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Impact of Air Connectivity on Tourism, FDI and Trade: Insight from the Western Cape

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by

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ABSTRACT

This study investigated the impact of air connectivity on macroeconomic factors, specifically tourism, FDI and trade in the Western Cape, based on quarterly data from 2010 to 2018. The Autoregressive Distributed Lag (ARDL) bounds approach for cointegration was used to assess whether long-run relationships existed between air connectivity and tourism, FDI and trade. The ARDL bounds test found a cointegrated relationship between air connectivity and tourism, FDI and trade respectively.

Air connectivity was found to have a positive and significant long-run relationship with tourism This also supports the literature findings that air connectivity improves countries' accessibility and increases tourist arrivals from various markets. This confirms that air connectivity leads to an increase in the number of international tourists visiting the Western Cape, which contributes significantly to the tourism industry and the Western Cape economy.

In addition, air connectivity was observed to have a positive but statistically insignificant long-run relationship with FDI and trade respectively. Therefore, this study concludes that air connectivity plays a key role in the economy, specifically regarding tourism through the facilitation of more tourists into the Western Cape. Furthermore, although the study showed positive and insignificant relationships between air connectivity and FDI and trade respectively, air connectivity is related to FDI and trade and these relationships require further investigation.

Therefore, it is recommended that policymakers and decisionmakers on the African continent need to have initiatives that support the improvement of air connectivity, especially given that Africa has only a 2.2% market share of global air passengers and less than 10% of the continent's population uses air transport. Other African countries and regions should use a similar approach to what the Western Cape has done to improve the air connectivity between Cape Town and the rest of the world. In addition, investment in airports and airport-related infrastructure is critical and necessary, as poor airport infrastructure has been cited to be one of the obstacles in improving air connectivity in the continent. Furthermore, the development of an air connectivity index for the continent is required. This index will have to take into account the availability of data and the African context. Where data does not exist, a robust plan for the collection of data will also have to be developed. Lastly, the regulation of the aviation market needs urgent attention, starting with an Open Skies policy. The deregulation of air access could play a significant role in improving the African Continent's air connectivity.

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GLOSSARY OF TERMS

ABS – Australian Bureau of Statistics

ACSA – Airports Company South Africa

AfCFTA – African Continental Free Trade Agreement

AfDB – African Development Bank

ARDL – Autoregressive Distributed Lag

ATAG – Air Transport Action Group

PWC – PricewaterhouseCoopers

BASA – Bilateral Air Service Agreements

CTIA – Cape Town International Airport

ECM – Error Correction Model

FDI – Foreign Direct Investment

GATT – General Agreement on Tariffs and Trade

GDP – Gross Domestic Product

IATA – International Air Transport Association

ICAO – International Civil Aviation Organisation

IMF – International Monetary Fund

ITF – International Transport Forum

NADP – National Airports Development Plan

OAG – Official Aviation Guide

OECD – Organisation for Economic Co-operation and Development

OLI – Ownership, Location and International

ORTIA – O. R. Tambo International Air Airport

Pero – Provincial Economic Review and Outlook

SAATM – Single African Air Transport Market

Stats SA – Statistics South Africa

UNCTAD – United Nations Conference on Trade and Development

UNWTO – United Nations World Tourism Organisation

VFR – Visiting Friends and Relatives

WCG – Western Cape Government

WEF – World Economic Forum

WTO – World Trade Organisation

WTTC – World Travel and Tourism Council

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CHAPTER 1: INTRODUCTION

1.1. Background

Air connectivity enables global travel, economic relations and trade. It allows easy movement of people, goods and services between countries, which plays a crucial role in economic growth and development. Economic growth, in turn, is considered as one of the drivers of demand for air transport (IATA, 2007). Global air traffic has improved significantly with more people using air transport as their preferred choice of transportation over the past 15 years (ICAO, 2017). According to the International Civil Aviation Organization (ICAO)'s Aviation Benefits Report, ICAO (2017), in 2016, airlines carried approximately 3.8 billion passengers and transported 53 million tons of cargo, representing a 6.8% and 4% increase from 2015 for passengers and cargo respectively. In contrast, only about 1.8 billion passengers and 32 million metric tons of cargo were transported via air transport in 2001. The air connectivity market is usually dominated by North America and Europe, however, recent trends show improvement in the Middle East, Asia and Latin America in terms of passenger traffic (PWC, 2013).

ICAO defines air connectivity as "an indicator on a network's concentration and its ability to move passengers from their origin to their destination seamlessly". Similarly, Burghouwt & Redondi (2013, pg 37) defines air connectivity as "the degree to which nodes in networks that are connected to each other". Simply put, air connectivity is the ease with which people, goods and services are transported between the chosen points of origins and destinations via air transport.

As mentioned above, air connectivity by its nature unlocks economic growth potential partly due to its ability to enable countries to attract business investments and human capital (PWC, 2013). PWC (2013) further argues that improved air connectivity facilitates improvements in tourism, which is a significant contributor to several countries' economic prosperity.

Ceteris paribus, passengers, mostly, choose non-stop (direct) connections compared to indirect or even hub connections as direct connections do not involve stopovers for transfer and/or detours that are prevalent in indirect and hub connections (Burghouwt, 2017). However, most leisure travellers are price-sensitive, therefore their choice is largely influenced by price. Nevertheless, both indirect and hub connections contribute to a country's connectivity as they allow countries and people to connect to destinations indirectly that do not have sufficient passenger demand/traffic to justify a direct connection (Burghouwt, 2017).

A further distinction is made in terms of the types of travellers including business, leisure and visiting friends and relatives (VFR) travellers as each type has different preferences. For example, business travellers are time-sensitive, convenience-driven and not influenced by price, whereas leisure travellers are more concerned with cost-effectiveness. VFR travellers also tend to be price sensitive.

This paper seeks to provide a research approach that could be used to analyse the impact of air connectivity on economic growth, with a specific focus on foreign direct investments (FDI), trade, and tourism in South Africa, specifically in the Western Cape. The intention is to understand whether there is a relationship between air connectivity and economic growth through FDI, trade and tourism respectively.

1.2. Statement of the Problem

The Western Cape Province has limited air connectivity with the rest of the world relative to the Gauteng Province as shown in Figure 1 and 2 below.

Figure 1: Cape Town International Flights Route Map

Source: Cape Town Air Access (2018)

Figure 2: ORTIA International Flights Route Map

Source: Airports Company South Africa

In 2015, ORTIA had 85 direct and non-stop destinations, compared to 30 for Cape Town International Airport (CTIA) (ACSA, 2018). This is due to the hub and spoke natures of the aviation industry and air connectivity. ORTIA is considered as the hub for South Africa and Cape Town a spoke. The hub and spoke model allows for indirect connections to destinations where there is not sufficient demand to justify direct flights (Burghouwt, 2017). However, these indirect connections impose an additional uncertainty around time (making a stopover, disembarking and embarking of a different flight) and an inconvenience cost (such as an increased probability of lost luggage due to the flight change required to make the second connection). These inconveniences present challenges for both leisure and business passengers that are travelling in and out of the Western Cape and, therefore, affect the economic competitiveness of the Western Cape, as travelling and transporting goods from and to the Western Cape becomes relatively longer.

In improving the number of direct air connections in and out of Cape Town, thus improving air connectivity with the rest of the world, the study seeks to understand whether improved air connectivity will help improve the economic competitiveness of the Western Cape region and the various sectors of the Western Cape economy. This may potentially lead to improved productivity and economic growth via increased foreign direct investment, more trade, improved tourism and job creation. Improved air connectivity is one of several drivers of economic growth and development through the facilitation of tourism (both business and leisure), trade and FDIs (ICAO, 2017).

To illustrate the importance of air connectivity to the local economy, South Africa has collected US$140 billion in foreign direct investment and exported US$110 billion worth of goods and service (ICAO, 2017). In addition, in 2014, foreign tourists to South Africa spent US$9.2 billion.

The Western Cape has made significant progress in improving air connectivity. In 2011, the Western Cape Government (WCG) initiated the Air Access initiative that aims to improve the direct air connectivity between Western Cape and the rest of the World, with an initial focus on Africa. This initiative focused on creating new direct air routes and stimulating demand on existing routes in and out of Cape Town. Most research shows that improved air connectivity unlocks economic growth through FDI, tourism and trade (IATA (2007); ICAO (2017) and Burghouwt (2017)).

To this end, this dissertation will analyse the impact of improved air connectivity on economic growth, particularly the impact of air connectivity on FDI, trade and tourism respectively using Western Cape as a case study, to assess whether relationships exist between the aforementioned variables. Given that the rest of the African Continent also has limited air connectivity compared to other regions, including other developing countries, the intention is to provide recommendations for policymakers and decisionmakers in Africa on how to develop initiatives that could improve economic growth through air connectivity.

1.2.1. Research questions

As mentioned above, the study seeks to analyse the impact of air connectivity on tourism, FDI and trade respectively to provide guidance and recommendations to policymakers and decision-makers on how to improve air connectivity. To do that, the study will examine the following questions:

1) How does improved air connectivity affect FDI, trade and tourism respectively?

1.3. Statement of research objectives

The objective of this study is:

- To examine the impact of air connectivity on tourism, FDI and trade respectively, using the Western Cape as a case study.

1.4. Justification of the study

The primary motivation for this research is to provide insights on the impact of air connectivity on tourism, FDI and trade based on empirical research to help inform initiatives to improve air connectivity in Africa. Air connectivity, as mentioned above, by its nature unlocks economic growth potential partly due to its ability to enable countries to attract business investments and human capital (PWC, 2013). PWC (2013) further argues that improved air connectivity facilitates improvements in tourism, which is a significant contributor to several countries' economic prosperity.

Considering the size of the African continent in terms of gross domestic product (GDP) and population, and the growing middle class with its desire to travel to see the world and conduct business globally, the continent is under-represented in terms of air connectivity. In 2017, Africa had 2.2% of the global market share for air passengers, representing 88 million passengers (from a population of 1.24 billion people) from the total of 4.2 billion global passengers (ATAG, 2018). This shows that less than 10% of the continent's population use air transport. However, despite this limited share of the global market share, the aviation industry contributed US$55.8 billion to Africa's GDP in 2016 and supported 6.2 million jobs (ATAG, 2018).

To this end, Africa's air connectivity and the related market share could be improved through deliberate interventions. Africa has a significant potential for growth, due to the potential to service a very large and developing population (ICAO, 2017). Air connectivity can play a huge role in improving the competitiveness, productivity and economic growth of various African countries and stimulate job creation in the continent. The aim is that the analysis from this study will help inform key recommendations that can help policymakers and decisionmakers, mainly in government, to improve air connectivity on the continent through deliberate interventions in order to improve economic growth, create jobs and alleviate poverty.

Air connectivity is also gaining attention on the African continent. Ms Nkosazana Dlamini Zuma, the former chairperson of the African Union (AU), highlighted the importance of regional integration and stated in a speech that "(By) Connecting Africa through aviation, aviation infrastructure is critical to integration, intra-Africa trade, as well as to tourism, economic growth and development more generally. The aviation sector is also an important creator of jobs and critical skills on the Continent. The aviation sector is strategic for the implementation of Agenda 2063" (SAATM, 2017:9).

1.4.1. Benefits of the research

This research assignment is relevant and significant to government policymakers and decisionmakers for the following reasons:

- It provides evidence of the relationship between improved air connectivity on economic growth, FDI, trade and tourism respectively.
- It highlights the key levers to pull to increase air connectivity in order to improve economic growth, create jobs and alleviate poverty.

1.4.2. Knowledge gap

The literature on air connectivity is growing, however, most of it does not consider the African continent in much detail. All these studies, although focusing mainly in developed countries show that there is a positive relationship between air connectivity and economic growth. However, only a few of them consider the impact of air connectivity on tourism, trade and FDI respectively all at once, as most of them look at these issues separately. Given that there is very limited literature that focuses on African countries, the intention for this study is to use the Western Cape as a case study to assess the relationship between air connectivity and tourism, FDI and trade respectively to understand the impact on economic growth. The aim is to get a better understanding of these relationships and be able to make recommendations to policymakers and decisionmakers in Africa on how to improve air connectivity to drive economic development.

1.5. Organisation of the study

This dissertation is organised as follows: Chapter 1 provides an introduction of the study, highlighting the background of the study, problem definition, research objective and hypothesis and the justification of the study. Chapter 2 is the literature review, which discusses previous theories, provides the necessary definition, and critically analyses various literature that supports and/or contrasts the relationship between air connectivity and economic growth, with particular focus on tourism, FDI and trade respectively. Chapter 3 outlines the research methodology including the data collection, data validity, sampling frame and sampling design, the models that were used to assess the relationships and the research limitations. Chapter 4 outlines the research analysis and findings taking into account the literature review. Finally, Chapter 5 provides the conclusion and the recommendations for policymakers and decisionmakers as well as recommendations for areas of future research.

CHAPTER 2:
LITERATURE REVIEW

2.1. Introduction

This chapter provides an analysis and review of the existing literature on the impact of air connectivity on economic growth, specifically FDI, trade and tourism. This chapter begins by providing definitions of the key concepts that the paper will discuss and analyse. This is followed by an analysis of air connectivity and its impact on the economy. The chapter then provides an overview of the Western Cape economy. The chapter moves further to a critical analysis of the impact of air connectivity, specifically on FDI, trade, and tourism respectively. And lastly, the chapter concludes with a summary of the discussion of the literature review, findings and intentions of this study.

2.2. Definition of Concepts

Air Connectivity – The International Civil Aviation Organization (ICAO) defines air connectivity as “an indicator on a network’s concentration and its ability to move passengers from their origin to their destination seamlessly”. Similarly, Burghouwt & Redondi (2013, pg 37) defines air connectivity as “the degree to which nodes in a network that is connected to each other”. Simply put, air connectivity is the ease with which people, goods and services and are transported between the chosen points of origins and destinations via air transport.

Foreign Direct Investment (FDI) – refers to the cross-border investment made by the resident of a country into another country’s enterprise with the intention of making long-term interest/returns (OECD, 2013). The investment in a foreign country includes the purchase of a foreign company or construction of a new plant or even an expansion of an existing plant.

Economic Growth – refers to a positive change in the country’s gross domestic product (GDP). In other words, economic growth is an increase in the number of goods and services produced in a country over a period of time, usually in a quarter or a year.

Tourism – refers to all the activities that people travelling and staying in places outside of their normal environment for less than one consecutive year undertake (UNWTO). South African Tourism (SAT) further describes a tourist as a visitor that spends at least one night in the visited place.

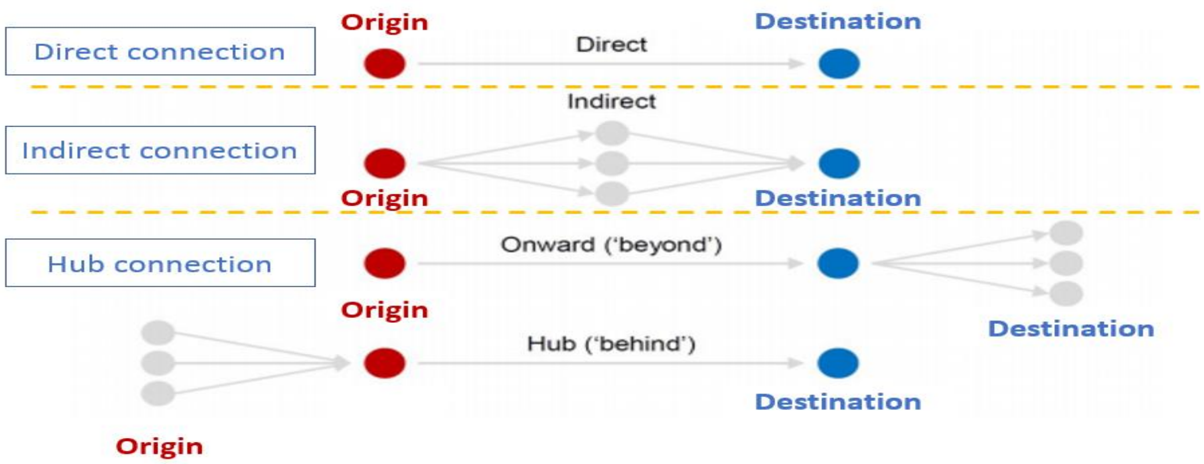
Trade – refers to buying and selling of goods and/or services in national and international markets, however, this study focuses on international trade.

2.3. Theoretical Review: Air Connectivity and the Economy

2.3.1. Types of air connectivity

Burghouwt (2017) posits that air connectivity can be differentiated as direct connectivity that involves non-stop flights, indirect connectivity that involves a stopover for transfer at an in-between hub, and hub connectivity that provides inward (behind) and outward (beyond) connection opportunities. This differentiation is presented in Figure 3 below.

