel cointegration test – between –dimension						
Group rho-Statistic	1.084603	0.8610	0.946749	0.8281	0.574601	0.7172
Group PP-Statistic	-6.720021	0.0000	-4.658255	0.0000	-5.471651	0.0000
Group ADF-statistic	-8.482068	0.0000	-6.081870	0.0000	-5.522296	0.0000

Table 7: Westerlund ECM panel cointegration results

Statistic	Value	Z-value	P-value	Robust P-value
Model 1 – Trade1 = f (Tour, y, Inv, Gov, FD)				
Gt	-3.215	-3.460	0.000	0.000
Ga	-11.639	0.038	0.515	0.000
Pt	-13.211	-5.477	0.000	0.000
Pa	-12.785	-2.071	0.019	0.000
Model 2 – Trade2 = f (Tour, y, Inv, Gov, FD)				
Gt	-2.891	-2.358	0.009	0.000
Ga	-11.302	0.190	0.576	0.000
Pt	-10.396	-3.174	0.001	0.000
Pa	-11.306	-1.426	0.077	0.000
Model 3 – Trade3 = f (Tour, y, Inv, Gov, FD)				
Gt	-3.305	-3.766	0.000	0.000
Ga	-10.760	0.435	0.668	0.000
Pt	-15.134	-7.050	0.000	0.000
Pa	-13.269	-2.281	0.011	0.000

The results of the Pedroni (2004) cointegration test reported in Table 6 show that in each of the three models estimated, cointegration has been supported by three Pedroni statistics. In Model 1, the cointegration has been supported by the Panel v-Statistic, Panel PP-Statistic, Panel ADF-Statistic, Group PP-Statistic and Group ADF-statistic. In Model 2, the cointegration has been supported by the Panel v-Statistic, Panel PP-Statistic, Panel ADF-Statistic, Group PP-Statistic and Group ADF-Statistic. In Model 3, the cointegration has been supported by the Panel rho-Statistic, Panel PP-Statistic, Panel ADF-Statistic, Group PP-

Statistic and Group ADF-Statistic. These results have also been corroborated by the Westerlund ECM panel cointegration test. The Robust P-value shows that all Westerlund statistics Gt, Ga, Pt and Pa are statistically significant at the 1% level of significance in all three models. For the P-value test, the results show that three of the four Westerlund test statistics Gt, Pt and Pa are statistically significant in Models 1, 2 and 3. These results, therefore, confirm the existence of the cointegration relationship among the variables in the presence of cross-sectional dependence.

Dynamic OLS (DOLS) and Fully-Modified OLS (FMOLS)

Based on the results of cointegration, we can employ two dynamic panel regression techniques, namely DOLS and FMOLS, to examine the relationship between the various proxies of trade openness and tourism development in the countries under study. The results of the DOLS and FMOLS are reported in Table 8.

Table 8: DOLS and FMOLS results

Explanatory Variables	**DOLS**		**FMOLS**	
Model 1 – Trade1 = f (Tour, y, Inv, Gov, FD)				
	Coefficient	**t-statistic**	**Coefficient**	**t-statistic**
Tour	1.76E-05**	2.370738	0.089730**	2.019326
y	-0.001962	-0.165367	-0.045526	-1.339573
Inv	0.961973***	15.10336	1.246148***	24.11050
Gov	0.044172	0.296153	0.208904***	4.226377
FD	0.550229***	4.717636	0.521420***	10.58782
Model 2 – Trade2 = f (Tour, y, Inv, Gov, FD)				
Tour	1.06E-05*	1.745264	0.043197	0.964108
y	0.025619*	1.781728	-0.027504	-0.628888
Inv	-0.153255	-1.530169	0.210393***	4.046242
Gov	0.058566	0.412079	0.293415***	6.238802
FD	0.693878***	4.515849	0.304199***	5.999561
Model 3 – Trade3 = f (Tour, y, Inv, Gov, FD)				
Tour	6.06E-06***	3.542621	0.048253*	1.857566
y	-0.003279	-1.438868	0.026618*	1.692315
Inv	0.719334***	25.97228	0.838658***	22.64472

Gov	0.148303***	3.232979	0.552812***	16.53455
FD	0.266795***	7.620397	0.037143	1.201560

Note: ***, ** and * indicate significance at 1%, 5% 10% levels, respectively.

