Economic Integration of the East African Community

A Thesis submitted in fullfilment of the requirements for the degree of Doctor of Philosophy

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Declaration

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

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Abstract

This thesis contributes to the debate of the consequences of preferential liberalization through assessment of the trade and welfare effects of a Preferential Trade Agreement (PTA) on its member countries. In particular, it examines the potential and actual impacts of the East African Community (EAC), which is hailed as one of the most successful PTAs in Africa (Koami et al. 2016). The aim of this thesis is to understand how formation of the EAC affected the economies of its member countries and whether it is the best trade liberalization strategy for them. The thesis undertakes both theoretical and empirical analyses to examine the trade and welfare effects of the EAC. It is comprised of five main chapters.

Chapter 1 surveys the academic literature on the welfare effects of PTAs and presents the aims and objectives of this thesis. The main goal is to provide a background for subsequent analyses. It gives a brief overview of the evolution of PTAs, examines the theoretical literature on static and dynamic effects of PTAs and reviews the ex-ante and ex-post models for evaluation of the welfare effects of PTAs.

Chapter 2 gives a background to the EAC and underscores the need for research on its trade and welfare effects on member countries. It undertakes a political economy analysis of the challenges facing the implementation of the EAC Treaty. It also investigates how far the lessons learnt from previous attempts at integration among the EAC countries have shaped the current progress.

Chapter 3 theoretically analyses the welfare effects from the formation of a PTA using a stylized three-country model of international trade under oligopoly. It com-

pares the differences in welfare implications between a Free Trade Agreement (FTA) and a Customs Union (CU) on the member countries who differ in their market sizes. The findings show that both are welfare improving for the member countries provided that the difference in market sizes is not too large. Comparing the FTA and CU, the smaller partner in the trade agreement will prefer an FTA over a CU. This is because the profits gains for the firm from protection of the regional market due to higher tariffs in an FTA outweighs the forgone gains in consumer surplus and tariff revenue due to lower tariffs in a CU. On the other hand, the larger partner will prefer a CU over an FTA since its population size will lead to higher consumer surplus and tariff revenue that will outweigh forgone gains from firm's profits. The findings of this chapter sheds light on some of the reasons why the EAC is facing challenges in its implementation.

Chapter 4 empirically assesses whether the EAC countries economically benefited from trade liberalization. It quantifies the trade creation, trade diversion and the welfare effects of trade liberalization on the EAC countries using an estimation and general equilibrium simulation procedure by Anderson et al. (2015) built around the structural micro-foundations of the gravity equation. The results show that the EAC integration generated large trade creation effects for all member countries that superseded the trade diversion effects. Kenya, which is the most industrialized country in the EAC, was the only country that did not have a trade diversion effect. On the other hand, the welfare analysis indicate that the EAC led to economic gains for its member countries of between 0.01 - 0.9 percent of real GDP with Kenya enjoying the highest gains. The welfare gains for Kenya were due to producer surpluses while the welfare gains for all other EAC countries stemmed from consumer surpluses. These finding suggest that the EAC has achieved its objective of generating welfare gains for its member countries. Second, the findings also show that the benefits of trade liberalization among developing countries will be inclined to the most industrialized countries.

Chapter 5 empirically investigates the effects of the East African Community

(EAC) in lowering trade costs for the agricultural, manufacturing and mining sectors. The first part of the chapter calculates comprehensive trade costs, using an approach by Novy (2013), and decomposes it into tariffs and non-tariff trade costs. The second part of the chapter, uses these measures of trade costs in a gravity model to estimate the effects of the EAC on tariffs and Non-Tariff Measures (NTMs). The results indicate that the EAC is associated with the reduction of overall trade costs across all sectors. When the trade costs are further broken down into tariffs and NTMs, the impact of the EAC is seen to have been more successful in reduction of tariffs than NTMs across all sectors. This indicates that as EAC countries reduced tariffs, they adopted NTMs to protect their domestic industries from regional competition. The only sector with a significant reduction in NTMs is the manufacturing sector and this can be attributed to the weak industrial capacities in most EAC countries. Gains from lower domestic prices will outweigh the firm's profits if their domestic market were protected.

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Chapter 1

Background and Motivation

1.1 Introduction

The world trading system has witnessed a shift of attention from multilateral trade negotiations to preferential trade agreements (PTAs) over the last few decades. Progress in multilateral trade negotiations, under the World Trade Organization (WTO), has been slow while the number of PTAs have exponentially increased. At the end of 2019, the WTO indicates that there were 301 PTAs in force, an increase of more than five-fold since the early 1990s, with both developed and developing countries heavily involved in their negotiations. With virtually all countries in the world currently being members of at least one PTA, the value of international trade governed by PTA policies has substantially increased. A report by the United National Conference on Trade and Development (UNCTAD) noted that about 50 percent of international trade in most countries occur under some form of a PTA (UNCTAD 2015).

While the growth of PTAs has been remarkable, the most defining transformation in international trade is the increase in the breadth and depth of their trade policies. The breadth of a trade policy refers to the number of policies negotiated. These policies include tariffs, Non-Tariff Measures (NTMs), policies on trade in services, policies on investment, included intellectual property rights, competition polices and policies on government procurement. The depth of a trade policy refers to the level

of application of the policies by the PTA countries. The PTA can either adopt non-reciprocal policies in the case of the General Systems of Preferences (GSP), reciprocal bilateral policies in the case of a Free Trade Agreement (FTA), or common external policies in the case of a Customs Union (CU). The diversity in the design and content of PTAs show the clear difference in the objectives and perceived benefits that countries seek when negotiating them. This makes them an interesting object of study with researchers attempting to explain the reasons for their formation, their designs and their consequences.

This thesis contributes to the debate on the consequences of PTAs through assessment of the trade and welfare effects on the member countries. In particular, this thesis examines the potential and actual impacts of the East African Community (EAC), which is hailed as one of the most successful PTAs in Africa (Koami et al. 2016). At the initial stages of the formation of a PTA, an assessment of its potential effects for each member country is necessary since it shapes each country's negotiating strategy and decision whether to join the PTA. After the PTA has been implemented, an assessment of the actual impact on each member country is necessary to determine whether the PTA's objectives have been met and what adjustments may be needed to exploit the full benefits of trade liberalization.

There is a rich and diverse academic literature, incorporating both theoretical and empirical studies, that examines the effects of PTAs. The theoretical studies can be divided into two main groups: those estimating static effects, which are the one-off welfare impacts resulting from changes in prices, and those estimating the dynamic effects, which are the medium-term and long-term welfare impacts of PTAs due to higher investments and technological progress. The empirical studies can also be divided into two groups: the ex-ante analysis, which is the quantification of possible future effects of a PTA, and the ex-post analysis, which is the measurement of the effects of a PTA that is already in place.

This chapter surveys the academic literature on the welfare effects of PTAs. The main goal is to provide a background for the analyses in subsequent chapters. The

remainder of the chapter is organized as follows. Section 1.2 gives a brief review of the evolution of PTAs. Section 1.3 examines the theoretical literature on static and dynamic effects of PTAs. Section 1.4 examines the ex-ante and ex-post models for evaluation of welfare. Section 1.5 provides the aims and objectives of this thesis. Finally, section 1.6 gives an overview of the analysis in subsequent chapters.

1.2 Evolution of PTAs

Preferential trading is a concept whose history can be traced back to the early nineteenth century. Most of the PTAs then were between colonies under an empire and bilateral agreements mainly between European countries. However, the First and Second World Wars shattered most of these trade agreements (Brown 2009). The modern form of PTAs commenced after the Second World War, guided by the provisions created in the General Agreement on Tariffs and Trade (GATT) in 1948.

The GATT (later succeeded by the WTO in 1994) ushered in the idea of a wider and multilateral system of trade being more beneficial compared to the preferential trade systems that had been common previously. The GATT's core principle was non-discrimination in trade with its centrepiece being the Most Favoured Nation (MFN) principle. The MFN principle requires WTO members to grant equal advantage, privilege, favour or immunity to similar products from other members with respect to tariffs and other trade policies. However, it also included a provision for exceptions to the MFN principle that will allow for the formation of PTAs with the understanding that their aim is to facilitate the trade between its parties and not to raise trade barriers with other countries (Irwin et al. 2008).

Article XXIV of the GATT provides rules for the formation and operationalization of Free Trade Agreements (FTA) and Customs Unions (CU) that cover the trade in goods. An FTA is a form of PTA where all trade restrictions are completely removed across member countries, but each continues to maintain autonomous trade barriers with non-member countries. A Customs Union (CU) is similar to an FTA but goes a step further by uniting the external trade policies of all members and

adoption of a Common External Tariff (CET). The GATT required that, in formation of either the FTA or the CU, the duties and other restrictions affecting 'substantially all' the trade among the member countries should be removed. Further, any FTA formed should not raise their external tariffs for non-member countries, while the CET of any CU should not exceed that of individual external tariffs of members countries prior to the formation of the CU. This set the stage for the formation of PTAs which can be grouped into three waves.

The first wave of PTAs commenced within ten years of negotiations of the GATT up until the 1970s. The main idea behind their formation was the opportunity to undertake trade liberalization beyond what was being provided in the GATT. This started with the formation of the European Economic Community (EEC) in 1958 that later became the European Union (EU) in 1993. The establishment of the EEC prompted the formation of the European Free Trade Area (EFTA) in 1959 by other European countries that chose to stay outside the EEC. The European integration motivated other regions to form PTAs including the Canada-US Automobile Products Trade Agreement formed in 1965, which went ahead to become the North African Free Trade Area (NAFTA) in 1994, and the Association of South East Asian Nations (ASEAN) in 1977. The European model of integration was also adopted by developing nations in Africa, Central America and South America, majorly following colonial lines. Some of the earliest ones include the Latin America Free Trade Association (LAFTA) and the Central American Common Market (CACM) in 1960, the Yaoundé Convention between the EEC and former French, Belgian and Italian colonies in Africa in 1963 and the East African Community (EAC) in 1967. However, by the end of the 1970's, a number of PTAs among developing countries collapsed including the CACM and EAC (De Melo and Panagariya 1995). Bhagwati (1995) noted the reason for the collapse was the attempt by developing countries to use PTAs to allocate industries by bureaucratic negotiations rather than using trade liberalisation, and hence prices, to guide allotment.

These early advancements in PTAs had a significant impact on the GATT ne-

gotiations. There have been eight successful rounds of GATT/WTO negotiations between 1947 and 1994 and one round that has been in a stalemate since 2001. The MFN tariff reductions was a subject covered in each of them while the last three successful rounds of negotiations introduced other policies that had been featured separately in various PTA negotiations. This is a clear indication that the deeper negotiations at PTA levels encouraged countries to seek reciprocal treatment at a multilateral level. The Kennedy Round (1964 – 1967) brought to the forefront the anti-dumping agreement. The Tokyo Round (1973 – 1979) covered a raft of NTMs and adopted other 'framework' agreements including the Enabling Clause, which provided for the General Systems of Preferences (GSP) agreements. The GSPs are a system of generalized, nonreciprocal preferences by developed countries to developing countries with the aim of promoting their participation in world trade. The Uruguay Round (1986 – 1994) became the most extensive of all GATT negotiations and was characterised by a number of proposals to extend the multilateral trade agreement into several new areas. Apart from tariffs, other subjects covered included non-tariff barriers, intellectual property rights, dispute settlement, textiles, and policies on agriculture. It also led to the establishment of the WTO that took over from the GATT and adoption of the General Agreement of Trade in Services (GATS) to provide for an arrangement covering trade in services (WTO 2011).

The second wave of PTA formations began in the early 1980s after the Tokyo Round of negotiations up until the early 2000s. Europe was still a key driver in the second wave of PTAs, deepening its integration to form the EU single market in 1993. The EU also expanded its membership to incorporate Central and Eastern European countries in the early 2000s. The North Americans followed suit with the formation of NAFTA in 1994 which included Mexico. The period also saw the introduction of cross-regional PTAs with the EU negotiating a number of bilateral FTAs with Middle East and North African countries in the 1990s while the US negotiated an FTA with Israel in 1985. Among developing countries, old PTAs that had stalled such as the CACM and EAC were revived during the period. In addition, new PTAs

were established including the MERCUSOR in South America, the Association of Southeast Asian Nations (ASEAN), the Southern Africa Development Community (SADC) and Common Market of East and Southern Africa (COMESA). The adoption of the Enabling Clause in the Tokyo Round of negotiations also led to formation of GSP agreements between a number of developed and developing countries such as the Africa Growth Opportunities Act (AGOA) in 2000 between the US and African countries, and the Everything but Arms (EBA) in 2001 between the EU and African countries.

With more countries increasingly participating in international trade and their production networks more intertwined, a third wave of PTA formations has been witnessed in the last two decades. These PTAs include trans-regional initiatives such as the Comprehensive and Progressive Agreement on Trans-Pacific Partnership (CPTTP) in 2018 and the proposed African Free Trade Agreement (AFTA). PTA to Country agreements have also been formed for example the EU-Canada FTA in 2017. Finally, an increase in economic growth among developing countries has led to some of the GSP agreements being turned into FTAs such as the EU-SADC FTA in 2016.

The second and third waves had the highest number of PTAs negotiated. Existing literature points out to at least three reasons for this explosion of PTAs. First, the lengthy duration and complexity of multilateral trade negotiations increased the interest in PTAs since they were seen to have a better chance of success (Capling and Low 2010). The complexity in the Uruguay round of negotiations (1986-1994) and the Doha round of negotiations that commenced in 2001 but has been in a stalemate ever since have prompted several countries to pursue PTAs as an insurance in the event of a failure of the negotiations. However, other researchers viewed the explosion of the PTAs as the reason for the slow pace in multilateral negotiations, especially the Doha round (Bhagwati 2008). Second, the fear of market share loss due to being excluded from existing PTAs has also pushed countries to sign up to PTAs (Baldwin and Jaimovich 2012). Lastly, and arguably the largest contributor to

the rise in PTAs has been the contents of these agreements. The contents of PTAs have expanded to include not only trade in goods but also other socio-economic and political aspects such as trade in services, policies on investments, competition policies, intellectual property rights, dispute settlements, environmental protection, security, governance, democracy and human rights.

Despite CU being seen by reseachers as being the superior PTA (Ornelas 2007), FTAs have been more popular. As of 2019, WTO indicated that FTAs accounted for 86 percent of all PTAs in force, CU accounted for 6 percent while GSPs and other Economic Integration Agreements (EIA) accounted for 9 percent as seen in figure 1.1. The popularity of FTAs may be because of the unwillingness of countries to lose sovereignty since they are eager to form trading blocs with their closest trading partners but reluctant to go the extra step of pooling control over their trade policy.

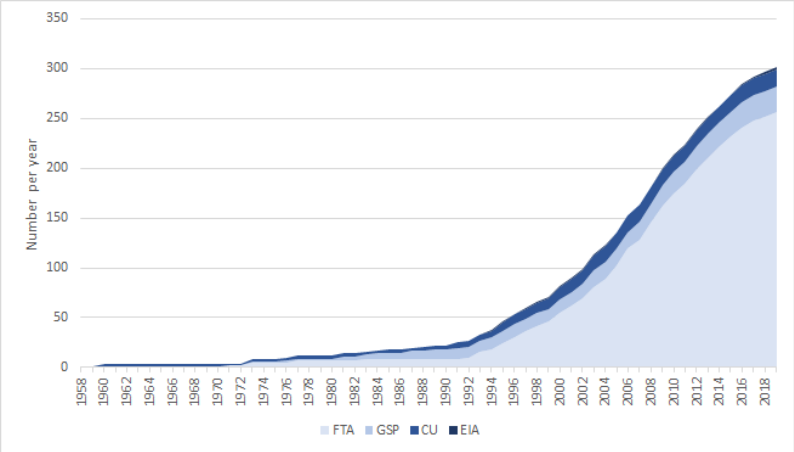

Figure 1.1: Evolution of PTAs by type of integration
Source: WTO Regional Trade Agreements database

1.3 Review of Theoretical Literature on PTAs

The effects of PTAs on economic welfare can be comprehensively categorized into static and dynamic effects (Bhagwati and Panagariya 1996). Static effects are the one-off effects due to improvement in allocative and productive efficiency. Trade liberalization opens a country's domestic market to foreign competition thus forcing domestic firms to reduce prices thereby shrinking their profit margins. The reduction

in profit margins force the less-productive firms out of the market thereby reallocating market shares to more-efficient firms that can produce at lower prices. The lower prices benefit the consumer by increasing their purchasing power. Viner (1950) pioneered the static analysis of PTAs and introduced the concepts of 'trade creation' and 'trade diversion'. The dynamic effects are the medium-term and long-term impacts of PTAs attributed to higher levels of investment and rapid technological progress. The pressure from foreign competition, the selection of firms due to reallocation of market shares, and the opening up of foreign markets induces firms to increase their investments in innovation and technology to improve their productivity and stay ahead of their competitors (Impullitti and Licandro 2018). This section will theoretically review these two effects.

1.3.1 Static Effects of PTAs

Viner's Model

Viner (1950) seminal contribution titled *'The Customs Union Issue'* was the first to propose a concrete criterion for evaluating the welfare effect of a PTA. Viner showed that in the world of trade protection, the reduction of certain trade barriers through formation of a PTA involves two fundamental effects: trade creation and trade diversion. He described 'trade creation' as a shift of consumption by a country from a higher-cost domestically produced good to a lower-cost import from another PTA country. This shift has two aspects: the production effect which is the reduction of domestic production of a good in favour of its importation from a cheaper partner country, and the consumption effect, which is the increase in domestic consumption of a good due to a reduction in its domestic market price. On the other hand, he described trade diversion as a shift of imports from a lower-cost non-member country to higher-cost PTA country. This shift increases the cost of producing the good. Viner argued that 'trade creation' increases welfare while 'trade diversion' reduces welfare.

Figure 1.2 can be used to explain trade creation effect using a partial equilibrium

diagram with three countries ('Home', 'Partner' and 'RoW') and a single commodity. The figure illustrates the demand and supply of the good in Home's domestic market. It is assumed that Home is a small country in economic sense thus it is unable to influence international prices. It is also assumed that Partner is a more efficient producer of the good, followed by RoW while Home is the least efficient producer. Before formation of the PTA with Partner, Home imposes a non-discriminatory tariff on all imports of the good from both countries. Therefore, Home's consumers purchase Q_d units of the good with Q_s being domestically produced and Q_d-Q_s being imported from Partner.

After forming the PTA, Home removes tariffs on imports from Partner leading to a lower domestic price of the import good. This drop in price causes Home's consumers to increase demand to Q'_d while Home's domestic production contracts to Q'_s. This leads to a production effect, given by the reduction in production by Home in favour of the cheaper imports from Partner (Q_s-Q'_s), and a consumption effect, given by the increase in domestic consumption in Home country due to the lower domestic prices (Q'_d-Q_d).On the other hand, formation of the PTA also leads to a loss in Home's tariff revenue on imports Q_d-Q_s.

Figure 1.2: Trade creation effects of a PTA

Figure 1.3 demonstrates the trade diversion effect using a partial equilibrium analysis of a three country ('Home', 'Partner' and 'RoW') framework with a single commodity. The figure illustrates the demand and supply of the good in Home's domestic market. It is assumed that Home is a small country in economic sense thus it is unable to influence international prices. It is also assumed that Home is the least efficient producer, followed by Partner while RoW is the most efficient producer. Before formation of the PTA, Home's consumers purchase Q_d units of the good with Q_s being domestically produced and $Q_d - Q_s$ being imported from RoW, which is the cheapest supplier.

After forming the PTA, Home removes tariffs on imports from Partner making their good to be cheaper compared to that of the RoW and Home. The lower domestic price causes Home's consumers to increase demand to Q'_d while domestic production contracts to Q'_s. The country now sources all its imports from Partner rather than RoW since they are cheaper. This leads to a production effect, given by the reduction in production by Home in favour of the cheaper imports from Partner $(Q_s - Q'_s)$, and the consumption effect, given by the increase in domestic consumption in Home country due to the lower domestic prices $(Q'_d - Q_d)$. On the other hand, formation of the PTA also leads to a loss in Home's tariff revenue on imports $Q_d - Q_s$.