Figure 3: Types of Connectivity



Source: Adapted from Burghouwt (2017)

2.3.2. Air connectivity and the economy

Burghouwt (2017) argues that improved air connectivity increases productivity, research and development (R&D), foreign direct investment and enables trade specialisation that makes countries relatively more competitive. In other words, improved air connectivity improves the competitiveness of regions, countries and cities, which leads to improved productivity and economic growth. Similarly, IATA (2007) asserts that air connectivity stimulates productivity and economic growth through the provision of access to markets, improved linkages between and within businesses and broader reach to resources and international capital markets. Moreover, IATA (2007) found that productivity increases more in developing countries compared to developed countries. This could be due to the fact that developing countries start from relatively low levels of productivity compared to developed countries. Therefore, even minor improvements in air connectivity in the developing countries will have a relatively higher impact on productivity since they are starting from a relatively low base compared to the developed countries.

The positive relationship between air connectivity and economic performance is also evident in South Africa. Over time, South Africa has collected US$140 billion in foreign direct investment and exported US$110 billion worth of goods and service (ICAO, 2017). In addition, in 2014, foreign tourists to South Africa spent US$9.2 billion. This illustrates the importance of air connectivity to the local economy.

Evidence from IATA (2007), summarises the following as the benefits that are facilitated by air connectivity:

1. World Trade
   The connections created by air connectivity provide greater market access, creating a larger customer base for businesses and opportunity for exports. Through air connectivity, businesses are offered the opportunity to transport their goods and services via air transport. Air transportation of goods and services is, however, only beneficial for high value and low volume goods and time-sensitive goods. According to Button (2008), 40% of global trade value is transported via air; however, this value only accounts for 2% of global trade by weight, demonstrating the high value, low volume argument.

2. Boosting productivity across the economy
   Due to an increased customer base provided by improved air connectivity, businesses can exploit economies of scale in their production and reduce the production cost per unit, leading to improved productivity. However, the improved customer base and connections expose businesses to more competition, which pushes them to be more innovative if they want to remain competitive. Through an increasingly innovative approach to remain competitive, companies end up being more productive and contributing even more to economic growth.

3. Improvement in the efficiency of the supply chains
   Air connectivity helps improve efficiencies in the supply chains by making the just in time inventory management system more efficient through the speedy and reliable delivery of goods and services. Through the just in time inventory management that is facilitated by air connectivity, businesses can keep minimal stock in storage, as goods are ordered when

required, and the speedy delivery through air connectivity means that stock is delivered on time. Inventory related costs are reduced, leading to a reduction in the overhead costs of the business.

4. Enables inward and outward investment

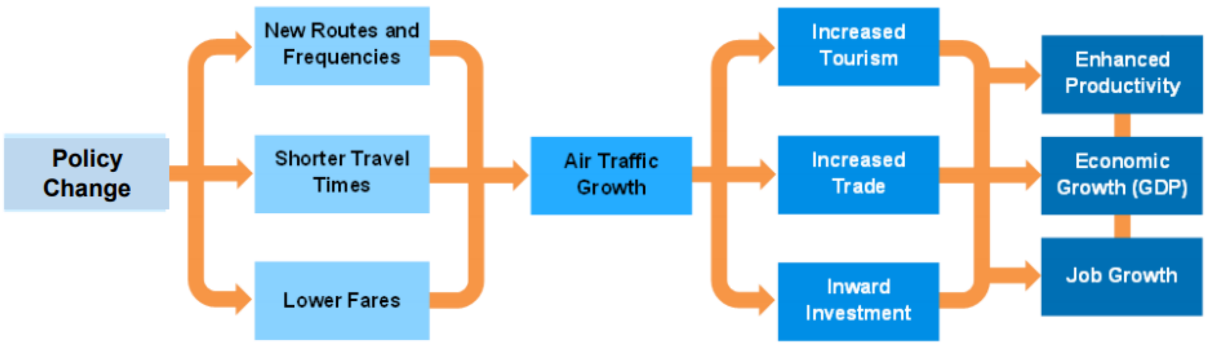
   Air connectivity enables businesses to recognise and attract foreign-based assets and provides an opportunity for international firms to invest in the domestic economy. Through air connectivity, personnel, including executives, can visit international offices relatively easily. Therefore, if a company is faced with a decision regarding the opening of new offices internationally, access to air transport is one of the key considerations.

5. Facilitates innovation

   Improved air connectivity allows for interaction and partnerships among companies from different countries leading to the sharing of ideas that can help each other perform better in the market place. Similar to what is mentioned above, access to a larger market exposes a business to more competition, thereby forcing them to be more innovative if they want to remain competitive. However, to be more innovative, more spending on research and development is required.

Furthermore, ICAO (2017) provides a compelling summary of how air connectivity could result in economic growth and job creation as depicted in Figure 4 below. This is the foundation of this study.

Figure 4: Potential Benefits of Air Connectivity



Source: ICAO 2017

For consumers, improved air connectivity reduces travelling costs through reduced travel time, and offering more choices in terms of operating airlines and the number of available flights (Burghouwt, 2017). The impact of air connectivity in the overall economy is significant; however, policymakers and decisionmakers need to create an enabling environment (including the provision of airports infrastructure and conducive regulations) for airlines so that they can establish more routes and prosper, allowing air connectivity to improve.

Despite the benefits that air connectivity facilitates for the economy, the African continent is still underserved in terms of air connectivity. Asia/Pacific is the leading region in terms of world traffic activity with a 33% share, followed by Europe with a 27% share and North America with a 24% share. The Middle East, Latin America and the Caribbean and Africa had 9%, 5% and 2% share respectively (ICAO, 2017). One of the reasons why the African continent is still lagging behind other regions, despite having a relatively larger population and a large and growing middle class, is the poor support of the open skies policy (Yamoussoukro Decision) by some of the African countries due to their protection of national carriers.

The Yamoussoukro Decision is an agreement that was meant to be signed by 54 African countries to liberalise air service in Africa, by allowing for more openness in terms of freedom of traffic rights, capacity, tariffs and designation of airlines (Schlumberger, 2010). Some of the regions that pioneered and embraced the open skies policy such as America and Europe are reaping the benefits of fully supporting the initiative. Lack of competition due to protectionism by several African countries has kept travelling by plane relatively expensive for most African countries (WEF, 2017). This shows that market regulation is one of the major bottlenecks in air connectivity. The liberalisation of air services could make a significant contribution to improving air connectivity in Africa and increase the number of flights in and out of Africa. According to Piermartini and Rousava (2008), there is a positive relationship between the liberalisation of air service and air traffic, implying that the more liberalised the air service, the higher the air traffic volumes. Open skies with no restriction on routes and capacity are what the policymakers should aim for, similar to what America and Europe did, even if that starts at the intra-Africa level with all the African countries signing the Yamoussoukro Agreement before fully opening up to countries from other regions.

Recent developments have been made to improve intra-Africa air connectivity. In January 2018, the Single African Air Transport Market (SAATM) aimed to create a single unified air transport market and was launched by the African Union in Addis Ababa as part of advancing the Africa economic integration agenda. According to a study commissioned by the African Civil Aviation Commission (AFCA) and IATA in 2015 to assess the benefits of full air transport liberalisation between 12 countries (South Africa, Senegal, Ethiopia, Egypt, Ghana, Kenya, Nigeria, Namibia, Tunisia, Uganda, Algeria and Angola), full air transport liberalisation between the 12 countries would add US$1.3 billion to GDP and create 155 000 new jobs (SAATM, 2017). In addition, the consumers from the 12 countries would benefit from a 75% increase in direct air connections, a fare saving between 25% – 35% and time savings and convenience. However, for the African continent to reach the full benefit of air transport liberalisation, speedy adoption and implementation of SAATM is critical. In line with SAATM, improved air connectivity will play a significant role in driving and promoting Africa's economic regional integration through the facilitation of movement of people, goods and services.

Inadequate infrastructure is another bottleneck that limits Africa's air connectivity and economic development. Romp and de Haan (2005) assert that high and sustainable economic growth requires an up-to-date and reliable infrastructure. A similar argument is made by Beckers, Chiara, Flesch, Maly, Silva and Stegemann (2013) that inadequate and underdeveloped infrastructure impedes economic growth and social development. For the aviation industry, airport infrastructure is a prerequisite. Airports are a vital component of the aviation industry as they provide the infrastructure that facilitates tourism and trade, thereby contributing to socio-economic development through improved accessibility for people to geographical areas, cargo movement, property and infrastructure development (NADP, 2015). Some of the other activities that take place at airports include aircraft storage facilities, aircraft maintenance and repairs, aircraft fueling, retail space for businesses, hospitality, offices and conferences and events (NADP, 2015).

According to the WEF (2017), several African countries have inadequate and underdeveloped airport infrastructure, and this results in very low air traffic. Therefore, addressing the airport infrastructure could play a significant role in improving the Continent's air connectivity. Without adequate investment in airports infrastructure, the air connectivity will not be able to reach its full potential and successfully drive economic development.

2.4. Western Cape at a Glance

2.4.1. Western Cape Economy

The Western Cape is home to about 6 million people, with an annual provincial growth rate of 1.5% and 13.7% contribution to the South African economy in 2016 (Stats SA, 2018). In 2016, about 72.5% of the provincial economic output was from the City of Cape Town (Pero, 2018). In terms of trade, the Western Cape exports and imports grew by 6.6% and 10.6% on average per annum respectively over the last 10 year (Pero, 2018). As for tourism, international passenger arrivals were 2.6 million in 2018, an increase of 9.6% from 2017.

2.4.2. Cape Town International Airport

Cape Town International Airport (CTIA), is located 20 kilometres away from Cape Town city centre and the Port of Cape Town, putting it in an ideal location. This airport was launched in 1954 as a replacement for Cape Town's earlier Airport, the Wingfield Aerodrome. CTIA is the 3rd largest Airport in Africa after O.R. Tambo International Airport (ORTIA) and Cairo International Airport. In South Africa, CTIA is the 2nd largest and busiest airport after ORTIA. CTIA experienced some upgrades before 2010 in preparation for the 2010 FIFA World Cup. Currently, CTIA handles over 10 million passengers per year, with approximately 20% of those passengers being international passengers. In 2019, the airport had 23 operating airlines serving over 100 destinations (with 25 international destinations). Table 1 below provides an overview of statistics related to CTIA from 2014 to 2018.

Table 1: Cape Town International Airport Summary Statistics

	2014	2015	2016	2017	2018
Total passenger numbers	8 636 294	9 407 375	10 090 418	10 693 063	10 777 524
International passenger numbers	1 568 912	1 713 047	1 990 621	2 391 163	2 592 330
Number of international destinations served	14	13	17	20	23
Air Traffic Movement	90 478	98 525	99 981	102 079	99 856
International Air Traffic Movement	7 757	9 955	11 602	14 602	15 038

Source: Composed by the author using ACSA & OAG data (2019)

In 2017, CTIA contributed R2.014 billion and 2 669 jobs to the South African economy (ACSA, 2018).

2.4.3. Western Cape Air Connectivity (Air Access Initiative)

In 2011, the Western Cape Department of Economic Development and Tourism (DEDAT) initiated the Air Access initiative aimed at improving the direct air connectivity between the Western Cape, specifically CTIA, and the rest of the world. The motivation for the project was to improve the Western Cape's competitiveness (improved trade, FDI and tourism numbers) through having more direct air connections and reducing the travelling time that it takes to connect to Western Cape. Since 2015, the Air Access initiative has created 15 new direct routes to Cape Town and has expanded frequencies in 21 routes, increasing CTIA international seat capacity by over 1.5 million seats, with estimated direct tourism spend of R6 billion and a 52% increase in air cargo (King, 2019).

2.5. Determinants of Air Connectivity

2.5.1. Measuring air connectivity

If you cannot measure it, you cannot improve it. One of the important questions that face policymakers and decisionmakers is how to measure air connectivity. By understanding how to measure air connectivity and what drives it, policymakers and decisionmakers will have a clearer understanding of which levers to use to stimulate air connectivity. However, we cannot talk about air connectivity without mentioning one of the prerequisites and enablers of air connectivity, the Bilateral Air Service Agreements (BASAs). BASAs are agreements signed between two countries to allow for reciprocal international commercial air transport to those countries. These agreements outline the number of entry points (international airports) in each country, frequencies of flights per week, designated airlines that will be operating the identified routes for the respective countries and the traffic rights. Therefore, without BASAs in place, air connectivity cannot be facilitated. Burghouwt (2017) states that the availability of traffic rights as outlined in BASAs is a necessary condition for the establishment of direct connectivity to international markets.

Similarly, air connectivity cannot happen without airports. Therefore, policymakers also need to consider the importance of airports and airport-related infrastructure when looking at initiatives to improve air connectivity. Linked to this, is that improved air connectivity will lead to more passengers going through various airports and accordingly an increase in passenger numbers will also have implications for airport infrastructure and potential airport expansion. This may mean more investment in airport development and/or expansion to accommodate the increased passenger numbers.

According to ITF (2018), a single best approach of defining and measuring air connectivity does not exist. Therefore, various metrics based on schedule or traffic data and modelling techniques are used.

PWC (2013), refers to total passenger traffic, ticket prices, number of non-stop (direct) destinations and the time it takes to travel as some of the measures of air connectivity, and these measures can be used as separate proxies and/or a combination thereof can be used. Similarly, IATA (2007) measures air connectivity as the number of destinations served, frequency of services to each destination and the number of onward connections available from each destination. Likewise, Pearce (2007), measures air connectivity as the number of destinations served, the frequency of service to each destination, seat capacity per flight and the size of the destination airport. As such, increases in the number of destinations, frequencies served, and onward connections available improves air connectivity, with the opposite also being true. This shows that the number of nonstop destinations served and the rate of service to each destination tend to be common variables that are taken into account when assessing air connectivity.

Several indices including the IATA Connectivity Index, Oxford Economics Connectivity Index, World Economic Forum Connectivity Index and World Air Connectivity Index are some of the other popular measures of air connectivity and are considered by the ITF as complex metrics. ITF (2018), further compares different approaches to measuring air connectivity as follows:

a) **Metrics based on network quality**

   Metrics based on network quality estimate the number of direct, indirect and hub connections, weighted by their quality and measured in terms of transfer and detour time. With this approach, a comprehensive overview of the connectivity can be provided given that all significant connections are included in the estimate. Moreover, an analysis of changes to the route network could easily be done including scenario analyses based on metrics estimate. The estimates are also easy to understand and communicate. However, the disadvantage of these metrics is that they are difficult to model and may require expert judgement.

b) **Metrics based on quickest path length models**

   Metrics based on quickest path length models estimate the average time to reach all other airports in a network, and number of markets connected within a certain time limit.

Similar to the metrics based on network quality, the estimates for metrics based on quickest path length models enable an analysis of changes to route networks and scenario analyses. However, these metrics have several disadvantages that affect the route connectivity picture, including the complex modelling required, the fact that they do not take all significant routes or route frequencies into account, and they account for connections with little or no demand.

c) **Metrics based on generalised travel cost models**

These metrics estimate the monetary terms of the welfare impacts of connectivity changes. Like the metrics based on network quality, metrics based on generalised travel cost models also provide a detailed connectivity overview that considers all the significant connections and the route network and scenario analyses could be easily done. Over and above the similarities, metrics based on generalised travel cost models provide an analysis of welfare impact changes to the route network. However, there are also several challenges about the metrics based on generalised travel cost models including complex modelling requirements, collection of data from multiples sources, use of ticket price data that is often exposed to unreliability for some markets, and difficult interpretation and communication.

For this paper, the metrics based on the quality of networks are most appropriate for what is intended to measure air connectivity for the Western Cape, and these metrics will make use of the number of destinations served, frequency of service to each destination and the available seat capacity as a measure of air connectivity in line with Oxford Economics Connectivity Index. This approach takes into account the economic importance of each destination served, and the data for the variables is more readily available for the Western Cape.

2.6. Impact of improved air connectivity on economic growth

Air connectivity leads to the improved economic performance of the wider economy by improving a country's level of productivity (Oxford Economics, 2011). The improved productivity in businesses outside the aviation sector is seen from two main channels: increased access of domestic firms to international markets; and enhanced competition in the domestic market that is led by a free movement of goods, services, capital and people (including labour) between countries (Oxford Economics, 2011). In contrast, constraints to air connectivity can lead to a reduction in the number of available destinations served, less convenient schedules, and less competition between different carriers. This, in turn, will negatively affect competitiveness and productivity and therefore impede economic growth.

