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Intra-Regional Trade in Africa in the Era of Regional Integration

by

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Abstract

A global surge in the number of regional trade agreements has taken place since the 1990s. Their impact on the trade patterns and development of participating countries has been a frequent topic of debate. In this study I analyse the impact of joining a regional trade on the trade patterns of African countries. I find that on average regional trade agreements increase the intra-regional exports between member states. Furthermore, the impact is the most meaningful for agreements with a smaller number of countries and in trade blocs with deeper policy integration. The results found in this study are more conservative than what previous literature has found, as an updated methodology is used. This thesis offers a starting point for further research as well as some tentative policy direction regarding regional integration.

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1 Introduction

Since the beginning of the 1990s regional integration has been increasing all over the world (Otsubo, 1998; Cernat, 2001; Ekanayake & Mukherjee, 2010). The number of regional trade agreements (RTA) has risen sharply, with the WTO (2021) reporting 349 RTAs to be in force worldwide. This trend is prevalent in Africa as well, where multiple RTAs, with ambitious goals of integration, have been established (Musila, 2005; Hartzenberg, 2011). What regional integration entails for global trade and development, however, is not completely clear. The debate is mainly focused around two camps. One side of the debate argues that regional integration is obstructing the rise of more overarching trade liberalization and is, thus, hindering the development of the economies involved, especially in the developing world (Yang & Gupta, 2005; Afesorgbor & Van Bergeijk, 2011). On the other side, regional integration is considered a path for development and further trade liberalization, through gradual opening up to trade (Balassa & Stoutjesdijk, 1975). In this case integrating with neighbouring countries can increase the size of the markets of developing countries and make them less prone to negative externalities of global markets (Chingono & Nakana, 2009).

Despite the theoretical disputes regarding the impact of RTAs on the development of African countries, trade between members of different RTAs has grown on the continent (Musila, 2005). Multiple RTAs have announced ambitious integration plans going beyond simple tariff reduction (Hartzenberg, 2011; EAC, 2013). Deeper integration often includes customs unions, policy coordination in trade and important industries and formation of monetary unions. For example, in the case of the East African Community (EAC) plans go as far as establishing a political federation (EAC, 2013).

Studies analysing the impacts of regional integration on trade flows have generally found RTAs to be beneficial to trade (Cernat, 2001; Glick & Rose, 2002; Musila, 2005; Ekanayake & Mukherjee, 2010; Afesorgbor, 2017). The studies often focus on the static effects of regional integration, as introduced by Viner (1950). The static effects investigate how the trade patterns of a country change after joining an RTA. While research has been made on the trade effects of regional integration, with some also considering African RTAs, new econometric literature has questioned the consistency of their methods (Santos-Silva & Tenreyro, 2006; Yotov, Piermartini, Monteiro & Larch, 2016; Larch, Wanner, Yotov & Zylkin, 2019). For this reason, this study aims to find new evidence on the trade effects of African RTAs by using the theoretically consistent methods that have been recommended. Furthermore, considering multiple African RTAs with different characteristics allows me to find differences in impacts between them and compare the characteristics of successful and unsuccessful RTAs.

1.1 Research Problem

The importance of this topic becomes clear when considering the vast number of RTAs reported by the WTO (2021) and the lack of consensus in the theoretical literature on the benefits and costs of forming RTAs. While the empirical literature has mostly found RTAs beneficial for trade in developing countries, the methodologies they follow have been called into question (Musila, 2005; Santos-Silva & Tenreyro, 2006; Ekanayake & Mukherjee, 2010). Prior studies on RTAs typically employ an Ordinary Least Squares (OLS) regression, which Santos-Silva and Tenreyro (2006) critique as econometrically inconsistent. They recommend the use of a Poisson Pseudo Maximum Likelihood (PPML) method. The lack of consensus in the theoretical debate on the benefits and costs of regional integration and the choice of methodology of the prior empirical literature on the subject create a clear research gap which this study attempts to fill.

The framework of this study is based on the strand of literature, which argues that regional integration is beneficial for developing countries. This is strengthened by the empirical findings, which on average find regional integration to have a positive impact on intra-regional trade patterns (Afesorbor, 2017). Thus, based on the literature this paper follows, the expected impact of regional integration on intra-regional export patterns is positive, but smaller in magnitude than what prior studies have found with different methodologies. Furthermore, when investigating the different African RTAs separately, the expectation is that blocs with less member states, that are also at a similar level of development, will prove to increase intra-RTA exports the most, as argued by Helleiner (1996) and Ethier (1998).

1.2 Aim and Scope

The aim of the study is to quantitatively analyze the impact of regional integration on intra-regional trade patterns in Africa. To tackle this aim, the following research question is chosen and attempted to answer: *How does regional integration impact intra-regional trade flows in Africa?* To answer the research question, static effects of regional integration, as introduced by Viner (1950), will be considered. This means analyzing how joining an RTA impacts the trade patterns countries have with the other member states. Furthermore, the analysis will have two steps. First, the overall effect of RTAs in Africa on intra-regional trade is analyzed. Second, the RTAs considered will be analyzed individually. This second step allows further examination of differing effects of RTAs with certain characteristics and circumstances.

The relationship between regional integration and intra-regional trade will be investigated with the gravity model of international trade, first utilized by Tinbergen (1962). Unlike in previous studies, for example Cernat (2001) and Musila (2005), in this paper a Poisson Pseudo Maximum Likelihood (PPML) estimator will be utilized instead of an ordinary least squares (OLS) estimator, as suggested by Santos-Silva and Tenreyro (2006). This method will also allow causal inference to be drawn from the results (Larch et al., 2019).

A panel dataset covering 47 African countries' bilateral export statistics between the years 1988 and 2019 is used to carry out the analysis. The time frame is chosen according to the availability of the data. The latest trade statistics available through the IMF Direction of Trade Statistics are for the year 2019, which excludes the turbulent, and in many cases catastrophic, times of the Covid-19 pandemic. The data is calculated at an aggregated level, as is the norm in the existing literature (Cernat, 2001; Yotov et al., 2016). Aggregated data allow for easier analysis when multiple countries are considered, as well as minimizing the problems of data unreliability (Yotov et al., 2016).

The theoretical literature specifies two distinct paths in which regional integration can impact countries. These two paths are called the static effects, introduced by Viner (1950) and the dynamic effects, introduced by Balassa (1961). The static effects concentrate on the changes in a country's trade patterns with the regional partners and the outside world after joining an RTA, while the dynamic effects consider more long-term, economic restructuring effects, Marinov (2014) explains. This study focuses on the static effects of regional integration in Africa. Quantifying the dynamic effects of regional integration is considered difficult, Marinov (2014) explains, and the model considered in this study is not suitable for the task. Thus, this study focuses on the static effects of regional integration, with the dynamic effects remaining outside of the scope of this study. Furthermore, it is important to first understand how the trade patterns of a country change with its partner states before turning to more in-depth analysis of specific areas of the economy and restructuring effects. Thus, while the static effects may not tell the whole story of how regional integration impacts developing countries, it is an integral part of the wider subject and a good place to start the investigation.

With this study I aim to add to the empirical literature on the effects of regional integration. By using the econometrically consistent methods recommended by Santos-Silva and Tenreyro (2006) and Yotov et al. (2016), this study will update some empirical findings on the topic, which have been shown to be unreliable by the recent econometric research. Besides updating results on the trade effects of regional integration in Africa, this thesis also aims to provide some further understanding on which characteristics in RTAs are beneficial for higher intra-RTA export growth. Analyzing RTAs with different characteristics and circumstances will allow inference on the reasons for differing impacts on trade to be done. With this step, some tentative implications for policy on regional integration can be suggested.

1.3 Outline of the Thesis

The outline of this thesis will proceed in the following manner: Chapter 2 will discuss the relevant existing literature. More precisely, first an overview of regional integration in Africa will be presented, second the theoretical literature and debates will be discussed, and third the most relevant empirical findings are presented and discussed. Chapter 3 focuses on the methodological side of the thesis. First, an overview of the gravity model of international trade is given and discussed, and second, the approach and models of this study are presented. Chapter 4 presents the data, and their sources, used for this study. Chapter 5 includes the

empirical analysis of this study. The results of the study are presented and discussed. Finally, chapter 6 presents concluding remarks for the thesis.