The analysis so far has considered the changes in prices and quantities. The welfare effects entails understanding the implications of the PTA on consumer surplus, producer surplus and tariff revenue. Consumer surplus is the net benefit to the consumers from the market, which is the difference between what the consumers are willing to pay for a good and what they actually pay for it. In both figures, this is represented by the area below the demand curve but above the market price. Producer surplus is how much domestic producers benefit from selling their outputs in the market and, in both figures, it is represented by the area above the supply curve but below the market price. Tariff revenue is the tariff multiplied by the quantity of imports. The net welfare effect for a country is the sum of changes in consumer

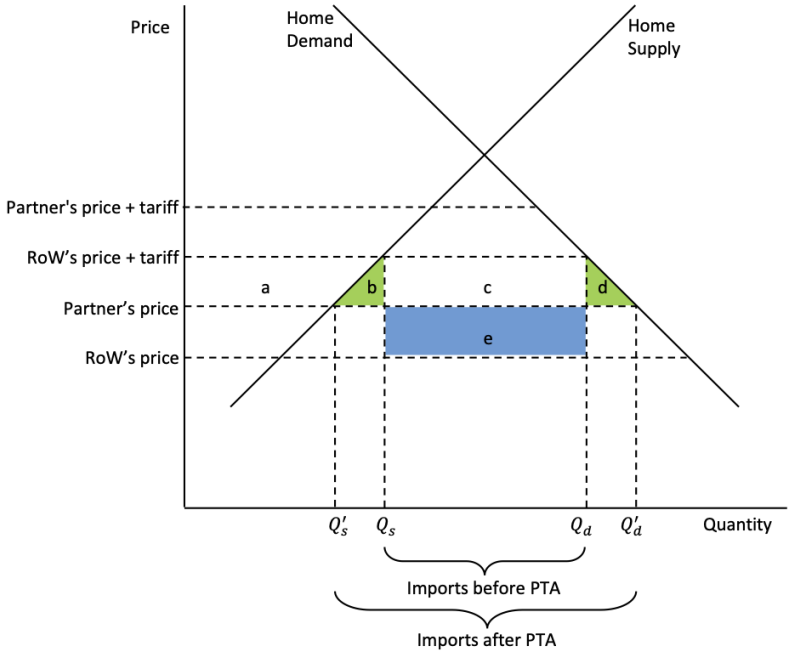

Figure 1.3: Trade diversion effects of a PTA

surplus, producer surplus and tariff revenue.

From figure 1.2, the trade creation effect will lead to gains in consumer surplus given by the sum of the areas $a + b + c + d$, loss in producer surplus corresponds to area a and the loss in tariff revenue corresponds to area c. Therefore, the net welfare effect for trade creation is given by $b + d$ meaning that trade creation will always lead to a gain in welfare.

In the case of trade diversion as demonstrated in figure 1.3, the gains from consumer surplus due to formation of the PTA is the sum of the areas $a+b+c+d$, the loss in producer surplus corresponds to the area a and the loss in tariff revenue is the sum of areas $(c + e)$. Therefore, the net welfare effect of the PTA for Home country is given by $(b + d - e)$. If the sum of the efficiency gains $(b + d)$ are higher than the loss in tariff revenue (e), then the PTA is beneficial for Home country. Otherwise, the net welfare effect is negative. Thus, the net welfare effect from trade diversion is ambiguous.

Viner's analysis came at a time when there was a debate on whether regionalism was a better option compared to multilateralism. The classical argument as proposed in Article XXIV of the GATT was that PTAs were efficient and welfare improving

since they reduced tariffs to zero for its members and did not increase tariffs for non-member countries. However, Viner's model was instrumental in showing that a PTA could either have a positive or a negative impact on welfare. He argued that trade diversion may not necessarily be harmful to welfare since it will depend on whether the gains in consumer surplus due to a fall in domestic prices is sufficient enough to offset the loss in tariff revenue. He concluded that the question on whether PTAs are good or bad remains open from a theoretical perspective. This led to the famous Viner ambiguity: 'where the trade-diverting effect is predominant, at least one of the member countries is bound to be injured, the two combined will suffer a net injury, and there will be injury to the outside world and to the world at large' (Viner 1950). Despite the general acceptance of Viner's initial contribution, a number of criticism have been raised pointing out that Viner's trade creation and trade diversion effects may not be sufficient measures to determine the welfare effect of PTAs since they fail to cover all effects generated by preferential tariff liberalization (Baldwin 2008).

Subsequent Development to Viner's model

The Vinerian ambiguity formed the basis of PTA literature and became a driving force for subsequent welfare analysis by authors who sought to consider different conditions under which PTAs may improve or reduce welfare. Viner's analysis now fits into the theory of second best by Lipsey and Lancaster (1956). The theory holds that for any given distorted economic system, elimination of one set of distortions does not guarantee an improvement in the overall economic welfare so long as other distortions remain. When applied to the analysis of PTAs, this theory implies that a preferential reduction in trade restrictions may not improve the welfare of an individual country or the whole world. In this context, subsequent authors focused on studying the effects of PTAs in the presence of multiple goods.

The focus on the market of only one good makes the Viner model ignore interactions with other goods markets that will also be affected by the tariff liberalization. Meade (1955) noted that Viner's partial equilibrium analysis only accounted for the

effect of change in tariffs on a single good since it assumed that income and all other prices remain unchanged. He argued that additional welfare could be gained if we consider the secondary effects of the change in tariffs on complementary and substitute goods. The consideration of all possible secondary effects in an economy will require the use of a general equilibrium analysis framework.

The earliest general equilibrium analyses were based on the three-country two-commodity framework, with some notable applications by Meade (1955) and Lipsey (1957). This framework developed a new approach of welfare analysis where the impact of a PTA can be captured by two terms: the 'trade-volume' effect which is related to the change in consumption due to a change in tariffs, and the 'trade-price' effect which is related to the change in terms of trade. Terms of trade is the differences in the cost of exports relative to imports, due to a change in prices. However, analysing trade in such a framework was still termed insufficient since the trade pattern had to be asymmetric and the formation of a PTA led to a complete reorientation of the previous trade patterns.

With only two goods, one must be an export and another an import for each country. In addition, a two-commodity framework meant that a country could either trade with its partner or with the rest of the world after formation of a PTA. This does not capture the realistic case where a country can trade with both PTA countries and other non-member countries. Further, a two-commodity framework could not effectively be utilized in comparing the welfare benefits from different forms of PTAs. In a two-commodity model, countries forming a PTA will ultimately import different types of goods from each other so the impact of an FTA and a CU will be equivalent. The relation of complementarity in demand can only be analysed in a model with three commodities.

The three-country three-commodity framework was first introduced by Meade (1955) and later extended and modified by a number of authors including Vanek (1965) and Lipsey (1970). This framework was based on two critical assumptions: that the formation of a PTA does not change the existing international trade patterns

as in the case of the two-commodity models and that all countries consume all goods but need not trade in all of them. Lloyd (1982) examined four variations of the three-commodity framework. He subjected them to a similar general equilibrium framework and found out that the differences in their propositions was due to the difference in the assumptions of their patterns of trade among the countries and the sizes of the countries considered. He noted that they yielded welfare results that were different from those of the two-commodity framework with 'the larger number of relative price changes and the possibilities of complementarity giving rise to more ambiguities' (ibid.).

Since the results of the three-commodity models were defined by the particular patterns of trade adopted, some authors considered models with a greater number of goods. Three-country n-commodity framework were developed to incorporate all possible patterns of trade. Berglas (1979) discussed an extension of his three-commodity model to incorporate n goods showing that two small countries can have an improvement in welfare depending on the nature of the terms of trade. Wooton (1986) modified and extended the n commodity framework of Berglas (1979) but maintained the two critical assumptions as in the other three-commodity models. He found out that when an arbitrary number of traded goods are considered, two small countries forming an PTA will gain if their volume of international trade increases while if two large countries form an PTA, their welfare will depend on the movements of the world prices. Harrison et al. (1993) adapted the model by Wooton (1986) and proposed two new channels for decomposition of the welfare changes from formation of a PTA: the 'home-price' effect, which is the consumer and producers gains due to changes in domestic prices, and the 'tariff-revenue' effect, which is the loss in tariff revenue by the government.

Despite the criticisms, Viner's model has remained a central structure in the policy debates since the concepts of trade creation and trade diversion are seen to be highly effective in focusing policy analysts on the welfare effects of PTAs (Panagariya 2000). The model provides some of the basic aspects to focus on when

deciding whether forming a PTA is good or bad based on whether it leads to a net trade creation or a net trade diversion. For example, a number of studies use gravity models to empirically test the partial-equilibrium effects of forming PTAs with the volume of trade as the dependent variable. In such a case, the gains or losses in trade are measured in terms of the trade creation and trade diversion effects. However, the correct procedure for measuring the impact of PTAs is to assess the welfare effects using general equilibrium models (Harrison et al. 1993).

1.3.2 Dynamic Effects of PTAs

In assessing the welfare effects of PTAs, a number of authors noted that the static effects accounted for very small gains. Therefore, to explain the evident success of PTAs, an alternative way of evaluation emerged. Balassa (1961) and Cooper and Massell (1965) were among the first to introduce the dynamic effect of PTAs. Balassa (1961) defined dynamic effects as the hypothetical growth of national income achievable with a given resource use and savings ratio. Whereas static efficiency would require that the economy operates on its production possibility frontier, the movement of this frontier outwards can represent dynamic efficiency. Brada and Mendez (1988) noted that, unlike the static effects that have an established theoretical framework, dynamic effects are generally presented as a series of separate and often unrelated phenomena that cannot be easily captured by a single model. Some of the most important dynamic effects are economies of scale, enhanced competitiveness and increased incentives for foreign direct investments (FDI).

Economies of scale are the reduction in average costs as outputs increases. They result from the efficient use of factors of production in large-scale production thus lowering the average cost of production and increasing output. Corden (1972)was the first to investigate the influence of economies of scale on the welfare effects of PTAs. He indicated that the formation of a PTA will increase the market for commodities in a member country, hence an increase in production at a lower average cost. He termed this reduction in prices due to economies of scale as the 'cost-reduction'

effect. He also observed that economies of scale could have negative welfare effects since formation of a PTA will lead to a reduction in exports by a non-member country to the PTA countries. He termed this as the 'trade-suppression' effect. Due to the close similarity of Corden's concepts to Viner's concept, Krauss (1972) suggested that the economies of scale effects should be accommodated as extensions rather than supplements of the trade creation and trade diversions effects.

In addition, PTAs may increase competition by eroding the market power of dominant firms in member countries previously protected by tariffs. This healthy competition within the PTA weeds out less productive firms and favours more productive firms. This pro-competitive effect also leads to improvements in productivity and efficiency due to increased investment in more efficient technology, improvement in structural efficiencies and resource allocation, and specialization in production (Baldwin and Venables 1995). However, the benefits of economies of scale and pro-competitive effects are not guaranteed since for one to be achieved, the other will be impacted. Industrial restructuring due to competition may lead to oligopoly markets within the PTA, which will inhibit the price-reduction effect (Haaland and Wooton 1991).

Lastly, formation of a PTA attracts long-term foreign direct investment (FDI) flows through two channels: horizontal and vertical FDI. Horizontal FDI is motivated by the trade-off between concentration of production and trade costs. If formation of a PTA leads to creation of a large market that allows for exploitation of economies of scale, this may motivate multinational corporations (MNCs) with no presence in the region to set up a plant in a PTA country that will serve the whole market. Vertical FDI is explained by the differences in relative factor endowment and the resulting factor price differentials among PTA countries. MNCs will fragment their production process and decentralize the different stages of production to the PTA countries with the most cost-efficient factor inputs. The FDI movement comes with additional benefit of transfer of technology and managerial expertise to the recipient country (Markusen 2004).

1.4 Empirical Evaluation of the Welfare Effects of PTAs

These welfare effects of PTAs can be empirically evaluated by either undertaking ex-ante analysis, which is the quantification of possible future effects of a PTA, or ex-post analysis, which is the measurement of the effects of a PTA that is already place. Ex-ante analyses commonly use computable general equilibrium (CGE) models while ex-post analyses can employ either CGE models or other econometric approaches such as the structural gravity model. Both models are micro-founded and can be used to measure partial and general equilibrium trade effects.

CGE models are large-scale complex models that capture demand and supply in each sector, and interlinkages among sectors. They feature multiple dimensions of the economy including endogenous capital accumulation, non-homothetic preferences, multiple sectors and multiple factors of production. An advantage of the CGE models is that by having more features in a model, it is possible to explore the trade effects at a more detailed sector-level or factor level. However, their extensiveness and complexity is also a disadvantage since it makes the results more difficult to interpret, a feature that a number of researchers regard as a black box (Costinot and Rodriguez-Clare 2014; Hertel et al. 2007).

Structural gravity models contain fewer parameters and can consider either a single sector or be extended to cover multiple sectors. They provide a closer linkage between theory and data with equations being derived directly from theory and all parameters in the model are estimated using the same database used for simulation. Some researchers consider the simplicity of structural gravity models as an advantage since it makes them easier to estimate and interpret compared to the CGE models. However, others see it as a disadvantage since it does not capture the present-day complexities of PTAs (Costinot and Rodriguez-Clare 2014).

1.5 Research Aims and Objectives

The aim of this thesis is to understand how formation of the EAC affected the economies of its member countries and whether it is the best trade liberalization strategy for them. The thesis undertakes both a theoretical and an empirical analysis to examine the trade and welfare effects of the EAC through the goods channel. The study makes qualitative predictions on the welfare effects using an oligopolistic trade model. It then undertakes an ex-post analysis of the trade and welfare effect using the gravity model. It should be noted that the EAC also has other provisions such as liberalization of trade in services and investments, but they are not included in this study. The specific objectives of this thesis are as follows:

i To determine the type of PTA that will offer the highest welfare gains for its member countries when they differ in the sizes of their markets.

ii To assess the trade and welfare effects of the EAC on each member country.

iii To investigate the impact of the EAC on tariffs and Non-Tariff Measures (NTMs).

1.6 Organization of the Thesis

The remainder of the thesis consists of four main chapters. Chapter 2 presents a political economy analysis of the challenges facing the EAC. The objective is to examine the progress of the EAC countries towards implementation of the Customs Union. It also investigates how far the lessons learnt from the first attempt of the EAC have shaped the current progress of economic integration. The purpose of this chapter is to give a background to the EAC and underscore the need for research on its trade and welfare effects on member countries. Chapter 3 analyses the welfare effects from formation of a Preferential Trade Agreement (PTA) between countries that differ in the market sizes. Using a stylized three-country model of international trade under oligopoly, the paper compares the differences in welfare implications

between a Free Trade Agreement (FTA) and a Customs Union (CU) on the member countries.

Chapter 4 assesses whether the East African Community (EAC) countries benefited from trade liberalization. It quantifies the trade creation, trade diversion and the welfare effects of trade liberalization on the EAC countries using an estimation and general equilibrium simulation procedure built around the structural microfoundations of the gravity equation. Chapter 5 empirically investigates the effects of the East African Community (EAC) on trade costs. First, it measures bilateral trade costs and then decomposes it into tariff and non-tariff trade costs. These trade costs are constructed separately for agriculture, manufacturing and mining sectors. Second, the chapter estimates the effects of the EAC on the measured trade costs using a gravity model. The final chapter is the conclusion. It provides a discussion of the overall findings and the implications of the results.

Chapter 2

Background of the East African Community

2.1 Introduction

The East African Community (EAC) is a Preferential Trade Agreement (PTA) that came into force in 2000 following ratification by the three original countries: Kenya, Tanzania and Uganda. They were later joined by Burundi and Rwanda in 2007 and South Sudan in 2016. The EAC is an ambitious agreement focused on pursuing trade and economic integration with the idea that it will address some of the constraints that hinder their economic development thereby increasing their economic growth and employment prospects. With an ultimate goal of forming a political federation, the EAC has made substantial steps in its integration process and is currently regarded as the most integrated PTA in Africa (Koami et al. 2016).

The EAC has pursued a linear model of integration, starting with the formation of a Free Trade Agreement (FTA) in 2000. It then launched a Customs Union protocol in 2005 with a five-year transitional period that ended with the establishment of a fully-fledged Customs Union (CU) in 2010. Thereafter, it launched a Single Market protocol in 2010 and a Monetary Union protocol in 2013. However, EAC countries are yet to finalize the process of amending their national policies, laws and

systems to conform to these two protocols. Based on this progress, the EAC's main focus so far has been on trade liberalization for goods.

Trade liberalization in goods entails removal of trade costs, which are broadly categorised as tariffs and Non-Tariff Measures (NTMs). Although implementation of the FTA and the CU was intended to remove all intra-EAC trade costs and adopt a common external policy, some impediments still remain. So far, most intra-EAC tariffs have been successfully reduced and a Common External Tariffs (CET) adopted but NTMs are still prevalent in the region. In addition, overlap in membership of regional PTAs by EAC countries is also a threat to the implementation of the CET. These impediments are likely to be a contributing factor to the slow implementation of deeper forms of integration such as the Single Market and Monetary Union.

To understand these challenges in the EAC, one must study the history of integrations the region. The current EAC is a second attempt to economic integration in the region with the first attempt collapsing in 1977 after 10 years in existence. The failure of the first EAC was largely due to political and economic differences among its members. To guarantee success in its second attempt, the EAC had to consider the lessons learnt from the collapse of its predecessor and put measures that will help it avoid repetition of old mistakes. Its rapid progress to achieving a Customs Union within 10 years may be attributed to the preventive measures taken from the lessons learnt. However, some of the reasons that led to the disintegration, such as the economic differences among its members, could be a contributing factor to the slow pace in further deepening of the current EAC.

This chapter presents a political economy analysis of the challenges facing the EAC. The objective is to examine the progress in implementation of the EAC treaty by its member countries. It also investigates how far the lessons learnt from the first attempt of the EAC have shaped the current progress of economic integration. The purpose of this chapter is to give a background to the EAC and underscore the need for research on its trade and welfare effects on member countries.

The remainder of the chapter is organized as follows. Section 2.2 is a brief history

of the EAC to contextualize the current relationships among member countries. Section 2.3 reviews the economic and trade profiles of the EAC countries with a view of investigating the current challenges facing economic integration. Section 2.4 provides the conclusion.

2.2 Evolution of the EAC

The East African countries have traditionally had economic and social ties due to their close geographic location. Prior to the colonial period in the late 1800's, they were borderless and ethnic communities in the region traded freely between each other. Some of these ethnic communities are currently present in more than one country for example the Maasais, found in both Kenya and Tanzania, and the Luo, found in Kenya, Uganda and Tanzania. The colonial period in the late 1800's led to the demarcation of African countries and thereafter the need to establish trade agreements that could govern cross-country socio-economic relationships. The subsequent history of the East African integration can be broken into three segments: the colonial period; the first attempt at the EAC (1967 – 1977); and the second attempt at the EAC (2000 – to date).

2.2.1 East African Integration in the Colonial Era

Economic integration in East Africa had its origins in the early 1900s during the colonial era. At the start of the twentieth century, Kenya and Uganda were under British colonial rule. One of the first integration efforts by the British was the formation of a currency union between Kenya and Uganda in 1905 but the most definitive attempt to integrate the region was the formation of a customs union (CU) between the two countries in 1917 after completing the railway connecting them. The railway was an important economic link for the two countries since Uganda is landlocked and required access to the Kenyan coast for its exports and imports. After World War I, Tanzania fell under the control of the British since the

Germans were required to surrender all their colonial territories to other European nations under the Versailles Treaty of 1919. Tanzania was immediately incorporated into the currency union and thereafter joined the CU in 1927.

This CU had the features of current forms of CU except for a common customs administration. In place of a Common External Tariff (CET), the region instituted a system of 'transfer forms' where the import duty was calculated and transferred from the collecting country to the country of final destination of the imported good (Kahnert and Richards n.d.). The need for management of the CU and the urge for deeper integration by the three countries led to the establishment of the East African High Commission (EAHC) in 1948. The EAHC was established to administer both the political and economic matters of the three countries. It created the East African Customs and Excise Department that established a CET and removed all trade restrictions. It also created a single market and economic union with centrally managed monetary and fiscal policies. Further, it managed the operations of common services such as the regional railway and port services (East African Railways and Harbours Cooperation), the regional air service (East African Airways), the regional telecommunication sector (East African Post and Telecommunication Cooperation) and the regional university that had campuses in each country (Kimbugwe et al. 2012).

The infant industry argument may have been the key reason for adoption of the CET. The colonial administration had developed small manufacturing industries in the region and required protection from international competition. Small firms in least developed countries have little chance of competing with established firms in developed countries since the latter have higher production efficiencies so they can offer their products at a lower price in the international market. Because of this protection, researchers identify this as the 'golden age' of the region's integration since many industries and institutions were established during this period, which went on to become the backbone of post-independence East African integration (Mwithiga 2015). However, these industries were not equally distributed across

the EAC countries. Since Kenya enjoyed better infrastructural development in the region, most of these industries were established in the country. This inequality has been the main point of contention in EAC negotiations.