2.6.1. Empirical Findings

Most studies show a significant statistical relationship between air connectivity and economic growth. IATA (2007), asserts that a 10% increase in air connectivity leads to a 0.07% increase in productivity and a 0.9% increase in long term economic growth. This productivity improvement was also confirmed by Gillen, Landau and Gosling (2015) in their study in the United States of America that shows that air connectivity affects multifactor productivity in different industries and the impact varies from one industry to the other. According to Baruffaldi (2015), in Germany, regions where improved air connectivity catalysed higher level inter-regional knowledge integration showed significant improvements in productivity.

Similarly, a study that was done by Hu, Xiao, Deng, Xiao and Wang (2014) in China found that a 1% increase in passenger traffic leads to a 0.9% increase in real GDP. Another study by PWC (2013) in the UK used seat capacity created as a measure of connectivity, and showed that a 10% increase in seat capacity could have the following impact on the UK economy:

- 1% increase in short term GDP;
- 4% increase in tourism inside the UK while UK tourists travelling abroad could increase by 3%;
- Improved trade: product imports could increase by 1.7% and product exports could increase by 3.3% while services imports could increase by 6.6% and services exports could increase by 2.5%;
- 4.7% increase in FDI inflows and a 1.9% increase in FDI outflows.

In South Africa, Oxford Economics (2011), estimated that a 10% increase in air connectivity would lead to R1,5 billion per annum increase in long-run GDP. The eruption of Iceland's Eyjafjoell volcano in April 2009, that led to a significant disruption of air service in Europe including air freight, further demonstrates the importance of air connectivity in the economy (Arvis and Shepherd, 2011). According to Arvis and Shepherd (2011), press reports showed that Kenyan farmers lost $3.8 million per day as they had to dump the flowers that were destined for Europe due to unavailability of air service caused by the Eujfjoell volcano.

The above-mentioned literature shows that there is a positive relationship between air connectivity and economic growth, although different measures of air connectivity are used. Furthermore, the relationships between air connectivity and trade, FDI and tourism respectively are also evident. These relationships are the basis of this study and will be explored further in the following sections.

2.7. Impact of improved air connectivity on trade

Trade is recognised as an important instrument in development. The initial work on the impact of trade on economic growth and development is associated with Smith (1776) who suggested that trade was a mechanism for increased production and market diversification. Similarly, Marshall (1890) argued that the economic progression of nations was linked to the study of international trade. For the last couple of decades, international trade has grown significantly. According to Were (2014), the world's value of merchandise trade has increased by an average of 7% between 1980 and 2011. In 2017, world merchandise exports amounted to $17 trillion, up by $1 trillion recorded in 2016 (UNCTAD, 2018). Despite the increase in the value of trade and the importance of trade for economic development, the benefits of trade are not the same for all the contracting parties (trading countries). This is confirmed by Were (2014) who argues that although international trade leads to economic growth in developing and developed countries, the impact on the least developed countries is insignificant. This is mainly due to the General Agreement on Trade and Tariffs (GATT).

Trade liberalisation in terms of the GATT, now known as the World Trade Organisation (WTO), was not necessarily beneficial to all the member countries (Ismail, 2018). Ismail (2018) asserts that trade liberalisation in GATT favoured the developed countries more than the developing countries due to differences in the level of development between the member countries. One of GATT's principles is the most favoured nation principle, which implies reciprocal tariffs for all the member countries, regardless of the level of development. Developing countries deserve some level of protection and should not be expected to open up their markets to the full extent as the developed countries (Ismail, 2018). Despite such contention about trade liberalisation, trade plays a significant role in economic development. However, the African continent still has a relatively low share of the world trade, sitting at about 3%. Furthermore, intra-Africa trade is significantly low compared to other regions. According to WTO (2015), intra-Africa trade was about 18% compared to other regions such as Europe, North America and Asia, that have about 70%, 52% and 52% intra-regional trade respectively.

Logistics costs have often been identified as one of the key impediments to Africa's trade potential and market access, as a result of underdeveloped infrastructure. According to AfDB (2018), input cost could be increased by 200% in some African countries due to poor infrastructure. In 2018, the infrastructure gap for the African continent was sitting between $130 billion and $170 billion a year (AfDB, 2018). Improved air connectivity could play a role in improving Africa's trade potential by facilitating trade and reducing some of the logistic costs as alluded by Burghouwt (2017). A similar argument is made by the Canada Airports Council (2013), which states that distance is one of the barriers to trade and that air connectivity, facilitated by air transport and the airport infrastructure, plays a critical role in addressing this barrier.

Similarly, Oxford Economic Forecasting (2006) alludes that air connectivity enables international trade and allows countries to focus on goods and services that they have a comparative advantage in producing. Moreover, Burghouwt (2017) argues that there is a growing acknowledgement of air connectivity as a critical asset for improving the competitiveness of cities, region, and countries. Burghouwt (2017) asserts that improved air connectivity reduces travelling costs for consumers and business and facilitates global trade. Likewise, ICAO (2017) posits that air connectivity allows for improved global reach for businesses allowing for a convenient and faster way of shipping products to markets (ICAO, 2017).

It is evident that air connectivity acts as an enabler for trade and business opportunities. In 2001, about 32 million tons of cargo were transported via air transport. In 2016, 53 million tons of cargo representing a 4% increase from 2015 was transported by air transport and the cargo transported via air is anticipated to more than double by 2034 (ICAO, 2017). This is mainly due to improved connectivity and lower transport costs. In 2017, 61.9 million tons of cargo was transported via air transport, representing about 35% of world trade by value and less than 1% of world trade by volume.

Air transport also plays a critical role in global value chains and supply chains where a significant amount of multinational corporations buy the inputs (raw material and intermediate goods) globally. As an example of global value chains, Milberg and Winkler (2013) use an Apple iPod's manufacturing process, with the innovation and design done in the United States of America (by Apple Inc), the hard drive made in Japan (by Toshiba), the multimedia processor chip made in the United States of America (by Broadcom) and the final insertion, test and assembly done in China (by Inventec, Taiwanese Company). In 2011, about 50% of world trade was done within the global value chains (Ismail, 2018).

This supports the argument that air connectivity plays a key role in facilitating global trade, especially for high value and low volume goods (such as electrical components, diamonds, aerospace components and medical devices) and time-sensitive goods (such as fresh produce and vaccines) due to the speed and reliability of air transport. However, it is important to note that air connectivity is not the only contributor to increased trade, and there are other variables that drive trade. Below, this study investigates some of the drivers of trade in order to select feasible variables to be included as control variables in this study's trade model.

Determinants of Trade flows

Several studies have used exchange rates as one of the determinants of trade. Kodongo and Ojah (2013) found that a causal relationship exists between the exchange rate and trade flows in Africa. The authors' study found that, in the short run, trade flow increased as a result of the net effect of depreciation leading to an increase in trade flows (Kodongo & Ojah, 2013). Similarly, Hye, Iram and Hye (2009) found that there is a positive relationship between exchange rate and trade. Other studies also found that a positive relationship exists between exchange rate and trade (Wang, 2007), and exchange rate volatility and imports (Choudhry, 2008). However, some authors found no relationship between exchange rate volatility and trade including Tenreyro (2007) and Puah, Yong, Shazali and Lau (2008).

The law of demand is relevant with the exchange rate and trade, where depreciation of the local currency, ceteris paribus, makes local goods and services relatively cheaper in international markets compared to foreign goods and services, resulting in an increase in demand for local goods and services. Therefore, exports should increase with lower exchange rates. On the other hand, the depreciation of local currency makes foreign currency relatively more expensive, thereby making the cost of imports relatively more expensive, resulting in a decrease in imports. However, the overall impact of the depreciation of the local currency is an improved net trade flow driven by an increase in exports and decrease in imports. This also supports the volume effect theory that suggests that the depreciation of local currency results in relatively cheaper local goods and services (improved competitiveness) leading to increased exports and fewer imports (Onafowora, 2003).

Infrastructure in the source and destination country, especially economic infrastructure such as energy, transport and information and communication and technology (ICT) infrastructure, is another driving factor of trade since it affects the logistics costs. Jansen & Nordas (2004), and Limao & Venables (2001) in their respective studies found that improvements in source country infrastructure lead to improved trade performance.

Furthermore, economic growth is another variable that is often used as a determinant for trade. Sulaiman and Saad (2009) investigated the relationship between economic growth and exports in Malaysia from the period of 1960 to 2005 and found that a positive relationship between economic growth and exports exists. Their study also showed that there exists a negative relationship between imports and economic growth. Using the standard GDP equation, $GDP = C + I + G + X - M$, (where C is consumption, I is investment, G is government expenditure, X is exports and M is imports) an increase in exports should lead to an increase in GDP. In contrast, an increase in imports should lead to a decrease in GDP. Therefore, Sulaiman and Saad's study is in line with economic theory. Furthermore, Ho's (2013) study also found that economic growth and exchange rates are the critical determinants of international trade.

This paper has, therefore, used the rand/dollar exchange rate, economic infrastructure and economic growth as the other key independent variables (control variables) of trade in addition to the air connectivity variable. Since there is no overall variable that looks at infrastructure, a proxy will be used, specifically the World Bank's quality of infrastructure index.

2.7.1. Empirical findings of the impact of air connectivity on trade

Smyth, Christodoulou, Dennis and Campbell (2012), argue that air service played a critical role specifically for the UK's trade with the emerging countries including China and India, and it was central in improving the UK's competitiveness compared to other countries globally. 55% of the UK's exports out of the European Union (EU) are exported via air transport, and similarly, a significant amount of the UK's imports depends on air transport, with 60% of imports that originate outside the EU shipped via air transport (Smyth et al., 2012). Similarly, a positive relationship between air connectivity and trade was found in Canada, where a 1% increase in air connectivity was associated with a 0.88% increase in trade, taking into account all their trading partners (Canada Airport Council, 2013).

Moreover, in 2014, $6.4 trillion worth of goods were transported via air transport (ICAO, 2017). ICAO (2017) further asserts that about 87% of business to consumer (B2C) parcels are shipped via air. In Kenya, the cut flower industry generates about US$1 billion each year and supports

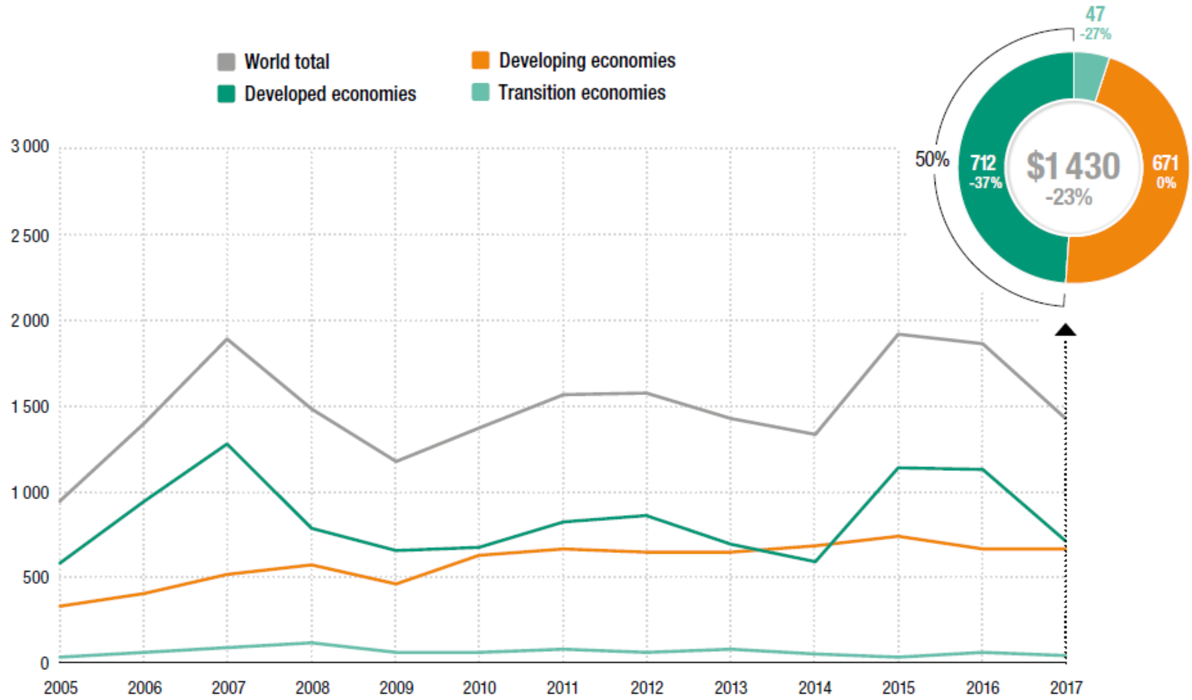
1.6% of the national economy, and over 90% of fresh-cut flowers are transported via air transport (ICAO, 2017). In South Africa, US$110 billion worth of goods and services were transported via air in 2014. This shows the role that air transport through air connectivity plays in facilitating trade. Access to various international markets is made possible via air transport and air connectivity by having direct and indirect connections between countries.

2.8. Impact of improved air connectivity on FDI

FDI plays a critical role in improving economic growth and job creation and in some instances leads to skills development and knowledge transfer. Although the global flow of FDI declined by 23% in 2017, FDI still plays a critical role in economic development. Foreign investment is central to industrial policies and the accompanying investment policies aimed at attracting FDI, as it aligns to international markets and stimulates innovation and competitiveness of countries and businesses in various sectors of the economy (UNCTAD, 2018).

Between 2016 and 2017, global FDI inflows fell by 23% from $1.87 to $1.43 trillion as illustrated in Figure 5 below, and a significant part of this decline was experienced in developed countries, whilst the developing countries remained relatively stable (UNCTAD, 2018). This decline could be explained by various factors including the asset-light forms of overseas operations, low economic growth and a decline in rates of returns on FDI from 8.1% to 6.7% between 2012 and 2017 (UNCTAD, 2018). In Africa, the rate of return of FDI fell from 12.3% in 2012 to 6.3% in 2017.

Figure 5: FDI Inflows, Global and by Groups of Economies ($Billion and %)

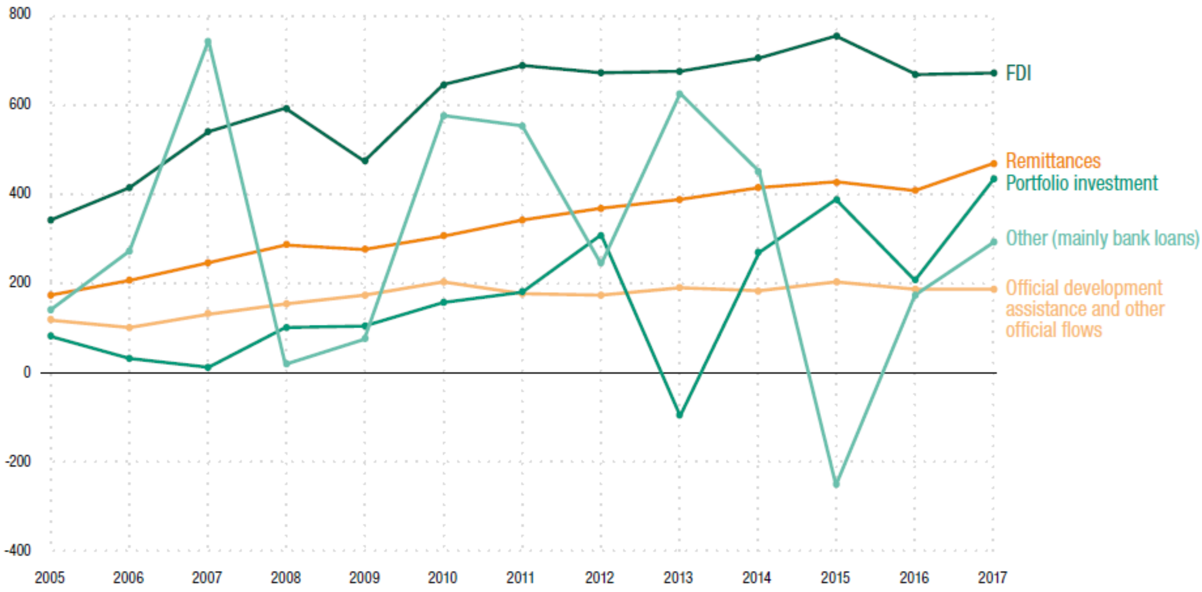


Source: UNCTAD (2018)

As mentioned above, despite the decline in global FDI, the developing countries FDI inflow remained stable. However, for the African continent, the decline was quite significant with a 21% decrease in FDI inflows between 2016 and 2017, largely due to low oil prices and a decline in commodity prices (UNCTAD, 2018). Moreover, Africa still attracts relatively low FDI inflows compared to other regions. Nevertheless, the decline in FDI does not take away the importance and relevance of FDI in economic growth and development.