2 Theory

2.1 Regional Integration in Africa

Regional cooperation and integration in Africa have been topics of interest since the early age of independence (Nyirabu, 2004). Influential leaders like Kwame Nkrumah of Ghana and Ahmed Sékou Touré of Guinea were strong advocates of Pan-Africanism and argued that in order to fully benefit from the vast natural riches of the continent, and to avoid exploitation in the global markets, a union encompassing all of Africa was needed. This, however, was not to be, as Nyirabu (2004) explains. He adds that a more incremental approach, advocated by Julius Nyerere of Tanzania, won in the end, which led to the creation of regional blocs on the continent.

Today there are multiple RTAs operating in Africa and overlapping membership of more than one agreement is common for a country (Afesorghor & Van Bergeijk, 2011). The RTAs considered in this paper are those that are categorized as customs unions by the WTO: The Common Market for Eastern and Southern Africa (COMESA), The Economic Community of West African States (ECOWAS), The East African Community (EAC), The Southern African Customs Union (SACU), The Economic and Monetary Community of Central Africa (CEMAC) and The West African Economic and Monetary Union (WAEMU). Table 1. presents the different RTAs considered in this study with their respective member states.

COMESA was established in 1993 and is the largest RTA in Africa with 21 member states, however, only 15 are included in the sample (WTO, 2021). The number of countries and large area creates a vast economic area. However, this has created some difficulties as well, as policy integration has remained low, Geda and Kebret (2008) explain. The functioning of the customs union has been inefficient and many of its goals have not been achieved, they argue.

The second largest African RTA is ECOWAS with 15 members (WTO, 2021). First established in 1975 to promote economic and political cooperation the customs union treaty came to force in 1995 (Oloruntoba, 2016). Some of the development goals, like industrialization remain unachieved, as the share of manufacturing in exports has in fact declined since the early 1990s. Other areas where ECOWAS has struggled, Oloruntoba (2016) argues, are policy integration and infrastructure. Free movement, on the other hand, has been widely achieved, which has a positive effect especially on the lives of the people living in the rural border areas (Musabanganji et al., 2016; Oloruntoba, 2016).

Table 1. RTAs and the member states.

COMESA	Angola Burundi Comoros Congo, Dem. Rep. Egypt	Ethiopia Kenya Malawi Mauritius Rwanda	Sudan Tanzania Uganda Zambia Zimbabwe
ECOWAS	Benin Burkina Faso Cabo Verde Cote d'Ivoire Ghana	Guinea Guinea-Bissau Liberia Mali Niger	Nigeria Senegal Sierra Leone The Gambia Togo
EAC	Burundi Kenya Tanzania Rwanda Uganda		
SACU	Botswana Namibia South Africa		
CEMAC	Cameroon Chad Congo, Rep. Gabon Equatorial Guinea	Central African Republic	
WAEMU	Benin Burkina Faso Cote d'Ivoire Guinea-Bissau Mali	Niger Senegal Togo	

Source: WTO Regional Trade Agreements Database (2021)

EAC has a long history that traces back to the colonial age, when the unification of Kenya, Tanzania and Uganda was attempted (Busse & Shams, 2003). The new EAC, however was established in 1999. A customs union was established in 2005 and in 2009 EAC expanded, as Rwanda and Burundi joined as member states (EAC, 2013). The bloc has goals of becoming a political federation in the future, although, no timeline has yet been given on the process.

SACU dates back all the way to 1910 when a customs union agreement was established between the Union of South Africa and the British administered areas of Swaziland, Botswana and Lesotho (Draper et al., 2007). The modern agreement, however, was established in 2002 with five member states. The agreement includes notions of establishing common industrial policies and a regional agricultural sector. De Melo and Tsikata (2015), argue that SACU is the most deeply integrated RTA in Africa and a large part of this is due to the long history of its existence.

Established in 1994, CEMAC consists of six Central African states (Bongyu, 2009). The bloc has widely integrated economic policies, as they share a common currency, the Central African CFA Franc, in addition to the customs union. The Bank of Central African States has the exclusive right to issue new currency, Bongyu (2009) explains. Furthermore, he adds, harmonizing policies on education, environmental protection and tourism are attempted to achieve. However, the member countries are highly dependent on natural resource revenues, Coorey and Akitoby (2012, p.3) explain. This, they explain, makes the bloc vulnerable to international commodity price changes.

WAEMU was established in 1994 by seven countries, with Guinea-Bissau joining in 1997, Ogbuabor, Anthony-Orji, Ogbonna and Orji (2019) explain. Much like CEMAC, the bloc shares a common currency, the West African CFA Franc, which is pegged to the Euro, they add. The treaty establishing WAEMU identified economic integration, free movement of people, goods and services, strengthening the financial capabilities and harmonizing the legal environment as main goals of the bloc (Ndiaye and Xu, 2016). Despite of ambitious integration goals, Ogbuabor et al., (2019) find that the role of WAEMU in generating economic growth in the member states has been largely insignificant.

While categorized as a customs union by the WTO, the Arab Maghreb Union (AMU) is not included in the sample as an RTA. The union, composed of North African states, was created in 1989, but the attempts to integrate the economies has largely been non-existent, according to Chabbouh El Asmi (2018). Disagreements between its member states over the issue of West-Sahara has strained the working of the union since creation, they explain. For these reasons, the union is often considered dormant and will be considered so in this study as well.

2.2 Literature Review

The literature on regional integration is filled with differing names and abbreviations for the phenomenon. The most commonly used are Regionalism and regional integration, with Regional Trade Agreement (RTA) and Regional Integration Agreement (RIA) representing common denotations for the actual agreements. RTAs can roughly be divided into two different types of agreements: Free Trade Areas and Customs Unions according to Panagariya (2000). A Free Trade Area is an agreement between two or more countries that abolishes tariffs between them, he explains. A Customs Union goes further by abolishing the internal tariffs within the member states and also establishing common external tariffs for countries outside the trade agreement, he adds.

Regionalism can, according to Hallett and Braga (1994) be divided into market driven and policy driven integration. Market driven regionalism tends to arise naturally due to market sizes and populations. Policy driven regionalism, on the other hand, usually arises due to political decisions. They tend to lead to the formation of RTAs. A major rationale for policy driven regionalism is the idea that there is strength in numbers Chingono and Nakana (2009). Economic regional cooperation can be a powerful tool in creating unity and increasing the pace of development, because of stabilizing effects on politics and conflicts, they add. Indeed, the most successful regional organization in the world, the European Union, was originally established, among other reasons, to create peace and unity between the European countries (Slocum-Bradley & Felício, 2006). An RTA approach to trade liberalization can, thus, increase trade flows through increased macroeconomic stability and increased market size, according to Chingono and Nakana (2009). Regionalism has a specifically important impact on developing countries that are too weak to survive alone in the global markets, they argue.

Otsubo (1998) argues that the first wave of RTAs in the 1960s and 1970s of the developing world were largely trade diverting because of their import substitution tendencies. Beginning in the 1990s, however, a new wave of regionalism has arisen with a more positive attitude towards trade openness. The political aspect of regionalism has become important for many RTAs since the new wave of regionalism started in the 1990s, according to Otsubo (1998). The aim of most RTAs is not just to reduce tariffs in the trade of goods, but to achieve deeper trade policy integration as well as political and institutional integration, he adds. Deeper political integration, however, has a cost of decreasing internal sovereignty. Thus, the most successful RTAs tend to be the ones most dedicated towards the goal of integration. For example, the East African Community has been considered a relatively successful RTA both in economic and political aspects (Mayer & Thoenig, 2016). This is argued to have much to do with its efforts in binding the political and economic institutions of the member countries together and achieve deep integration (EAC, 2013; Mayer & Thoenig, 2016).

How regional integration impacts trade between partner states is affected by the organization of the particular integration arrangement (Shams, 2003). As all RTAs have some levels of policy coordination as well, what this coordination includes is important for the success of the agreement. Increased trade and welfare do not only depend on tariff reduction, but also on the monetary policies between the member states of the regional integration agreement, Shams (2003) argues. Hirschman (1971) takes this view further and argues that policy coordination may be even more important for promoting trade between member countries than simple tariff reduction. Deeper integration in political levels may, thus, lead to stronger trade impacts through binding the goals and industries of the partner countries more strongly together. Evidence of deeper integration leading to higher levels of intra-regional trade is found by Glick and Rose (2002). In their study the formation of a currency union is an indicator of deeper monetary policy integration. They find that a common currency on average doubles the bilateral trade flows between two countries. More conservative results are found by Larch et al. (2019), who utilize an updated model to study the same phenomenon. They find currency unions to only slightly increase bilateral trade flows, and in many cases they find them to have no impact at all.