Despite the nature of its role, the EAHC did not propose any political federation but maintained its focus on economic integration. This was seen to have contributed to the economic success of the region since the regional institutions had minimal political interferences in their operations. Between 1959 and 1961, intra-regional trade grew by over 20 percent while trade with the rest of the world increased by over 10 percent (Segal 1966). Researchers compared the region's success at that time to the European Economic Community (EEC) despite the region not having the depth and breadth of integration like Europe (Nye 1968).

As the countries were about to achieve independence in the early 1960s, the colonial administration created the East African Common Services Organization (EACSO) in 1961 to take up the duties of the EAHC and streamline how joint services were to be managed after independence. The effort and optimism of a political federation came to the forefront post-independence with Tanzania's suggestion to have its independence delayed, if necessary, to enable the three countries to unite and form the East African Federation. By 1963, all the three countries had attained independence, and each evaluated the East African integration agreement from their national perspectives, resulting in a divergence in developmental agendas.

Tensions developed in the region immediately after independence with Tanzania being the only country that was interested in a political federation while Kenya and Uganda both preferred economic integration. Another catalyst to the tensions was the economic imbalance in the region with Kenya's economy being superior to that of Uganda and Tanzania due to its geographical position and favoured treatment during the colonial period. Kenya accounted for about 60 percent of total regional trade and 60 percent of all manufacturing industries serving the region. It also provided the headquarters for most regional joint services and was the major transit route for the EAC countries due to its superior transport infrastructure. This gradually

made it the main exporter of both goods and services in the region.

In 1964, Uganda and Tanzania advocated for a policy to address these imbalances through redistribution of industries in the region by allocation of selected new major industries in the least industrialized states and application of a quota system for their more industrialized partner. However, Kenya refused to ratify it, leading to the abandonment of the common currency by Uganda and Tanzania in an attempt to keep control of their own monetary policies (Robson 2012). In 1967, the three countries abandoned the ambitions for a political federation but agreed to maintain economic integration due to its evident success. This led to the formation of the East African Community (EAC) to take over the functions of the EASCO.

2.2.2 The 'Old' EAC

The central focus of the 1967 EAC treaty was to strengthen and regulate the industrial, commercial and other relations of its member countries. Its aim was to accelerate, harmonise and balance development in the region and expansion of economic activities with the benefits being equally shared (Eken 1979). The treaty was based on three broad areas of cooperation: harmonization of the economic policies, setting up of formal structures to administer the common institutions and setting up of the East African Single Market. The EAC treaty provided for a CET, abolishment of all intra-regional trade restrictions with the exception of a transfer tax, and harmonization of monetary and fiscal policies.

The EAC countries maintained separate currencies but agreed to harmonise their monetary policies to the extent required for the proper functioning of the Single Market (Hazlewood 1979). However, the single market was still not fully implemented since it did not embrace free movement of labour and capital (Eken 1979). The abundance of cheap low skilled labour and the lack of adequate large-scale industries equitably distributed across the region created different levels of unemployment across the countries. These unemployment levels forced each country to protect their labour markets after independence. The few large-scale industries in the re-

gion constructed by the colonial administration were based Kenya. Since there was a reasonably good transport infrastructure to reach most parts of the EAC, there was no incentive by the manufacturers for capital mobility in the region.

In addition, the EAC treaty put more focus on development and protection of manufacturing industries across the region. It did not have any provision for agricultural products despite it being key for all EAC countries (Eken 1979). The reasons for this can be traced back to the colonial administration's focus to tap raw materials and securing markets for British industries. Therefore, all EAC countries focused on production of raw or semi-processed agricultural goods that were exported mainly to Britain.

To address the pertinent issue of different levels of economic development across the region, the EAC treaty enshrined the equitable distribution of benefits of cooperation between the member countries. It abolished the fiscal redistribution pool that was part of the previous regional integration framework for compensation of the inequitable operation of the single market. It also provided three measures for promotion of balanced industrial development in the region. The first was the transfer tax which is a legalized tariff applied by Tanzania and Uganda against some Kenyan goods. Its objective was to encourage industrialization in Uganda and Tanzania by protecting their infant industries. The second was the establishment of the East African Development Bank (EADB) whose main purpose was to promote equitable industrial development by favouring Uganda and Tanzania. Lastly, it provided for relocation of the headquarters of some of the regional joint services from Kenya to other EAC countries. The headquarters of the East African Harbours Cooperation and the EAC secretariat were moved to Tanzania while the headquarters of the East African Post and Telecommunication Cooperation and the EADB were moved to Uganda.

Research has shown that the EAC had huge success over its lifetime and it was seen as one of the most economically integrated regions in the developing world during the 1960s and 1970s (Ravenhill 1979). Hazlewood (1979) noted that there

had been many attempts at economic integration in different parts of the Third World, but none covered a wide range of activities with a highly organized system such as the EAC. However, fractures were witnessed during the lifetime of the EAC caused by a number of political and economic shocks, both internal and external. The divergence in the reactions of the EAC countries to these shocks was a catalyst to final collapse of the EAC in 1977, a decade after its formation.

One of the main reasons for the collapse was the ideological and political differences of the three partner states (Ravenhill 1979). Despite the post-independence focus on the need to develop an East African Political Federation on the structures it inherited from the EACSO, each country pursued different political and economic ideologies post-independence. Economically, Kenya pursued a capitalistic development path with a market economy, Tanzania pursued socialism and self-reliance while Uganda was non-committal. The countries also had differences in foreign policy approaches with Kenya being more inclined to the USA while Uganda and Tanzania were inclined to the Soviet Union. They also differed in foreign policies with other African countries: Kenya proposed joint initiatives with Ethiopia; Uganda developed closer links with Zaire (current Democratic Republic of Congo); and Tanzania established closer relations with Zambia leading to construction of the Tanzania-Zambia railway which was outside the framework of the East African Railways Cooperation. Political volatility within Uganda, which led to a successful coup in 1971, strained the relationship between Uganda and the other EAC countries. The differences in ideologies and the political discord made the EAC unable to agree on political and economic decisions necessary for the community's operations.

Another reason that contributed to the collapse was the differences in the economic structures of the EAC countries (Segal 1966). The provisions in the treaty to address these dissimilarities were unsuccessful. Implementation of the transfer tax was derailed by a lack of centralized development to avoid duplication of industries. The independent industrial policies by each EAC country were focused on import-substitution which led to uneconomical duplication of industries. This led

to multiplication of small-scale industries such as steel-mills, but some large-scale industries were unaffected by the transfer tax due to the economic size of the EAC. Therefore, the transfer tax was unable to increase the competitiveness of the Ugandan and Tanzanian industries. The EADB also failed as an equalizing tool due to limited funds and its inability to influence the development plans of each country. As a result, these unequal benefits led to unequal economic growths especially for the manufacturing sectors in the three countries (IMF 1979).

The EAC treaty also expected that free trade will lead to increased economic growth for its member countries. However, this did not yield the desirable results since it was not trade barriers but the patterns of their production that were the primary impeded to trade. Their trade patterns can be explained using the Heckscher-Ohlin (HO) theory of international trade. The HO theory states that countries produce relatively more of the goods that use their relative abundant factor of production. Therefore, the trade relations of the three EAC countries inclined to highly industrialized countries since their exports were predominantly primary products while their imports consisted of industrialized goods. Moreover, the implementation of the Customs Union widened the economic disparities among the EAC countries since Kenya had a comparative advantage in production of industrialized goods. After implementation of the CET, it became the key source of industrialized goods for Tanzania and Uganda and compensation from loss of tariff revenue became a major concern in the region. This was further aggravated due to inadequacies with the compensation mechanism and created tension in the EAC with Kenya being regarded as the only beneficiary (Vaitsos 1978).

Occasionally, the EAC countries were unable to harmonise their monetary and fiscal policies as agreed in the Treaty. Huge disruptions were witnessed due to divergence in economic policies of the EAC countries, which undermined the spirit of the single market and contributed to the fracturing of the union. In 1967, Tanzania imposed exchange controls on Kenya while Uganda imposed exchange controls in 1970 against Kenya and Tanzania to restrict capital flight after it adopted a nation-

alisation policy. Both instances triggered retaliatory measures from the other EAC countries. Further, the countries also had different reactions to external economic shocks including Kenya's balance of payment crisis in 1971-72, the oil price shocks in 1973 and the commodity boom of 1976-77.

Ultimately, the political disagreements coupled with the increasing economic imbalances led to the collapse of the EAC. After dissolution, the EAC countries still acknowledged the benefits of integration and were willing to explore areas of future integration among themselves. They formed a Mediation Committee whose report in 1984 resolved on the division of EAC's assets and liabilities and made provision to facilitate the re-establishment of a future EAC. The 1984 Agreement for the Division of Assets and Liabilities indicated that the EAC countries were willing to explore and identify areas for future co-operation, to arrange for such co-operation where necessary, and for the continuation of certain institutions and services such as the EADB (EAC 1984).

2.2.3 The 'New' EAC

The 1990s saw an increase in the formation of PTAs between developing countries. The African Union through the 1991 Abuja Treaty proposed an integration policy for Africa. The objective of the treaty was to establish a continent-wide economic community by strengthening existing and building new PTAs. Eight PTAs were identified each with a role to ensure peace and stability in their regions, contribute to raising the living standards of the people of Africa and development of the continent through expansion of African markets, and increase in trade between African countries and the rest of the world. One of the eight PTAs identified was the EAC. The idea of reviving the EAC was considered in 1993 leading to the re-establishment of the EAC in July 2000.

The EAC Treaty outlined an ambition of developing policies and programs aimed 'at widening and deepening co-operation among partner states in political, economic and social matters for their mutual benefit' (EAC 1999). The EAC adopted the

linear model of integration that follows a stepwise integration of goods and services, labour and capital markets, culminating in monetary and fiscal integration. It is based on four key pillars: establishment of a Customs Union, a Single Market, subsequently a Monetary Union and ultimately a Political Federation. Its objective was to strengthen and consolidate economic cooperation, promote sustainable use of the region's natural resources; put in place measures for effective protection of the environment; enhance the role of women in development; and promote peace, security and good neighbourliness (EAC 1999). At its inception, the EAC comprised of the original three partner states: Kenya, Uganda and Tanzania. They were joined by Rwanda and Burundi in July 2007 and South Sudan became the sixth member in September 2016.

To guarantee success, the EAC had to consider the lessons learnt from the collapse of its predecessor. The preamble of the EAC Treaty identified the factors that led to the collapse as the 'lack of strong political will, lack of strong participation of the private sector and civil society in the cooperation activities, the continued disproportionate sharing of benefits of the Community among Partner States due to the differences in their levels of development and lack of adequate policies to address the situation' (ibid.). It went ahead to put measures to avoid repetition of old mistakes.

To ensure political commitment by the EAC leaders, the decision-making structure informed the depth and breadth of the integration and prioritised the principles of consensus and subsidiarity. Each decision of the EAC was to be taken by consensus to ensure that there was a joint agreement among all member countries before the implementation of any policy. Permanent institutions with decision-making authority were also put in place at the inception of the EAC to oversee the implementation of policies and safeguard the Treaty. It also guaranteed that decision-making is people centred and market driven by giving the private sector and civil society organizations a prominent role in the operations of the EAC. Finally, it put in place policies that will guarantee fair distribution of benefits from the cooperation. To

allay any fears of domination by the more developed countries, it provides that each stage of integration will not be rushed but implemented progressively in the course of a transition period.

In considering the differences in economic levels, the Treaty recognized that Kenya had a more developed economy than the others did so it was required, from the onset, to remove all tariffs on goods from other EAC countries. On the other hand, Uganda and Tanzania were allowed a gradual harmonization process where some level of internal tariffs was maintained for protection of their infant industries. The goods destined from Kenya to other EAC countries had a phased reduction of tariffs in each of the first five years and thereafter tariff free access would be applied. The agreement was to ensure all countries totally remove tariffs by 2005 when the discussions for the CU protocol were to be initiated. Thus, the initial focus was to operationalize an FTA as a precursor of the CU. The Treaty also proposed that the setting up of the CU was also to be done progressively over a course of a transition period.

The CU protocol was launched in July 2005 with the objective of deepening the integration process by liberalization and promotion of intra-regional trade, promotion of efficiency in production, enhancement of domestic and foreign investments and promotion of industrial diversification with a view to enhance economic development (EAC 2004). Kenya, Uganda and Tanzania were allowed a five-year transition period to harmonize their national policies, laws and regulations. The decision to adopt a long transition period was to take into account the differences in sizes and structures of the partner states. Burundi and Rwanda, who joined the EAC in 2007, agreed to a three-year transition period. This culminated in the establishment of a fully-fledged Customs Union in January 2010 characterised by a common external tariff (CET) on imports from non-member countries, a duty-free trade between partner states and a common customs procedure, which included common customs laws and a common regulatory body.

With the successful implementation of the CU, the EAC countries proceeded

to launch the Single Market protocol in July 2010. The overall objective of the Single Market is to widen and deepen the cooperation among the EAC countries in economic and social fields for their benefit (EAC 2009). This creates a single market in the community characterised by free movement of people, goods, services, labour and capital, plus a right of residency and establishment. The countries agreed to a five-year transition period to align their relevant laws with those of other partner states. However, implementation of the Protocol has lagged behind schedule and the Single Market is yet to be fully operationalized.

The EAC countries also adopted a Monetary Union protocol in 2013 with the objective of promoting and maintaining monetary and financial stability that will facilitate economic integration to attain sustainable growth and development of the Community (EAC 2013). The Monetary Union was to be characterised by a common currency with a centralized monetary authority, coordinated macroeconomic policies, central institutions and common policies for structural change and development. The countries agreed on a set of performance convergence criteria where each was required to harmonize their fiscal, monetary and exchange rate policies, and the financial sector rules and regulations by 2021. The convergence criteria incorporate a headline inflation ceiling of 8 percent of GDP, a foreign exchange reserve cover of 4.5 months of import, a fiscal deficit ceiling of 3 percent including grants and a gross public debt ceiling of 50 percent of GDP. The Monetary Union is projected to be fully operationalized in 2024 when all EAC countries will have achieved and maintained the set performance convergence criteria for at least three consecutive years and the Single Market is fully implemented.

The ultimate goal of the EAC integration process is a political federation that will entail the pooling of their national sovereignty into a central political authority with the capacity to manage better the regional resources, facilitate regional peace, stability, good neighbourliness and peaceful settlement of disputes (EAC 2014). The process toward formation of the East African Federation is being fast-tracked but the timing of its implementation is yet to be finalized. Despite political unification

being placed as the final stage of the EAC integration, it was still seen as a crucial component for the effective progression from one level to another due to the substantial loss of sovereignty by member countries (Sapir 2011). Thus from inception, the EAC laid a firm foundation for the political federation by establishing fully functioning executive, legislative and judicial organs mandated to oversee and safeguard the implementation of the EAC Treaty (EAC 2016).

Since its revival in 2000, the EAC has succeeded in achieving a significant degree of economic integration compared to other PTAs in Africa (Koami et al. 2016). Apart from trade liberalization among themselves, its significant progress in economic integration may also be attributed to the region's adoption of an outward looking integration strategy of export promotion rather than the inward-looking import-substitution strategy of its predecessor. The EAC countries have negotiated an Economic Partnership Agreement (EPA) with the European Union, which is one of their biggest trading partners, and a trade and investment framework agreement with the United State of America (USA) under the African Growth and Opportunities Act (AGOA).

However, full implementation of EAC policies have been constrained due to reluctance by member countries to comply with regional integration protocols. For example, after implementation of the Customs Union in 2010, tariffs were largely eliminated but NTMs have still persisted. Subsequent attempts to eliminate NTMs through a legislation in 2015 was also hampered by Uganda, Rwanda and Burundi delaying their assent to the law. On the other hand, the implementation of the Single Market Protocol has also been stalled due to some EAC countries delaying the harmonization of their laws, policies and systems. Movement of labour has been liberalized to a very small extent with some countries only providing free movement for the very highly skilled workers. Access to and use of land has largely remained a subject of national policies which restricting the movement of capital. The paths to a monetary union and political federation are also proving to be difficult due to lack of commitment by the EAC countries.

2.3 Current Economic and Trade Structures of the EAC

2.3.1 Macroeconomic Structures of EAC Countries

This section reviews the economic structures and performances of the EAC countries [1]. The region has a combined GDP of US$186.9 billion with a total population of 184 million as at 2018 (World Bank WDI). It is one of the fastest growing regions in the world with an average GDP growth rate of 5.6 percent over the last 10 years, well above the Sub-Saharan Africa (SSA) growth rate of 3.6 percent and the world growth rate of 2.5 percent. Rwanda and Tanzania are among the world's fastest growing economies in the last decade with an average economic growth of 7.1 percent and 6.3 percent respectively. Kenya (5.7 percent) and Uganda (5.4 percent) have also had modest average growth performance over the period while Burundi (2.4 percent) had the lowest average growth owing to its political and economic crises.

Kenya is the single biggest economy in the region accounting for 47 percent of EAC's GDP. It is a low-middle income country with a GDP of US$87.5 billion and has the region's highest GDP per capita of US$1,711 as of 2018. It accounts for a third of the region's population, estimated at 53 million in 2019. It is the most diverse economy in the region with the most advanced service and industrial sectors. However, the 16 percent contribution of the industrial sector to the country's GDP still trails that of Services (43 percent) and Agriculture (34 percent). Kenya's significant size in the region is because of its strategic geographical position, superior transport infrastructure, relatively skilled labour force and strong institutions compared to other countries.

Tanzania is the second largest economy in the EAC with a GDP of US$58 billion and a GDP per capita of US$1,051 as of 2018. It accounts for over a third of the region's land area and a third of its population, estimated at 56 million in 2018.

[1] It excludes analysis South Sudan in the economic and trade analysis due to unavailability of reliable data.

Compared to other EAC countries, Tanzania has a sizable share of industrial sector in its economy (25 percent of GDP) due to its vast mineral resources. However, this still trails that of Services (40 percent) and Agriculture (29 percent). Kenya and Tanzania are the only EAC countries with access to the sea, so they play a pivotal role of linking the other EAC landlocked countries to the world. However, due to its superior transport infrastructure over Tanzania, Kenya enjoys a higher volume of transit traffic compared to Tanzania. For example, 80 percent of Uganda's exports and imports passes through the Kenyan port of Mombasa.

Uganda is the third largest economy in the EAC with a GDP of US$27.5 billion and a GDP per capita of US$643 as at 2018. It accounts for about a quarter of the region's population, estimated at 43 million in 2018, with 73 percent of its workforce dependent on agriculture. Services and Agriculture are the main drivers of the economy accounting for 48 percent and 24 percent of GDP respectively. It experienced one of the world's highest growth rates of GDP per capita in the 1990s due to its sound macroeconomic policies and market-friendly business environment. However, this pace of growth declined in the past decade due to a deterioration of its terms of trade and a rapidly growing population.

Rwanda, though the second smallest country in the EAC, is seen as one of the most promising economies in the world due to its significant economic progress after the economic turmoil caused by the 1994 genocide. It has performed well in terms of macroeconomic stability, development of infrastructure, socio-economic development and institutional capacity. It is ranked as the second highest African country in the World Bank's Ease of Doing Business Index. As of 2018, it had a GDP of US$9.5 billion and a GDP per capita of US$773. Services and Agriculture are the main drivers of the economy accounting for 48 percent and 29 percent of GDP respectively.

Burundi is the smallest economy in the EAC with a GDP of US$3 billion and has the lowest GDP per capita of US$272 as at 2018. Its population is estimated at 11 million with 92 percent of its workforce dependent on agriculture. Burundi has

a fragile economy due to its permanent state of political instability. Since independence, it has endured six civil wars that have resulted in the collapse of the country's economy and an emergence of a large refugee population in the neighbouring EAC countries. The most recent slowdown in its economy was a contraction in 2015 and 2016 due to a political crisis after the country's presidential elections.