According to the OECD (2013), in a conducive environment for FDI, FDI is another source of funding for development. This is further supported by UNCTAD (2018) that asserts that FDI is the largest development finance source for the developing countries and contributes about 39% of total incoming finance as illustrated in Figure 6 below. It is also important to note that FDI has been a relatively more stable source of funding compared to the other sources such as portfolio investment and bank loans throughout 2005 to 2017, although there has been an overall upward trend.

Figure 6: Sources of External Finance for Developing Economies ($ Billion)



Source: UNCTAD, (2018)

In terms of the relationship between air connectivity and FDI, Banno and Redondi (2014) assert that improved air connectivity through the establishment of new routes could reduce transport costs and enable knowledge flow, which should then lead to an increased probability of FDI flow between the connected countries. Various studies argue that the location of FDI is linked to the multinational companies' objective to gain access to international markets (Carod, Solis and Antolin, 2010).

Similar to trade, air connectivity is not the only variable that affects FDI. There are other variables that affect FDI, which are investigated below. This investigation aims to assess the other feasible variables (control variables) that could be included as independent variables in addition to air connectivity.

Determinants of FDI

Location is one of the key factors that are considered when determining where to invest. The OLI (Ownership, Location and International) paradigm is one of the most well-accepted and appropriate theoretical approaches of the location determinants of FDI (Luiz and Charalambous, 2009). The OLI model considers the ownership, location and international advantages that are critical to firms' decision to invest in a foreign country (Dunning and Lundan, 2008). The model suggests that before a firm can consider investing abroad, they must determine a firm-specific competitive advantage that enables the firm to overcome the cost of operating abroad. Furthermore, a consideration for the right location will have to take into account access to resources including inputs and skills, geographical factors such as region and distance and the legislative and policy environment. Furthermore, consideration of how the firm will operate abroad will have to be made. However, this model is difficult to use with data. Moreover, the model does not fully consider institutions as they are hard to predict (Dunning and Lundan, 2008). However, institutions are one of the mechanisms that countries use to create incentives to attract FDI including creating an enabling and conducive business environment with the protection of property rights and law enforcement, and the OLI model does not account for institutions.

Literature also considers push and pull factors that drive FDI. According to De Vita and Kyaw (2008), the push factors are usually related to the economic situation in source countries that drive FDI to the recipient countries, whereas the pull factors refer to the economic situation in the recipient countries that attract FDI.

Table 2: Examples of Push and Pull Factors of FDI

Push Factors	Pull Factors
Changes in international interest rates	Market potential in the host country (market size)
Economic growth	Raw materials
Labour costs	Political stability
Bureaucracy	Labour costs, availability and skills
Increasing competition in the home country	Technological/ managerial know-how
Strict laws in the home country	Exchange rate
Shrinking market	Inflation rate
Excess production capacity	Welcoming to FDI
Active encouragement from the home government	Geographical location
	Infrastructure
	Trade openness
	Institutions

Source: Kodongo (2018)

Although the literature does not reveal harmony in terms of the dominance of push or pull factors, various authors argue that the push and pull factors are complementary in creating an enabling environment to induce FDI (Chuhan et al., 1998).

The exchange rate is one of the most used determinants of FDI. Kodongo and Ojah (2013) found that there is a positive relationship between exchange rates and FDI, with a 1% depreciation in the exchange rate leading to a 0.045% increase in FDI flows.

Another determinant of FDI is economic growth. UNCTAD (2018) posits that weak economic growth globally makes it difficult to mobilize external sources of funding including FDI. This puts more pressure on domestic revenue to meet the economic development needs. Moreover, Koojarroenprasit (2013), in his study of the factors that determine FDI inflows in Australia from 1986 to 2011, found that larger GDP, depreciation of exchange rate and lower interest rates are the pull factors of FDI.

A similar study by Hara and Razafimahefa (2005) on determinants of FDI inflows in Japan found that GDP, exchange rate volatility and inflation are the key determinants of FDI. Their study shows that there is a positive relationship between GDP and FDI and a negative relationship between FDI and inflation, and FDI and exchange volatility respectively. Bevan, Estrin and Meyer (2004), also found a positive relationship between FDI inflows and GDP. This is further supported by Ranjan and Agrawal (2011) who showed that there is a positive relationship between GDP and FDI.

Another important factor for consideration regarding FDI is the state of infrastructure, specifically the economic infrastructure such a transport (road, air, rail and sea), energy and information, communication and technology (ICT) infrastructure. Such infrastructure affects the cost of doing business including the logistics costs, access to markets and other operational costs. Therefore, better economic infrastructure should lead to an improved FDI inflow.

Literature suggests that the size of the economy measured by GDP and exchange rates are common variables that affect FDI inflow. In addition to infrastructure, the interest rate has also been mentioned as another variable that affects FDI. For the purposes of this study, long term interest rates were used. According to the OECD, long term interest rate is the interest rate for the 10-year government bonds. These rates are based on the price charged by the lender, the risk profile of the borrower and the decrease in capital value. OECD further argues that the long-term interest rates are one of the key considerations for business investment as relatively high rates will increase the cost of borrowing and discourage investment. In contrast, low interest rates reduce the cost of borrowing and therefore encourages investment which is a major source of growth.

Accordingly, this study uses the rand/dollar exchange rate, economic infrastructure, the size of the source country’s economy (GDP) and the interest rate as the other determinants of FDI in addition to the air connectivity variable.

2.8.1. Empirical findings of the impact of air connectivity on FDI

According to Bel and Fegeda (2008), having a direct flight connection is a key consideration for large European multinationals' location choice. Bel and Fegeda (2008) found that the number of headquarters grew by 4% in European metropolitan areas due to a 10% growth in intercontinental flights, ceteris paribus. Similarly, Strauss-Kahn and Vives (2009) found that the likelihood of firms moving to a particular location rises by 90% if there is a large airport nearby or 40% if there is a small airport. Likewise, Oxford Economic Forecasting (2006) found that in the long run, a 10% improvement in air connectivity leads to a 3.5% rise in fixed investment. This shows that air connectivity is a significant determinant of corporates' decision to locate in a particular country/region and concomitantly contributes significantly in the facilitation of FDI flows in the local economy.

Furthermore, Banno and Redondi (2014) argue that for future travel, convenience is one of the key factors that influence decisions about the location of investment and that subsidiaries often locate within close proximity to major airports. Banno and Redondi (2014) found that the establishment of a new route increased FDI by 33.7% two years after inception. They further argue that, given the benefits that air connectivity plays in facilitating FDI flows, policymakers and decisionmakers should promote the development of international airports.

However, Arauzo-Carod, Manjon-Antolin and Liviano-Solis (2010) argue that air connectivity's impact on FDI depends largely on each sector of the economy and its dependency on accessibility, and therefore air connectivity does not always lead to increase in FDI. This is valid and true; however, improved air connectivity does enable FDI inflows due to relatively cheaper transport costs (more flights, therefore improved competition) and employees have relatively more and easier access to transport that allows them to travel between offices/locations. Moreover, even though Cuervo-Cazurra (2008) argues that the longer distance between destinations has a negative impact on FDI, overall air connectivity does influence multinational companies' decision to locate to a particular country of interest.

In summary, a positive relationship seems to exist between air connectivity and FDI, with improved air connectivity leading to an increase in FDI.

2.9. Impact of improved air connectivity on Tourism

It is well established that air transport enables and facilitates global travel. According to the (ATAG, 2018), in 2017, airlines carried over 4 billion passengers, increasing from 3.8 billion passengers in 2016 while 57% of international tourists across the world travelled via air transport and spent $719 billion. For the African continent, foreign visitors contributed $35.9 billion and supported approximately 4.9 million jobs in 2016 (ATAG, 2018). Moreover, ICAO (2017) anticipates the global air passenger traffic to be more than 7.7 billion passengers by the year 2036.

Although the number of tourists travelling by air transport has been increasing, it is worth noting that tourists, specifically leisure tourists, are price-sensitive, and therefore respond quite significantly to price movements. Since 1970, the real costs of air travel have decreased by 60% and this decline in costs has contributed significantly to air traffic growth (ICAO, 2017). This reduction in costs has increased the accessibility of air travel in both the developed and the developing countries, making air travel available to more people. Air transport is also critical for business tourism, in particular meetings, incentives, conferences and exhibitions (MICE activity), which has a potentially bigger economic impact since business tourists spend relatively more per day compared to leisure tourists (ICAO, 2017). Both leisure and business tourists contribute significantly to the tourism industry.

The tourism industry plays an important role in driving economic development by creating jobs and contributing to the overall economy of a country. In 2017, the total contribution of the global tourism industry to GDP was $8.3 trillion, or 10 % of global GDP and 312 million jobs (WTTC, 2018). For South Africa, the tourism industry's total contribution to GDP was R412 billion (9% of total GDP) and just over 1.5 million jobs (9.5% of total employment) for the same year (WTTC, 2018). Furthermore, according to ATAG (2018), tourism that is facilitated by air transport generated approximately 36.7 million jobs worldwide. For the African continent, the impact of tourism facilitated by air transport is estimated to be $159 billion and supports 9.8 million jobs.

Countries that are remote from their source markets of tourists, specifically in developing countries, largely depend on air connectivity as a critical enabler of a solid inflow of international tourists (ATAG, 2018). Without air connectivity, such countries would struggle to attract international tourists and therefore, their economies may suffer, resulting in relatively poor economic growth. However, this does not imply that developed countries that are remote from their source markets are not dependent on air connectivity as an enabler of international tourists. In Australia, there were 9.2 million international visitors in 2018 that contributed $43.9

billion to the economy (ABS, 2019). About 99% of international visitors to Australia arrive via air transport (DITRDLG, 2009). Cetin et al. (2016), argue that improved air connectivity makes a country more accessible globally, thereby increasing international arrivals from various markets.

However, similar to trade and FDI, air connectivity is not the only driver of international tourism (arrivals). There are other variables that drive international tourism. These will be interrogated further in the following section in order to select feasible variables that could be included as independent variables (control variables) in addition to the air connectivity variable.

Determinants of international tourism

Naude and Saayman (2004), in their study of the determinants of tourism arrivals in Africa, established that tourism infrastructure, political stability and information and marketing are critical determinants of tourism to Africa. They further argued that tourists from the US tend to be relatively more price sensitive compared to tourists from other countries who are relatively price-neutral.

According to Lim (1997) the most common variables that are considered as determinants of tourism include the following:

- Income – ability to pay for international travel. This is usually measured as per capita income (GDP per capita);
- Relative prices of goods and services that tourists buy in a particular destination in relation to the country of origin and other destinations. This is usually measured by the Consumer Price Index ratio;
- Round trip cost of travel from the country of origin to the destination of choice;
- Exchange rates between the country of origin and the destination;
- Other competing destinations as potential substitutes;
- Marketing expenditure to promote the country as a destination;
- Business travel/trade – travelling for purposes of doing business.

Moreover, Kester (2003), argues that poor infrastructure (air transport), facilities (tourism infrastructure) and difficulty in accessing tourism attractions due to poor marketing and communication negatively affect international tourism to Africa. Lack of price and quality competitiveness are also regarded as key obstacles to the growth of the tourism sector in Africa (Christie and Crompton, 2001). This strongly relates to the relatively poor quality of the packages offered and relatively higher airfares (travelling costs) in Africa.

Furthermore, Gani and Clemes (2017) in their study of the determinants of international arrivals in New Zealand found income of the source country, the distance between source market and New Zealand, exchange rates, and good governance of New Zealand to be significant drivers of international arrivals to New Zealand. Nordstrom (2002) and Naude and Saayman (2004), also use GDP per capita as a proxy for income for the country of origin. Chi and Baek (2013) in their study of the dynamic relationship between air transport demand and economic growth in the US, also found that an increase in income leads to an increase in demand for the air transport, and therefore to an increase in air travel.

Another study by Duval and Schiff (2011) uses GDP and exchange rates as control variables in assessing the effect of air service availability on international visitors to New Zealand.

It is evident that tourism infrastructure (Naude and Saayman, 2004; Kester, 2003), cost of travel (Lim, 1997), income (Lim, 1997; Chi and Bael, 2013; Gani and Clemes, 2017) and exchange rates (Lim, 1997; Gani and Clemes, 20117; Duval and Schiff, 2011) are important determinants of international arrivals. The IMF (2014) also found that exchange rate movements in the destination country affect international arrivals. The above-mentioned variables could also be used as a measure of the competitiveness of the destination’s tourism sector.

For this paper, tourism infrastructure, exchange rates, GDP per capita (as a measure of income) and travelling cost will be used as the other key determinants of international tourism in addition to air connectivity.

Due to the unavailability of data, proxies will be used to estimate some of the above-mentioned variables. For tourism infrastructure, this study will use the number of hotel rooms available since they signify the capacity to accommodate tourists. The more hotel rooms available, the more a country can accommodate tourists, thereby adding to the competitiveness of the country’s tourism offering. It is also important to note that the income in the source country, which measures the ability to afford foreign travel, is also important, and for this variable, the study will use average GDP per capita of the top 5 source countries, as these countries are responsible for approximately 45% of the international arrivals to the Western Cape (ACSA, 2018). In addition, given that tourists, specifically leisure tourists, are price sensitive, the cost of travelling will also be considered, and jet fuel costs will be used as a proxy for this variable.

Initiatives aimed at improving air liberalisation such as SAATM will play a huge rule in improving competition between airlines, create more direct city to city connections and drive down air transport fares in Africa. This will, in turn, lead to an increase in tourism numbers. However, the impact of such initiatives is not within the scope of this paper.

2.9.1. Empirical findings of the impact of air connectivity on tourism

Improved air connectivity implies more connected origin and destination points through the establishment of new routes and improved frequencies on existing routes. Everything being equal, this means that because of the improved air connectivity, the passenger traffic in and out of a country will be improved and for the local/domestic economy, inward traffic improves tourism numbers. This was evident in a PWC (2013) study in the UK that showed that a 10% increase in air connectivity improved tourism into the UK by 4% and increased tourists travelling outside the UK by 3%. Tourists spend on accommodation, sightseeing, food and drinks and therefore contribute to the tourism sector and the overall economy.

Moreover, Oxford Economics (2014) states that foreign tourists in the UK spend about 22.6 billion pounds every year, with 75% of the tourists travelling via air transport. Therefore, foreign tourists travelling by air transport spend approximately 17 billion pounds each year in the UK. Cetin et al., (2016) in their study of the impact of direct flights on tourism volume in Turkey, found that there was a significant positive relationship between direct flights and international arrivals. Their study showed that the introduction of a direct flight resulted, on average, to 410 000 additional annual arrivals in Turkey.

Furthermore, according to the Canada Airport Council (2013), in 2012 Canada received about 7.5 million international visitors that travelled via air transport, and these visitors spent about $7.6 billion in Canada’s economy. Similarly, in 2014, foreign tourists to South Africa that arrived by air transport spent (direct, indirect and flow-on) US$9.2 billion in the economy as mentioned above. In 2018, South Africa recorded 10.5 million overnight trips by international tourists with R82.5 billion total foreign direct spend (Tourism Performance Report, 2019). Of the 10.5 million international tourists, 1.7 million visited the Western Cape.

It is evident that air connectivity affects the number of international tourists that visit a country and such visitors have a positive impact on the tourism sector and the economy as a whole.

2.10. Conclusion

Although various studies use different measures to measure air connectivity, a clear measure of air connectivity has been established for this study. Furthermore, the chapter illustrates the positive impact of air connectivity on economic growth, trade, FDI and tourism. Literature shows that air connectivity plays a key role in facilitating global trade, especially for high value and low volume goods and time-sensitive goods due to the speed and reliability of air transport. In terms of FDI, literature also shows that air connectivity is one of the key factors that multinational companies take into consideration when they make their decision to invest abroad. Furthermore, the chapter shows that improved air connectivity means that passenger traffic both in and out of the country will be improved, and for the local/domestic economy, inward traffic improves tourism numbers, making a positive impact on the tourism sector and the economy as a whole.

Policymakers and decisionmakers could improve air connectivity by developing airports and airport-related infrastructure, and by creating an enabling environment for the airlines to establish and build up their networks in order to improve the connections a country has with the rest of the world (PWC, 2017). By improving air connectivity, there is potential for economic growth to be stimulated through improved trade, an increase in FDI inflows and an increase in international tourists visiting a country.