The results reported in Table 8 show that the impact of tourism development on trade openness depends on the proxy used to measure the level of trade openness, as well as the estimation technique used. When DOLS is used as the estimation technique, tourism development is found to have a positive impact on trade in all three models. This has been confirmed by the coefficient of tourism development in trade openness, which has been found to be positive and statistically significant in all three models. However, when FMOLS is used as the estimation technique, tourism development is found to have a positive impact on trade openness in Models 1 and 3, but not in Model 2. This has been affirmed by the coefficient of the tourism development in trade openness, which has been found to be positive and statistically significant in Models 1 and 3, but insignificant in Model 2. Based on these results, we can conclude that, overall, tourism development has a positive impact on trade in the countries under study. Kumar *et al*. (2019) and Chaisumpunsakul and Pholphirul (2018) found similar results in a study on international tourism and trade in the United States of America and Thailand, respectively.

Other results show that for Model 1, investment and financial development have a positive impact on trade when the estimation is conducted using both DOLS and FMOLS, while government consumption has a positive impact on trade only when FMOLS is used as the estimation technique. This finding has been confirmed by the corresponding coefficients of investment and financial development in both the DOLS and FMOLS estimations, and the coefficient of government consumption in the FMOLS estimation, which have all been found to be positive and statistically significant. For Model 2, the results show that economic growth and financial development have a positive impact on trade in the DOLS estimation. This has been found by the coefficients of economic growth and financial development, which have been found to be positive and statically significant in the DOLS estimation. The results also show that investment, government consumption and financial development have a positive impact on trade in the FMOLS estimation, as shown by the positive coefficients of these three variables in the trade equation. For Model 3, the results show that investment and government consumption have a positive impact on trade in both DOLS and FMOLS estimations, while economic growth has a positive impact on trade only when FMOLS is used as the estimation technique. This has been confirmed by the coefficients of investment and government consumption in the DOLS and FMOLS estimations, and the coefficient of economic growth in the FMOLS estimation, which have all been found to be positive and statistically significant.

Heterogeneous Panel Causality Analysis

Heterogeneous panel Granger-causality based on Dumitrescu and Hurlin (2012) has been used to further examine the relationship between tourism development and trade. The empirical results reported in Table 9 show that there is a unidirectional causal flow from tourism development to trade in the countries under study. This finding has been confirmed by the Zbar-Statistic, which has been found to be statistically significant in the tourism equation, but not in the trade equation in Models 1, 2 and 3. These results corroborate the previous results from DOLS and FMOLS, which found that, on the whole, tourism has a positive impact on trade in SSA countries. The results are not unique to this study but are consistent with the findings in Khan *et al.* (2005). Other results show that in Model 1, i) financial development Granger-causes trade; ii) tourism Granger-causes investment; and iii) financial development Granger-causes tourism. In Model 2, i) trade Granger-causes investment; ii) trade Granger-causes financial development; iii) there is a bi-directional causality between economic growth and tourism development and iv) investment Granger-causes tourism development. For Model 3, the results show that i) tourism Granger-causes investment; and ii) financial development Granger-causes tourism development.