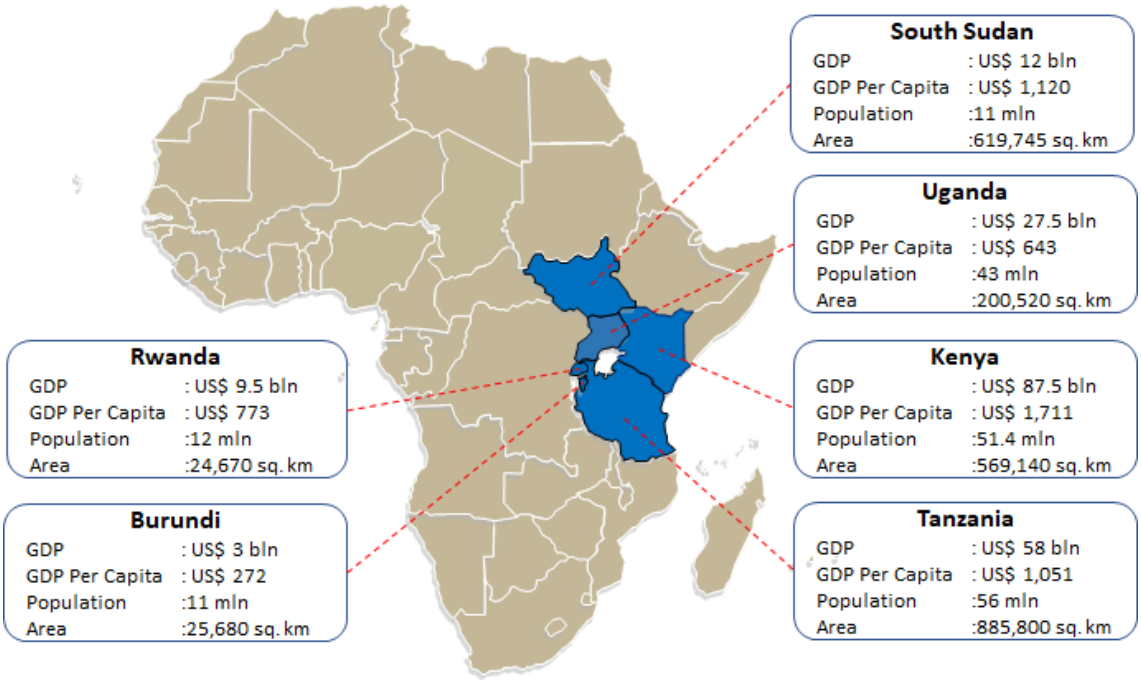

Figure 2.1: Economic structures of EAC countries, 2018
Source: World Bank's World Development Indicators
Note: GDP and GDP per capita figures measured in current US dollars

2.3.2 EAC's Trade Structure

Intra-EAC trade constitutes a small share of the region's total trade, accounting for only 20 percent of total exports and 8 percent of total imports. Kenya and Uganda are the major players in intra-EAC trade, each accounting for more than 30 percent of the region's total exports and imports. Kenya is a major exporter of manufactured products in the region while Uganda is a major exporter of agricultural products. Kenya, Tanzania and Uganda all have trade surplus in intra-EAC trade while Rwanda and Burundi have trade deficits. The low intra-EAC trade, which is dominated by a few countries, will lead to low and uneven economic benefits from

trade liberalization. Further, the trade deficits of Rwanda and Burundi may also cause a drag in their economic growth over time.

Extra-EAC trade is very significant for the EAC, accounting for more than 80 percent of its total exports and imports. The EAC's trade with African countries has been relatively balanced but despite that, all countries have a deficit on trade with other African countries except for Tanzania. This is likely due to Tanzania's significant trade with Southern African countries through its membership in the South African Development Community (SADC). On the other hand, trade with non-African countries has a deficit. In 2018, the trade deficit amounted to US$22 billion, with its exports to non-African countries covering less than 30 percent of its imports.

	Burundi	Kenya	Rwanda	Tanzania	Uganda	EAC
Total Exports (US$billions)	0.2	6.1	1.1	3.7	3.1	14.1
	% of total exports					
EAC	7.9	18.8	11.3	15.8	32.8	20.4
Rest of Africa	9.7	14.4	16.3	31.8	15.6	19.3
Rest of the World	82.4	66.8	72.4	52.3	51.6	60.4
Total Imports (US$billions)	0.8	17.4	2.5	8.6	6.7	36.0
	% of total imports					
EAC	23.2	4.5	25.4	3.2	14.3	7.9
Rest of Africa	8.3	7.5	6.7	10.0	8.3	8.2
Rest of the World	68.5	88.0	67.9	86.8	77.4	83.9

Table 2.1: Intra-EAC and Extra-EAC trade in goods, 2018
Source: UNCTADstat Database

EAC's goods exports are mainly primary products. Agriculture accounts for more than half of the total exports for Kenya and Uganda while minerals account for more than half of the exports for Burundi and Rwanda. Kenya and Tanzania are the only countries with a large share of their exports being manufactured products, accounting for more than a quarter of their total exports. On the other hand, the regions imports are predominantly manufactured products, accounting for more than 60 percent of total imports for all EAC countries. This dichotomy of the trade

structures indicates that EAC countries are still trading based on their comparative advantages in line with conventional HO trade models and that there has been limited transformation of their economies. The focus on exports of primary products and imports of manufactured products may be one of the key reasons why intra-EAC trade is relatively low even after removal of trade restrictions. Therefore, the EAC countries are likely to have minimal economic gains from trade liberalization except for Kenya which is the most industrialized country in the region.

	Burundi	Kenya	Rwanda	Tanzania	Uganda	EAC
Total Exports (US$billions)	0.2	6.1	1.1	3.7	3.1	14.1
	% of total exports					
Agriculture	37.7	60.0	26.8	40.8	57.4	51.5
Manufacturing	6.9	27.7	8.7	34.8	15.0	25.0
Minerals	53.1	6.7	55.2	22.6	23.3	18.9
Fuel	2.2	4.4	8.2	1.6	4.0	3.9
Total Imports (US$billions)	0.8	17.4	2.5	8.6	6.7	36.0
	% of total imports					
Agriculture	18.6	15.4	17.3	10.8	12.6	14.0
Manufacturing	63.9	66.4	78.4	67.1	66.4	67.4
Minerals	1.1	1.4	1.6	2.9	5.7	2.6
Fuel	16.1	15.8	3.5	17.3	14.5	15.1

Table 2.2: Breakdown of EAC countries' trade in goods, 2018
Source: UNCTADstat Database

The EAC is a net exporter of services with a surplus of US$2.8 billion in 2017. The main exporters of services are Kenya and Tanzania, and each enjoy a trade surplus while all other countries have a trade deficit. The EAC's main export is travel services while its main import is transport service. Under the travel services, all the EAC countries have a robust tourism industry due to their wildlife reserves. However, Kenya and Tanzania enjoying a larger share of that market since they have coastal attractions and superior infrastructure. On the other hand, Burundi, Rwanda and Uganda are the main importers of transport service since they are landlocked and require access to the sea through Kenya and Tanzania. Kenya stands out as the biggest beneficiary in the EAC since it has a prominent business service industry that provides financial and insurance services across the region.

A number of studies have claimed that the PTAs are likely to be successful if member countries are 'natural trading partners' including Lipsey (1970), Wonnacott and Lutz (1989) and Summers et al. (1991). One of the prominent measures for determining a country's natural trading partners is the trade complementarity. Since the EAC countries have similar production networks that are inclined to primary production, they do not make good trading partners. Both the gains in trade from exploitation of their comparative advantages and trade liberalization are expected to be small. The gains from trade liberalization are likely to arise from trade diversion rather than trade creation since the region has fewer and smaller manufacturing industries compared to other developed countries. These gains will also be asymmetric in favour of Kenya which has the most industries in the region. Furthermore, services play an important role as intermediary imports for trade in goods so low levels of trade in services have exponential effects on overall economic growth.

	Burundi	Kenya	Rwanda	Tanzania	Uganda	EAC
Total Exports (US$billions)	0.1	4.6	1.0	3.9	1.6	11.2
	% of total exports					
Goods-related services	-	0.4	1.0	-	-	0.3
Transport	3.1	34.9	19.4	29.8	9.5	27.9
Travel	4.7	19.7	43.9	58.7	57.3	40.7
Other Business Services	92.2	45.0	35.7	11.5	33.2	31.2
Total Imports (US$billions)	0.2	3.1	1.0	2.0	2.1	8.4
	% of total imports					
Goods-related services	-	2.2	8.7	-	-	1.9
Transport	63.9	33.4	38.9	38.6	57.9	42.1
Travel	10.4	8.5	29.1	40.0	10.6	19.1
Other Business Services	25.7	56.0	23.3	21.4	31.5	36.9

Table 2.3: Breakdown of EAC countries' trade in services, 2017
Source: UNCTADstat Database

2.3.3 EAC's Trade Policy

Tariffs

All EAC countries have removed tariffs on intra-regional trade and currently apply the EAC Common External Tariff (CET) on imports from non-member countries. The EAC CET is a simple three-band tariff scheme in respect to all products imported into the region comprising of a minimum rate of zero percent, a middle rate of ten percent and a maximum rate of twenty-five percent. The minimum category covers raw materials and capital goods. The medium category covers intermediate goods and other essential inputs needed in production. The maximum category covers finished products and agricultural commodities that are produced in the EAC region. In addition, the EAC countries identified a list of Sensitive Items (SI) that they gave additional protection over and above the maximum twenty-five percent duty. The list mostly contains agricultural goods that are domestically produced and traded within the region thus requiring special protection from imports originating from outside the EAC. The rationale behind this tariff structure was the infant industry argument. To enable local manufacturers build capacity in production of goods, protection in the form of import tariffs will raise the domestic price of the product and reduce imports from the rest of the world.

The EAC countries started implementing the CET at different times during the 5-year transition period provided by the Customs Union Protocol. The EAC tariff rates are mostly ad valorem and are applied on the value of imports. The impact of the CET on the simple average applied tariff rate for EAC countries as shown in figure 2.2 clearly indicates a convergence to an average rate of between 10 and 12 percent. Significant changes are seen in 2005 for the original EAC countries (Kenya, Uganda and Tanzania), and in 2009 for Burundi and Rwanda. This is in-line with the implementation dates of the EAC Customs Union Protocol for each country. However, after full implementation of the Customs Union in 2010, no additional changes in tariffs have been observed.

Successful trade policy reforms are attributed with reduction and harmonization

of the average applied tariff rates. The EAC CET has successful harmonized tariffs with a flatter tariff schedule being witnessed. However, it has not led to significant reductions in protection with the EAC countries having relatively higher applied tariffs than those of developed countries, which are typically below 5 percent. It is also interesting to note that Uganda witnessed an increase in its level of protection after adoption of the CET while all other countries had a reduction in their applied rates.

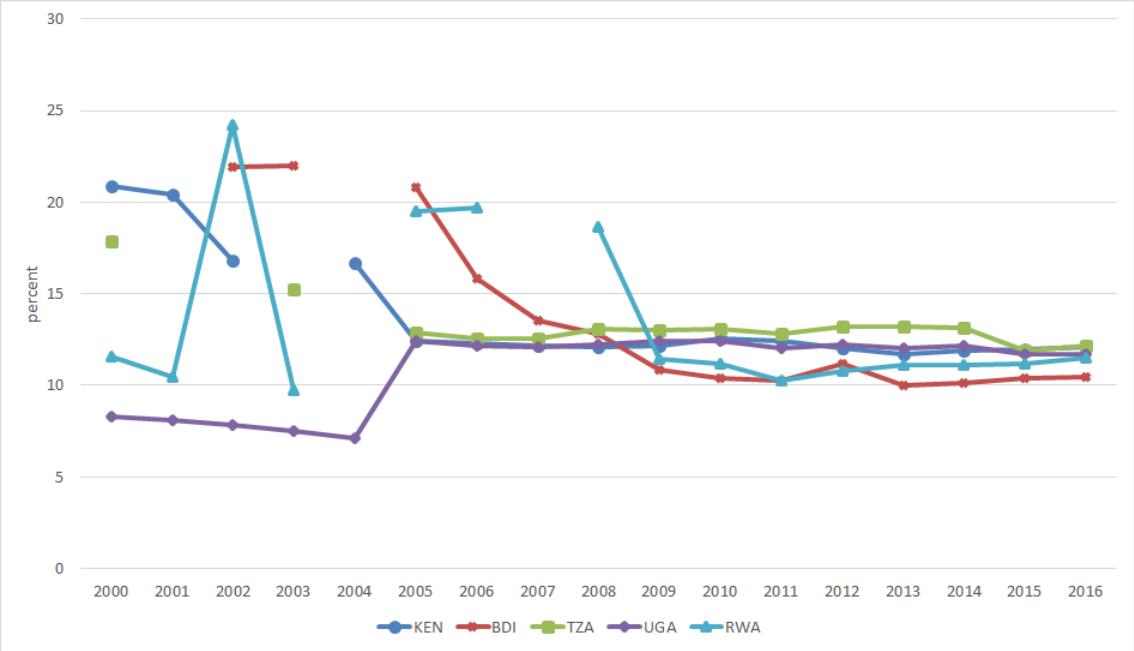

Figure 2.2: Simple average applied tariff rates in EAC countries
Source: World Bank's World Development Indicators

Non-Tariff Measures (NTMs)

Apart from the CET, the EAC countries also agreed to eliminate all NTMs that may have an effect on intra-regional trade. The EAC defines NTMs as policy measures other than tariffs that can potentially restrict trade in goods (EALA 2015). Such restrictions can take the form of national laws, regulations, administrative and technical requirements. The NTMs can be generally classified under four broad categories:

i 'Tax-like measures' which have equivalent effects to tariffs e.g. distribution

restrictions,

ii 'Quality and safety standards issues' e.g. sanitary and phytosanitary (SPS) measures,

iii 'Direct imports bans' e.g. quantity and price control measures, and

iv 'Customs and trade facilitations measures' that are not related to quality and safety standards e.g. pre-shipment inspections.

To tackle NTMs, the countries set up a monitoring mechanism in 2009 to identify and monitor their removal. As of 2016, 104 NTMs had been successfully resolved while 25 remained unresolved showing that a lot of progress has been made in tacking them (Calabrese and Eberhard-Ruiz 2016). The NTM measures identified in 2016 were distributed as follows: tax-like measures were 38 percent, customs and trade facilitation measures were 37 percent, quality and safety standards were 17 percent and direct import bans were 9 percent. Prevalent tax-like measures included non-harmonised road tolls and delays in transportation of cargo by transit vehicles. The most common customs and trade facilitation measures included prolonged clearance procedures and re-testing of products.

The degree to which EAC countries have either contributed or been affected by the NTMs varies significantly. From figure 2.3, Tanzania and Kenya have generated higher numbers of NTMs compared to the other countries. Tanzania has the highest contribution for tax-like measures while Kenya was responsible for majority of the customs and trade facilitation measures. On the other hand, NTMs affected Kenya and Uganda relatively more than the other countries. It is noted that Uganda, Rwanda and Burundi have been significantly more affected by NTMs than they have been a source of them. Since both Kenya and Tanzania are the largest economies and the only coastal countries, their significant role in the EAC trade may give them a higher chance of imposing NTMs on other countries. That notwithstanding, this may also reflect on the different degrees of commitment by countries in the EAC.

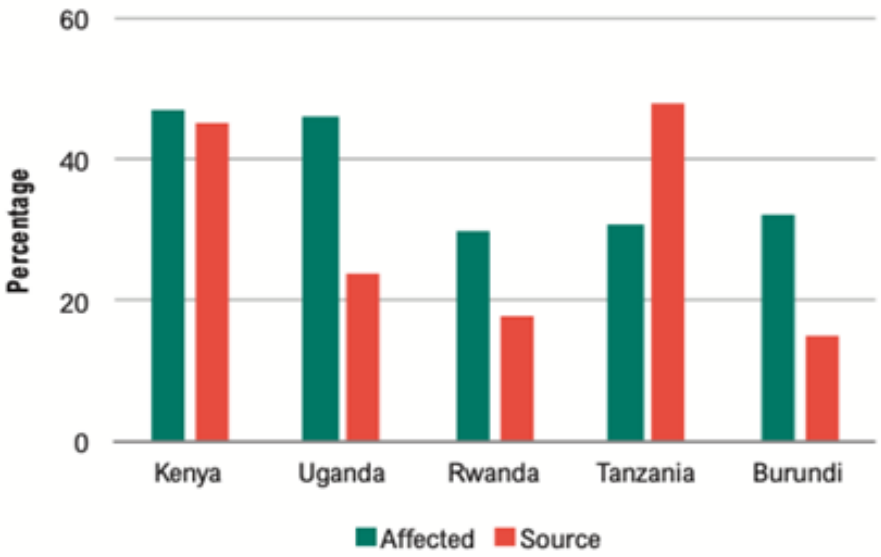

Figure 2.3: EAC countries contributions to resolved NTMs and how they were affected
Source: Adopted from Calabrese and Eberhard-Ruiz (2016)
Note: NTMs can affect and originate in several countries at the same time

2.3.4 Multiple Membership in PTAs

The rise in PTAs among developing countries in the 1990s brought a challenge of multiple memberships. This overlap of PTAs, widely referred to as the spaghetti bowl effect, complicates the implementation of PTA policies (Bhagwati 1995). The interest in the multiple PTA memberships by a country is due to the differences in provisions and market sizes of PTAs. On the surface, this increased participation in PTAs indicates increased international trade among developing countries. However, its consequence may be detrimental to its members since overlapping PTAs have conflicting rules, which may lead to weak implementation of the PTA policies. For example, overlapping FTAs may lead to trade deflection due to application of different rules-of-origin (ROO).

Trade deflection is the redirection of goods imported from a non-member country to a high-tariff PTA country through a low-tariff PTA country. Trade deflection is unlikely in a CU because of it imposes a Common External Tariff (CET) on imports from non-member countries. However, since an FTA lacks harmonized external tariffs, trade deflection can be a problem. To eliminate this risk, FTAs

adopt Rules-of-Origin (ROO) which define under which conditions a good is said to have originated from a member country of the FTA so that it can benefit from a preferential treatment. A good is classified as one that originates within a PTA based on the value of domestic content or a requirement to source inputs or perform processes locally. ROOs can increase trade diversion since they create an incentive for producers to source inputs locally so as to gain preferential treatment for the export of the final processed good. The rules can also reduce trade creation if complying with the rules is more costly than the cost of import tariffs.

The EAC countries provide a good illustration of the spaghetti bowl effect as shown in Figure 2 4. With the exception of South Sudan, all EAC countries belong to more than one PTA. Kenya, Uganda, Rwanda and Burundi are members of the Common Market for East and Southern Africa (COMESA), which is an FTA comprising of 19 countries. Tanzania is a member of the Southern Africa Development Corporation (SADC), which is an FTA comprising of 15 members. COMESA and SADC also have other overlapping members who are not part of the EAC, for example, 4 of the SADC members are also part of the South African Customs Union (SACU). Studies have shown that apart from the differences in market sizes, the COMESA, EAC, and SADC also have different provisions for tariff liberalization, non-tariff barriers, rules-of-origin and other customs procedures (Sandrey et al. 2011).

EAC countries recognize their multiple memberships in PTAs as a possible conflict of their obligations to the Customs Union Protocol. The EAC Customs Management Act indicates that, notwithstanding the CET, preferential treatment is applied to goods imported from COMESA and SADC to respective member countries as prescribed by their national legislations but will be subjected to EAC tariff and ROO arrangements by other member countries. Despite the plan to end this preferential treatment by 2008, it is still in practice since member countries have been unable to agree on how to streamline their participations in other PTAs (Aloo 2017). This multiplicity of PTA membership complicates the application of the CET,

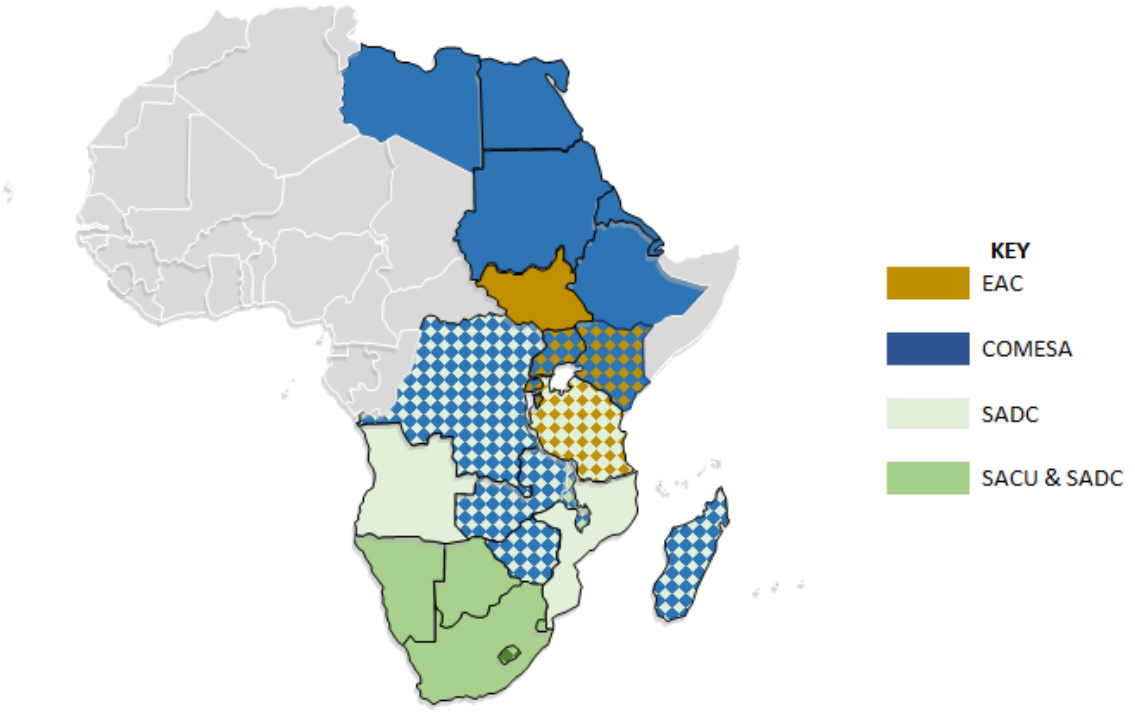

Figure 2.4: Spaghetti Bowl of PTAs in Eastern and Southern Africa
Source: WTO Regional Trade Agreement's Database

making the EAC countries reluctant to eliminate internal boundaries, and increases the significance of Rules-of-Origin (ROO). An attempt to address the challenge led to the proposal to negotiate a Tripartite Free Trade Agreement (TFTA) between COMESA, EAC and SADC. The TFTA seeks to harmonise of the trade policies of the three PTAs but its progress has been stalling due to the significant differences in the strategic, political and economic objectives of each bloc.