Further differences from regional integration can occur depending on the sizes of the participating countries. Kreinin (1964) argues that the benefits of integration are higher for

small countries when integrating with a larger country, especially if the larger country is also more developed. This is due to the large increase in market size for the smaller country's exports. However, opposing views also exist, as the smaller country can be seen to be at an unequal situation, where it must adjust to the economic structure of the larger country (Helleiner, 1996). Economic growth rates also matter when outcomes from integration are discussed, according to Balassa (1961). He argues that countries with higher growth rates also benefit more from regional integration. Countries with high economic growth rates tend to be more efficient and dynamic in taking advantage of new markets and opportunities.

Deeper institutional integration can be crucial for RTAs to become successful. Simple tariff reduction might not be enough for trade to reach higher levels when non-tariff barriers to trade (NTB) are high (Gelan & Amore, 2014; Calabrese & Eberhard-Ruiz, 2016). NTBs include factors like infrastructure, corruption and other things that impact the cost of trade. Resolving NTBs and harmonizing the access to trade among members of an RTA requires not only political will, but also consent to lose some internal control over policy, as argued by Otsubo (1998).

The size of an RTA can have an impact on its success or failure, according to Ethier (1998). He argues that the smaller the number of participating countries, the larger the probability of success. This, he adds, is true because fewer actors participating in negotiations means fewer conflicts of interest and, thus, a better possibility of achieving overarching agreements that resolve issues in trade and policy.

Mattli (1999) argues that the wide range of outcomes from different RTAs can be credited to supply and demand side conditions which both need to be satisfied for a successful outcome. The demand side conditions are derived from institutional theory, including property rights and quality of government. The supply side, on the other hand, represents the willingness of the governments to allow integrating policies. Many of the characteristics of successful RTAs discussed above can be included in these two conditions.

The seminal work on quantifying the impact of regional trade agreements is Jacob Viner's (1950) *The Customs Union Issue*. His theory consists of two possible effects for trade when a customs union is established, trade creation and trade diversion. Trade creation takes place when production shifts from a higher cost producer to a lower cost producer between member states of the integration agreement. Trade diversion occurs when lower cost imports from a non-member state are shifted to a member state with higher production costs. This shift takes place when the tariffs for imports to the customs union protect inefficient production within it. According to Viner (1950) trade creation increases welfare within the union, while trade diversion decreases welfare. When addressing the welfare effects of regional integration, he adds that customs unions are only a partial step for higher integration, which can be reached more equitably through global tariff reduction.

Viner's (1950) framework establishes many of the static effects of regional integration. Balassa (1961) introduces the dynamic effects of economic integration to further the framework. Dynamic effects of regional integration include outcomes that can be seen in the medium and long-term (Marinov, 2014). These effects can be, for example, technological

change, economies of scale, and the impact of integration on market structures and competition (Balassa, 1961).

Static and Dynamic effects of regional integration can also be characterized as short-term and long-term effects (Marinov, 2014). Static effects characterize the initial changes in an economy following the shock of integration, while dynamic effects characterize the restructuring effects of the economy into the new normal (Panusheff, 2003). For empirical studies, the main difference between the two effects is the difficulty of quantifying the dynamic effects. This is also one reason why the scope of this study is limited to the static effects of regional integration.

Most empirical studies on the static effects of regional integration find RTAs to be welfare enhancing, according to Afesorgbor (2017). However, differing impacts are found between locations for developing countries. In the 1990s, African RTAs were found to be on average trade creating, while those in Latin America were mostly trade diverting (Cernat, 2001). Looking further into the African RTAs, Musila (2005) finds that the trade creation effects were larger in ECOWAS than COMESA in the 1990s, however he does not offer any explanations for the difference. Ekanayake and Mukherjee (2010) find that RTAs in Asia have had largely net trade creating impacts between 1980 and 2009.

The suitability of the traditional regional integration theory on developing countries has been called into question by some researchers (Marinov, 2014). Balassa (1965) notes that the theoretical framework of static and dynamic effects of customs unions discusses the issue only from the point of view of developed countries. In developing countries, the goals of regional integration should be vastly different than in industrialized countries. Regional integration in developing countries should be considered as a path toward development, rather than as an optimal trade policy from an efficiency point of view (Balassa & Stoutjesdijk, 1975). Potential benefits for developing countries are, for example, better market access and increased foreign investment due to the increased size of the internal market.

The ability of RTAs between developing countries, or so-called South-South RTAs, to have a positive impact on bilateral trade levels between members has been questioned by some (Afesorgbor & Van Bergeijk, 2011). The sceptical view relies mainly on the theoretical framework of the Heckscher-Ohlin model. The Heckscher-Ohlin model predicts that a country specializes in the export of products that are intensive in the use of the abundant factors of production in said country (Ray, 1998). African countries rich in natural resources especially would, according to the model, specialize in exporting primary products to the capital-intensive developed world (Afesorgbor & Van Bergeijk, 2011).

Some worries on the abilities of African RTAs in particular have also been acknowledged by Hartzenberg (2011). She finds that African RTAs have largely been unsuccessful in promoting intra-regional trade. This, she argues, is because integrating small and developing economies provides only marginal support for economies of scale to arise and the existence of non-tariff barriers further lower the impact of tariff reduction.

Yang and Gupta (2005) find regional integration agreements to be an obstacle for further development in developing countries. They argue that a more broad-based trade liberalization

policy should be favoured to achieve higher levels of regional trade. Vamvakidis (1998) supports this view and finds that RTAs lead to lower economic growth and investment. He argues that regional integration taking the place of broader trade liberalization leads to these effects. However, his study focuses on a time period that ends in 1992, after which many of the newer RTAs emerged with deeper integration-oriented views and more outward looking agendas (Otsubo, 1998). An important benefit from North-South trade that lacks in South-South trade is the possible transfer of technology from a developed country to a developing country (Chui, Murshed & Pearlman, 2002). However, North-South trade agreements can have negative effects on the industrialization of developing countries as well (UNCTAD, 2007). A trade agreement between a developed and a developing country can lead to loss of policy sovereignty in local industrialization and FDI policies in the developing country. Furthermore, Bajona and Kehoe (2010) show with a dynamic Heckscher-Ohlin model that trade between a developed and a developing country can lead to income divergence because of specialization in low-capital exports in the developing country. This debate shows that the manner in which South-South partnerships impact the patterns of trade flows and development in developing countries lacks a strong theoretical consensus.

2.3 Theoretical Framework

The overall impact of regional integration on intra-regional trade in this study is expected to be positive. This assumption is based on the results of previous empirical studies employing gravity models, like Musila (2005), Ekanayake and Mukherjee (2010) and Afesorgbor (2017). Furthermore, this relies on the arguments of Chingono and Nakana (2009). In their view regional integration is a path to development and a first step toward broader liberalization. Thus, RTAs do not divert trade from global markets but create trade that did not, for different reasons, exist between partner states previously. However, as most of the prior gravity model studies employed an OLS estimator in their models, which is criticized by Santos-Silva and Tenreyro (2006), the impact found in this study is expected to be of smaller magnitude. Following their suggestion, this study employs a PPML estimator. The rationale behind the critique and the model chosen for this paper is explained more thoroughly in chapter 3.