It is also important to note that there is not a lot of literature on the impact of air connectivity on economic growth focusing on the African continent. Given the significant impact that improved air connectivity has on economic growth, it is important to get a better understanding of the associations and linkages between air connectivity and economic growth, specifically the impact of air connectivity on tourism, trade and FDI respectively in the context of African and developing countries. In addition, air connectivity in Africa is very under-developed, therefore, this study aims to help inform policymakers and decisionmakers on how to improve air connectivity to improve economic competitiveness, stimulate economic growth and create the much-needed jobs on the continent in order to improve the standard of living.

CHAPTER 3:
RESEARCH METHODOLOGY AND TECHNIQUES

3.1. Introduction

This chapter describes the research methodology used in this study to provide answers to the research questions and to test each of the hypothesis outlined in section 3.5 below. This paper aims to gain an understanding of the impact of air connectivity on economic growth, specifically, the impact of air connectivity on trade, FDI and tourism respectively. The question this paper seeks to answer is: Does improved air connectivity affect trade, FDI and tourism?

The chapter starts with outlining the research approach and strategy. The chapter then moves to outline the data sources and the data collection process that will be used to collect the required data. The econometric model and the estimation approach are also discussed in this chapter.

3.2. Research approach and strategy

This study analyses the impact of air connectivity on economic growth for the Western Cape region, specifically the impact of air connectivity on trade, FDI and tourism respectively. The study started by analysing the determinants of air connectivity to understand what drives it. From there, the paper then moved on to assess the relationships between air connectivity and FDI, trade and tourism respectively. These relationships are assessed in Chapter 4 using the Autoregressive Distributed Lag model.

For the air connectivity indicator, the number of destinations served, frequency of services to those destinations, passenger traffic and importance of destination (seat capacity) were used to estimate this indicator. Appropriate weightings were allocated to each variable based on the importance of each variable.

To conduct the research, this study followed a deductive approach to assess the hypotheses. A deductive approach involves quantitative data and assessment of relationships, which is what this study intended to do. This study was also explanatory in nature as it sought to understand the nature of relationships for quantitative data. Explanatory research strategy allows the researcher an opportunity to explore the cause and effect of the relationships (Saunders, et al., 2007). Furthermore, this strategy is in line with subjectivist epistemology philosophy, specifically the interpretivism.

This study used quantitative research that collected numerical data to perform the analysis required to answer the research question (Saunder et al., 2007).

3.3. Data sources and data collection

The paper used secondary data to conduct the econometric analysis by using quarterly time-series data from January 2010 to December 2018 (36 observations) and the Western Cape was selected as the study region. The secondary data is already existing data that was collected from the following sources:

- Airports Company South Africa (ACSA), Official Aviation Guide (OAG), Quantec and IHS Global Insights databases;
- Economic growth, FDI, Tourism and Trade data obtained from Quantec and FDI intelligence;
- Passenger numbers, number of destinations served, frequency of services to each destination and seat capacity data obtained from OAG and ACSA.

The selection of the appropriate variables to use in the analysis was informed by the literature review conducted in chapter 2 and the availability of reliable data. Diagnostics tests were undertaken to ensure the robustness of the model and data.

3.4. The econometric model

The study used regression analysis to assess the relationships between dependent and independent variables. To be more specific, the Autoregressive Distributed Lag (ARDL) approach for cointegration analysis was used to assess the short-run and the long-run relationships between variables. Econometric models that provide a better understanding of the relationships between air connectivity and trade, FDI and tourism in the Western Cape economy were built.

IATA (2007), posits that improved air connectivity leads to an increase in economic growth, however, economic growth also necessitates improvements in air connectivity. A similar pattern is observed between air connectivity and trade, FDI and tourisms respectively. This shows the need for the cointegration analysis which is discussed below under the estimation approach section of this study.

The regression models utilised are as follows:

$$FDI_t = \beta_0 + \beta_1 Air\ Connectivity_t + \beta_2 Size\ of\ the\ Economy_t + \beta_3 Exchange\ Rate_t + \beta_4 Economic\ Infrastructure_t + \beta_4 Interest\ Rate_t + \varepsilon_t$$

$$Tourism_t = \theta_0 + \theta_1 AirCon_t + \theta_2\ Toursm\ Infrastructure_t + \theta_3 Exchange\ Rate_t + \theta_4 Income_t + \theta_5 Travelling\ Costs_t + \varepsilon_t$$

$$Trade_t = \delta_0 + \delta_1 AirCon_t + \delta_2 Exchange\ Rate_t + \delta_3 Economic\ Infrastructure_t + \delta_4 Economic\ Growth_t + \varepsilon_t$$

3.4.1 Definition and Measurement of Variables

Table 3: Description of Variables

Variable	Proxy/Indicator	Measurement	Source
Dependent variables			
FDI_t	Rand value of FDI inflow	Whole number	FDI Intelligence
$Tourism_t$	Number of international arrivals/tourists	Whole number	ACSA
$Trade_t$	Trade flows (Rand value of Import plus exports)	Whole number	Quantec
Independent variables			
$Air\ Connectivity_t$	Calculation based on the number of destinations served, frequency of services to each destination and seat capacity.	Whole number	Author's calculation
$Tourism\ Infastructure_t$	Number of hotel rooms	Whole number	Quantec
$Income_t$	Average GDP per capita of the top 5 source countries for international arrivals	Whole number (US$)	OECD
$WC\ Economic\ Growth_t$	Change in GDP	Percentage	Quantec
$Economic\ Infrastructure_t$	Quality of infrastructure Index.	Whole number (Index)	World Bank
$Size\ of\ the\ Economy_t$	Average GDP growth of the top 5 FDI source market	Percentage	World Bank
$Exchange\ Rates_t$	Rand/dollar exchange rate	Whole number	IMF
$Travelling\ Costs_t$	Jet fuel costs, rand per gallon	Whole number	Index Mundi
$Long-term\ Interest\ Rate_t$	Interest Rate on 10-year bonds	Percentage	World Bank

3.5. Development of Hypothesis

The study will test the following hypotheses based on the above-mentioned questions:

H_0: There is no statistically significant relationship between air connectivity and FDI. Meaning that the expected change in FDI is zero.

H_1: There is a statistically significant (positive or negative) relationship between air connectivity and FDI.

H_0: There is no statistically significant relationship between air connectivity and tourism. Meaning that the expected change in tourism is zero.

H_1: There is a statistically significant (positive or negative) relationship between air connectivity and tourism.

H_0: There is no statistically significant relationship between air connectivity and trade. Meaning that the expected change in trade is zero.

H_1: There is a statistically significant (positive or negative) relationship between air connectivity and trade.

3.6. Estimation approach

3.6.1. Unit root analysis

According to Gujarati (2003), empirical work based on time series assumes that the data is stationary, meaning that the mean and variance do not change over time. To test this assumption, the unit root test was used, specifically the Augmented Dickey-Fuller (ADF) test or the Phillip Perron (PP) test. ADF test is used when the error terms, u_t are correlated and seeks to address the potential serial correlation in error terms (Gujarati, 2003). This is done by adding lagged difference terms of the dependent variable. The hypothesis for this test is as follows:

H_0: the data is non-stationary, i.e. unit root exists.
H_1: the data is stationary i.e. there is no unit root.

Similarly, the PP test uses nonparametric statistical methods to address the issue of serial correlation in the error terms without adding the lagged difference terms used in the ADF test. In this study, both methods are used, where ADF was used as a primary test for stationarity while PP test was used to verify the ADF test results to ensure the robustness of the model.

Unit root analysis was conducted before running the regression model to assess whether the data showed any signs of trend and non-stationarity in the mean. Non-stationary variables could result in spurious regression and the standard t-test and F-test may be deceiving. Therefore, where a trend (non-stationarity) was detected, an appropriated trend removal technique was applied, specifically the first difference of the non-stationary variables.

When conducting a unit root analysis, the optimal number of lags needs to be established as relatively fewer lags may not necessarily remove the autocorrelation, while relatively too many lags diminish the robustness and the power of the test (Brooks, 2014). To this end, various information criteria could be used to establish the optimal number of lags including Schwartz Information Criterion (SIC) and Akaike Information Criterion (AIC) and are often used (Gujarati, 2003). For this study, AIC was used.

3.6.2. Autocorrelation

Keller (2014), posits that if the error values are correlated over time, then autocorrelation or serial correlation is present. To assess whether the error values are dependent or correlated with each other, the Breusch-Godfrey test was used. The aim was to ensure that the independence assumption is not violated and that there is no presence of autocorrelation. The presence of autocorrelation implies that there is a dependence between error values, and particular pattern may emerge which may distort the results. Therefore, it is important to ensure that the error values are not correlated.

3.6.3. Cointegration analysis

The cointegration analysis is done to test whether variables have a relationship between themselves in the long run (Gujarati, 2003). To test whether cointegration exists between variables, Engle-Granger (EG) or Augmented Engle-Granger (AEG) or Cointegrating Regression Durbin-Watson (CRDW) or Johannes cointegration or Autoregressive Distributed Lag (ARDL) tests could be used. Engle-Granger and Johansen are two commonly used cointegration methodologies (Bilgili, 2008). The EG technique is useful for analysing both the short-term and long-term economic relationships between variables. In addition, it is relatively easy to use for the first indication of a long-run relationship. Button et al. (1999) used a similar approach to assess the direction of the causal relationship between passenger traffic, per capita income, total income and employment. Engel and Granger (1987:253), explains that time series x_t and y_t are said to be cointegrated of order d, b, where $d \geq b \geq 0$, expressed as:

$x_t, y_t \sim CI(d,b)$, if

i) Both series are integrated of order d,

ii) There exists a linear combination of these variables, say $\alpha_1 x_t + \alpha_2 y_t$, which is integrated of order d – b. The vector $[\alpha_1, \alpha_2]$ is called the cointegration vector.

However, Bilgili (1998), in his study of the comparison on EG and Johansen methodologies, finds that the two steps approached followed by EG approach has a potential of carrying the errors made in step 1 into step 2. Whereas, the Johansen maximum likelihood methodology avoids the potential flaws of EG approach by estimating and testing for the existence of multiple cointegrating vectors through the largest acknowledged correlations. Bilgili (1998), concludes that the Johansen methodology produces better cointegration analysis than EG. It is also important to note that the Johansen methodology assumes that all the underlying variables are integrated of order 1.

Although the Johansen methodology seems to provide a relatively better cointegration analysis, Chi and Baek (2013) argue that ARDL is superior to both the EG and Johansen methodology. They argue that ARDL circumvents the pre-testing problems as it could be applied regardless of the order of integration. Furthermore, they argue that ARDL has been confirmed to be relatively more robust and performs relatively better for small sample sizes, which is the case in this study, compared to the standard cointegration methodologies. Moreover, ARDL could be transformed to derive the Error Correction Model (ECM). Therefore, this paper opted to use the ARDL cointegration analysis. Specifically, ARDL was used to assess long run and short run cointegration between air connectivity and trade, FDI and tourism respectively.

If there is cointegration between variables, then a long-run relationship between the variables will be present and variables will move closer together over time. The ARDL cointegration equation of order *p* and *q* for this study is presented as follows:

$$\mathrm{y_t} = c_0 + c_1\mathrm{t} + \sum_{i=1}^{p} \emptyset y_{t-i} + \sum_{i=1}^{q} \beta_i' x_{t-i} + \mu_\mathrm{t} \,,$$

Or

$$Y_t = \mu + \beta_0 X_t + \beta_1 X_{t-1} + \ldots + \beta_q X_{t-q} + \chi_1 Y_{t-1} + \ldots + \chi_p Y_{t-p} + u_t$$

Furthermore, Gujarati (2003) suggests that an Error Correction Model (ECM), developed by Engle and Granger, is a way of integrating the short-run behaviour of a variable with its long-run behaviour. Stated differently, ECM reconciles the short-run and the long-run relationships of the underlying variables. The dynamic nature of the ARDL and ECM due to multiple lags could sometimes make it difficult to interpret the short-run coefficients results of the independent variables (Phillips, 2018).

To supplement the cointegration analysis, a Granger Causality analysis was conducted to assess whether there is a causal relationship between the variables of interest in the short run. The IATA reports use the same approach to assess the benefit of air connectivity in the economy.

3.6.4. Granger Causality Test

The assumption for this study is that there is a positive relationship between air connectivity and trade, FDI and tourism respectively. This means that a positive correlation between these variables is expected, where an increase in air connectivity is expected to lead to an increase in trade, FDI and tourism respectively. However, it is important to note that correlation does not imply causality, and therefore a test for a causal relationship between air connectivity and trade, FDI and tourism respectively is necessary, which raised the need for Granger Causality Test. Gujarati (2003) posits that if event X occurs before event Y, there is a possibility that X may be causing Y, while it is impossible that Y may be causing X. In summary, past events could be causing current events, however, future events cannot be causing current events (Gujarati, 2003).

This test intended to assess both the unidirectional and bidirectional causal relationships between air connectivity and trade, FDI and tourism respectively and vice-versa.

3.7. Conclusion

The research methodology explained in this chapter, formed the basis for the analysis of this paper, which is presented in Chapter 4. Chapter 4 provides analysis and findings of the relationships between air connectivity and trade, tourism and FDI respectively.

CHAPTER 4:
RESEARCH FINDINGS, ANALYSIS AND DISCUSSION

4.1. Introduction

This chapter outlines the research findings and provides a discussion on the analysis of the various tests that were conducted in pursuit of answering the research question. The unit root analysis to determine the stationarity and the order of integration will be covered. This will be followed by the cointegration analysis using the ARDL method. The Granger Causality analysis will also be conducted to assess causality between variables. And lastly, the post-diagnosis analysis will be conducted to assess the stability of the models.

4.2. Descriptive Statistics

Table 4: Descriptive Statistics

	Mean	Median	Std Deviation	Kurtosis	Skewness	Min	Max	Count
Tourism	222797.03	221542	74612.45	-0.26	0.63	127479	387783	36
Air Connectivity	58598.01	55060.75	18934.71	0.01	0.81	34042	104041.5	36
Trade	72054.9	76889.05	15361.47	-0.24	-0.88	38755.82	96217.88	36
FDI (Rmn)	173.2	139.26	127.96	1.72	1.34	0	556.7	36
Travelling costs	22.78	22.1	4.87	-1.07	0.17	15.16	31.83	36
Income ($)	40517.94	40567.89	3324.8	-1.07	0.1	34892.18	46135.71	36
Rand/$ exchange rate	10.9	10.97	2.79	-1.41	-0.06	6.63	15.55	36
Interest Rate	0.08	0.09	0.01	-0.35	-0.22	0.07	0.1	36
Tourism Infrastructure	18762.04	18756.5	217.03	-1.41	0.16	18469	19090	36
WC Economic Growth	0.01	0.01	0	-0.31	-0.36	-0.01	0.01	36
Economic Infrastructure	4.36	4.48	0.2	-1.16	-0.6	4.03	4.6	36
Size of the economy ($bn)	1376.051	1369.67	68.67	1.86	0.24	1264.75	1498.74	36

The quarterly average tourist arrivals (tourism), FDI inflows and trade value between 2010 and 2018 was 222 797 tourists, R173.2 million and R72.1 billion respectively. On the other hand, the standard deviation for tourist arrivals (tourism), FDI and trade is 74 612 tourists, R128 million and R15.4 billion. For all the variables analysed in Table 4, the kurtosis coefficients are lower than 3, and the skewness of the variables are relatively close to 0, showing that data resembles a normal distribution.

4.3. Unit Root Test

The ADF with a trend that was conducted for this study and summarized below in Table 5 and 6, showed that at lag(0), only four variables were stationary at 1%, 5% and 10% significance level, namely tourism (international arrivals), FDI inflows, Western Cape's (WC's) economic growth and the air connectivity. This is demonstrated by the test statistics (T-stats) values that are outside of the critical values and further confirmed by the p-values that are significantly low and close to zero, leading to the rejection of the null hypothesis and therefore, there is no unit root in these variables.

The remainder of the variables, namely, jet fuel price/litre, rand/dollar exchange rate, tourism infrastructure, economic infrastructure, income, size of the economy and interest rates were not stationary for lag(0) meaning that unit root was present. This was evidenced by relatively large p-values and the test statistics values that fell within the critical values. Non-stationary variables present a serial correlation problem which could lead to the misinterpretation of findings if such data is used. To address the non-stationary variables, the first difference of each of the non-stationary variables was used, and the ADF test was done again for these variables, which all proved to be stationary. To confirm the findings, a PP test was also conducted and was in alignment with the ADF.