Another significant challenge of the overlap is from the complications of negotiating PTA-PTA agreements. This can be seen from recent EU Economic Partnership Agreement (EPA) negotiations with SADC and EAC. Since Tanzania is a member of both PTAs, its preference for participating in the EU-SADC EPA led to stalling of the negotiations for the EU-EAC EPA. Thus, this overlap of PTAs is an unnecessary burden to the EAC countries since in increases the costs of compliance and makes the customs administration become complex.

2.4 Conclusion

This review provides an extensive insight of the achievements and challenges of the EAC. It has noted that the member countries learnt lessons from the collapse of the first EAC and implemented measures that made their second attempt to progress within a very short time into a fully fledged customs union. However, delays in implementation of EAC policies hampered the progress into a Single Market, Monetary Union and Political Federation. Moreover, it is noted that although the CET is formally in place, it has also not been fully implemented due to the problem of overlapping membership in PTAs. The general perception by EAC countries is that they stand to lose or have minimal gains compared to other partners from deepening and broadening the EAC agreement.

Since generating welfare gains for its member countries is a key objective of any PTA, assessing the size and identifying the source of gains from trade is important. Theoretical studies have divided the gains from trade into static and dynamic effects as discussed in 1. The EAC has limited potential of welfare gains from both the static and dynamic effects due to its weak internal trade. The trade is also dominated by a few countries, with Kenya and Uganda being the main export and import destinations. There are a few reasons why the trade among EAC countries continues to be modest despite its 20 years on integration. First, geographical barriers and poor transport infrastructure in most EAC countries contribute to the weak internal trade by increasing trade costs. Second, the EAC domestic market is constrained by low income levels since most of the EAC countries are relatively small economies. Lastly, there is complementarity in the production of goods with most EAC countries exporting primary goods for which trade rarely takes place between themselves.

The welfare gains from static effects are expected to be minimal since tariffs are generally low across most countries due to successive multilateral trade liberalizations. Further, these gains may also be limited due to the low volume of trade between the EAC countries. Trade liberalization will lead to changes in domestic prices for a small number of commodities. Similarly, welfare gains from dynamic

effects will also be small since there is no huge pressure for firms to invest in innovation and technology due to limited competition. Further, these benefits are also expected to be skewed to Kenya since it is the most industrialized country in the region and the dominant trading partner. To determine whether the EAC has been successful in achieving its economic objectives, it is necessary to undertake an empirical assessment of its trade and welfare impacts on each member country. The impact of the EAC integration on tariffs and NTMs in various sectors will also be essential to understand the source of welfare gains.

Chapter 3

Preferential Trade Agreements between Countries with Asymmetrical Market Sizes

3.1 Introduction

Due to the proliferation of Preferential Trade Agreements (PTA) and their growing significance in international trade, a huge literature now exists motivated by the need to understand their welfare implications. This is because assessment of the potential gains from joining a PTA will shape each country's negotiating strategy and ultimate decision. As discussed in chapter 1, these welfare implications can either be static effects, which are the one-off welfare impacts resulting from changes in prices, or dynamic effects, which are the medium-term and long-term welfare impacts of PTAs due to higher investments and rapid technological progress. However, research has shown that these trade gains are not guaranteed for all participating countries because of the nature of preferential discrimination by the different types of PTAs.

PTAs typically take the form of a Free Trade Agreement (FTA) or a Customs Union (CU). An FTA require members to collectively eliminate tariffs between them-

selves but individually set their own external tariffs towards non-members. On the other hand, a CU requires member countries to remove tariffs between themselves and set a Common External Tariff (CET) on imports from non-member countries. This difference in internal market structures of PTA has been seen to have significant effects on the welfare gains for member countries. Existing literature on welfare comparisons between PTAs point to CUs as the optimal type due to the coordination benefits with respect to external tariffs. Mukunoki (2004) showed that a CU is superior to an FTA due to the externality internalizing effect while Ornelas (2007) showed that a CU guarantees member countries higher aggregate welfare compared to an FTA because of the enhanced profits from exports in each of their countries. In addition, both researchers identify that their analysis is dependent on the countries being symmetric. However, they note that a more comprehensive analysis of welfare effects of a PTA can be undertaken by introducing country asymmetry in the analysis.

Countries forming PTAs have asymmetry in their market sizes and economic structures. Since international trade agreements are bilateral and reciprocal in nature, the larger partner in the PTA is likely to have a dominant role in the negotiation because the reciprocal exchange is based on symmetry in market power for both countries. Therefore, the levels of tariff and non-tariff measures (NTMs) will largely be set at levels that will benefit the country with the higher market power. Despite the possibility of losing significant proportions of its tariff revenue, the smaller partner is likely to accept the PTA proposal due to the potential benefit of access to a larger market. Therefore, the asymmetry in market size is likely to have an influence in the potential welfare gains for countries forming a PTA.

The purpose of this chapter is to theoretically investigate the strategic interaction between the type of PTA and asymmetry in market structures of countries. The objective is to determine the type of PTA that will offer the best welfare gains for a country taking into consideration how its market size compares to that of its partners. This is done by examining the differences in welfare implication from

formation of an FTA and a CU and assessing how the degree of market asymmetry between member countries impacts on their welfare effects.

These welfare effects can either be assessed using perfectly competitive models of international trade, which explain inter-industry trade, or imperfectly competitive models, which justify intra-industry trade. Since most of the current PTAs are formed between countries with a lot of similarities in their production structures, imperfect competitive models will be the most appropriate method for analysis. There are two different types of imperfectly competitive models: the monopolistic competition models which feature a large number of relatively small firms and oligopolistic competition models which feature a small number of relatively large firms. This study analyses the welfare effects of a PTA using an oligopoly model of international trade since it is a good representation of market structures in most PTAs.

Section 3.2 presents a review of oligopoly trade model. Section 3.3 presents a simple Cournot oligopoly model of the world economy consisting of three countries. Section 3.4 uses the model to analyse the welfare effects of forming an FTA and a CU. The conclusion is presented in section 3.5.

3.2 Trade under Oligopoly

Welfare analysis has been studied under perfect competition, monopolistic competition and oligopolistic markets. Ever since the works of Ricardo in 1817 on trade theory up until the 1980s, perfectly competitive models dominated the mainstream analysis of positive and normative aspects of trade. Trade under perfectly competitive models arises mainly from differences in comparative advantages where trade is free and countries specialize in the production of those goods which they produce relatively more efficiently. Perfect competitive models relied on the assumptions of a large number of relatively small firms with free entry and exit in the market, constant returns to scale and non-strategic competition in production.

The revolution of the 'new trade theory' from 1980s onwards by Krugman and

others expanded the understanding of international markets by incorporating imperfect competition into trade theory. In the 'new trade theory', trade arises independent of any patterns of comparative advantage because of product differentiation, economies of scale, differences in market structures and strategic interactions. The imperfectly competitive models of international trade consisted of two different strands of literature that have distinct differences. On one hand is the model of monopolistic competition by Krugman (1980), which had a lot of similarities in assumptions to those of perfect competitive models except that it allowed for product differentiation and increasing returns to scale. On the other hand is the model of oligopolistic competition by Brander (1981) which included differences in market structures and strategic interactions. Of the two theories, monopolistic competition became the preferred approach so much that Paul Krugman remarked that there are now 'Two and a Half Theories of Trade' with perfect and monopolistic competition being the dominant paradigms and oligopolistic competition the weaker discipline (Neary 2010).

While the perfect competition and monopolistic competition models have proved to be very fruitful in explaining international trade, they may not adequately address some of the current issues in trade. Based on their assumptions, they are not well suited in examining the current global markets which have been seen, through empirical studies, to be dominated by a small number of firms with the large firms accounting for the major share of exports (Leahy and Neary 2013). By contrast, the oligopolistic models are better suited for studies of current global markets since they focus on large firms' persistence of profits and allow for a wide range of strategic interaction between firms and governments to preserve and enhance these profits.

Brander (1981) pioneered the analysis of trade under oligopoly using the 'reciprocal-markets' model to assess the welfare effects of international trade in a case where trade costs are zero. The model adopted a Cournot oligopoly market structure where firms compete in terms of quantity produced. An essential assumption of this model was that national markets were segmented, which is a convenient property

that makes it possible to study each country's market in isolation. This implies that a firm's output can command different prices in different countries and each firm can make distinct output or price decision for each market. This provided a new explanation of international trade and a justification for it. The model showed the possibility of two-way trade or 'cross-hauling' of identical products even in a perfectly symmetric case, where countries engaging in international trade have identical firms and markets. It also showed that 'cross-hauling' created pro-competitive effects, which is the disciplinary effects of foreign competition on domestic mark-ups, leading to the lowering of domestic prices. The movement away from autarky in effect meant the movement from a monopoly to an oligopolistic market structure. Since domestic firms now perceive themselves as facing a higher elasticity of demand, they increase production and reduce prices. This raises consumer surplus to a level that can offset the loss in profits by the domestic firm, thus increasing the overall welfare of a country.

Brander and Krugman (1983) extended the analysis by Brander (1981) to allow for trade costs in the form of transport costs. They showed that incorporation of trade costs greatly enriched the results of the model by Brander (ibid.). Assume there are two countries with identical market structures and engaging in bilateral trade in identical goods. Each exporting firm will have to match the price of the locally produced good. This means that the firm will be expected to absorb the trade costs in the export price since it will accept a lower producer price for its exports. As a result, its profit margin from its export sales will be lower meaning it is 'dumping' in its foreign market. Since the foreign firm is also doing the same in home's market, the Cournot equilibrium with trade costs exhibits 'reciprocal-dumping' by both firms.

In addition, Brander and Krugman (1983) showed that trade costs have a reducing effect on the overall welfare. Their findings indicate that a fall in trade costs leads to a monotonic increase in consumer surplus, with its maximum at free trade, while the firm's profits have a U-shaped relationship with trade costs, reaching a

maximum at autarky. The U-shaped relationship is due to the opposite effects of a fall in trade costs on a firm's profits in the domestic and foreign markets. As trade costs fall, the firm reduces domestic sales due to exposure to greater competition while it increases its exports due to expansion of opportunities in the foreign market. Likewise, the overall welfare (sum of consumer surplus and firm's profits) will also be a U-shaped function of trade costs, reaching a maximum at free trade and a minimum at the neighbourhood of autarky. An explanation for this is that lower trade costs lead to pro-competitive effects, due to distortion of the monopoly in the domestic market, while higher trade costs leads to 'dumping' effect in the foreign market. In the neighbourhood of free trade, the pro-competitive effects dominate while in the neighbourhood of autarky, the 'dumping' effects dominate.

Apart from a Cournot oligopoly, welfare effects of trade under oligopolistic competition can also be analysed under Bertrand oligopoly where firms compete in terms of price. Clarke and Collie (2003) were the first to derive the welfare effects of free trade under Bertrand oligopoly with differentiated products. Their findings indicate that profits and welfare behave quite similarly to that of Cournot oligopoly: consumer surplus is monotonically decreasing in trade costs while profits and welfare are both a U-shaped function of trade costs. However, in contrast to Cournot oligopoly, there cannot be two-way trade in identical products since a small difference in price ensures that no trade occurs. In addition, the impact of pro-competition effects applies more strongly in Bertrand oligopoly since even at autarky, the home firm's behaviour will be affected by the potential threat of export to the home market from a foreign firm. Therefore, even if no trade actually occurs, there may still be some pro-competitive effects which will raise welfare.

3.3 Model

Consider a simple world economy with three asymmetric countries indexed by A, B and C. Countries A and B are developing countries intending to form a PTA while country C represents the rest of the world (RoW). There are two final goods

produced and traded by all countries denoted by X and Y. It is assumed that both sectors use labour as their factor of production and both goods are produced under constant returns to scale meaning that labour coefficients are given. Good X is produced by all countries in a perfectly competitive industry and assumed to be freely traded thus it is the numeraire good. Good Y is produced by all countries in an oligopolistic industry and their markets are segmented which leads to trade in the good. Each country has a single firm, referred to by its own country's name, that produces the oligopolistic good. Since it is produced under a constant return to scale production function, the marginal cost of producing good Y, in terms of the numeraire good, is constant across all countries and denoted as $c > 0$. The three firms compete in quantities (Cournot competition) in each country's market.

Focusing on good Y, the pattern of trade is as shown in figure 3.1. Countries A and B have two-way trade, but their firms do not export any good to country C while the firm in country C exports good Y to both countries. The total goods available for consumption in country $i \in (A, B, C)$ will be the sum of outputs from all firms selling in its market given by $Y_i = \sum_{j \in (A,B,C)} y_{ij}$. For expositional simplicity, we assume no transport costs and tariffs are the only trade costs. In the absence of a PTA, the tariff imposed by each country will be the Most Favoured Nations (MFN) tariff.

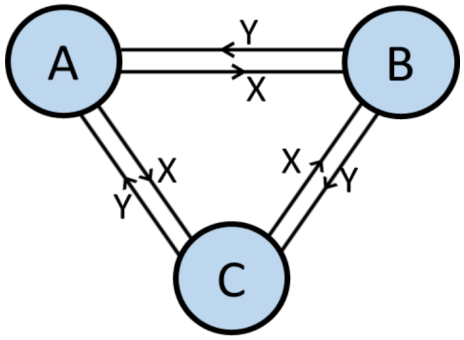

Figure 3.1: Trade patterns for good Y

The analysis focuses on the reactions of the consumers in countries A and B to the output decisions in each of their markets by all firms resulting from the change in the tariffs on trade between A and B. Therefore, it considers the impact of formation

of a PTA between countries A and B, which can take the form of either an FTA or a CU. Before formation of a PTA, each country i imposes a non-discriminatory tariff ($t_{ij} > 0$) on all its imports of Y from country j, while after formation of a PTA, the tariff is levied only on imports from C. As provided by Article XXIV of the GATT, forming an FTA entails removal of tariffs on bilateral trade between countries A and B but each partner independently set tariffs for trade with country C [2]. On the other hand, forming a CU also involves removal of tariff on bilateral trade and both countries A and B agree on a Common External Tariff (CET) for their imports from country C.

Preferences are identical across countries and a representative consumer in each country has a quasi-linear utility function that is linear in the numeraire good and quadratic in the oligopolistic good given by:

$$u_i = \alpha y_i - \frac{1}{2\beta} y_i^2 + x_i \tag{3.1}$$

Where x_i is the consumption of the numeraire good and y_i is the consumption of the oligopolistic good by the representative consumer in country i. α is the consumer's maximum willingness to pay for a product and β is the slope of the demand curve for the representative consumer. Throughout the analysis, it is assumed that the following conditions are satisfied $\alpha > c$ and $\beta > 0$. The first-order condition of the utility function yields the inverse demand function given by:

$$P_i = \alpha - \frac{1}{\beta} y_i \tag{3.2}$$

where P_i is the price of the oligopolistic good in country i. Aggregating the inverse demand functions of all individual consumers in each country will yield the

[2]The difference in tariffs on imports from country C may cause re-exportation of the good within the FTA from the lower-tariff member to the higher-tariff member. To avoid such trade deflection, the FTA countries must agree on Rules of Origin (ROO) requirements for imports from partner countries. In this study, we assume that the FTA has ROO requirements that prevents trade deflection. However, the ROO is not necessary in the case of a CU.

inverse demand functions in each country given by:

$$P_i = \alpha - \frac{1}{\beta_i} Y_i \tag{3.3}$$

Where Y_i is the total consumption of the oligopolistic good in country i and β_i is the slope of the national demand curve resulting from aggregating domestic demand of all individual (identical) consumers in country i. Therefore, the difference in the population size leads to the differences in the market demand curves across countries. Since country C's demand is irrelevant in this analysis, the focus of the market size asymmetry will be between countries A and B. Without loss of generality, we assume that the population of country B is a numeraire (β_B), and the population of country A is n times that of country B ($\beta_A = n\beta_B$). Therefore, $n > 1$ if country A is larger and $n < 1$ if country B is larger.

In a Cournot oligopoly, each firm aims at maximising their profits taking quantities of the other producers and the tariffs in the respective markets as given. Ignoring fixed costs, the profits of the firm in country i from sales in its domestic and foreign markets is given by:

$$\pi_{ii} = (p_i - c)y_{ii} \tag{3.4a}$$

$$\pi_{ij} = (p_i - c - t_{ij})y_{ij} \tag{3.4b}$$

Where π_{ij} is the profits and y_{ij} is the output of country i's firm in country j's market. Assuming an interior solution where all firms supply to country i, the Cournot-Nash equilibrium output of goods sold in country i by its domestic and foreign firms will be given by:

$$y_{ii} = \frac{\beta_i}{4}(\alpha - c + t_{ij} + t_{ik}) \qquad i, j, k \in (A, B, C) \tag{3.5a}$$

$$y_{ij} = \frac{\beta_i}{4}(\alpha - c - 3t_{ij} + t_{ik}) \qquad i, j, k \in (A, B, C) \tag{3.5b}$$

Each firm's output decreases with tariffs imposed on its country's exports and

increases in tariffs imposed on other country's exports. However, to ensure positive quantities of imports, each country's import tariffs should not be prohibitive. This analysis assumes this condition holds for all countries. The market price in each country will be obtained by substituting the value of total consumption into the inverse demand function. The Cournot-Nash equilibrium profits for each firm can be solved by substituting the market price and equilibrium quantities of output into the profit functions for domestic and foreign markets:

$$\pi_{ii} = \frac{1}{\beta_i}(y_{ii})^2 \tag{3.6a}$$

$$\pi_{ij} = \frac{1}{\beta_i}(y_{ij})^2 \tag{3.6b}$$

Given the partial equilibrium nature of the model, the national welfare will be dependent on the consumption and sales of the non-numeraire good. The paper assumes that the objective of the government is to maximize social welfare by imposition of import tariffs. Thus, the total welfare for country i will be the sum of the Consumer Surplus (CS), aggregate profits for the domestic firm (Π) and tariff revenue (TR) calculated as follows:

$$W_i = CS_i + \Pi_i + TR_i \tag{3.7}$$

Where the consumer surplus is given by:

$$CS_i = \frac{1}{2\beta_i}Y_i^2 = \frac{1}{2\beta_i}(\sum_j y_{ij})^2 \tag{3.8}$$

The aggregate profit for firm i is the sum of its total profits from sales in the domestic and foreign markets given by:

$$\Pi_i = \sum_j \pi_{ij} = \sum_j \frac{1}{\beta_i}(y_{ji})^2 \tag{3.9}$$

The total tariff revenue levied on imports by country i from all other countries

is given by:

$$TR_i = \sum_{j \neq i} t_{ij} y_{ij} \tag{3.10}$$

Before formation of a PTA, there is non-discriminatory trade between the countries so all imports of Y face the same tariffs. In this set-up, countries A and B each choose their optimal non-discriminatory tariff that maximises their welfare, given that they know the responses of the other firms in choosing their sales in their respective markets, and the resulting Cournot-Nash equilibrium. If an FTA is in place, countries A and B will remove tariffs on their bilateral trade and independently decide on a tariff with country C. If a CU is in place, countries A and B will remove tariffs on their bilateral trade and jointly decide on a CET that will maximise their combined welfare. The analysis assumes that a country is willing to join an FTA or a CU as long as doing so will be welfare improving as compared to its pre-PTA equilibrium. This analysis will focus on country A.