Table 9: Heterogeneous panel causality results

	Zbar-Stat.	Prob.	Causality	Zbar-Stat.	Prob.	Causality	Zbar-Stat.	Prob.	Causality
	Model 1 (Trade 1)			Model 2 (Trade 2)			Model 3 (Trade 3)		
Tour does not homogeneously cause Trade	2.82969	0.0047	Tour → Trade	2.93358	0.0034	Tour → Trade	1.93605	0.0529	Tour → Trade
Trade does not homogeneously cause tour	0.50665	0.6124		0.62393	0.5327		0.97578	0.3292	
y does not homogeneously cause Trade	-0.62752	0.5303	y [0] Trade	-0.22414	0.8226	y [0] Trade	-0.48173	0.6300	y [0] Trade
Trade does not homogeneously cause y	-0.89455	0.3710		-0.18794	0.8509		-0.69338	0.4881	
Inv does not homogeneously cause Trade	0.79482	0.4267	Inv [0] Trade	0.37682	0.7063	Trade → Inv	0.56423	0.5726	Inv [0] Trade
Trade does not homogeneously cause Inv	0.70153	0.4830		1.75304	0.0796		0.84256	0.3995	
FD does not homogeneously cause Trade	2.20440	0.0275	FD → Trade	-1.10818	0.2678	Trade → FD	0.98560	0.3243	FD [0] Trade
Trade does not homogeneously cause FD	-0.82144	0.4114		1.89038	0.0587		0.63192	0.5274	
Gov does not homogeneously cause Trade	0.52464	0.5998	Gov [0] Trade	-1.25524	0.2094	Gov [0] Trade	0.52888	0.5969	Gov [0] Trade
Trade does not homogeneously cause Gov	0.70917	0.4782		0.72577	0.4680		-0.35723	0.7209	
y does not homogeneously cause Tour	1.43240	0.1520	y [0] Tour	3.39777	0.0007	y ←>Tour	1.43240	0.1520	y [0] Tour
Tour does not homogeneously cause y	-0.23485	0.8143		2.15968	0.0308		-0.23485	0.8143	
Inv does not homogeneously cause Tour	0.75939	0.4476	Tour → Inv	1.95570	0.0505	Inv →Tour	0.75939	0.4476	Tour → Inv
Tour does not homogeneously cause Inv	2.86218	0.0042		-0.27476	0.7835		2.86218	0.0042	
FD does not homogeneously cause Tour	3.83225	0.0001	FD → Tour	1.56333	0.1180	FD [0] Tour	3.83225	0.0001	FD → Tour
Tour does not homogeneously cause FD	0.97956	0.3273		0.82759	0.4079		0.97956	0.3273	
Gov does not homogeneously cause Tour	0.47232	0.6367	Gov [0] Tour	0.39635	0.6918	Gov [0] Tour	0.47232	0.6367	Gov [0] Tour
Tour does not homogeneously cause Gov	0.48843	0.6252		0.97264	0.3307		0.48843	0.6252	

5. Conclusion and policy implications

In this study, the relationship between tourism development and trade in 12 SSA countries during the period 1995-2019 was examined. The study was driven by the increasing contribution of tourism on trade and sustainable development, on the one hand, and the need to promote tourism–trade linkages in the SSA region, on the other hand. Three proxies of trade were used, namely i) the total volume of exports plus imports, ii) the total volume of exports of goods and services and iii) the total volume of import of good and services, thereby leading to three separate model specifications. In order to examine the presence of cross-sectional dependence among the cross-sections, the study used three cross-sectional dependence tests, namely i) Breusch-Pagan (1980) LM; ii) Pesaran (2004) scaled LM; iii) Baltagi, Feng and Kao (2012) bias-corrected scaled LM; and iv) Pesaran (2004) CD. In order to test for slope homogeneity, the Pesaran and Yamagata (2008) homogeneity test was used, which has been found to be valid when the panels have a large N and T. Departing from some of the previous studies, the second-generation panel unit tests were used to examine the order of integration among the variables. Similarly, the second-generation panel cointegration test based on Westerlund (2007) was used alongside the Pedron (2004) residual-based cointegration test to examine the presence of cointegration among the variables used. In addition, the heterogeneous panel causality model based on Dumitrescu and Hurlin (2012) was used to examine the causal relationship between trade and tourism. Using the dynamic ordinary least squares (DOLS) and the fully modified ordinary least squares (FMOLS), it was found that the impact of tourism development on trade largely depends on the proxy used to measure the level of trade openness, as well as the estimation technique employed. When DOLS is used as the estimation technique, tourism development was found to have a positive impact on trade in all three models. However, when FMOLS is used as the estimation technique, tourism development is found to have a positive impact on trade openness in Models 1 and 3 only. On the whole, the results show that tourism has a positive impact on trade in the countries under study. This finding is also supported by the heterogeneous causality test, which shows that there is a distinct unidirectional causal flow from tourism development to trade in the SSA countries under study. This applies, irrespective of the variable used to measure the level of trade openness. These results show that inbound tourism promotes international trade in SSA. It is, therefore, recommended that SSA countries should implement policies aimed at promoting sustainable international tourism in order to increase their international trade and boost their overall trade balance. Moreover, the positive impact of tourism development on trade must be considered alongside the regional and global effects of economic cooperation policies. Therefore, since tourism plays an important role in promoting trade and sustainable development in the countries under study, it is prudent for future studies in this area to adopt disaggregated data that fully explore the tourism-trade nexus within and outside the SSA region.