When the different RTAs are considered separately some characteristics and circumstances are expected to create variation in the trade increasing power of the agreements. RTAs with a smaller number of member states are expected to achieve larger increases in intra-regional trade. This is based on the theory of Ethier (1998), which argues that the agreements are more likely to address a larger number of issues with less disagreements when the number of partners is lower. Related to the overarching way in which to address trade and policy issues, RTAs with higher levels of integration are expected to perform better. As tariffs are not the only barriers to trade between countries, maximizing the effect of tariff reduction on trade requires harmonizing macroeconomic policies and border bureaucracy (Hirschmann, 1971; Calabrese & Eberhard-Ruiz, 2016). Addressing the non-tariff barriers to trade takes political will and commitment from the participating countries to achieve higher levels of integration (Otsubo, 1998). The will and interest towards higher levels of integration also depend on what can be achieved through higher intra-regional trade. Countries that are dependent on natural

resource exports in Africa find the destination markets for their most important exports to be located outside of their region, mostly in the capital abundant developed world (Afesorgbor & Van Bergeijk, 2011). Thus, the role that regional trade has in the policies of these countries may have a secondary importance at best. Finally, the levels of development of the participating countries are expected to play a role in the magnitude of the impact of regionalism on trade. Being at similar levels of development between participating countries is expected to increase intra-regional trade the most effectively. This is due to the facility of creating mutually beneficial agreements, when one country does not have a clear advantage over the rest (Helleiner, 1996).

Following this theoretical framework, a testable hypothesis is formulated. The average impact of African RTAs on intra-regional export flows is positive. When considered individually, smaller RTAs with member states at similar levels of development will achieve higher levels of intra-regional export flows.

3 Methodology

3.1 The Gravity Model

The gravity model of international trade was first introduced by Tinbergen (1962). The model relies on the notion that international trade flows between country A and country B behave according to Newtonian ideas of gravity. In this way of thinking the gravity between two objects is directly proportional to the product of their sizes, and inversely proportional to the square of their distance from each other (Golovko & Sahin, 2019). The gravity model has been one of the more successful empirical models in economics and is especially robust in representing trade flows in a multi-country setting, according to Anderson (2011). The robustness of the model in such setting, is due to its modularity, which he clarifies: “the distribution of goods or factors across space is determined by gravity forces conditional on the size of economic activities at each location” (Anderson, 2011, p.134.). In this section the gravity model specification suitable for this study is built step by step through contributions by multiple authors.

The standard model, developed by Tinbergen (1962) includes the basic gravity variables of GDP for both exporter and importer and the distance between the countries. It takes the following form:

$$(1) \text{ Export}_{ij} = \alpha_0 * GDP_i^{\alpha_1} * GDP_j^{\alpha_2} * Distance_{ij}^{\alpha_3} * \mu_{ij} ,$$

where the subscripts i and j mark the exporter and importer, respectively; μ represents an error term and α_0 , α_1 , α_2 and α_3 are unknown parameters. Typically, equation (1) is then log-linearized, and the parameters are estimated with least squares, allowing for the estimates to be analysed as elasticities (Santos-Silva & Tenreyro, 2006). The equation then takes the form:

$$(2) \ln \text{Export}_{ij} = \ln(\alpha_0) + \alpha_1 \ln(GDP_i) + \alpha_2 \ln(GDP_j) + \alpha_3 \ln(Distance_{ij}) + \ln(\mu_{ij}).$$

This model can then be augmented with other variables that offer resistance to trade (Santos-Silva & Tenreyro, 2006). Typically, these variables include population sizes, common borders, shared common languages, and shared religious practices (Cernat, 2001; Musila, 2005; Ekanayake & Mukherjee, 2010).

Equation (2), while often used in the literature, runs into validity issues, according to Santos-Silva and Tenreyro (2006). They explain that the validity of the model rests on the assumption that the error term is statistically independent of the regressors. If the variance of the error term $\ln \mu_{ij}$ in equation 2 depends on the regressors, it violates the consistency conditions of OLS (Stock & Watson, 2007, p.247). In their investigation, Santos-Silva and Tenreyro (2006), find that when using the standard OLS gravity model the error terms are heteroskedastic, violating the OLS-assumptions. Furthermore, including an RTA term into equation (2) would introduce endogeneity issues, as the direction of causality between trade and the trade agreement would be difficult to entangle (Larch et al. 2019). Combating the endogeneity issue will be discussed in the final step, with equation (7).

Another issue that emerges in the log-linearization process, according to Santos-Silva and Tenreyro (2006), is how to deal with zero trade flows. While in Newtonian physics, they explain, gravity between two objects can be small but never zero, in international trade zero-trade flows are a possibility. Indeed, especially small and distant economies in Africa often do not trade with each other. Furthermore, zero trade values can also occur because of rounding down errors in the data as well as marking missing trade values as zeroes, Santos-Silva and Tenreyro (2006) add. With the log-linear OLS model these zero trade values are simply dropped out of the analysis, as the logarithm of zero is undefined (Yotov et al., 2016). This, however, leaves a lot of information unused.

Several methods have been created to combat the zero trade flow problem, Yotov et al. (2016) explain. One method is to add a small value in place of the zero. But, as Yotov et al. (2016) add, this is inconsistent with the theory and leads to inconsistent estimates of the coefficients of interest. Eaton and Tamura (1995) propose the use of a Tobit estimator, but Yotov et al. (2016) argue that there is a disconnect between the practice and theory in the use of this method. A convenient method to use is the Poisson Pseudo Maximum Likelihood (PPML) estimator, as proposed by Santos-Silva and Tenreyro (2006). The reason for the success of this method is that it allows for exports to be analysed in levels instead of logarithmic form. Furthermore, this estimator also corrects the heteroskedasticity issue present in the OLS model. The PPML estimator, supported by Santos-Silva and Tenreyro (2006), Yotov et al. (2016) and Larch et al. (2019), will be explained in more detail shortly.

Anderson and van Wincoop (2003) argue that the traditional log-linear gravity equation is not specified correctly, as it lacks a control for multilateral trade resistance (MTR). MTR can be defined as “the barriers to trade that each country faces with all its trading partners” (Adam & Cobham, 2007, p.1). In essence, MTR is the cost of exporting by country A to country B when compared to the cost of exporting by country A to any other country. One way in which Anderson and van Wincoop (2003) correct for the lack of MTR in the standard gravity model is by including exporter and importer fixed effects. By doing this, they control for the relative costs of trade with each country. At the same time the exporter and importer fixed effects control for all country specific variables like GDP and population, as well as variables that are constant towards all other countries, such as average tariffs (Head & Meyer, 2013). Santos-Silva and Tenreyro (2006) formulate the model with exporter and importer terms in its multiplicative form in the following way:

$$(3) \text{ Export}_{ij} = \alpha_0 * \text{Distance}_{ij}^{\alpha_1} * \varepsilon^{\delta_i * E_i + \delta_j * I_i} * \mu_{ij} \quad ,$$

where α_0 , α_1 , δ_i and δ_j are the parameters that are to be estimated, and E_i and I_i are dummy variables identifying the exporter and the importer, respectively.

While this model addresses some of the issues suffered by the traditional gravity model, problems still exist, according to Santos-Silva and Tenreyro (2006). In practice the multiplicative equation 3 will be log-linearized, which causes issues with the zero trade flow values, they explain. Furthermore, they add, that even when using fixed effects, the model, according to their estimations, still produces heteroskedastic error terms. They argue that the properties of trade data cause heteroskedasticity to always be a prominent issue in gravity models with OLS estimators.

Santos-Silva and Tenreyro (2006) propose the use of a PPML estimator when working with a gravity model. A major benefit of the model is that it allows for export trade flows to be analysed in levels, rather than in logarithmic form, disposing the question of how to deal with zero trade values, they explain. The estimator produced with the PPML model are also consistent in the presence of heteroskedasticity (Yotov et al., 2016). Santos-Silva and Tenreyro (2006) show that for consistency in the estimator, only correct specification of the conditional mean is required. Furthermore, Larch et al. (2019) explain that the PPML estimator is more consistent in dealing with trade data than the OLS estimator, as the latter gives a disproportionate weight on smaller values and, thus, smaller countries in the sample. These factors make the PPML estimator an attractive and suitable method when analysing trade data with a gravity model (Santos-Silva & Tenreyro, 2006; Yotov et al., 2016; Larch et al, 2019).

Following the specification of Larch et al. (2019), the gravity equation (3) can be formulated with a PPML estimator in the following way:

$$(4) \text{ Export}_{ij} = \exp(\beta_0 + \beta_1 \ln(\text{Distance}_{ij}) + \pi_i + \gamma_j) + \mu_{ij} \quad ,$$

where π_i and γ_j represent exporter and importer fixed effects, respectively; β_0 , β_1 are the parameters to be estimated. Often other relevant variables are also included to the equation in addition to the distance variable.