3.4 Welfare Effects

3.4.1 Pre-PTA

Prior to the formation of any PTA, we assume that all countries trade under the GATT/WTO agreement where each charges a non-discriminatory MFN tariff on all its imports from other countries. Country A impose a uniform tariff $\bar{t}_a$ on all its imports of good Y from countries $j \in (B, C)$ such that $\bar{t}_a = t_{ab} = t_{ac}$. The bar $(-)$ indicates the pre-PTA level of a variable. Substituting these conditions into the welfare functions for country A and deriving the first order condition $\frac{\delta W_a}{\delta t_a}$ yields the optimal MFN tariff that maximizes its total welfare:

$$t_a = \frac{3}{10}(\alpha - c) \tag{3.11}$$

The MFN tariff is positively related to the consumer's maximum willingness to pay for a product in each country. Since all consumers in countries A and B are

assumed to have identical preferences, the optimal MFN tariff for country B will be given by $t_b = \frac{3}{10}(\alpha - c)$. These MFN tariffs can be used to calculate the pre-PTA equilibrium quantities for price, total consumption in country A and outputs sold by each firm:

$$\overline{P}_a = \frac{2\alpha + 3c}{5} \tag{3.12a}$$

$$\overline{Y}_a = \frac{3}{5}(\alpha - c)n \tag{3.12b}$$

$$\overline{y}_{aa} = \frac{2}{10}(\alpha - c)n \qquad y_{ba} = \frac{1}{10}(\alpha - c)n \qquad y_{ca} = \frac{1}{10}(\alpha - c)n \tag{3.12c}$$

$$\overline{y}_{ab} = \frac{1}{10}(\alpha - c) \tag{3.12d}$$

Firm A is the largest supplier in its domestic market while firms B and C have equal market shares since they face similar levels of market access. Substituting these into the welfare functions for country A gives the pre-PTA equilibrium quantities of consumer surplus, profits, producer surplus and total welfare:

$$\overline{CS}_a = \frac{9}{50}(\alpha - c)^2 n \tag{3.13a}$$

$$\overline{\Pi}_a = \frac{1}{100}(\alpha - c)^2(16n + 1) \tag{3.13b}$$

$$\overline{TR}_a = \frac{3}{50}(\alpha - c)^2 n \tag{3.13c}$$

$$\overline{W}_a = \frac{1}{100}(\alpha - c)^2(40n + 1) \tag{3.13d}$$

These pre-PTA equilibrium quantities will be the benchmark to evaluate the welfare effects from formation of an FTA and CU.

3.4.2 FTA

If countries A and B form an FTA, they will remove tariffs on bilateral trade between themselves, $t_{ab} = t_{ba} = 0$, but each independently sets its tariff on trade with country C and agree on ROO that will prevent any trade deflection from country C. Article XXIV of the GATT requires FTA countries not to raise their external tariffs for

non-member countries above the pre-PTA levels. Therefore, each FTA country may either maintain their non-discriminatory MFN tariffs or choose a lower optimal tariff that will maximise their total welfare. This section will estimate the welfare effects of an FTA with MFN tariffs, whose variables will be denoted by the superscript f_{mfn}, and that of an FTA with optimal tariffs, whose variables will be denoted by the superscript f_{opt}.

FTA with MFN tariffs

Under this scenario, each country maintains their MFN tariffs on trade with country C thus $t_{ac}^{f_{mfn}} = t_{bc}^{f_{mfn}} = \frac{3}{10}(a-c)$. These MFN tariffs are used to calculate the equilibrium quantities for prices, total consumption and outputs by each firm. These are then substituted into the welfare functions for country A to get the FTA equilibrium quantities of consumer surplus, profits, tariff revenue and total welfare. Country A will be willing to join an FTA if the welfare-improving condition is met, $W_a^{f_{mfn}} > \overline{W}_a$.

Before formation of an FTA, country A's tariff targeted imports from all countries. After joining the FTA, external tariffs only targeted imports from country C leading to a reduction in its firm's sales in country A since consumers regard them as more expensive compared to goods produced by firms A and B. The removal of tariffs on country B increases its firm's market access in country A leading to an increase in sales. The changes in tariffs also exposes firm A to increased competition from firm B thereby reducing its domestic sales. This implies that forming an FTA leads to firm B gaining additional market share at the expense of firms A and C. The increased production by firm B and competition in the domestic market leads to a reduction in country A's domestic price of the good and an increase in the total quantities consumed. Since the same impact is felt in country B's market, country A exports increase. The expressions for changes in equilibrium quantities for prices,

total consumption and outputs by firms is given by:

$$\Delta P_a^{f_{mfn}} = -\frac{3}{40}(\alpha + c) \tag{3.14a}$$

$$\Delta Y_a^{f_{mfn}} = \frac{3}{40}(\alpha - c)n \tag{3.14b}$$

$$\Delta y_{aa}^{f_{mfn}} = -\frac{3}{40}(\alpha - c)n \quad \Delta y_{ba}^{f_{mfn}} = \frac{9}{40}(\alpha - c)n \quad \Delta y_{ca}^{f_{mfn}} = -\frac{3}{40}(\alpha - c) \tag{3.14c}$$

$$\Delta y_{ab}^{f_{mfn}} = \frac{9}{40}(\alpha - c) \tag{3.14d}$$

The lower prices benefit the consumers by increasing their purchasing power and subsequently increasing the quantity they purchased. Therefore, the formation of an FTA will lead to an increase in consumer surplus relative to the pre-PTA regime $CS_a^{f_{mfn}} > \overline{CS}_a$. The expression of change in consumer surplus is given by:

$$\Delta CS_a^{f_{mfn}} = \frac{153}{3200}(\alpha - c)^2 n \tag{3.15}$$

The formation of an FTA has an ambiguous impact on profits. In country A, firm A loses part of its domestic market share to imports from firm B due to increased competition. In country B, firm A gains additional market share from both firms B and C due to favourable market access. Therefore, its profits from sales in country A reduces while its profits from sales in country B increases. This makes the aggregate change in profits from joining an FTA ambiguous since it will depend on the difference in the market size of the member countries. The overall profit of firm A will be dependent on whether the increase in profits from exports will outweigh the reduction in profits from domestic sales. The expression for change in total profits is given by:

$$\Delta \Pi_a^{f_{mfn}} = \frac{1}{1600}(\alpha - c)^2(153 - 87n) \tag{3.16}$$

On the other hand, the formation of an FTA has a negative impact on tariff revenue $TR_a^{f_{mfn}} < \overline{TR}_a$. The removal of tariffs on imports from Country B means the country A will only collect revenue on its imports from country C. The reduction

in imports from country C also contributes to further reduction in total tariff revenue collected. The expression for change in total tariff revenue relative to the pre-PTA regime is given by:

$$\Delta TR_a^{f_{mfn}} = -\frac{21}{400}(\alpha - c)^2 n \tag{3.17}$$

Since the overall change in welfare is a summation of the changes in consumer surplus, producer surplus and tariff revenue, its impact is also be dependent on the difference in the market sizes of the two member countries. The expression for change in welfare is given by:

$$\Delta W_a^{f_{mfn}} = \frac{1}{3200}(\alpha - c)^2(306 - 189n) \tag{3.18}$$

The next step will be do determine the degree of market size asymmetry that will guarantee welfare gains from joining an FTA for country A. From the welfare equation, it is seen that country A will benefit from an FTA with country B when the following condition is satisfied: $0 < n \leq 1.62$. From this, we can establish the following:

i An FTA with MFN tariffs raises the smaller country's welfare relative to pre-PTA regime regardless of the size of its partner.

ii An FTA with MFN tariffs raises the larger member's welfare relative to pre-PTA regime if its size is not greater than 1.62 times the size of its partner. If the difference in market size between the two countries is greater than 1.62, an FTA decreases the larger member's welfare.

FTA with optimal tariffs

Under this scenario, each member countries sets optimal tariffs on trade with country C that will maximise their welfare. This optimal tariff will be estimated by substituting these bilateral tariff conditions ($t_{ab} = t_{ba} = 0$) into the overall welfare functions of country A and then derive the first order condition $\frac{\delta W_a}{\delta t_{ac}}$. This yields the

optimal FTA tariff:

$$t_a^{f_{opt}} = \frac{1}{7}(\alpha - c) \tag{3.19}$$

This is consistent with the requirement of Article XXIV of the GATT that the external tariff after formation of a PTA be no greater than the MFN tariff to avoid any negative welfare effects on non-member countries. Since the consumers in countries A and B are assumed to have identical preferences, the optimal tariff for country B will be given by $t_{bc}^{f_{opt}} = \frac{1}{7}(a-c)$. These MFN tariffs are used to calculate the equilibrium quantities for prices, total consumption and outputs by each firm. These are then substituted into the welfare functions for country A to get the FTA equilibrium quantities of consumer surplus, profits, tariff revenue and total welfare. Country A will be willing to join an FTA if the welfare-improving condition is met, $W_a^{f_{opt}} > \overline{W}_a$.

The impact of joining an FTA with optimal tariffs is similar to that of an FTA with MFN tariffs except that the magnitudes of the changes in equilibrium quantities differ since the optimal tariffs are lower than the MFN tariffs. Since external tariffs of country A only targeted imports from country C after formation of the FTA, firm C reduces its sales while firms A and B increase their sales. The increased production by firm B and competition in the domestic market leads to a reduction in country A's domestic price of the good and an increase in the total quantities consumed. Since the same impact is felt in country B's market, country A exports increase. The expressions for changes in equilibrium quantities for prices, total consumption and outputs by firms is given by:

$$\Delta P_a^{f_{opt}} = -\frac{4}{35}(\alpha + c) \tag{3.20a}$$

$$\Delta Y_a^{f_{opt}} = \frac{4}{35}(\alpha - c)n \tag{3.20b}$$

$$\Delta y_{aa}^{f_{opt}} = -\frac{8}{70}(\alpha - c)n \quad \Delta y_{ba}^{f_{opt}} = \frac{13}{70}(\alpha - c)n \quad \Delta y_{ca}^{f_{opt}} = \frac{3}{70}(\alpha - c)n \tag{3.20c}$$

$$\Delta y_{ab}^{f_{opt}} = \frac{13}{70}(\alpha - c) \tag{3.20d}$$

Formation of the FTA has a positive impact on consumer surplus $CS_a^{f_{opt}} > \overline{CS}_a$ since it leads to a reduction in domestic prices and an increase in quantity purchased.

It also has a negative impact on tariff revenues since country A will only collect revenue on its imports from country C $TR_a^{fopt} < \overline{TR}_a$. The formation of an FTA has an ambiguous impact on profits since the aggregate change in profits will depend on the difference in market sizes. Ultimately, the impact on overall welfare for the country will also be ambiguous. The expressions for change in consumer surplus, profits, tariff revenue and overall welfare are given by:

$$CS_a^{fopt} = \frac{9}{1225}(\alpha - c)^2 n \tag{3.21a}$$

$$\Pi_a^{fopt} = -\frac{1}{4900}(\alpha - c)^2(351 - 384n) \tag{3.21b}$$

$$TR_a^{fopt} = \frac{97}{2450}(\alpha - c)^2 n \tag{3.21c}$$

$$W_a^{fopt} = \frac{1}{4900}(\alpha - c)^2(351 - 210n) \tag{3.21d}$$

The degree of market size asymmetry that will guarantee welfare gains from joining an FTA for country A is $0 < n \leq 1.67$. From this, we can establish the following:

i An FTA with optimal tariffs raises the smaller country's welfare relative to pre-PTA regime regardless of the size of its partner.

ii An FTA with optimal tariffs raises the larger member's welfare relative to pre-PTA regime if its size is not greater than 1.67 times the size of its partner. If the difference in market size between the two countries is greater than 1.67, an FTA decreases the larger member's welfare.

3.4.3 Customs Union

If countries A and B form a CU, they will remove tariffs on bilateral trade between themselves, $t_{ab} = t_{ba} = 0$, and adopt a CET for trade with country C, $t_{ac} = t_{bc} = t^{cu}$. The superscript (cu) denotes CU variables. The CU members will decide on the optimal CET which will jointly maximize the sum of their welfares. This optimal tariff will be estimated by substituting these tariff conditions into the welfare

functions for each country, summing them up ($W^{cu} = W_a + W_b$), and then deriving the first order condition $\frac{\delta W_c u}{\delta t_{cu}}$. This yields the optimal CET given by:

$$t^{cu} = \frac{5}{19}(\alpha - c) \tag{3.22}$$

This indicates that formation of a CU between the two countries is consistent with Article XXIV of GATT/WTO that requires the CET not to be greater than the pre-PTA tariff to avoid negative welfare effects on non-members. The CET is used to calculate the equilibrium quantities for prices, total consumption and outputs by each firm. These are then substituted into the welfare functions for country A to get the CU equilibrium quantities of consumer surplus, profits, tariff revenue and total welfare. Country A will be willing to join a CU if the welfare-improving condition is met, $W_a^{cu} > \overline{W}_a$.

Before formation of a CU, country A's tariff targeted imports from all countries. After joining the CU, external tariffs only targeted imports from country C. Firm B increases production due to ease in market restrictions, firm A reduced production due to increased competition from cheaper imports from country B, and firm C reduced production since it is the only firm in the market facing trade restrictions. The increase in production by firms B and competition in the domestic market leads to a reduction in domestic price. The lower prices benefit the consumers by increasing their purchasing power and subsequently increasing the quantity they purchased. Similar the changes in country B's market leads to an increase in exports by firm A. The expressions for changes in equilibrium quantities for prices, total consumption and outputs by firms is given by:

$$\Delta P_a^{cu} = -\frac{8}{95}(\alpha + c) \tag{3.23a}$$

$$\Delta Y_a^{cu} = \frac{8}{95}(\alpha - c)n \tag{3.23b}$$

$$\Delta y_{aa}^{cu} = -\frac{16}{190}(\alpha - c)n \quad \Delta y_{ba}^{cu} = \frac{41}{190}(\alpha - c)n \quad \Delta y_{ca}^{cu} = -\frac{9}{190}(\alpha - c)n \tag{3.23c}$$

$$\Delta y_{ab}^{cu} = \frac{41}{190}(\alpha - c) \tag{3.23d}$$

Forming a CU has a positive impact on consumer surplus $CS_a^{cu} > \overline{CS}_a$ since it leads to a reduction in domestic prices and an increase in quantity purchased. It also has a negative impact on tariff revenues since country A will only collect revenue on its imports from country C $TR_a^{cu} < \overline{TR}_a$. The formation of an FTA has an ambiguous impact on profits since the aggregate change in profits will depend on the difference in market sizes. Ultimately, the impact on overall welfare for the country will also be dependent on the market size asymmetry. The expressions for change in consumer surplus, profits, tariff revenue and overall welfare are given by:

$$CS_a^{cu} = \frac{488}{9025}(\alpha - c)^2 n \tag{3.24a}$$

$$\Pi_a^{cu} = -\frac{1}{36100}(\alpha - c)^2(3239 - 2176n) \tag{3.24b}$$

$$TR_a^{cu} = \frac{833}{18050}(\alpha - c)^2 n \tag{3.24c}$$

$$W_a^{cu} = \frac{1}{36100}(\alpha - c)^2(3239 - 1890n) \tag{3.24d}$$

For country A to benefit from a CU with country B, the following condition needs to be satisfied: $0 < n \leq 1.71$. From this we can establish the following:

i A CU raises the smaller country's welfare relative to the MFN regime regardless of the size of its partner.

ii A CU raises the larger member's welfare relative to the MFN regime if its size is not greater than 1.71 times the size of its partner. If the difference in market size between the two countries is greater than 1.71, a CU decreases the larger member's welfare relative to the MFN regime.

3.4.4 Comparison of Welfare Effects from FTA and CU

Comparing Welfare Implications of an FTA with MFN tariffs versus one with optimal tariffs

Figure 3.2 compares the changes in real welfare from the two FTA scenarios. For both, the changes in welfare will depend on the difference in the market sizes of

the member countries. The results indicate that a small partner will always prefer to maintain their MFN tariffs rather than optimising external tariffs since it will offer it higher welfare gains. On the other hand, the larger partner will prefer to maintain MFN tariff except for a situation where the market size asymmetry is $1.48 < n \leq 1.67$ for which it will choose to optimise its external tariffs. If the difference in the market size is greater than 1.67, the larger member will prefer not to join an FTA since it will not be welfare improving. This means that an FTA with optimal tariffs will allow for a greater degree of market asymmetry compared to an FTA with MFN tariffs.

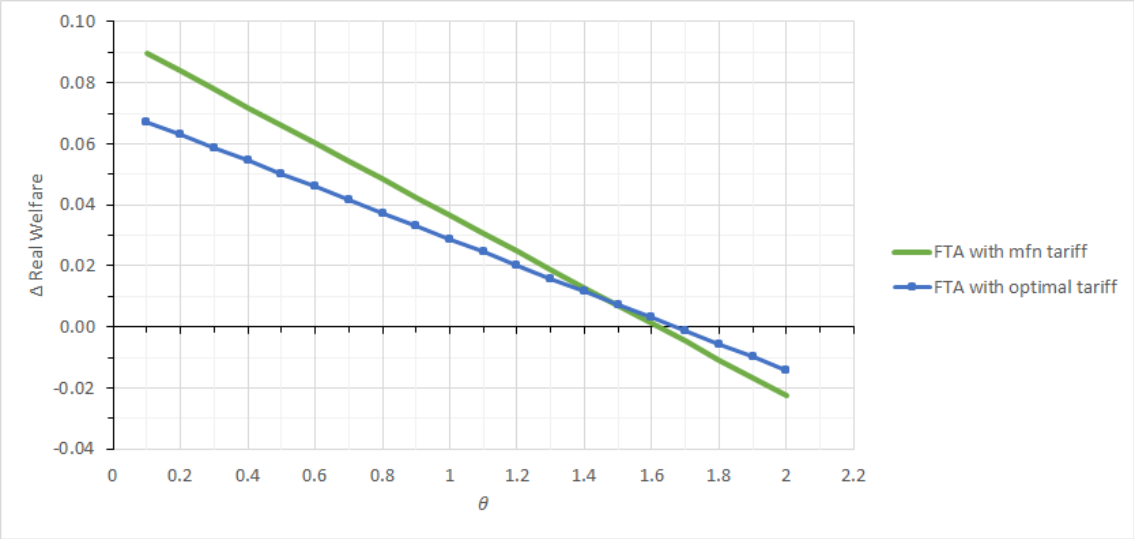

Figure 3.2: Comparing the welfare effects of the two FTA scenarios

The reasons for the differences in overall welfare from the two FTA scenarios can be understood by looking at the disparities in each welfare component. Consumer surplus is greater for an FTA with optimal tariffs compared to one with MFN tariffs ($CS_a^{f_{mfn}} < CS_a^{f_{opt}}$). Since optimal tariffs are lower than MFN tariffs, imports from country C will be higher under an FTA with optimal tariffs. This means that domestic production by firm A will be lower due to increased competition, leading to lower domestic prices and higher demand compared to an FTA with MFN tariffs. Similarly, tariff revenue is greater for an FTA with optimal tariffs compared to one with MFN tariffs ($TR_a^{f_{mfn}} < TR_a^{f_{opt}}$). In both, tariff revenue is collected only on imports from country C, but the optimal tariffs are lower leading to higher imports

from country C. For both FTA scenarios, the profits will depend on the difference in the market sizes of the member countries. However, regardless of the market size, a firm will always enjoy higher profits (or smaller losses) under an FTA with MFN tariffs compared to one with optimal tariffs ($\Pi_a^{f_{mfn}} < \Pi_a^{f_{opt}}$). This is because firm A faces lesser competition in both its domestic and foreign markets due to higher trade restrictions on firm C in an FTA with MFN tariffs.

From the analysis, a small country will prefer both FTA partners maintain their MFN tariffs since the gains from protection of its domestic and foreign markets will outweigh the forgone gains in consumer surplus and additional tariff revenue. The choice by a larger country will be dependent on the difference in market sizes. As long as its market size difference is between $1.48 < n \leq 1.67$, reduction of domestic prices will generate huge gains in consumer surplus since it has a large population. This coupled with larger revenue collected from increased imports is likely to outweigh any forgone gains in profits from market protection.