Table 5: ADF and PP Tests Results at Lag (0)

	ADF Test CV 5% (-3.56)			PP Test CV 5% (-3.56)		
Variables	**T-stats**	**P-value**	**Decision**	**T-stats**	**P-value**	**Decision**
Tourism	-5.609	0.0000***	Stationary	-6.275	0.0000***	Stationary
Air Connectivity	-4.048	0.0075***	Stationary	-3.867	0.0134***	Stationary
Trade	-1.886	0.6620	Nonstationary	-1.951	0.6279	Nonstationary
FDI	-7.189	0.0000***	Stationary	-7.452	0.0000***	Stationary
Travelling Costs	-1.729	0.7381	Nonstationary	-1.84	0.6849	Nonstationary
GDP/capita top 5	-2.429	0.3643	Nonstationary	-2.726	0.2253	Nonstationary
Rand/$ exch rate	-1.664	0.7663	Nonstationary	-1.83	0.6902	Nonstationary
Tourism infra	-2.655	0.2551	Nonstationary	2.519	0.3187	Nonstationary
Economic infra	-2.138	0.5250	Nonstationary	-2.078	0.5583	Nonstationary
Interest rate	-2.641	0.2613	Nonstationary	-2.630	0.2663	Nonstationary
WC econ growth	-4.658	0.0008***	Stationary	-4.634	0.0009***	Stationary
Economy Size	-1.281	0.8926	Nonstationary	-1.642	0.7756	Nonstationary

Note: ***1% significance level.

Table 6: ADF and PP Tests Results at Lag (0) for the First Difference

Variables	ADF Test (5% CV -3.564) T-stats	P-value	Decision	PP Test (5% CV -3.564) T-stats	P-value	Decision
Trade	-6.638	0.0000***	Stationary	-6.636	0.0000***	Stationary
Travelling Cost	-5.701	0.0000***	Stationary	-5.736	0.0000***	Stationary
GDP/capita top 5	-4.802	0.0005***	Stationary	-4.859	0.0000***	Stationary
Rand/$ exch rate	-5.276	0.0001***	Stationary	-5.261	0.0001***	Stationary
Tourism infra	-5.239	0.0001***	Stationary	-6.618	0.0000***	Stationary
Economic infra	-6.403	0.0000***	Stationary	-5.242	0.0001***	Stationary
Interest rate	-6.035	0.0000***	Stationary	-6.081	0.0000***	Stationary
Economy Size	-4.994	0.0002***	Stationary	-4.985	0.0002***	Stationary

Note: ***1% significance level.

The unit root tests conducted above were also important in identifying the order of integration, which is the number of times a variable has to be differenced before it could become stationary. Given that tourism (international arrivals), FDI inflows, WC's economic growth and air connectivity were stationary without applying any remedial technique, the study can conclude that they are integrated of order zero, I(0). Whereas travelling cost, rand/dollar exchange rate, tourism infrastructure, economic infrastructure, income, economy size, trade, and interest rates are integrated of order one, I(1), as they became stationary after the first difference of each variable was applied.

4.4. Tourism and Air Connectivity

As a starting point, a correlation matrix was produced to assess the co-movement of the independent variables. From the correlation matrix in Table 7 below, the following variables showed a strong positive correlation with more than 0.70 correlation coefficients. This implies that there is a strong co-movement amongst these variables.

- Log_income and log_rand_exchange_rate = 0.907
- Log_income and log_tourism_infrastructure = 0.962
- Log_tourism_infrastructure and log_rand_exchange_rate = 88.9

Log_income and log_tourism infrastructure had the highest correlation of 0.962, very close to 1, indicating that the variables move very closely with each other. According to Gujarati (2003), a correlation coefficient that is greater than 0.80 could be an indication of multicollinearity. For the purpose of this study, the literature review strongly showed that all the identified variables are important determinants of tourism. For the income variable, the economic theory suggests that the higher the income the greater the demand for a particular good, in this case, the higher the demand for travel and therefore the higher the number of international arrivals to the Western Cape. On the other hand, to accommodate international arrivals, adequate tourism infrastructure (accommodation/hotel rooms) needs to be in place. Therefore, for those reasons, we included both variables in our model. The other variable to note is the rand/dollar exchange rate, which showed a strong positive co-movement with both the income and tourism infrastructure variables.

Table 7: Correlation Matrix for the Tourism Model

Variables	tourism	air _connectivity	income	travelling _costs	rand_exchange _rate	tourism _infrastructure
tourism	1					
air_connectivity	0.9493	1				
income	0.6122	0.685	1			
travelling_costs	0.0267	-0.0115	0.2469	1		
rand_exchange_rate	0.4927	0.5141	0.9073	0.0951	1	
tourism_infrastructure	0.6048	0.6715	0.9616	0.0649	0.8889	1

Keller (2014) suggests a stepwise approach to assess the importance of the strongly correlated variables in the model to be used. To that end, the backward stepwise approach was utilised, and three models were assessed, each showing removal of one of the highly correlated variables. Table 8 provides a summary of the three models.

Table 8: Models from the Backward Stepwise Approach

Model	Variables
1	Tourism, air connectivity, income, travelling costs, rand/dollar exchange rate
2	Tourism, air connectivity, travelling costs, tourism infrastructure, rand/dollar exchange rate
3	Tourism, air connectivity, income, travelling costs, tourism infrastructure,

4.4.1. Cointegration Analysis

The results of the cointegration analysis for the three models are presented in Table 9 below. The F-statistics of 8.76, 10.29 and 8.10 for model 1, 2 and 3 respectively were greater than the critical values of the upper bounds at all the significance levels analysed, therefore, the null hypotheses are rejected in favour of the alternative hypothesis, as there is sufficient evidence to conclude that long-run relationships exist between tourist arrivals and the variables of interest.

Table 9: Cointegration Results for the Tourism Models

Critical Values	Cointegration Lower Bound – I(0)	Upper Bound – I(1)		Model 1	Model 2	Model 3
1%	3.74	5.06	**F-Statistics**	8.76***	10.29***	8.10***
2.5%	3.25	4.49	**Lag optimal**	4,4,4,4,4	4,3,2,4,4	3,4,0,4,3
5%	2.86	4.01				
10%	2.45	3.52				

Note: ***1% significance level.

4.4.2. Long-run estimates

Based on the evidence of the long-run relationship from the cointegration results in Table 9, the long-run results are estimated for all the three models and the results are summarised in Table 10 below. From the results in Table 10, a positive and significant coefficient for the air connectivity is observed at 1% significance level across all three models which is consistent with the study's expectation and the study done by PWC in the UK in 2013, that showed that a 10% increase in air connectivity increased the number of tourists visiting the UK by 4% (PWC, 2013). This also supports the findings of Cetin et al., (2016), ICAO (2017) and ATAG (2018) that air connectivity improves countries' accessibility and increases tourist arrivals from various markets. Due to more flights and more connecting destinations provided by the improved air connectivity, the Western Cape becomes relatively more accessible to international tourists, and therefore, allows more people to come to the Western Cape. The coefficients of 0.73, 0.68 and 0.54 for Model 1, 2 and 3 respectively suggest that a 1% increase in air connectivity will lead to 0.73%, 0.68% and 0.54% increase in international tourist arrivals (tourism) in the Western Cape for Model 1, 2, and 3 respectively.

The income coefficient is observed to be negative and positive for Model 1 and 3 respectively, however, the significance is only achieved in Model 3 at a 5% significance level, which indicates that the higher the income of the source countries' citizen, the higher the number of tourists to the Western Cape. This is in line with the study's expectation and the findings from Gani and Clemes (2017), that showed that a positive relationship exists between the income of the source country and international (tourist) arrivals; a higher income means greater disposable income and more people can afford to travel via air transport.

The travelling costs coefficient is observed to be positive and significant at 1% significant level for Model 2, however, this is in contradiction to the study's expectation and Naude and

Saayman (2004), who found that tourists from the US tend to be relatively more price sensitive. This relationship also contradicts the ICAO (2017) that showed that the reduction in the cost of travel has significantly contributed to the air traffic growth as demonstrated by an increase in international tourists travelling via air transport. The increase in travelling costs was expected to decrease the number of tourist arrivals to the Western Cape, however, the results of this model suggest that a 1% increase in travelling costs will increase tourist arrivals by 0.19% in the long-run. This could be explained by the fact that tourists usually plan their trips in advance, therefore, although travelling costs could be increasing, a particular number of tourists will be arriving in the Western Cape at some point in time regardless of travelling costs then. Naude and Saayman (2004) also argue that most tourists to Africa are price-insensitive except for the Americans.

Table 10: Long-run estimates of the Tourism Model

	Model 1		Model 2		Model 3	
	Coef.	**t-test**	**Coef.**	**t-test**	**Coef.**	**t-test**
log_air_connectivity	0.7316*** (0.1532)	4.78	0.6806*** (0.0758)	8.97	0.5403*** (0.0356)	15.16
log_income	-0.3302 (0.1881)	-0.28			1.2594** (0.5559)	2.27
log_travelling_costs	0.1424 (0.0982)	1.45	0.1912*** (0.0546)	3.5	-0.0006 (0.0329)	-0.02
log_rand_exchange_rate	-0.3619 (0.2755)	1.31	0.3912 (0.222)	1.76		
log_tourism_infrastructure			-1.7484 (5.4481)	-0.32	-0.4061 (3.5119)	-0.12

Note: *** 1% significance level. ** 5% significance level. * 10% significance level.

4.4.3. Short-run estimates

The short-run analysis of the three tourism models produced negative error correction terms of 1.45, 1.57 and 2.89 for Model 1, 2, and 3 respectively, with Model 1 and 2 significant at 10% significance level, while model 3 was significant at 1% significant level. The error correction terms show the speed at which any divergence from the long-run models in the short-run will be corrected. Model 3 had relatively higher convergence speed at 289% (significantly overshooting) compared to 145% and 157% for Model 1 and 2 respectively. The absolute value of the error term that is greater than 1 implies that the error correction is overshooting the long-run equilibrium, but it also confirms the existence of the long-run and short-run relationship amongst the variables of interest. The overshooting of the error correction term can be explained by fluctuations/volatility in the variables of interests. According to Narayan and Smith (2006), an error correction term that is greater than 1, means that the convergence to the long-run equilibrium is not monotonical but rather oscillatory.

The air connectivity coefficients are positive and significant at 10% and 1% significance level for Model 1, 2 and 3 respectively. This is consistent with this study's expectation and PWC (2013) and ICAO (2017) that also observed a positive relationship between air connectivity and tourist arrivals. However, the air connectivity coefficient is negative and significant at 10% significant level for LD, highlighting the instabilities of the short-run cointegration models. The short-run instabilities of the ARDL and ECM model were also observed by Phillips (2018), who argued that the multiple lags could sometimes make it difficult to interpret the short-run coefficients results of the independent variables.

Income coefficients are positive and significant at the 10% and 5% significance levels for model 1 and 3 respectively, which is in line with the study's expectation and Gani and Clemes (2017), who showed that a positive relationship exists between the income of the source country and international arrivals (tourism). The travelling costs coefficients are also positive and significant at 5% and 1% significance level for Model 1 and 3 respectively, however, this positive relationship is in contradiction to the study's expectation and literature review. It is important to note that the short-run cointegration model is subject to a lot of instability, therefore, we will not focus a lot on the interpretation of the short-run model as argued by Phillips (2018).

The rand/dollar exchange rate coefficients are observed to be negative and significant at the 10% and at 1% and 5% significance level for Model 1 and 2 respectively, which also contradicts this study's expectation. Therefore, this implies that there is a negative relationship between the rand/dollar exchange rate and tourism. This study was expecting a positive relationship between the rand/dollar exchange rate and tourism. The increase in the rand/dollar exchange rate (depreciation of the Rand) was expected to make the cost of travelling, accommodation and general spending in South African and the Western Cape to be relatively cheaper and therefore attract more international tourists to the Western Cape.

A negative relationship is also observed between tourism infrastructure and tourist arrivals (tourism), with a negative and significant coefficient for the tourism infrastructure in Model 2, which contradicts this study's expectation and Kester (2003) and Naude and Saayman (2004) who argue that poor tourism infrastructure negatively affects international tourists to Africa.

Table 11: Short-run Estimates of the Tourism Models

	Model 1		Model 2		Model 3	
	Coefficients	t-test	Coefficients	t-test	Coefficients	t-test
Constant	-9.3072	0.83	32.2391	0.47	-8.7887	-0.1
log_tourism LD.	-0.0396	-0.08	0.1422	0.26	1.2526***	3.1
log_tourism L2D	-0.3074	-0.97	-0.0325	-0.09	0.6799**	2.96
log_tourism L3D	-0.6054**	-3.44	-0.373**	-2.8		
log_air_connectivity D1.	0.6071*	6.32	0.6681***	5.75	0.7534***	5.54
log_air_connectivity LD.	-0.1263	-0.49	-0.1894	-0.62	-0.5872*	-1.94
log_air_connectivity L2D.	0.0985	0.52	-0.1418	-0.52	-0.3452	-1.62
log_air_connectivity L3D.	0.2402**	1.64			-0.0095	-0.06
log_income D1.	5.5595*	2.07			3.6487**	2.52
log_income LD.	0.6021	0.26				
log_income L2D.	-2.4847	-0.98				
log_income L3D.	7.0295**	2.6				
log_travelling_costs D1.	-0.0311	-0.38	0.2552***	3.42	0.1038	0.4
log_travelling_costs LD.	0.0178	0.25	-0.0207	-0.2	0.1199	1.34
log_travelling_costs L2D.	0.2381**	2.62			0.112	1.73
log_travelling_costs L3D.	-0.0126	-0.14			0.1079	1.6
log_tourism_infrastructure D1.			-8.1774	-1.55	-0.2773	-0.04
log_tourism_infrastructure LD.			-3.8629	-0.54	6.2005	1.04
log_tourism_infrastructure L2D.			-6.9091	-1.52	7.7279	1.28
log_tourism_infrastructure L3D.			-12.8728**	-3.17		
log_rand_exchange_rate D1.	-0.1547	-0.89	-0.1339	-0.62		
log_rand_exchange_rate LD.	-0.3128	-1.88	-0.7469***	-5.13		
log_rand_exchange_rate L2D.	-0.2613*	-1.91	-0.449**	-2.84		
log_rand_exchange_rate L3D.	0.049	0.38	-0.2449	-1.3		
ECM(-1)	-1.4481*	-2.25	-1.5691*	-2.23	-2.8971***	-5.44
F	281.57		246.91		97.04	
Prob > F	0.0000		0.0000		0.0000	
R-squared	0.9990		0.9981		0.9926	
Adj R-squared	0.9954		0.9940		0.9824	
Root MSE	0.0240		0.0274		0.0471	

Note: *** 1% significance level. ** 5% significance level. *10% significance level.

4.4.4. Model diagnostics

All three models were a good fit as illustrated by the R^2 of 0.9990, 0.9981 and 0.9926 for Model 1, 2 and 3 respectively, implying that about 99% of the variation in these models is explained within these models.

Tests for Heteroscedasticity, Normality, Serial Correlation and stability were also performed and are summarised below in Table 12:

Table 12: Breusch-Godfrey LM Test for Autocorrelation for the Tourism Models

Models	lags(p)	chi^2	df	Prob > chi2
Model 1	1	11.068	1	0.0009
Model 2	1	13.539	1	0.0002
Model 3	1	1.734	1	0.1878

H_0: No serial correlation

Model 3 showed a p-value of 0.1878, implying that there is insufficient evidence to reject H_0 and therefore there is no serial correlation in the residuals. However, for Model 1 and 2, their respective p-values of 0.0009 and 0.0002 respectively suggest that there is sufficient evidence to reject the null hypothesis, and therefore these models suffer from autocorrelation. According to Gujarati (2003), autocorrelation could sometimes be caused by the neglection of some of the lag terms for the variables of interest. In this study, AIC was used to select the optimal lags, which could have neglected other lags in prioritisation of the optimal number of lags. To remedy the autocorrelation, Gujarati (2003) suggests a transformation of the data via the generalised difference approach or a moving average mechanism or even a combination thereof. However, for this study, we will not undertake such a measure given that one of the models does not suffer from autocorrelation.

Table 13: White's Test for Homoskedasticity for the Tourism Models

Source	Model 1 (P-values)	Model 2 (P-values)	Model 3 (P-values)
Heteroskedasticity	0.4167	0.4167	0.4167
Skewness	0.6957	0.2968	0.3643
Kurtosis	0.0710	0.3945	0.2869
Total	0.5021	0.3405	0.3741

H_0: No heteroscedasticity i.e. there is homoskedasticity

For heteroscedasticity, all three models had significantly high p-values, meaning that there is insufficient evidence to reject the null hypotheses and therefore there is no heteroscedasticity in the models (that is, the residuals have equal variance). The results also showed skewness and kurtosis for the models and based on the p-values at 5% significance level, there is insufficient evidence to reject the null hypotheses that the residuals are normally distributed. Therefore, the residuals are normally distributed.