Gravity models become more reliable when the number of countries and years in the sample are increased, Larch et al. (2019) explain. Because of this, they recommend using panel data when applying gravity models on trade. Furthermore, as the data will be covering multiple years, they suggest the use of exporter-time and importer-time fixed effects, instead of just exporter and importer fixed effects, to account for MTR. This allows for controlling of time-variant country effects in the data. The exporter-time and importer-time fixed effects also absorb the economy size variables, as the exporter and importer fixed effects do in equation

(3) (Head & Meyer, 2013; Yotov et al., 2016, p.19). Both the OLS model and the PPML model can be presented in panel data format, following Larch et al. (2019), in the forms:

$$(5) \ln Export_{ijt} = \ln(\alpha_0) + \alpha_1 BTP_{ijt} + \alpha_2 \ln(Distance_{ij}) + \pi_{it} + \gamma_{jt} + \ln(\mu_{ijt})$$

$$(6) Export_{ijt} = \exp(\beta_0 + \beta_1 BTP_{ijt} + \beta_2 \ln(Distance_{ij}) + \pi_{it} + \gamma_{jt}) + \mu_{ijt} ,$$

Where BTP stands for a vector of chosen time variant bilateral trade policies between two countries; the subscript t represents the year of the observation and; as explained above, π_{it} and γ_{jt} represent exporter-time and importer-time fixed effects, respectively. The terms absorb time-variant country effects present in the data.

When applying equations (5) and (6) in studying the trade effects of currency unions, Larch et al. (2019) note that endogeneity becomes an issue. With this, they mean that it is difficult to say if changes in trade happen because of joining a currency union or if changes in trade lead to joining a currency union. This issue is also noted by Yotov et al. (2016). The solution suggested by Yotov et al. (2016) and Larch et al. (2019) is to control for any time-invariant trade policies between any country-pair. This they do by introducing a country-pair fixed effect term in the model. The term also, as noted by Yotov et al. (2016, p.21), absorbs all time-invariant variables specific to each country-pair like distances and shared borders that are included in the model. However, as Larch et al. (2019) explain, the country-pair fixed effect is a better control for trade policy specific impacts than the indicators traditionally used to proxy them. They also note that when controlling for the country-pairs, the results tend to be more conservative than when controlling for the traditional proxies. This implies that not including the country-pair term leads to biased estimates of currency unions.

The specification suggested by Larch et al. (2019) is a version of equation (6) with a dummy variable to indicate a currency union taking the place of the bilateral trade policy vector and including a term for the country-pair fixed effects. Their model takes the following form:

$$(7) Export_{ijt} = \exp(\beta_0 + \beta_1 CurrencyUnion_{ijt} + \pi_{it} + \gamma_{jt} + \theta_{ij}) + \mu_{ijt} ,$$

where θ_{ij} represents the country-pair fixed effects. Also different from equation (6) is the absence of the distance variable.

3.2 The Approach

In this study the impact of African RTAs on trade will be analysed with multiple models. The main models of interest are the ones estimated with the PPML method, but OLS models are included in the study to allow for comparison between the results. First, a variation of equation (5) is used to establish a baseline impact of RTAs on trade with the OLS estimator. To model previous research on the topic, the country-pair terms are not included in the OLS models. This model takes the following form:

$$(8) \ln Export_{ijt} = \ln(\alpha_0) + \alpha_1 \ln(Distance_{ij}) + \alpha_2 CommonBorder_{ij} + \alpha_3 CommonLanguage_{ij} + \alpha_4 \ln(ReligionIndex_{ij}) + \alpha_5 RTA_{ijt} + \pi_{it} + \gamma_{jt} + \ln \mu_{ijt} ,$$

where the dependent variable is the logarithmic form of export flow value from country i to country j in year t; $\ln(Distance_{ij})$ is the distance between the capital cities of the exporter and importer countries in logarithmic form; $CommonBorder_{ij}$ is a dummy variable, which takes the value 1 when the exporter and importer countries share a border; $CommonLanguage_{ij}$ is a dummy variable, which takes the value 1 when the exporter and importer countries share a common official language; $\ln(CommonReligion_{ij})$ is an index variable set between 0 and 1 transformed into logarithmic form, which takes higher values when the exporter and importer countries share common religious customs; RTA_{ijt} is the variable of interest, and is a dummy variable, which takes the value 1 if the exporter and importer countries belong in the same RTA at time t; π_{it} and γ_{jt} are the exporter-time and importer-time fixed effect terms, respectively; $\ln \mu_{ijt}$ represents the error term.

Second, a similar model but with a PPML estimator, and including country-pair fixed effects, is used to achieve econometrically consistent estimates for the impact of RTAs on trade. The two models are used to show the difference in magnitude of the estimates that the two models produce. The PPML equation (7) will be modified for this model, taking the form:

$$(9) Export_{ijt} = \exp(\beta_0 + \beta_1 RTA_{ijt} + \pi_{it} + \gamma_{jt} + \theta_{ij}) + \mu_{ijt} ,$$

where the dependent variable is the value of export flows from country i to country j at time t; RTA is a dummy variable which takes the value 1 when the exporter and importer countries belong to the same RTA in the year of the observation; π_{it} and γ_{jt} represent exporter-time and importer-time fixed effects, respectively; θ_{ij} represents the country-pair fixed effects, which absorb the time-invariant characteristics between the exporter and importer.

The third and fourth models are specified to find differences in trade effects of the different RTAs considered in the study. This is done by replacing the overall RTA dummy with dummy variables for each African RTA. Much like with the previous models, an OLS model and a

PPML model are specified to allow comparison between the estimators. The OLS model is specified in equation (10) and the PPML model is specified in equation (11) in the following ways:

$$(10) \ln Export_{ijt} = \ln(\alpha_0) + \alpha_1 \ln(Distance_{ij}) + \alpha_2 CommonBorder_{ij} + \alpha_3 CommonLanguage_{ij} + \alpha_4 \ln(ReligionIndex_{ij}) + \alpha_5 COMESA_{ijt} + \alpha_6 ECOWAS_{ijt} + \alpha_7 EAC_{ijt} + \alpha_8 SACU_{ijt} + \alpha_9 CEMAC_{ijt} + \alpha_{10} WAEMU_{ijt} + \pi_{it} + \gamma_{jt} + \ln \mu_{ijt}$$

$$(11) Export_{ijt} = \exp(\beta_0 + \beta_1 COMESA_{ijt} + \beta_2 ECOWAS_{ijt} + \beta_3 EAC_{ijt} + \beta_4 SACU_{ijt} + \beta_5 CEMAC_{ijt} + \beta_6 WAEMU_{ijt} + \pi_{it} + \gamma_{jt} + \theta_{ij}) + \mu_{ijt}$$

where $COMESA_{ijt}$ is a dummy variable, which takes the value 1 when the exporter and importer countries are member states of the COMESA at time t. The variables $ECOWAS_{ijt}$, EAC_{ijt} , $SACU_{ijt}$, $CEMAC_{ijt}$ and $WAEMU_{ijt}$ follow the same logic as $COMESA_{ijt}$.

With this method I can separate the overall effect of regional integration on trade into the effects of individual RTAs and see if there are specific characteristics of RTAs that tend to impact trade in similar ways. This method takes inspiration from Larch et al. (2019) who separate the impacts of different currency unions and analyse these differences.

Both the OLS and the PPML model produce results that are interpreted as elasticities (Santos-Silva & Tenreyro, 2006). This, first, allows the estimates produced by the models to be compared, and second, makes the interpretation of the estimates relatively simple. The interpretation, for example, of the coefficient of the variable of interest RTA in model (8) will be that countries export $100 * \alpha_5$ percentage more (or less) to countries they share an RTA with compared with countries they do not share an RTA with.

4 Data

The dataset gathered for this study includes bilateral trade observations between 47 African countries between the years 1988 and 2019. Larch et al. (2019) note that gravity model estimators become more reliable as the number of countries and years is increased. Thus, the sample was selected as all African countries for which data was available starting from 1988, which for most countries is the earliest date of continuously released bilateral trade data. Djibouti, Eswatini, Eritrea, Sao Tome and Principe, Somalia and South Sudan are not included because of insufficient data. In total, the dataset includes 61,394 observations. The full list of countries included in the study can be found in Appendix A.