Comparing welfare implications of a CU and an FTA with MFN Tariffs

Figure 3.3 compares the changes in real welfare for a CU and an FTA with MFN tariffs. For both, the overall welfare is ambiguous since it is dependent on the difference in market sizes of the member countries. For a small country, an FTA will offer higher welfare relative to a CU if its market is not larger than 0.88 times the size of its partner. If the market size is $0.88 < n \leq 1.71$, a CU will offer a small country higher welfare. For a larger country, a CU will offer a larger country higher welfare relative to an FTA as long as its market size is not larger than 1.71 times that of its partner. Also, a CU allows for a greater degree of market asymmetry compared to an FTA. Therefore, a large country forming a PTA with a smaller partner is likely to prefer a CU while a small country forming a PTA with a large partner is likely to prefer an FTA. Countries with relatively similar market sizes will prefer forming a CU to an FTA.

The reasons for the differences in overall welfare can be comprehended from

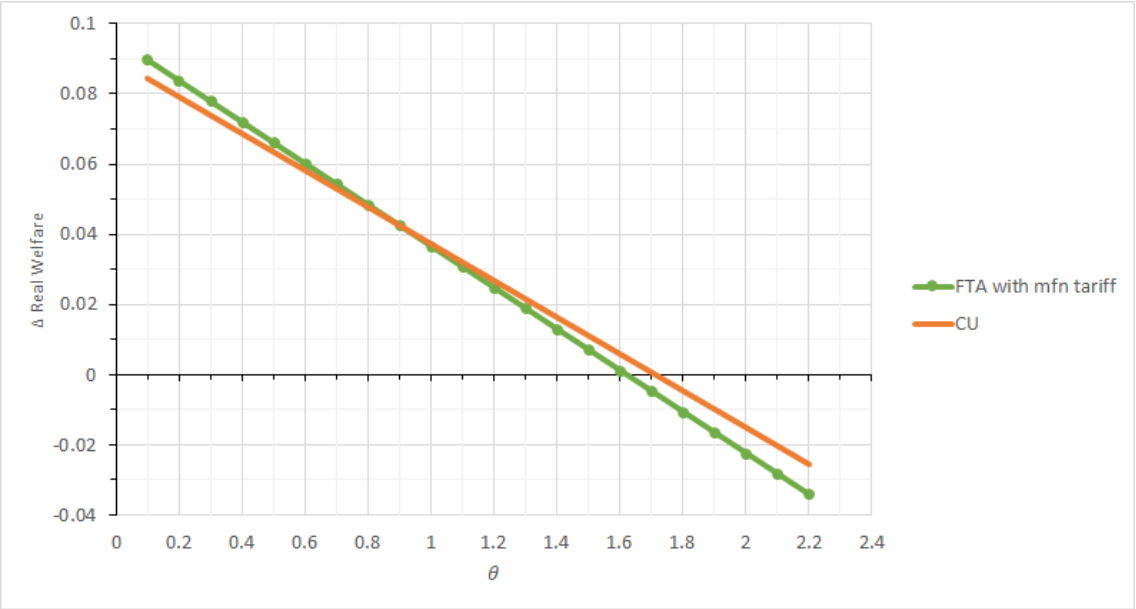

Figure 3.3: Comparing the welfare effects from an FTA with MFN tariffs and CU

analysing the gains and losses in the different welfare components. Consumer surplus is greater for a CU compared to an FTA ($CS_a^{cu} > CS_a^{f_{mfn}}$). A CU has lower tariff on imports from country C compared to an FTA ($t^{cu} < \bar{t}_a$) so imports from country C will be higher leading to a lower domestic price in country A and increasing quantity purchased. Similarly, tariff revenue is greater for a CU compared to an FTA ($TR_a^{cu} > TR_a^{f_{mfn}}$). In both, tariff revenue is collected only on imports from country C, but the optimal tariffs are lower leading to higher imports from country C. For both CU and FTA, the aggregate change in profits will depend on the difference in the market sizes of the member countries. However, a firm will always enjoy higher profits (or smaller losses) under an FTA compared to a CU regardless of the market size asymmetry ($\Pi_a^{cu} < \Pi_a^{f_{mfn}}$). This is because firm A faces lesser competition in both its domestic and foreign markets due higher trade restrictions on firm C.

From the analysis, a CU has higher gains in consumer surplus and tariff revenue compared to an FTA. Therefore, for a small country, the profits gains for a firm from higher domestic market protection in an FTA regime outweigh the loss in consumer surplus due to higher prices and tariff revenue due to reduced importation from the non-member country. On the other hand, the larger country will prefer a CU since its gains in consumer surplus due to lower prices and tariff revenue supersede the

loss in profits for its firms due to lower tariffs.

Comparing welfare implications of a CU and an FTA with Optimal Tariffs

Figure 3.4 compares the changes in real welfare for a CU and an FTA with optimal tariffs. For both, the overall welfare is ambiguous since it is dependent on the difference in market sizes of the member countries. For both countries, a CU will offer higher welfare gains to an FTA as long as the market size asymmetry is not too large. However, the CU guarantees welfare over a greater degree of market asymmetry. Under a CU, a country is guaranteed welfare gains as long as $n < 1.76$ while an FTA with the FTA guarantees welfare gains if $n < 1.67$.

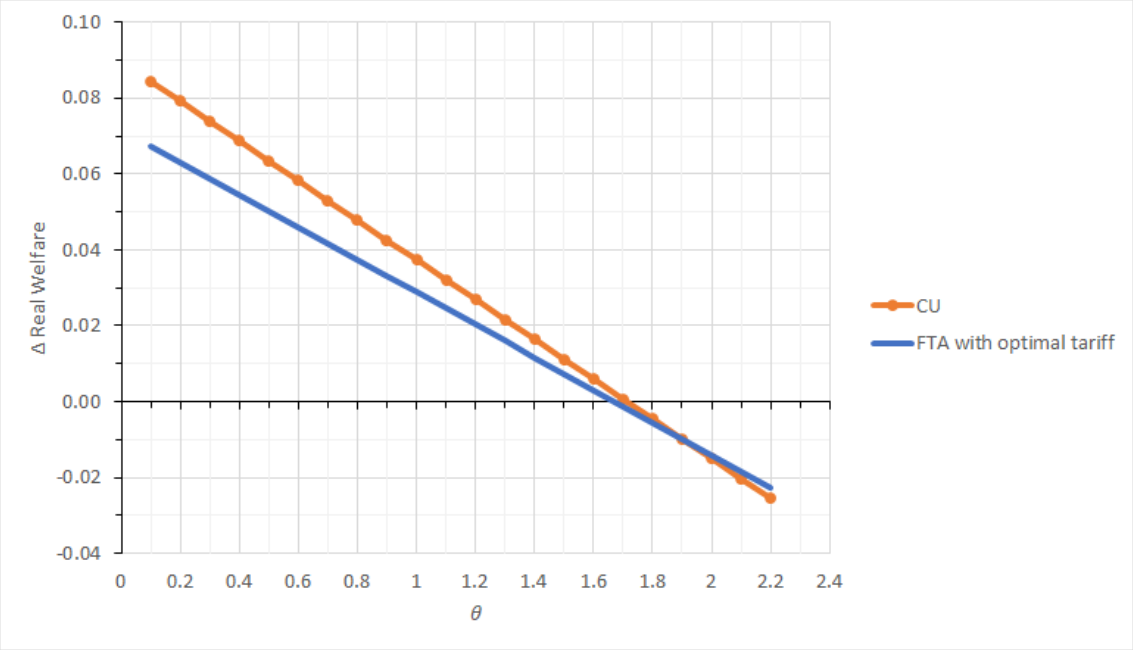

Figure 3.4: Comparing the welfare effects from an FTA with optimal tariffs and CU

Breaking down the changes into the different components of welfare, the CU offers lower consumer surplus ($CS_a^{cu} < CS_a^{f_{opt}}$) and tariff revenues ($TR_a^{cu} < TR_a^{f_{opt}}$). This is because a CU has higher tariffs compared to an FTA ($t^{cu} > t_{ac}^{f_{opt}}$). Therefore, country A will reduce imports from country C, leading to higher domestic price and a reduction in quantity purchased. Finally, the CU offers higher profits (or lower loses) than a CU regardless of the market size asymmetry ($\Pi_a^{cu} > \Pi_a^{f_{opt}}$). The

FTA also guarantees a firm larger profit over a greater degree of market asymmetry. Under an FTA, a firm will always enjoy a profit as long as $n < 1.48$ while a CU will guarantee profits if $n < 0.91$.

3.5 Conclusion

This paper has analysed the conditions under which there are welfare gains from joining a PTA where the member countries have differing market sizes. The paper uses an oligopoly model where the welfare gains from a country are sourced from consumer surplus, firm profits and tariff revenues. The conditions are shown to be determined by the type of trade agreement, either an FTA or a CU, and the degree of market asymmetry between the member countries. In examining the welfare effects of an FTA, the analysis incorporates two possible scenarios for a country in setting its external tariff. The country can either maintain the MFN tariffs or set an optimal tariff that maximises its welfare.

The study finds out that both FTA scenarios are welfare improving for a country provided the difference in its market size with its partner is not too large. For a small country, an FTA with MFN tariffs offers higher welfare since the gains from its firm's profits due to protection of the regional market is higher than the forgone gains from consumer surplus and tariff revenue if it had adopted of optimal tariffs. The choice of the larger country will be dependent on the market size asymmetry since its large population can generate higher consumer surplus and tariff revenue from adoption of optimal tariffs.

Similarly, the study found out that a CU is welfare improving as long as the market size asymmetry is not too large. Given an option between a CU and an FTA with optimal tariffs, a country will prefer a CU regardless of the market size since it offers higher welfare gains. However, between a CU and an FTA with MFN tariffs, a small country will prefer the FTA while a larger country will prefer a CU. The decision of the smaller country is based on fact that the profit gains for the firm outweighs the forgone gains in consumer surplus and tariff revenue due to lower

tariffs in a CU. On the other hand, a larger country's population makes it prefer a CU since the lower tariffs generate higher consumer surplus and tariff revenue.

Chapter 4

Trade and Welfare Effects of the East African Community

4.1 Introduction

The East African Community (EAC) is a Preferential Trade Agreement (PTA) that came into force in 2000 comprising of three member countries; Kenya, Tanzania, Uganda. They were later joined by Burundi and Rwanda in 2007 and South Sudan in 2016. The EAC is an ambitious agreement focused on pursuing trade and economic integration with the idea that it will address some of the constraints that hinder their economic development thereby increasing their economic growth and employment prospects. With an ultimate goal of forming a political federation, the EAC has made substantial steps in its integration process and is currently regarded as the most integrated PTA in Africa (Koami et al. 2016).

The EAC has pursued a linear model of integration, starting with a Free Trade Agreement (FTA) followed by the establishment of a Customs Union (CU) in 2010. With the focus of further deepening their integration, the EAC countries launched the Single Market protocol in 2010 and a Monetary Union protocol in 2013. However, both phases are yet to be established due to delays by member countries conforming to the protocols. The general perception by EAC countries is that they

stand to lose or have minimal gains compared to other partners from deepening and broadening the EAC agreement. This perception has also made member countries to pursue membership in other PTAs. Tanzania is a member of the Southern Africa Development Community (SADC) while Kenya, Uganda, Rwanda and Burundi are members of the Common Market for East and Southern Africa (COMESA). Since the EAC has only been able to make sufficient progress on trade liberalization for goods, this makes it an opportune time to assess the gains reaped from implementation of these trade-related policies as the region gears up to enact non-trade related policies.

The purpose of this chapter is to assess the trade and welfare effects of forming the EAC. More specifically, the analysis aims at addressing whether the EAC countries benefited from trade liberalization, whether the deepening and expansion of the EAC agreement has been beneficial, and whether the EAC is the best trade liberalization strategy for the member countries. The analysis is focused on the static effects [3] of the EAC through the goods trade channel. Static effects are the one-off effects due to improvement in allocative and productive efficiency. The welfare gains from static effects are expected to be minimal since tariffs are generally low across most countries due to successive multilateral trade liberalizations. Therefore, preferential reduction in tariffs may not have a huge impact on domestic prices.

The trade effects will be assessed based on Viner (1950) trade creation and trade diversion concepts. For this study, trade creation will be defined as the increase in imports due to formation of a PTA while trade diversion will be defined as the displacement of imports previously sourced from non-member countries by imports sourced from a PTA country. The analysis of the welfare effects will follow Harrison et al. (1993) who broke it down into two channels: the 'home-price' effect and the 'tariff-revenue' effect. The 'home-price' effect is the consumer and producers gains

[3]Gains from PTAs can either be analysed as static or dynamic effects. Measurement of the static gains of trade have long been the focus of empirical analysis while dynamic gains are ambiguous to measure and demand a detailed empirical analysis which is a difficult task with very few papers focusing on it (Mayer et al. 2019). For the case of the EAC, limited data availability makes it difficult to measure the dynamic gains.

due to changes in domestic prices after trade liberalization while the 'tariff-revenue' effect is the loss in tariff revenue by the government after trade liberalization.

This chapter is an ex-post analysis of trade integration, focused on estimating the historical impact of the EAC agreement from inception using a gravity model. Recent developments in trade theory have provided micro-foundations for the gravity model that makes them able to undertake general equilibrium analysis of the effects of PTAs. It utilizes the General Equilibrium Pseudo-Poisson Maximum Likelihood (GEPPML) procedure by Anderson et al. (2015). The procedure provides a consistent platform to estimate trade cost elasticities and conduct counterfactual simulations thus creating a better connection between trade theory, data and estimation of trade elasticities. This is because the key parameters for the counterfactual analysis are estimated in a gravity regression on the same sample of countries. The GEPPML model has been effectively utilized to quantify the gains of trade for PTAs including NAFTA Yotov et al. (2016) and mega-regional trade agreements for Asian countries Shepherd (2019).

A few papers have modelled the trade and welfare effects of EAC integration. Shinyekwa (2015) used a gravity model to estimate the trade creation and trade diversion effects of the EAC. His study covered the period 2001 to 2011 with a total of 70 countries. The study established that the trade creating effects of the EAC far outweigh the trade diversion effects. Buigut (2016) used a theoretically consistent gravity model to estimate the partial trade effects of the EAC Customs Union. His study covered the period 2000 to 2013 with a total of 49 trading partners. The coefficient estimate of the PTA dummy variable was 0.2 suggesting a 22 percent increase in trade due to the customs union. However, Mayer and Thoenig (2016) is the only paper to the best of my knowledge that has undertaken a general equilibrium exercise based on a gravity model to quantify the effects of the EAC. They utilised the General Equilibrium Trade Impact (GETI) procedure by Head and Mayer (2014) to estimate the trade creation, trade diversion and welfare effects for all EAC countries. They estimated the welfare effects from changes in producer

and consumer surpluses but did not provide estimates for the loss in tariff revenues. They reported that the EAC increased trade between its member countries by 213 percent. All EAC countries had a welfare improvement ranging between 0.18 – 0.7 percent of real GDP. This analysis differs quantitatively from the one by Mayer and Thoenig (2016) since it adops a different procedure for the general equilibrium analysis and accounts for tariff revenue loss in the welfare effect.

The remainder of the chapter is organized as follows. Section 4.2 presents the background and econometric specifications of the structural gravity equation and the methodology for the partial and general equilibrium analysis. Section 4.3 presents the data. Section 4.4 discusses the results in respect of trade creation, trade diversion and welfare effects. Section 4.5 concludes.

4.2 Gravity in Trade

4.2.1 History of the Gravity Model

The gravity model is one of the workhorse models for research in international trade. By analogy, it is based on the Newton's Law of Universal Gravitation, which states that particles are mutually attracted to one another by a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. Tinbergen (1962) is regarded as the first to relate Newton's law to trade flows, thereby providing the traditional setting of the gravity model. The general gravity model specifies that bilateral trade between two countries is directly related to their economic sizes and inversely related to trade costs, usually proxied by geographical distance. A high level of economic size for the importing country implies greater potential for imports while a high level of economic size for the exporting country gives rise to increased availability of goods for export due to greater levels of production. Trade costs reduce the profitability of supplying across borders and at a distance, leading to lower equilibrium export flows.

The gravity equation has proved to be hugely successful in explaining a large

fraction of variations in observed trade flows and is regarded as one of the most successful empirical relationships in economics. However, despite its solid empirical performance, the model initially lacked a theoretical framework and remained outside mainstream economics. Research on international trade had for a long time focused on Heckscher-Ohlin models that assumed no transportation costs. The disregard of distance, which is a cornerstone of the gravity equation, was what made it unpopular in trade analysis.

Anderson (1979) made the first attempt to formalize a theoretical basis for the model. He used a demand function with differentiated products, constant elasticity of substitution (CES) preferences and a simplified Armington assumption [4]. The theory explains that bilateral trade is not only affected by the sizes of the respective countries but also by their bilateral trade barriers and the average trade barriers the two countries face from all their other trading partners. Following Anderson (ibid.), a number of papers attempted to provide a theoretical foundation for the gravity model. Bergstrand (1985) developed a theoretical connection between factor endowments and bilateral trade. The emergence of the 'new trade theory' in the early 1980's also led to development of more theoretical foundations for the gravity model including that of Helpman and Krugman (1985) and Helpman (1987) based on a differentiated product framework with increasing returns to scale, and Bergstrand (1989) based on monopolistic competition.

Notwithstanding the many theoretical foundations developed, Leamer and Levinsohn (1995) noted that the model was not readily accepted by researchers of international economics despite its clear and robust empirical findings. They raised fundamental questions in their paper, 'Why don't trade economists "admit" the effect of distance into their thinking? How can this obvious conflict between fact and theory continue?' (ibid.). They noted one of the main downsides of the model was its weak link with international trade theory, writing 'An attempt to give a

[4]Armington assumption is based on the premise that goods that are produced in different regions are imperfect substitutes for each other and consumers will like to consume at least some of each country's goods.

theoretical foundation by Anderson (1979) is formally fruitful but seems too complex to be part of our everyday toolkit'. Trefler (1995) also reignited the debate on the importance of understanding the impediments of international trade. He coined the term 'missing trade' to describe the extent to which measured level of trade are smaller compared to the predicted level of trade based on international trade theory.

Another key contribution to the debate on the gravity equation's place in international trade theory was that of Krugman (1995) who considered the importance of remoteness in international trade. Krugman's experiment compared the hypothetical levels of trade between two small countries that are the same distance from each other, when they are in the middle of Europe and when they are moved to Mars. He showed that bilateral distance is crucial but not the only important parameter in the gravity model, pointing out a gap in understanding multilateral trade. McCallum (1995) seminal paper, another popular reference in the gravity equation literature, used the model in assessing the effect of national borders in the Canada-U.S. trade. McCallum concluded that the Canada-US international border caused the 1988 Canadian inter-provincial trade to be 22 times (2,200 percent) larger than the trade between US states and Canadian provinces. This phenomenon, which he referred to as the 'border puzzle', implied that international borders imposed dramatic costs on international relative to intra-national trade. The results not only showed the usefulness of the gravity equation in estimating trade policies but also led to a number of researchers to attempt to decipher the importance of trade border effects (Anderson and Van Wincoop 2003).

The articles by Krugman and McCallum inspired the landmark contribution of Anderson and Van Wincoop (ibid.) who formulated a new theoretical foundation for the gravity equation. Motivated by the results of the 'border puzzle', Anderson and Van Wincoop (ibid.) showed that the large inter-provisional trade was because of omitted variable bias and the small size of the Canadian economy. Their seminal work showed that controlling for the relative trade costs is important for proper specification of a gravity model. Their theory indicated that bilateral trade is not

only dependent on the absolute trade costs between the exporting and importing countries but also to some degree a weighted function of the trade barriers affecting all other countries. They termed these average trade barriers as 'Multilateral Resistance Terms'. After controlling for these multilateral resistance terms, they had smaller border effects than that of McCallum (1995).

Anderson and Van Wincoop (2003) decomposed these trade barriers facing the two trading partners into three: the bilateral trade barriers between country i and j; the outward multilateral resistance term which is country i's ease to trade with all countries; and the inward multilateral resistance term which is country j's ease to trade with all countries. The rational for their inclusion of the outward and inward multilateral resistance terms is based on the ideal that two small countries, say Belgium and Netherlands, surrounded by two other large economies, France and Germany, will trade less between themselves than if they were surrounded by oceans, say Australia and New Zealand. Anderson and Van Wincoop (ibid.) publication titled *'Gravity with Gravitas: a solution to the border puzzle'* put an end to the conventional wisdom that gravity equations lacked theoretical grounding.