The cusum tests showed that all three model's coefficients were stable as the cusum plots fell within the bounds at a 5% significance level as illustrated in Figure 7 in Appendix 1. There were no signs of structural breaks, confirming that the models could be used to make reliable projections.

4.4.5. Granger Causality Test

Furthermore, the Granger Causality test was also conducted to assess the causal relationship of the variables of interest and the summary of the results is presented in Table 14 below. The results for the Granger Causality test show that the null hypothesis that tourism does not cause air connectivity is rejected at 1% significance level for all 3 models. Similarly, all 3 models had the null hypothesis that air connectivity does not cause tourism rejected at 1% significance level. These results show that there is bidirectional causality between tourism and air connectivity.

A similar bidirectional causality was observed between air connectivity and travelling costs in Model 1. In Model 2, a bidirectional causality was observed between tourism and travelling cost and between tourism infrastructure and the rand/dollar exchange rate. In Model 3, a bidirectional causality was observed between air connectivity and tourism infrastructure and between tourism and tourism infrastructure. These results are in alignment with the literature review and this study's expectations. For Model 1, a unidirectional causality was observed, from tourism to income, tourism to travelling costs, air connectivity to income and air connectivity to exchange rate. For Model 2, a unidirectional causality was observed, from tourism to tourism infrastructure, air connectivity to tourism infrastructure, travelling costs to air connectivity and rand/dollar exchange rate to travelling costs. And lastly, for Model 3, a unidirectional causality was observed, from travelling costs to air connectivity and tourism infrastructure to income.

Table 14: Granger Causality Test for the Tourism Models

Models	Model 1	Model 2	Model 3
H_0	P-value	P-value	P-value
Tourism does not cause air connectivity	0.0040***	0.0000***	0.0000***
Tourism does not cause income	0.0000***		0.5130

Models	Model 1	Model 2	Model 3
H_0	P-value	P-value	P-value
Tourism does not cause travelling costs	0.0780*	0.0600*	0.2270
Tourism does not cause the rand/dollar exchange rate	0.2210	0.8260	
Tourism does not cause tourism infrastructure		0.0000***	0.0880*
Air connectivity does not cause tourism	0.0000***	0.0000***	0.0000***
Air connectivity does not cause income	0.0000***		0.7420
Air connectivity does not cause travelling costs	0.0050***	0.3920	0.5180
Air connectivity does not cause rand/dollar exchange rate	0.0340**	0.7200	
Air connectivity does not cause tourism infrastructure		0.0000***	0.0520*
Income does not cause tourism	0.1330		0.1070
Income does not cause air connectivity	0.1900		0.3060
Income does not cause travelling costs	0.2850		0.8290
Income does not cause tourism rand exchange rate	0.0320**		
Income does not cause tourism infrastructure			0.4670
Travelling costs does not cause tourism	0.0490**	0.0900*	0.1110
Travelling costs does not cause air connectivity	0.0350**	0.0460**	0.0370**
Travelling costs does not cause income	0.1670		0.5710
Travelling costs does not cause the rand/dollar exchange rate	0.0360**	0.1170	
Travelling costs does not cause tourism infrastructure		0.6290	0.7120
Rand/dollar exchange rate does not cause tourism	0.4740	0.3280	
Rand/dollar exchange rate does not cause air connectivity	0.6560	0.5000	
Rand/dollar exchange rate does not cause income	0.3050		
Rand/dollar exchange rate does not cause travelling costs	0.2260	0.0001***	
Rand/dollar exchange rate does not cause tourism infrastructure		0.0970*	
Tourism infrastructure does not cause tourism		0.6020	0.0320**
Tourism infrastructure does not cause air connectivity		0.2590	0.0380**
Tourism infrastructure does not cause income			0.0020***
Tourism infrastructure does not cause travelling costs		0.7720	0.0130***
Tourism infrastructure does not cause the rand/dollar exchange rate		0.0030***	

Note: *10% significance level. **5% significance level. ***1% significance level.

4.5. FDI and Air Connectivity

The study also assessed the correlation between the variables used for the FDI Model. The following variables showed a strong correlation with more than 0.70 correlation coefficients, as illustrated in Table 15. This implies that there is a strong co-movement amongst these variables.

- Log_economic_infrastructure and log_economy_size = -0.9500
- Log_economy_size and log_rand_exchange_rate = 0.8969
- Log_economic_infrastructure and log_air_connectivity = -0.7633
- Log_economic_infrastructure and log_rand_exchange_rate = -0.7869

Table 15: Correlation Matrix for the FDI Model

Variables	log_fdi	log_air _connectivity	log_ economic_ infrastructure	log_ interest_ rate	log_rand_ exchange _rate	log_ economy_ size
log_fdi	1					
log_air_connectivity	-0.0672	1				
log_economic_infrastructure	0.0834	-0.7633	1			
log_interest_rate	-0.1351	0.5152	-0.5341	1		
log_rand_exchange_rate	-0.2339	0.4845	-0.7869	0.3377	1	
log_economy_size	-0.1586	0.6874	-0.9500	0.4457	0.8969	1

Log_economic_infrastructure and log_economy_size had the highest correlation of -0.95, very close to -1, indicating that the variables move very closely with each other in opposite directions. Likewise, the size of the economy and the rand/dollar exchange rate showed a strong positive correlation of 0.8969, meaning that these variables move with each other in the same direction. Although there is a strong correlation among the above-mentioned variables, these variables are important for the model. The literature review showed that these variables are important determinants of FDI. Therefore, similar to the tourism model above, a backward stepwise approach was applied to assess the importance of the strongly correlated variables in the model. A summary of the model from the backward stepwise approach is summarised in Table 16 below.

Table 16: FDI Models from the Backward Stepwise Approach

Model	Variables
1	FDI, air connectivity, interest rate, Rand/dollar exchange rate, economy size
2	FDI, interest rate, Rand/dollar exchange rate,

Given that Model 2 does not have the air connectivity variable, this model will not be assessed, and therefore that analysis and discussion will focus only on Model 1.

4.5.1. Cointegration Analysis

The cointegration analysis for the FDI Model is presented in Table 17 below. The F-statistic of 15.6 for Model 1 was greater than the critical values of the upper bounds at all the significance levels analysed, therefore, the null hypothesis rejected in favour of the alternative hypothesis, as there is sufficient evidence to conclude that long-run relationships exist between the FDI inflow and the variables of interest.

Table 17: Cointegration Results for the FDI Model

Critical Values	Cointegration Lower Bound – I(0)	Upper Bound – I(1)		Model 1
1%	3.74	5.06	**F-Statistics**	15.60***
2.5%	3.25	4.49	**Lag optimal**	3,4,4,2,4
5%	2.86	4.01		
10%	2.45	3.52		

Note: *** 1% significance level.

4.5.2. Long-run estimates

Given the evidence of the long-run relationship from the cointegration results in Table 17, the long-run results are estimated for this model and summarised in Table 18. From the results of the long-run estimates of the FDI Model, presented in Table 18 below, a negative and significant coefficient was observed for the rand/dollar exchange rate at 10% significance level. This contradicts the study's expectation and the literature review. Kodongo and Ojah (2013) found that there is a positive relationship between exchange rates and FDI, with 1% depreciation in the exchange rate leading to a 0.045% increase in FDI flows. However, in this study, a negative relationship between exchange rate and FDI inflows is observed, with a 1% increase in rand/dollar exchange rate (depreciation of the Rand) resulting in a 1.34% decrease in FDI inflows to the Western Cape.

As for the air connectivity coefficient, a positive but statistically insignificant coefficient is observed. This suggests that a further investigation is required to assess the relationship between air connectivity and FDI as the study was expecting a positive and significant relationship between FDI and the air connectivity due to improved market access and the relative ease of travelling for the businesses that have directly invested in the Western Cape. Furthermore, Banno and Redondi (2014), Bel and Fegeda (2008), Oxford Economic Forecasting (2006) and ATAG (2018) show that a positive relationship exists between air connectivity and FDI, with an increase in air connectivity leading to an increase in FDI. All the remaining coefficients considered were also statistically insignificant.

Table 18: Long-run Estimates of the FDI Model

	Model 1	
Variables	**Coef.**	**t-test**
log_air_connectivity	0.3531	0.45
	(0.6650)	
log_interest_rate	0.1006	0.08
	(0.9350)	
log_rand_exchange_rate	-1.3386*	-1.97
	(0.0800)	
log_economy_size	3.1201	0.46
	(0.6530)	

Note: *10% significance level.

4.5.3. Short-run estimates

The short-run analysis presented in Table 19 below, produced negative error correction term of -4.75 which was significant at the 1% significance level. The absolute value of the error term that is greater than 1, implies that the error correction is overshooting the long-run equilibrium with oscillating convergence as alluded by Narayan and Smitt (2006), but it also confirms the existence of the long-run and short-run relationship among the variables of interest. The overshooting of the error correction term can be explained by fluctuations/volatility in the variables of interests, implying an oscillating convergence rather than a monotonic convergence (Narayan and Smith, 2006). The error correction term for Model 1 is way above 1, implying an over-exaggerated speed of eliminating the discrepancies/divergence between the short-run and the long-run in FDI inflows in an oscillating manner.

The air connectivity coefficient is observed to be negative and significant at a 5% significance level for Model 1, implying that a negative relationship exists between air connectivity and FDI inflow. This contradicts the literature review and what the study was anticipating. This study anticipated observing a positive relationship between air connectivity and the FDI inflow, due to improved air connectivity allowing business people easy access to the countries where they have invested and better market accessibility from those countries to their markets for goods that are viable for air transportation. Banno and Redondi (2014) assert that improved air connectivity through the establishment of new routes could reduce transport costs and enable tacit knowledge flow, which should then lead to an increased probability of FDI flow between the connected countries. Similarly, Bel and Fegeda (2008), argue that having a direct flight connection is a key consideration for large European multinationals' location choice. In their study, they found that the number of headquarters grew by 4% in European metropolitan areas due to a 10% growth in intercontinental flights, ceteris paribus.

The negative relationship between air connectivity and FDI observed in this study could be explained by the other variables that also affect FDI, such as the quality of infrastructure and the expected returns on FDI in Africa. The data used in this study showed that the quality of infrastructure has been declining in South Africa, therefore, poor infrastructure including roads, energy and ICT tend to discourage FDI inflow. This is mainly because poor economic infrastructure negatively affects the ease of doing business and raises logistics costs and operational costs and makes it difficult to access markets. Similarly, UNCTAD showed that the expected return for FDI in Africa has been declining since 2012, from 12.3% to 6.6% in 2017. UCTAD also alludes to relatively low economic growth as another contributing factor to the low FDI inflow to Africa. To this end, although the air connectivity may be improving, these two factors alone discourage FDI in South Africa and Western Cape. In addition, Arauzo-Carod, Manjon-Antolin and Liviano-Solis (2010) argue that air connectivity impact on FDI depends largely on each sector of the economy and its dependence on air accessibility, and therefore air connectivity could sometimes have a negative relationship with FDI depending on which sectors of the economy are FDI ready.

On the other hand, the coefficient for the interest rate is observed to be positive and significant at 1% and 5% significance level. This contradicts this study's expectation and the literature review. Increase in interest rate is expected to lead to an increase in the cost of borrowing, which results in the cost of debt and the cost of servicing debt. Therefore, this should discourage FDI inflow. This negative relationship between interest rates and FDI inflow is confirmed by OECD, which argues that long-term interest rates are one of the key considerations for business investment as relatively high rates will increase the cost of borrowing and discourage investment.

The coefficient for the size of the source country's economy (economy size) is observed to be negatively and statistically significant at the 10% significance level. This is also in contradiction with the literature review, which showed that GDP (economy size) is positively related to FDI inflow. Koojarroenprasit (2013), Hara and Razafimahefa (2005), Bevan et al., (2004) and Ranjan and Agrawal (2011) in their studies found that a positive relationship exists between GDP and FDI inflows.

This negative relationship between the size of the source country's economy and the FDI inflow could be explained by several factors including the decline in the rate of returns in FDI in Africa. Between 2012 and 2017, the rate of return for FDI fell from 12.3% to 6.7% in Africa (UNCTAD, 2018). Therefore, although the source country of FDI's economy may be increasing, the declining returns for FDI may discourage FDI inflow. In addition, based on the data used for the study, infrastructure quality has been decreasing for South Africa and given that poor economic infrastructure increases logistic costs and production costs, then FDI inflow could be decreasing even though the size of the economy of the source countries of FDI may be increasing. The rand/dollar exchange rate coefficient was observed to be statistically insignificant.

Table 19: Short-run Estimates of the FDI Model

	Model 1	
Variables	**Coef.**	**t-test**
log_fdi LD	2.5481*** (0.0060)	3.59
log_fdi L2D	1.0412** (0.0200)	2.83
log_air_connectivity D1.	-2.0921 (0.2750)	-1.16
log_air_connectivity LD.	-4.4097* (0.0980)	-1.84
log_air_connectivity L2D.	-3.5075** (0.0420)	-2.37
log_air_connectivity L3D.	-2.7843* (0.0510)	-2.25
log_interest_rate D1	8.4930** (0.0290)	2.59
log_interest_rate LD	14.8106*** (0.0010)	4.52
log_interest_rate L2D	4.8829 (0.1150)	1.75
log_interest_rate L3D	-3.3178 0.3780	-0.93
log_exchange_rate D1.	-2.4278 0.3610	-0.96
log_exchange_rate LD.	-4.9703 0.0220**	-2.77
log_economy_size D1.	-126.8521 0.0640*	-2.11
log_economy_size LD.	-148.0542 0.2130	-1.34
log_economy_size L2D.	43.2086 0.4840	0.73
log_economy_size L3D.	110.9186 0.0650*	2.10
Constant	-84.6311	-0.46

Variables	Model 1 Coef.	t-test
ECM(-1)	0.6580 -4.7449 0.0000***	-5.58
F	9.51	
Prob > F	0.0008	
R – squared	0.9569	
Adj R-squared	0.8563	
Root MSE	0.4023	

Note: *** 1% significance level. ** 5% significance level. *10% significance level.

4.5.4. Model diagnostics

The FDI Model is a good fit as illustrated by the R^2 of 0.9569, implying that about 95% of the variation is explained within the model.

Tests for Heteroscedasticity, Normality, Serial Correlation and stability were also performed and the results are summarised below:

Table 20: Breusch-Godfrey LM Test for Autocorrelation for the FDI Model

Models	lags(p)	chi^2	df	Prob > chi2
Model 1	1	1.442	1	0.2299

H_0: No serial correlation

Model 1 showed a p-value of 0.2299, implying that there is insufficient evidence to reject H_0 and therefore there is no serial correlation in the residuals.

Table 21: White Test for Homeskedasticity for the FDI Model

Source	Model 1 (P-values)
Heteroskedasticity	0.4154
Skewness	0.2982
Kurtosis	0.5523
Total	0.3531

H_0: No heteroscedasticity i.e. there is homoskedasticity

For heteroscedasticity, the model had significantly high p-values, meaning that there is insufficient evidence to reject null and therefore there is no heteroscedasticity in the models; that is, the residuals have equal variance. The results also showed skewness and kurtosis for both models with significantly high p-values, therefore, there is insufficient evidence to reject the null hypothesis that the residuals are normally distributed. Therefore, the residuals are normally distributed.

In addition, to test for structural breaks and the stability of the coefficients, a cusum test was conducted. The cusum tests showed that the model's coefficients were stable as the cusum plot fell within the bounds at the 5% significance level as illustrated in Figure 8 above in Appendix 1. There were no signs of structural breaks, confirming that the model could be used to make reliable projections.

4.5.5. Granger Causality Test

The Granger Causality test was also conducted to assess the causal relationship of the variables of interest, and the summary of the results is presented in Table 22 below. The results for the Granger Causality test showed that the null hypothesis of air connectivity does not cause interest rate, rand/dollar exchange rate and size of the source country's economy respectively is rejected at 1% significance level. No variable granger causes air connectivity, indicating a unidirectional relationship from air connectivity to interest rate, rand/dollar exchange rate and the size of the source country's economy respectively. In addition, the hypothesis that air connectivity does not granger cause FDI and vice-versa cannot be rejected, and therefore there is no causal relationship between air connectivity and FDI. This contradicts this study's expectation and suggests a need for further investigation.