The dependent variable in the study is the bilateral exports of a country. The data is gathered from the International Monetary Fund’s (IMF) Direction of Trade Statistics, which report bilateral trade flows between countries (IMF, 2020). For most African countries 1988 is a starting year of yearly reported data on exports, and the latest released data are for the year 2019. The major exception to this trend are Botswana, Namibia and South Africa, for which data is only available starting from the year 2000. Thus, the analysis concerning SACU will have less explanatory power than for the other RTAs. To ensure the validity of the results, a regression will be run with and without these countries. The data is reported in millions of US dollars. The bilateral data allows a database to be built, which covers the exports between all African countries included in the sample.

Table 2. Descriptive Export Statistics.

	<u>Mean</u>	<u>Min</u>	<u>Max</u>
<i>1988-2019</i>	18.28	0	5047.83
<i>1988-1998</i>	3.04	0	930.84
<i>1999-2008</i>	13.43	0	2425.68
<i>2009-2019</i>	36.92	0	5047.83

Source: IMF Direction of Trade Statistics (2021)

The values for the trade flows differ widely between the different exporter-importer pairs. Countries tend to trade more with larger economies and ones that are within a close distance, which follows the assumptions of the gravity model (Tinbergen, 1962). Furthermore, the export flow values increase over time, as shown in table 2. While much of the increase might be due to better environment for trade, like increased trade liberalization, some of it is also due to inflation, as the data is reported in current US Dollars. This, however, will be controlled for in the analysis with time fixed effects, as is common practice with gravity models when analysing trade flows (Yotov et al., 2016).

The data gathered for bilateral export flows, unfortunately, includes some missing values. Dealing with missing values in trade data introduces some issues, as the missing values can, in addition of actual missing values, represent zero values misreported as missing (Santos-Silva, 2006; WTO, 2012). The method, in dealing with these missing values, in this paper follows the suggestion of WTO (2012) and considers them as zero values.

Research utilizing bilateral trade data should, however, always take into account the possibility of inconsistent data quality, according to Jerven (2014). International trade data, according to him, can be unreliable because of omission and misreporting of data. This can be especially important in Africa, where informal trade is widespread, he explains. Unfortunately, there is no way to directly control for the issue, but some consideration should be reserved when analysing the results. While, this issue is to be taken seriously bilateral trade data is still the best alternative to study regional trade flows and are widely used in the literature (Glick & Rose, 2002; Musila, 2005; Larch et al., 2019).

The variables of interest for this study are dummy variables indicating if an export observation is between two members of the same RTA. In this study I consider only RTAs that are characterized as customs unions by the WTO, as this represents a deeper integration agreement than a simple free trade area. Multiple dummy variables are included to mark the RTAs. First, a dummy variable *RTA* is constructed that takes the value 1 if the exporting and importing countries are members of the same RTA. To further analyse the effect of regional integration on trade, dummy variables for the specific RTAs included in the study are created. These variables are *COMESA*, *ECOWAS*, *EAC*, *SACU*, *CEMAC* and *WAEMU*. The dummy for *COMESA*, for example, takes the value 1 if the exporter and importer are both members of *COMESA*. Same logic applies for the other RTA dummies. The variables are coded according to data published by the World Trade Organization (WTO) (2021) on RTAs and their member countries. The first period an RTA is considered to be functioning is coded as the first full year after the date of entry into force of the agreements. The dates of entries into force for the different RTAs vary between 1995 and 2002. Thus, the fact that the time period of the study starts in 1988 creates variation in the data.

Over the time period of the study 15 percent of the reported exports occurred between two member states of the same RTA. However, the mean value for exports between two member states of an RTA is higher than for exports between two countries that do not share an RTA, 42 million US Dollars and 13 million US Dollars, respectively.

Gravity models require data to proxy for the sizes of the economies (Tinbergen, 1962). Traditionally this is done by adding the GDPs and population sizes to the equation. However,

as shown by Yotov et al. (2016, p.19) including exporter-time and importer-time fixed effects absorb these variables. They argue that the fixed-effects method allows for more comprehensive controlling of the sizes economies. Thus, in this study the exporter-time and importer-time fixed effects are chosen to control for these country specific effects.

Traditional gravity models also require variables to proxy for the closeness of the markets (Ekanayake & Mukherjee, 2010). This is typically done by calculating the distances between the capital cities. In addition, other indicators that make trade easier are included. These indicators include a dummy variable that takes the value when the countries share a border, a dummy variable that takes the value 1 when the countries share a common official language, and a religious proximity index by Disdier and Mayer (2007), that is highest when countries share a dominant majority religion. Data for these variables are found from the CEPII database on world trade created by Head, Mayer and Ries (2010). These proxies are only relevant for the OLS models, however, as the PPML models include country-pair fixed effects, which absorb any country-pair specific time-invariant effects.

The closeness of markets is positively correlated with the value of export flows. Countries that share a common border have a mean export flow value of 97 million US Dollars in the dataset, while countries that do not share a border have a mean export flow value of 11 million US Dollars. Similarly, a common official language is positively correlated with export flows. The mean export value flow of countries that share a common official language is 25 million US Dollars, while countries without a common official language have a mean export flow value of 13 million US Dollars.

As is required in gravity models, all continuous variables will be transformed into logarithmic form in the regressions (Tinbergen, 1962). An exception to this is the dependent variable *export*, which will be kept in its original form for the PPML model, as explained by Santos-Silva and tenreyro (2006). When using an OLS estimator, however, the export values will also be transformed into logarithmic form.

5 Empirical Analysis

5.1 Results

The impact of African RTAs on trade flows is analysed with data covering the years 1988-2019 and 47 countries. Four different gravity models are used, two using a traditional OLS method and two utilizing a PPML estimator. The results can be found in table 3. Columns (1) and (3) show the results for the traditional OLS regressions with exporter-time and importer-time fixed effects, but without country-pair fixed effects. Column (1) presents the OLS results for the overall impact of RTAs on trade, while column (3) separates the RTA effects into the individual RTA organization effects. The OLS regressions include time-invariant variables controlling for characteristics that tend to make trade easier between countries.

Columns (2) and (4) present results for regressions obtained with a PPML estimator. These regressions include the exporter-time and importer-time fixed effects, but also country-pair fixed effects, which control for all country-pair specific time-invariant characteristics. Because of this, the time-invariant control variables are not included, as in the OLS regressions. Column (2) shows the results for the overall RTA impact on trade, while column (4) separates the RTA effect into individual RTA organization effects.

The results obtained in column (1) imply a large impact of RTAs on trade. They show that countries that share an RTA have export flows 136% higher than those exporting outside an RTA. This fits well with the existing literature, where estimates tend to be found between 100% and 200% (Cernat, 2001; Musila, 2005; Ekanayake, 2010). The other coefficients of the control variables follow the expected gravity model direction. Distance is negatively and significantly related to export flows, and the closeness variables are positively and significantly related to export flows.

The estimates obtained on the effects the individual RTA organizations on trade, in column (3), are all positive. Furthermore, all except the estimate for SACU and CEMAC are also significant. The estimate for COMESA implies that export flows between two member countries are 186% higher than export flows outside an RTA. This is higher than the estimates found by Musila (2005), though his research only considered the 1990s. The coefficients for ECOWAS, EAC and WAEMU are found between 0.7 and 1, which seem reasonable based on previous research (Cernat, 2001; Musila, 2005). The control variables act largely in a similar way in the regression of column (3) as they do in the regression of column (1).

The OLS regressions suffer from some shortcomings in estimating trade effects (Santos-Silva & Tenreyro, 2006). The major shortcomings are the inability to consider zero trade flows, heteroskedasticity and endogeneity. For this reason, the PPML estimator has been recommended as a more suitable method (Santos-Silva & Tenreyro, 2006; Yotov et al., 2016).

Table 3. Regression Results for Trade Effects of RTAs.