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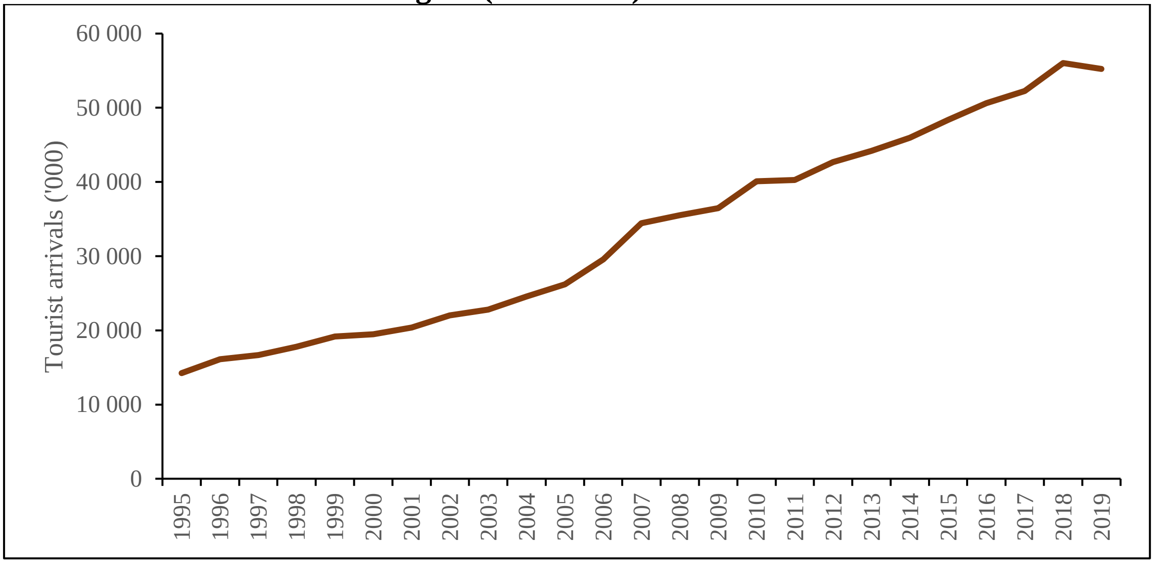
Appendix

A1: Tourist arrivals in SSA region (1995-2019)



Source: Authors' compilation using World Bank (2020a) data

A2. Top five countries in tourist arrivals and tourism receipts in SSA in – 2019

	Countries				
	South Africa	Zimbabwe	Mozambique	Namibia	Mauritius
Tourist arrivals (millions)	10.2	2.3	2.0	1.6	1.4
Most visited place	The Kruger National Park	Victoria Falls	Island of Mozambique	Etosha National Park	Port Louis
	South Africa	Tanzania	Mauritius	Uganda	Nigeria
Tourism receipts (US$ millions)	8384	2605	1779	1463	1449

Source: Authors' compilation using UNWTO (2020a; 2020b) data

A3. Descriptive statistics

Variables	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Tour	300	194539	262156.3	2900	1402000
Trade 1	300	51.53441	19.81738	14.77247	126.3508
Trade 2	300	20.40719	9.801148	4.685804	51.00886
Trade 3	300	31.12721	11.91351	9.803001	113.6609

y	300	641.4844	329.8284	208.0748	2095.048
Gov	300	12.33608	5.129114	2.057589	27.63867
Inv	300	18.09008	7.500125	2.1	59.72307
FD	300	20.06082	9.18537	2.857408	51.68221

A4. Correlation Matrix

Variables	**Tour**	Trade 1	Trade 2	Trade 3	y	Gov	Inv	FD
Tour	1.0000							
Trade 1	-0.1832	1.0000						
Trade 2	-0.1686	0.8929	1.0000					
Trade 3	-0.1661	0.9289	0.6626	1.0000				
y	0.4615	-0.0863	0.0167	-0.1572	1.0000			
Gov	-0.1138	-0.1311	-0.2881	0.0189	-0.3483	1.0000		
Inv	0.2181	0.2181	0.2893	0.5815	0.1649	-0.0338	1.0000	
FD	0.2490	0.2337	0.1076	0.3002	0.1568	0.3489	0.1347	1.0000