A bidirectional causality between interest rate and rand/dollar exchange rate was observed. In addition, for Model 1, a unidirectional causality was observed, from interest rate to FDI, rand/dollar exchange rate to FDI and rand/dollar exchange rate to the size of the source country's economy.

Table 22: Granger Causality Test for the FDI Model

	Model 1
H_0	**P-value**
FDI inflow does not air connectivity	0.5180
FDI inflow does not cause the interest rate	0.5580
FDI inflow does not cause the rand/dollar exchange rate	0.2990
FDI inflow does not cause the size of the economy	0.6450
Air connectivity does not cause FDI inflow	0.4880
Air connectivity does not cause the interest rate	0.0000***

H_0	Model 1 P-value
Air connectivity does not cause the rand/dollar exchange rate	0.0000***
Air connectivity does not cause the size of the economy	0.0000***
Interest rate does not cause FDI inflow	0.0010***
Interest rate does not cause air connectivity	0.7180
Interest rate does not cause the rand/dollar exchange rate	0.0130**
Interest rate does not cause the size of the economy	0.5010
Exchange rate does not cause FDI	0.0090***
Exchange rate does not cause air connectivity	0.3160
Exchange rate does not cause the interest rate	0.0050***
Exchange rate does not cause size of the economy	0.0030***
Size of the economy does not cause FDI	0.3340
Size of the economy does not cause air connectivity	0.6970
Size of the economy does not cause the interest rate	0.4020
Size of the economy does not cause the size of the economy	0.9820

Note: *** 1% significance level. ** 5% significance level. *10% significance level.

4.6. Trade and Air Connectivity

Similar to the tourism and FDI models, this study started with an analysis of the correlation between the variables of interest and the results are summarised in Table 23. The following variables showed a strong correlation with more than 0.70 correlation coefficients. This implies that there is a strong co-movement amongst these variables.

- Log_rand_exchange_rate and log_economic_infrastructure = -0.7968
- Log_economic_infrastructure and log_air_connectivity = -0.7533

Table 23: Correlation Matrix for the Trade Model

Variables	log_trade	log_air _connectivity	log_ economic_ infrastructure	log_rand_ exchange _rate	log_ economic_ growth
log_trade	1				
log_air_connectivity	0.2982	1			
log_economic_infrastructure	-0.5606	-0.7533	1		
log_rand_exchange_rate	0.8152	0.5057	-0.7968	1	
log_economic_growth	-0.4162	-0.0955	0.1469	-0.4430	1

Log_economic_infrastructure and log_rand_exchange_rate had the highest correlation of -0.80, followed by log_economic_infrastructure and log_air_connectivity with a correlation of -0.75, meaning that these variables move closely with each other in the opposite direction. Usually, as mentioned in the tourism and the FDI Model, a high correlation could lead to the multicollinearity problem. However, the literature review showed all variables to be important determinants of trade. Nonetheless, although the study intended to use all the variables suggested in the literature review, the high correlation between variables had to be addressed. To this end, a back stepwise approach was applied to assess the importance of the strongly correlated variables in the model. The final and viable model from this process is shown in Table 24 below.

Table 24: Trade Model from the Backward Stepwise Approach

Model	Variables
1	Trade, air connectivity, and rand/dollar exchange rate

4.6.1. Cointegration analysis

The F-statistics of 4.38 is higher than upper and lower bounds at the 10% significance level, and therefore, there is sufficient evidence to reject the null hypothesis that no cointegration relationship exists among the variable of interest. Therefore, there is a long-run relationship between trade, air connectivity and the rand/dollar exchange rate at the 10 % significance level.

Table 25: Cointegration Results for the Trade Model

	Cointegration			
Critical Values	**Lower Bound – I(0)**	**Upper Bound – I(1)**		**Model 1**
1%	5.15	6.36	**F-Statistics**	4.38*
2.5%	4.41	5.52	**Lag optimal**	1,4,0
5%	3.79	4.85		
10%	3.17	4.14		

Note: * 10% significance level.

4.6.2. Long-run estimates

The cointegration analysis for this model shows that the long-run relationship exists at the 10% significance level. Given this evidence of the long-run relationship, the long-run results are estimated, and the results are presented in Table 26 below. From the results of the long-run estimates, no coefficient was observed to be significant including the air connectivity coefficient that was observed to be positive but insignificant.

Table 26: Long-run estimates for the Trade Model

	Model 1	
Variables	**Coef.**	**t-test**
log_air_connectivity	0.3229 (0.2830)	1.10
log_rand_exchange_rate	0.2192 (0.4960)	0.69

4.6.3. Short-run estimates

The short-run analysis produced negative error correction terms of -0.221, which was significant at 5% significant level. The error correction term shows the speed at which any divergence from the long-run model in the short-run will be corrected. Therefore, this model corrects divergency between short-run and long-run of trade flows at a speed of 22%.

The coefficient of air connectivity was observed to be negative and significant at 1% and 5% significance level, suggesting a negative relationship between air connectivity and trade flows. This is contrary to the study's expectation and to the findings of Oxford Economic Forecasting (2006), Burghouwt (2017), ICAO (2017) and Smyth, Christodoulou, Dennis & Campbell (2012) that argue that air connectivity facilitates and enables international trade and gives companies global reach for their products. This contradiction could be potentially explained by the decrease in the quality of economic infrastructure that has been observed in the data that was used in this study. Jansen & Nordas (2004), and Limao & Venables (2001) in their respective studies found that improvements in source country infrastructure lead to an improved trade performance, therefore, the opposite is also true.

The other explanation for this may be the nature of the products traded between the Western Cape and the rest of the world. Air transportation is viable for time-sensitive goods and goods that are high value and low volume, therefore, if the products that are traded between the Western Cape and the rest of the world do not meet any of these criteria, these products will not necessarily be transported via air transport. A further investigation is required to assess this negative relationship between air connectivity and trade flows.

Table 27: Short-run Estimates for the Trade Model

	Model 1	
Variables	**Coef.**	**t-test**
log_air_connectivity D1.	-0.0770 (0.4830)	-0.71
log_air_connectivity LD.	-0.3693***	-3.08

Variables	Model 1 Coef.	t-test
	(0.0050)	
log_air_connectivity L2D.	-0.0485	-0.44
	(0.6650)	
log_air_connectivity L3D.	-0.2819**	-2.54
	(0.0180)	
log_exchange_rate D1.	0.0485	0.55
	0.5850	
Constant	1.6199	1.42
	0.1690	
ECM(-1)	-0.2211	-2.28
	0.0320**	
F	3.76	
Prob > F	0.0068	
R - squared	0.5233	
Adj R-squared	0.3843	
Root MSE	0.0500	

***1% significance level. **5% significance level. *10% significance level.

4.6.4. Model diagnostics

The model was a good fit as illustrated by the R^2 of 0.5233, implying that about 52% of the variation is explained within the models.

Tests for Heteroscedasticity, Normality, Serial Correlation and stability were also performed, and the results are summarised below:

Table 28: Breusch-Godfrey LM Test for Autocorrelation for the Trade Model

lags(p)	chi^2	Df	Prob > chi2
1	3.083	1	0.0791

H_0: No serial correlation

The model showed a p-value of 0.0791, implying that there is insufficient evidence to reject H_0 at the 5% significance level, and therefore, there is no serial correlation in the residuals.

Table 29: White's Test for Homoskedasticity for the Trade Model

Source	P-values
Heteroskedasticity	0.4167
Skewness	0.1424
Kurtosis	0.1190
Total	0.2244

H_0: No heteroscedasticity i.e. there is homoskedasticity

For heteroscedasticity, the model had significantly high p-values, meaning that there is insufficient evidence to reject the null hypothesis and therefore there is no heteroscedasticity in the models, that is, the residuals have equal variance. The results also showed skewness and kurtosis for the models and based on the significantly high p-values, there is insufficient evidence to reject the null hypothesis that the residuals are normally distributed. Therefore, the residuals are normally distributed.

In addition, to test for structural breaks and the stability of the coefficients, a cusum test was conducted. The cusum tests showed that the model's coefficients were stable as the cusum plot fell within the bounds at the 5% significance level as illustrated in Figure 9 in Appendix 1. There were no signs of structural breaks, confirming that the model could be used to make reliable projections.

4.6.5. Granger Causality Test

The Granger Causality test was also conducted to assess the causal relationship of the variables of interest, the summary of the results is presented in Table 30 below. The results for the Granger Causality test showed that the null hypothesis of trade does not cause air connectivity and the rand/dollar exchange rate respectively is rejected at the 1% significance level. A bidirectional causality between trade and air connectivity and trade and the exchange rate was observed. These results are in alignment with the literature review and this study's expectations In addition, a unidirectional causality was observed from air connectivity to the rand/dollar exchange rate at the 10% significance level.

Table 30: Granger Causality Test for the Trade Model

H_0	P-value
Trade does not cause air connectivity	0.0000***
Trade does not cause the rand/dollar exchange rate	0.0020***
Air connectivity does not cause trade	0.0760*
Air connectivity does not cause the rand/dollar exchange rate	0.0070***
Rand/dollar exchange rate does not cause trade	0.0110**
Rand/dollar exchange rate does not cause air connectivity	0.2400

*** 1% significance level. ** 5% significance level. *10% significance level.

CHAPTER 5:
CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter concludes the study of the impact of air connectivity on tourism, trade and FDI respectively by providing a summary and conclusion of the research findings. Based on the conclusion, policy recommendations are made on how to improve air connectivity on the African continent. Lastly, recommendations on areas of future research are provided.

5.2. Summary and Conclusions

This study investigated the impact of air connectivity on economic growth, specifically looking at the relationship between air connectivity and tourism, FDI and trade respectively in the Western Cape based on quarterly data from 2010 to 2018. The ARDL bounds approach for cointegration was used to assess whether long-run relationships existed between air connectivity and tourism, FDI and trade respectively. The ARDL bounds test found a cointegrated relationship between air connectivity and tourism, FDI and trade respectively.

Air connectivity was found to have a positive and significant long-run relationship with tourism, with 1% increase in air connectivity observed to lead to 0.73%, 0.68% and 0.54% increases in international tourist arrivals (tourism) in the Western Cape for Model 1, 2, and 3 respectively in line with the findings of the PWC (2013), ICAO (2017) and ATAG (2018). This also supports the findings of Cetin et al., (2016) that air connectivity improves countries' accessibility and increases tourist arrivals from various markets. This confirms that air connectivity leads to an increase in the number of international tourists visiting the Western Cape, which contributes significantly to the tourism industry and the Western Cape economy.

In addition, air connectivity was observed to have a positive but statistically insignificant long-run relationship with FDI and trade respectively. Therefore, this study concludes that air connectivity plays a key role in the economy, specifically on tourism through the facilitation of more tourists into the Western Cape. Furthermore, although the study showed positive and insignificant relationships between air connectivity and FDI and trade respectively, air connectivity is related to FDI and trade, and these relationships require further investigation.

5.3. Policy Recommendations

The observed literature in this study clearly shows that air connectivity plays a critical role in the economy by facilitating international arrivals (tourists) into a country and by facilitating global trade through the movement of goods and services via air transport. In addition, multinational cooperation takes air connectivity into account as part of the decision to invest in a particular county. To this end, it is recommended that policymakers and decisionmakers on the African continent need to have initiatives that support the improvement of air connectivity, especially given that Africa has only a 2.2% market share of the global air passengers and less than 10% of the continent's population uses air transport.

The findings from the Western Cape clearly show a positive and significant long-run relationship between air connectivity and tourism, implying that improved air connectivity leads to an increase in international tourists arrivals. Moreover, the findings also revealed a positive but insignificant long-run relationship between air connectivity and FDI and trade respectively. For the Western Cape, the improvements in air connectivity were mainly attributable to the Air Access initiative.

Therefore, other African countries and regions should use a similar approach to what the Western Cape has done to improve the air connectivity between Cape Town and the rest of the world. The following approach is recommended:

1. Establishment of relationships and partnerships with relevant stakeholders including government officials (especially the Department of Economic Development and the Department of Transport), airport management companies, tourism agencies, trade and investment facilitation agencies, and the private sector.
2. Establish a project committee with relevant skills and knowledge to undertake the day to day work of the initiatives and project steering committee to provide project oversight, strategic direction and unblock challenges. Terms of references for these committees are critical and will have to be signed by all the committed project stakeholders.
3. Undertake research and develop business cases for the potential routes to be established or routes to improve the frequency of flights on. Reliable data is critical for the success of the project. A strategic framework (approved by the project steering committee) for route selection will have to be developed to inform the route selection and the package of support required for each route.

4. Ongoing engagements with airlines in pursuit of the establishment of new routes and/or expanding frequencies on existing routes. Similarly, ongoing engagement with the private sector is also important in order to get a better understanding of businesses' market and investment opportunities.

In addition, investment in airports and airport-related infrastructure is critical and necessary, as poor airport infrastructure has been cited to be one of the obstacles in improving air connectivity in the continent.

Furthermore, the development of an air connectivity index for the continent is required. For this study, an air connectivity indicator was estimated and quantified by the author as no indicator/index could be found for the Western Cape. The other African countries may face a similar challenge. Therefore, this index will have to take into account the availability of data and the African context. Where data does not exist, a robust plan for the collection of data will also have to be developed.

Lastly, the regulation of the aviation market needs urgent attention, starting with an Open Skies policy. Deregulation of air access could play a significant role in improving the African Continent's air connectivity. However, the buy-in and commitment from all the African countries are required, starting with the signing of the Yammosokru Decision, and this process could be linked to the Africa Continental Free Trade Agreement.

5.4. Recommendations for future research

A region by region analysis is required to get a better understanding of the true effect of air connectivity post establishment of new routes or increasing frequencies on existing routes. Each of the models assessed in this study could benefit from a region by region analysis rather than aggregates of countries in order to truly understand how the creation of a particular new route or expansion of existing specific routes contributed to the Western Cape economy. For example, looking at tourist arrivals from a particular region rather the total international arrivals, in general, could provide more insight into the impact of air connectivity between the Western Cape and a particular region. Similarly, with the variables for the income and the size of the source country's economy, an average of the top 5 source countries was used rather than region by region variables. This region by region analysis could also be done for other regions in the African Continent and not only the Western Cape.

In addition, a further investigation is required for the FDI and Trade Models as they both showed a positive but insignificant relationship with air connectivity, although the study expected a positive and significant relationship. Using region by region data could paint a different picture and contribute to the literature.

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7. Appendix 1: Cusum Plots

Figure 7: Cusum Plots for The Tourism Model 1, 2 and 3

Model 1 Model 2 Model 3

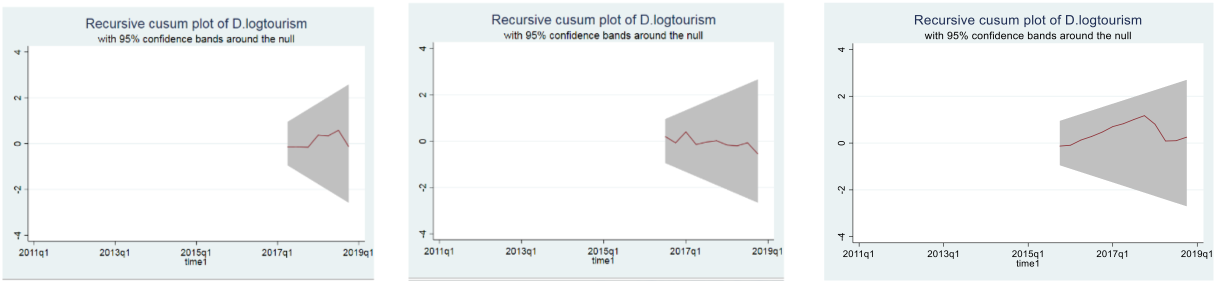

Figure 8: Cusum Plot for the FDI Model

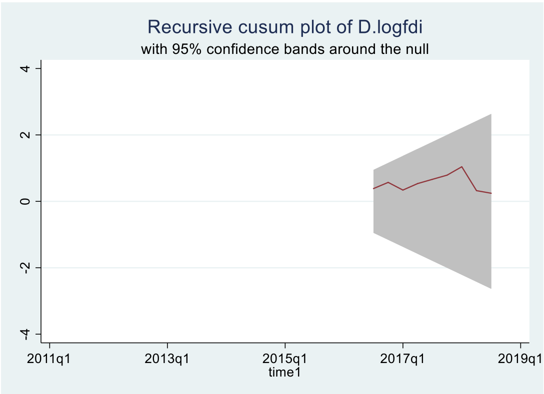

Figure 9: Cusum Plot for the Trade Model