	(1)	(2)	(3)	(4)
Estimator	OLS	PPML	OLS	PPML
Dependent Variable	ln(Export)	Export	ln(Export)	Export
<i>RTA</i>	1.358*** (0.200)	0.235* (0.0931)		
<i>COMESA</i>			1.864*** (0.259)	0.417 (0.273)
<i>ECOWAS</i>			0.799** (0.280)	-0.208 (0.158)
<i>EAC</i>			0.924* (0.379)	-0.233** (0.0828)
<i>SACU</i>			1.056 (0.886)	0.533** (0.202)
<i>CEMAC</i>			0.720* (0.332)	0.212 (0.177)
<i>WAEMU</i>			1.055*** (0.279)	0.810*** (0.112)
<i>ln(Distance)</i>	-1.452*** (0.193)		-1.466*** (0.199)	
<i>CommonBorder</i>	1.374*** (0.194)		1.360*** (0.201)	
<i>CommonLanguage</i>	0.800*** (0.0950)		0.742*** (0.0945)	
<i>ln(ReligionIndex)</i>	0.0983** (0.0371)		0.106** (0.0380)	
Observations	34,149	60,882	34,149	60,882
R-squared	0.590		0.593	
Pseudo R-Squared		0.9579		0.9580
Country-Pair FE	NO	YES	NO	YES

Robust standard errors in parentheses (country-pair clustered in columns (1) and (3))

*** p<0.001, ** p<0.01, * p<0.05

Column (2), thus, reports the PPML results for the overall RTA effect on export flows. The estimated impact of RTAs on export flows implies that on average countries' export flows to other member states are 24% percent higher than to countries they do not share an RTA with. This is a more conservative estimate than the one found with the OLS estimator in column (1). Larch et al. (2019) argue that the PPML model with country-pair fixed effects will produce substantially more conservative results on trade effects of bilateral trade policy than traditional OLS models. This they argue is due to the more suitable specification of the model, which handles the issues of endogeneity and heteroskedasticity better.

The estimates produced by the PPML model in column (4) differ from the OLS estimates of column (2) as well. The magnitudes of the coefficients for the different RTAs are more conservative and only WAEMU and SACU show significant positive impacts. The estimate for SACU implies that the agreement led to a 53% increase in export flows between the

member states compared to countries not sharing an RTA, while the estimate for WAEMU shows an 81% increase in export flows within the agreement. COMESA and CEMAC show positive but insignificant impacts on exports and ECOWAS shows a negative but insignificant impact. The estimate of EAC, on the other hand, shows a negative and significant impact on export flows. The results imply that joining EAC led to a 23% decrease in export flows between the member states compared to countries not sharing an RTA.

The estimates produced by the traditional OLS gravity model are quite different from the ones produced by the PPML model. The increased number of observations with the PPML model, as zero trade flows are considered, is already an important factor contributing to the model's success. Also, Larch et al. (2019) note that the OLS model gives disproportionate weight on small values, which skews the results even more. The PPML model shows to produce a better fitting model as well, shown by the Pseudo R-squared values of 0.96, compared with the lower R-squared values of 0.59 from the OLS models. The impact of the country-pair fixed effects in the PPML models in isolating the causation direction, as explained by Yotov et al. (2016), can also be seen in this study. When performed without country-pair fixed effects, the PPML models produce estimates that fall between the OLS estimates and the PPML estimates produced with country-pair fixed effects. The regressions for the PPML models without country-pair fixed effects can be found in Appendix B.

When the PPML models of columns (2) and (4) from table 3 are considered with a restricted sample, some differences appear. Botswana, Namibia and South Africa all had reported export data starting from the year 2000. For this reason, a sample omitting them is also considered. The countries form SACU, which is then also dropped from estimation. The results show the overall impact of RTAs on intra-regional trade in Africa to be insignificant. The coefficients for the individual RTAs change only marginally, and no changes in significance or direction of impact occur. As SACU in table 3 shows positive and significant results, its omission can explain much of the difference in the overall impact of RTAs between the full and restricted samples, since the individual coefficients change only marginally. The results for the regressions with the restricted sample can be found in appendix C.

The results obtained with the PPML models point to a more modest trade impact of RTAs in Africa than what previous research has found with the traditional OLS gravity model (Cernat, 2001; Musila, 2005). However, the theoretical justification, presented by Santos-Silva and Tenreyro (2006) and Larch et al. (2019), and the better fit of the PPML model in this paper clearly support the PPML model. Thus, these more conservative, and even in cases pessimistic, estimates should be preferred.

5.2 Discussion

The results found in this paper indicate that joining an RTA leads to a moderate increase in export flows between other member states in Africa. The larger, but theoretically inconsistent, estimates produced by the OLS model agree with much of the previous literature, that also

used OLS estimators, like Glick and Rose (2002) and Musila (2005). The selection of the most consistent model seems, thus, to be the gateway to understanding RTAs, and their impact on bilateral trade, better. Progress in theoretical framework and computational programs, by Santos-Silva and Tenreyro (2006) and Yotov et al. (2016), have made it easier to achieve more reliable estimates. The PPML estimates found in this study are more conservative than the OLS estimates, but still significantly positive. Larch et al. (2019), using a similar PPML model, found no statistical impact of currency unions on exports. This difference, however, is understandable, as different samples and specifications were used.

The overall results showed RTAs to have a positive impact on exports, but differences between the RTA organizations emerged when considered separately. Both COMESA and ECOWAS, the largest RTAs in the sample, showed to have no significant impact on intra-regional exports. This result seems reasonable, as according to Ethier (1998) a lower number of participating countries tends to lead to more comprehensive integration agreements. As he explains, the needs and conditions of different states compile, which makes broad integration difficult. The member states of COMESA and ECOWAS differ also in stages of development, which can further harm trade creation (Helleiner, 1996).

The estimates for SACU and WAEMU show significant and positive increases in intra-regional exports due to the RTAs. The magnitudes are not as high as what was found with the OLS model but increases of 53% for SACU and 81% for WAEMU are quite meaningful. SACU, as de Melo and Tsikata (2015) argue, has achieved relatively deep levels of integration. WAEMU as well, with a common currency, has achieved relatively high levels of integration (Ndiaye & Xu, 2016). The achievement of deeper integration can be key, as Otsubo (1998) explains, in attaining sustainable benefits from RTAs. Furthermore, both SACU and WAEMU include member states at relatively similar levels of economic development, which has been shown to be important in creating sustainable integration agreements.

The insignificant impact of forming an RTA on trade for CEMAC, can first seem surprising, as the integration levels are argued to be similar, or even higher, to WAEMU (Bongyu, 2009; Ndiaye & Xu, 2016). However, the economies in CEMAC have different compositions than those in WAEMU. Natural resources are a corner stone to the economies of CEMAC, Coorey and Akitoby (2012, p.3) explain. High shares of the countries' GDPs are made up of oil exports and rents, they add. This causes macroeconomic instability, which is harmful for trade, but also impacts the trade composition and the preferred export destinations of the bloc (Afesorgbor & Van Bergeijk, 2011; Coorey & Akitoby, 2012, p.3). Countries rich in natural resources tend to trade more with capital abundant developed nations. In situations, like this, it can reasonably be assumed that tariff reduction with neighbouring countries will have a minor impact, or no impact at all, on trade, when markets for the major exporting sectors do not exist in the partner countries.

The only negative and significant result is for the EAC. The result of a decrease of intra-regional exports due to the agreement is surprising, as the EAC has been characterized as a relatively well working RTA with high motivation for further integration (Gasiorek, Byiers & Rollo, 2016). One reason for the negative result can be found in the debate of whether economic integration, for small economies, with more industrialized countries is beneficial or

not. As de Melo and Tsikata (2014) note, Kenya is the most industrialized and dominant economy in the EAC. There exists opposing views on whether it is beneficial to form integration agreements with countries that have higher levels of development. The results of this study support the view that integration with a country that has a clear advantage in development and economic size is not beneficial. They imply that the economic superiority of Kenya over the other member states of the EAC has caused intra-regional exports to decrease after reducing tariffs.

Thus, the results of this study point towards an overall positive effect of joining an RTA on intra-regional exports flows in Africa. This impact, however, is not as large as previously thought. Still, the general trend of increasing number and ambition of South-South RTAs can be seen as a positive development policy in light of the results. The negative impacts of regionalism on international trade, argued by supporters of more broad based trade liberalization, like Yang and Gupta (2005), seem not to be very strong. A reason for this, can be the low openness to trade of developing countries in the first place. This would make regionalism a first step in gradual opening up to trade. In regionalism developing countries may find a path towards openness without becoming vulnerable to the conditions of international markets by gaining, as Chingono and Nakana (2009) put it, strength in numbers.

Analysing the individual impacts of the different RTAs on intra-regional exports also produce some interesting results. The results show that not all RTAs achieve the same effects. Thus, simple tariff reduction is not the key to increased trade between countries but responding to the broad ranging barriers to trade is needed to change trade patterns. RTAs that have reached deeper levels of integration on the political level tend to reach higher levels of intra-regional exports. This supports Hirschman (1971) and his arguments of higher importance of policy integration compared to tariff reduction. However, integration is not the only determinant of intra-regional trade, as seen from the case of CEMAC. The benefits of tariff reduction and integration can be marginal when the preferred destination markets for the exports of the countries involved are located in other parts of the world. Thus, it seems reasonable that the intra-regional export sector is of secondary importance to CEMAC countries.

Another major characteristic of the RTAs that was found to be linked with insignificant trade effects is the size of the RTAs. Both COMESA and ECOWAS include 15 member states in the sample and cover vast areas of land. A high number of member states with different preferences over policy tend to lead to inefficient trade agreements, according to the results. Furthermore, when multiple countries are involved in an RTA with a low level of policy integration, the benefits of tariff reduction can be marginal, as non-tariff barriers to trade dominate the cost structure due to greater distances between countries (Calabrese & Eberhard-Ruiz, 2016).

In achieving higher levels of intra-regional exports with RTAs, the selection of partner states can be crucial (Helleiner, 1996). Forging an RTA with a dominant and relatively industrialized economy can crowd out exporting endeavours in the other member states, as seems to be the case with the EAC. However, the possible existence of efficiency gains or technological transfers, as argued by Kreinin (1964) and Chui, Murshed and Pearlman, 2002, cannot be proven false on the basis of this paper. Further examining these more dynamic effects is outside of the scope of this study.

Thus, to conclude, there are multiple factors determining the success of RTAs in stimulating intra-regional trade flows. This study identifies policy integration, RTA size, level of development of the member states and the identification of destination markets of major export sectors as some of the more important determinants for African RTAs. Some of these factors can be seen as mutually reinforcing as well. For example, deeper policy integration is easier when the number of negotiating nations is lower. In the opposite direction, policy integration can prove more difficult when markets for the participating nations' exports do not exist in the other member states. The research question chosen to tackle in this study was the following: How does regional integration impact intra-regional trade flows in Africa? This study finds regional integration to increase intra-regional trade flows on average, but differences exist between the trade blocs. The effect regional integration has on trade flows depends on the characteristics, like size and policy harmonization, of the individual RTAs. Thus, a general answer on the benefits or costs of regional integration is difficult to give, as they are dependent on the circumstances in which the integration takes place.

6 Conclusions

Regional integration has been on the rise since the 1990s and many different RTAs have been established all over the world. Africa being no exception, multiple RTAs have been established on the continent, sometimes with overlapping memberships as well. The theoretical debate surrounding the benefits and costs of regional integration has largely been inconclusive in their findings. Whether regionalism is beneficial for international trade and development or not, has been debated on multiple fronts. The opponents of regional integration argue that integration hinders global trade liberalization and, thus, creates inefficiencies and slows development. The proponents of regional integration, on the other hand, argue, especially concerning developing countries, that integration creates a more stable path towards development and gradual trade liberalization.

This study set out to investigate the impacts of RTAs on the intra-regional exports in Africa. The hypothesis of the thesis predicted that the impact to be positive but smaller in magnitude compared to previous studies. Prior empirical literature on the topic has found largely positive impacts of RTAs on regional trade, but their methodologies have been shown to produce econometrically inconsistent results. For this reason, this study fills a gap in the literature by employing an up-to-date estimator, the PPML estimator, in tackling the issue. Furthermore, the traditional OLS estimator was also employed to show the difference between the results produced by the two estimates in practice.

The findings of this paper, indeed, differ from the existing literature. The PPML estimator finds the overall impact of RTAs on intra-regional exports in Africa to be positive, but the magnitude of the effect is smaller than what is implied in prior empirical research. This difference was also shown by running the regressions with models following the methodologies of the prior studies. The findings show that an OLS estimator overestimates the impact by a relatively large margin. Thus, the findings support the criticism of using an OLS estimator when employing a gravity model of international trade to study regional integration.

The positive impact of RTAs on intra-regional exports suggests that regional integration can be a beneficial policy for trade in developing countries, even though the impact is more conservative than previously found. Furthermore, when analysing the individual RTAs and their impacts on intra-RTA exports some interesting findings were made. The hypothesis predicted that smaller RTAs with countries on a similar level of development would be found to be more successful in increasing intra-RTA exports. The results partly support the hypothesis. While the largest RTAs were found to have insignificant impacts on intra-RTA exports, not all of the smaller RTAs proved to be successful in this aspect either. The inference drawn from the findings are that smaller RTAs tend to integrate their economies deeper than large ones, but the structure of the export sectors matters as well. If the markets for the countries' major export sectors are located in the developed world, as is the case of

natural resource producing countries, an RTA between neighbouring countries is unlikely to foster meaningful export growth. The choice of integration partners matters also in the case of one member state overshadowing the rest in the aspects of market size and economic development. In this case the market power of this dominating state can hinder, and even reduce, intra-regional exports when tariffs and barriers to trade are reduced.

This study establishes, with a consistent econometric model, the impact of RTAs on intra-regional exports in Africa. Furthermore, it analyses some characteristics of successful RTAs. However, there is still much to be investigated in the regional integration topic, and its importance is unlikely to shrink, as the trend of regionalism has spread to all corners of the world. This study found its results on African RTAs, but the circumstantial nature of many of the RTAs can produce different findings in other parts of world. For this reason, research including different samples are important for further understanding the trade effects of RTAs more fully. Furthermore, this can add to our understanding on the characteristics of successful RTAs. Aside from studying the static trade effects of regional integration, important and interesting questions can be answered through research on the dynamic, long-term, market restructuring effects. For example, how economies respond in the long run when integrating with a larger and more developed nation is a problem this study could not tackle. While these topics are outside the scope of this thesis, it provides a base to which new research and understanding can be added.

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Appendix A

Table A1. The Full List of Countries in the Sample.

Algeria	Congo, Rep.	Libya	Senegal
Angola	Cote d'Ivoire	Madagascar	Seychelles
Benin	Egypt	Malawi	Sierra Leone
Botswana	Equatorial Guinea	Mali	South Africa
Burkina Faso	Ethiopia	Mauritania	Sudan
Burundi	Gabon	Mauritius	Tanzania
Cabo Verde	Gambia	Morocco	Togo
Cameroon	Ghana	Mozambique	Tunisia
Central African Republic	Guinea	Namibia	Uganda
Chad	Guinea-Bissau	Niger	Zambia
Comoros	Kenya	Nigeria	Zimbabwe
Congo, Dem. Rep.	Liberia	Rwanda	

Source: The Author

Appendix B

Table B1. Regression Results for PPML model Without Country-Pair Fixed Effects.

	(1)	(2)
Estimator	PPML	PPML
Dependent Variable	Export	Export
<i>RTA</i>	0.860*** (0.213)	
<i>COMESA</i>		0.751** (0.286)
<i>ECOWAS</i>		1.832*** (0.348)
<i>EAC</i>		1.334** (0.459)
<i>SACU</i>		-0.866* (0.346)
<i>CEMAC</i>		1.927** (0.609)
<i>WAEMU</i>		0.368 (0.570)
<i>ln(Distance)</i>	-0.480*** (0.120)	-0.387*** (0.116)
<i>CommonBorder</i>	0.981*** (0.206)	1.019*** (0.190)
<i>CommonLanguage</i>	0.239 (0.156)	0.275 (0.142)
<i>ln(ReligionIndex)</i>	0.453*** (0.103)	0.508*** (0.103)
Observations	61,394	61,394

Country-pair clustered standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Appendix C

Table C1. PPML Regression Results Without SACU Countries

VARIABLES	(1) PPML	(2) PPML
<i>RTA</i>	0.0724 (0.0973)	
<i>COMESA</i>		-0.154 (0.270)
<i>ECOWAS</i>		0.0917 (0.160)
<i>EAC</i>		-0.193* (0.0871)
<i>CEMAC</i>		0.0829 (0.182)
<i>WAEMU</i>		0.763*** (0.104)
Observations	54,324	54,324
Country-Pair FE	YES	YES

Robust standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05