These multilateral resistance terms form the heart of the gravity models. A model is termed as 'structural gravity' if it accounts for multilateral resistance terms while one that that does not account for them is termed as a 'naïve gravity'. Structural gravity models can be derived from the demand-side as proposed by Anderson and van Wincoop (2003) and from the supply side using the Ricardian Comparative Advantage model as proposed by Eaton and Kortum (2002). It has also been shown to hold under monopolistic competition (Chaney 2008).

4.2.2 Structural Gravity Model

The gravity equation is an intuitive way of understanding trade flows. It links bilateral trade flows directly with the economic sizes of the countries and inversely with trade costs affecting them. Following the definition by Head and Mayer (2014),

the gravity equation takes a multiplicative form:

$$X_{ij} = S_i M_j \Phi_{ij} \tag{4.1}$$

Where X_{ij} represents the nominal trade flows from country i to country j. S_i is the supply 'capabilities' of country i to export commodities to all destinations. M_j is the market characteristics of country j that affects its demand of imports from all destinations. $\Phi_{ij} \geq 1$ is an inversed measure of trade costs faced by exporters in country i when accessing country j's market. Therefore, if the trade costs are eliminated (frictionless trade), the hypothetical level of frictionless bilateral trade is assumed to be proportional to the product S_i and M_j. Equation 4.1 can be expressed either as naïve gravity or structural gravity depending on how S_i and M_j are denoted.

For the naïve gravity equation, S_i and M_j are represented by the income terms of country i and country j respectively. Therefore, for each time period t, the naïve gravity equation takes the form:

$$X_{ijt} = Y_{it} E_{jt} \Phi_{ijt} \tag{4.2}$$

Where Y_{it} is the value of country i's total output of goods and E_{jt} is the value of country j's total expenditure on all goods sourced from all exporting countries including itself. The two income terms are usually proxied by the GDPs of their respective countries.

For the structural gravity equation, S_i and M_j are represented by both the income terms and multilateral resistance terms. Following the procedure by Anderson et al. (2015), the structural gravity system of equations derived from the demand-side under the assumption of identical Constant Elasticity of Substitution (CES) preferences across countries for national varieties differentiated by place of origin

takes the form:

$$X_{ijt} = \frac{Y_{it}}{\Pi_{it}^{1-\sigma}} \frac{E_{jt}}{P_{jt}^{1-\sigma}} \Phi_{ijt}^{1-\sigma} \tag{4.3a}$$

$$\Pi_{it}^{1-\sigma} = \sum_{j} \frac{E_{jt}}{P_{jt}^{1-\sigma}} \Phi_{ijt}^{1-\sigma} \tag{4.3b}$$

$$P_{jt}^{1-\sigma} = \sum_{i} \frac{Y_{it}}{\Pi_{it}^{1-\sigma}} \Phi_{ijt}^{1-\sigma} \tag{4.3c}$$

Where $\Pi_{it}^{1-\sigma}$ is the outward multilateral resistance, $P_{jt}^{1-\sigma}$ is the inward multilateral resistance and $\sigma > 1$ is the elasticity of substitution among goods from different countries. The outward multilateral resistance is exporter i's ease of market access and captures the dependency of exports from country i on trade costs across all possible export markets. The inward multilateral resistance is importer j's ease of market access and captures the dependency of imports of country j on trade costs across all possible suppliers. According to the theoretical foundations of the gravity model, the inward multilateral resistance is the CES price index of country j.

The structural gravity equation can used for measuring partial and general equilibrium trade effects. Partial equilibrium trade effects are the direct impacts on the trade liberalizing countries from a change in bilateral trade costs. The general equilibrium trade effects capture both the direct impacts on trade liberalizing countries and the indirect impacts caused by changes in third countries. The multilateral resistance terms are the general equilibrium trade cost terms that captures how the change in bilateral trade costs affects third countries and the possible feedback effects on the trade liberalizing countries.

The partial equilibrium effects will be estimated by holding the multilateral resistance terms and incomes constant. This can be expressed as follows:

$$\hat{X}_{ijt}^{PE} = \frac{(\Phi_{ijt}^{1-\sigma})'}{\Phi_{ijt}^{1-\sigma}} \tag{4.4}$$

Where $\hat{X}_{ijt}^{PE}$ is the partial trade effect with $\hat{X}_{ijt}^{PE} = 1$ for any pair of countries that do not have a trade agreement. The partial trade effect is seen as a solution of

'pure' trade creation effect since the impact on third countries are not considered. These effects have been seen as the strongest effects of trade liberalization but may not give reliable estimates of the full impact of a PTA since third country effects are omitted (Yotov et al. 2016).

The general equilibrium effects will be given by allowing for changes in the multilateral resistance terms and incomes. This can be expressed as follows:

$$\hat{X}_{ijt}^{GE} = \frac{(\Phi_{ijt}^{1-\sigma})'}{\Phi_{ijt}^{1-\sigma}} \times \frac{\Pi_{it}^{1-\sigma} P_{jt}^{1-\sigma}}{(\Pi_{it}^{1-\sigma})'(P_{jt}^{1-\sigma})'} \times \frac{Y_{it}' E_{jt}'}{Y_{it} E_{jt}} \tag{4.5}$$

Where $\hat{X}_{ijt}^{GE}$ is the general equilibrium trade effect. It is a solution for both the trade creation and trade diversion effects since the effects of the change in bilateral trade costs are allowed to affect third countries through the multilateral resistance terms. The results from the general equilibrium trade analysis can be used to estimate the welfare effects.

4.2.3 Estimation of Trade Effects of a PTA

Partial Equilibrium Trade Analysis

Due to its multiplicative nature, the gravity equation has to be transformed for it to be estimated using the normal linear methods. The standard procedure for transformation is by taking the natural logarithms of all variables to form a linear model. Thus, the log-linear form of the equation 4.3 can be expressed as:

$$lnX_{ijt} = ln\left(\frac{Y_{it}}{\Pi_{it}^{1-\sigma}}\right) + ln\left(\frac{E_{jt}}{P_{jt}^{1-\sigma}}\right) + ln\Phi_{ijt}^{1-\sigma} + \varepsilon_{ijt} \tag{4.6}$$

However, the multilateral resistance terms are theoretical constructs and not directly observable by research. Different ways have been proposed by researchers to account for them but use of time-varying fixed effects is the most common practice since it has been found to be an easy and consistent measure (Head and Mayer 2014). Fally (2015) showed that the exporter-time and importer-time fixed effects

correspond perfectly with the outward multilateral resistance and inward multilateral resistance respectively. Further, the use of these time-varying fixed effects do not only account for the unobservable multilateral resistance terms but also absorbs the output and expenditure terms as well as other country-specific observable and unobservable variables (Baldwin and Taglioni 2006). However, to avoid perfect collinearity, either one exporter-time or importer-time fixed effect has to be dropped.

The bilateral trade costs are commonly proxied by a number of observable variables that are believed to influence trade costs. The most widely used format for presenting trade costs is as follows:

$$ln\Phi_{ijt}^{1-\sigma} = \beta_1 lndist_{ij} + \beta_2 contig_{ij} + \beta_3 comlang_{ij} + \beta_4 comcol_{ij} + \beta_5 PTA_{ijt} \quad (4.7)$$

Where $dist_{ij}$ is the geographical distance between the two countries, $contig_{ij}$ is a dummy variable denoting whether the two countries share a common (contiguous) border, $comlang_{ij}$ is a dummy variable denoting whether the two countries have a common official language, $comcol_{ij}$ is a dummy variable denoting whether the countries share common colonial ties and PTA_{ijt} is a dummy variable denoting whether the two countries are members of a PTA.

Since there are numerous variables that contribute to bilateral trade costs, estimates of the gravity equation can be unreliable due to endogeneity and omitted variable bias especially for trade policy variables. Baier and Bergstrand (2007) proposed the use of country-pair fixed effect to control for these unobservable linkages between the endogenous trade policy term and the error term in the gravity equation. The country-pair fixed effect also control for all observable and unobservable time-invariant variables. Therefore, its biggest downside is if incorporated, it is possible to identify the effects of any time-invariant bilateral cost variables. However, it will not have an effect when focus is on estimation of bilateral trade policy, such as the effect of PTAs, since they are time varying.

Equation 4.6 can be re-written with exporter-time and importer-time fixed effects to control for the multilateral resistance terms and the country-pair fixed effect to

controls for all other unobservable bilateral linkages. It is estimated using ordinary least squares (OLS) as follows:

$$lnX_{ijt} = \alpha_{it} + \alpha_{jt} + \alpha_{ij} + \beta PTA_{ijt} + \varepsilon_{ijt} \tag{4.8}$$

Where α_{it} represents for full set of exporter-year fixed effects, α_{jt} represents for full set of importer-year fixed effects, α_{ij} represents country-pair fixed effect, and PTA_{ijt} is a dummy variable that takes unity if country i and country j are members of a PTA and zero otherwise. Thus β measures the impact on trade of a country from joining a PTA. It is noted that $PTA_{ijt} = 0$ for any pair of countries that are not in a PTA so the effects of third countries are exempted from the equation.

Researchers have criticized this estimation of the gravity equation using OLS. Silva and Tenreyro (2006) argued that estimation of gravity models using OLS is prone to two econometric challenges. The first challenge is the presence of zero trade flows which may arise since not all countries trade with each other in all given years or in some instances due to a measurement error. Since the standard way of estimating a gravity model is by using a log-linear approach, the zero trade flows are dropped when estimating the logarithm of the trade value. Therefore, the possibility of a high number of zero trades requires either the trade model be adjusted to accommodate zero trades, or the estimation method be changed to allow for consistent estimates in the presence of a dependent variable that takes zeros.

The second challenge is that trade data is likely to be prone to heteroscedasticity. One of the assumptions of the OLS estimation, the heteroscedasticity assumption, is that the error term should not be correlated with any of the explanatory variables. But when the gravity equation is estimated in a log-linear format, the expected values of the log-linearized error term will depend on the covariates of the regression hence OLS is likely to be inconsistent.

To address both issues, Silva and Tenreyro (ibid.) proposed the estimation of equation 4.6 using a Pseudo-Poisson Maximum Likelihood Method (PPML) as fol-

lows:

$$X_{ijt} = exp(\alpha_{it} + \alpha_{jt} + \alpha_{ij} + \beta PTA_{ijt}) + \varepsilon_{ijt} \tag{4.9}$$

From equation 4.9, it is noted that the dependent variable is estimated as nominal trade flows rather than the logarithm of trade flows, thereby even zero trades can be included in the estimation compared to OLS. Also, the expected value of the error term will not depend on the covariates of X_{ijt}. Despite these differences, PPML still shares a number of similarities with OLS in that they both are consistent with the importer-time, exporter-time and country-pair fixed effects, which are incorporated in the model as dummy variables. Further, the interpretation of the gravity estimates in both strategies follow similar patterns (Shepherd 2013).

Head and Mayer (2014) undertook a Monte Carlo simulation where OLS and PPML estimation procedures were compared. They noted that PPML was a consistent estimator in the presence of heteroscedasticity while OLS was not. In the presence of heteroscedasticity, OLS overestimates the distance and PTA effects while PPML is relatively consistent. The simulation also confirmed that PPML was a better estimator when the data had numerous zero trades while OLS was a poor estimator due to biasness on both distance and PTA. However, in a situation where there is a major error in the specification of the conditional expectation, $\hat{Y}_{ij}$, PPML was a biased estimator while OLS presented credible estimates (ibid.).

Another difference of PPML and OLS estimators was noted by Larch et al. (2017) who show that the application of the two estimation techniques on the same sample lead to large differences in estimates. In their study on the effect of the European Monetary Union (EMU), they noted that OLS and PPML estimates continually diverged as additional smaller countries were added into the sample. Indeed, Silva and Tenreyro (2006) summarized that OLS tends to put more weight on smaller trade flows compared to PPML. Larch et al. (2017) pointed out that smaller countries contributed relatively more to the sum of log of trade flows, lnX_{ijt}, which is the key component in OLS estimation, compared to the sum of trade flows, X_{ijt}, which is the key component of PPML estimation.

A decision on which of the two estimation procedures should be applied will highly depend upon the focus of study and the available data. Both of the estimators have interesting properties and none can be termed as exclusively superior to the other. In general, PPML estimation is more desirable since it addresses most of the theoretical concerns but in cases where the sample size incorporates small countries, OLS may be a preferable estimator. Therefore, the determination of the most appropriate estimator remains an empirical decision based on the dataset. Both OLS and PPML should be estimated as part of a 'robustness-exploration' and a comparison of their results be then used to draw conclusions on which is the suitable estimator (Head and Mayer 2014).

General Equilibrium Trade Analysis

To estimate the general equilibrium trade effects, the structural gravity model is estimated for the baseline scenario and the counterfactual scenario in terms of the observable trade costs, which in this study is a PTA. The difference of the solutions from the two scenarios is the general equilibrium trade effects. When estimating the counterfactual changes, the trade flows for all country pairs should be taken into account. The general equilibrium trade analysis procedure can be undertaken in three steps.

The first step is estimating equation 4.8 [5] to retrieve the baseline gravity estimates. The trade cost can be inferred as $ln(\Phi_{ijt}^{1-\sigma}) = \alpha_{ij} + \beta PTA_{ijt}$. As seen from equations 4.3, the multilateral resistance terms are conditional general equilibrium concepts since they are solved for a given level of outputs and expenditures. The estimation of the structural gravity equation requires dropping of one time-varying fixed effects to avoid perfect collinearity. It is common to drop the importer-time fixed effects for a reference country that shares a lot of similarities with the PTA member countries but will not be greatly affected by the counterfactual shock ($\alpha_{Rt} = 0$, where R is the reference country). This is equivalent to normalizing the inward mul-

[5] This can also be estimated using a PPML procedure using equation 4.9

tilateral resistance to be equal to one for this country ($P_{Rt}^{1-\sigma} = 1$). The multilateral resistance terms can then be inferred from the time-varying fixed effects as follows:

$$ln\left(\frac{Y_{it}}{\Pi_{it}^{1-\sigma}}\right) = \alpha_{it} + lnE_{Rt} \tag{4.10a}$$

$$\Pi_{it}^{1-\sigma} = E_{Rt}Y_{it}exp(-\alpha_{it}) \tag{4.10b}$$

and

$$ln\left(\frac{E_{jt}}{P_{jt}^{1-\sigma}}\right) = \alpha_{jt} + lnE_{Rt} \tag{4.11a}$$

$$P_{jt}^{1-\sigma} = \frac{E_{jt}}{E_{Rt}}exp(-\alpha_{jt}) \tag{4.11b}$$

From equation 4.11, it is seen that $P_{Rt}^{1-\sigma} = \frac{E_{Rt}}{E_{Rt}}exp(0) = 1$. The theoretical interpretation of all exporter-time and importer-time fixed effects will be relative to the reference country's expenditure (E_{Rt}).

The second step is to define the counterfactual scenario and solve for the conditional general equilibrium estimates. In this study, the counterfactual scenario will be the elimination of a PTA. This means that the trade frictions $ln(\Phi_{ijt}^{c})^{1-\sigma} = \alpha_{ij}^{c}$ since $PTA_{ijt}^{c} = 0$ where superscript c denotes counterfactual variables. The counterfactual gravity equation to be estimated in this step will allow for changes in multilateral resistance terms in response to the changes in trade costs but do not allow for changes in outputs, expenditures and trade flows. Hence, the solution will be referred to as conditional general equilibrium estimates. Therefore, the following gravity equation will be estimated:

$$lnX_{ijt} = \alpha_{it}^{c} + \alpha_{jt}^{c} + \alpha_{ij}^{c} + \varepsilon_{ijt}^{c} \tag{4.12}$$

This equation estimates the counterfactual time-varying fixed effects that are consistent with the original trade flows but with the counterfactual trade costs.

Therefore, α_{it}^{c} and α_{jt}^{c} can together with the original values of output and expenditures will be used to construct the conditional general equilibrium values for outward and inward multilateral resistance terms respectively. These will be the 'first-order' general equilibrium changes in multilateral resistance terms.

The third step is to solve for the counterfactual model in a full general equilibrium where changes in output, expenditures and trade flows are captured in addition to the changes in multilateral resistance terms. The market clearing condition can be utilized to translate the changes in the multilateral resistance terms into changes in factory-gate prices, which is the price paid by domestic consumers for domestic goods. This change in factory-gate prices triggers changes in output, expenditures and trade flows. These endogenous responses in values of output, expenditures and trade flows will translate to 'second-order' changes in multilateral resistance terms. Therefore, this step is solved using a four-stage iteration procedure.

The first stage of the iteration procedure is the estimation of the changes in factory-gate prices. By applying the market clearing conditions [6] and the definition of the outward multilateral resistance from equation 4.10, the changes in the time-varying fixed effects can be translated into changes in factory-gate prices (p_{it}) using the following expression:

$$\frac{p_{it}^{c}}{p_{it}} = \left(\frac{exp(\alpha_{it}^{c})}{exp(\alpha_{it})}\right)^{\frac{1}{1-\sigma}} \tag{4.13}$$

The second stage of the iteration procedure is the estimation of the changes in income and expenditures. This stage assumes an endowment economy that allows for balanced trade, where trade imbalances ratios for each country are assumed to remain constant in the counterfactual scenario ($\varphi_i = \frac{E_i}{Y_i}$). The changes in factory-gate prices will cause endogenous changes in the income and expenditures given by:

[6] The market clearing condition is given by $Y_{it} = \sum_j \left(\frac{\lambda_i p_{it} \Phi ijt}{P_{jt}}\right)^{1-\sigma} E_{jt}$ where p_{it} is the factory gate price for each variety of good in country i and $\lambda_i > 0$ is the CES preference parameter across all varieties of goods. Therefore, the factory-gate price can be expressed as $p_{it} = Y_{jt}^{\frac{1}{1-\sigma}} \frac{1}{\lambda_i \Pi_{it}}$

$$Y_{it}^{c} = \left(\frac{p_{it}^{c}}{p_{it}}\right) Y_{it} \tag{4.14a}$$

$$E_{it}^{c} = \left(\frac{p_{it}^{c}}{p_{it}}\right) E_{it} \tag{4.14b}$$

The third stage of the iteration procedure is the estimation of the changes in trade flows. These changes in income and expenditures, together with the changes in multilateral resistance terms and trade costs, in turn lead to changes in trade flows based on the theoretical gravity equation:

$$X_{ijt}^{c} = \frac{(\Phi_{ijt}^{1-\sigma})^{c}}{\Phi_{ijt}^{1-\sigma}} \times \frac{\Pi_{it}^{1-\sigma} P_{jt}^{1-\sigma}}{(\Pi_{it}^{1-\sigma})^{c} (P_{jt}^{1-\sigma})^{c}} \times \frac{Y_{it}^{c} E_{jt}^{c}}{Y_{it} E_{jt}} \times X_{ijt} \tag{4.15}$$

The fourth stage of the iteration procedure is the re-estimation of the gravity model with new values of trade flows:

$$lnX_{ijt}^{c} = \alpha_{it}^{c} + \alpha_{jt}^{c} + \alpha_{ij}^{c} + \varepsilon_{ijt}^{c} \tag{4.16}$$

The iteration procedure is repeated until convergence where the changes in factory-gate prices are close to zero. Once convergence is achieved, the full general equilibrium estimates of income, expenditure and trade flows can be calculated using equations 4.14 and 4.15. The difference, in percentages, between the full general equilibrium estimates and the baseline estimates measures the full general equilibrium effects of the PTA. These full general equilibrium effects can be used to estimate the welfare effects of a PTA.

4.2.4 Estimation of Welfare Effects of a PTA

According to Harrison et al. (1993), the welfare changes from the formation of a PTA can be decomposed into two channels, the 'home-price' effect and the 'tariff-revenue' effect. The 'home-price' effect is the consumer and producers gains due to changes in domestic prices after trade liberalization while the 'tariff-revenue' effect is the loss

in tariff revenue by the government after trade liberalization. The expression of the welfare effect will be given by:

$$W_i = HP_i + TR_i \tag{4.17}$$

Where W_i is the welfare effect, HP_i is the 'home price' effect and TR_i is the 'tariff-revenue' effect.

Arkolakis et al. (2012) demonstrated that the 'home-price' effect can be expressed as a combination of the change in intra-national trade as a share of total expenditure ($\frac{X_{ii}}{E_i}$) and the trade elasticity of substitution $(1-\sigma)$. Thus, based on the general equilibrium trade analysis, the welfare (real consumption) gain from trade will be calculated as a percentage change in real GDP as follows:

$$HP_i = \left(\frac{X_{ii}^c / E_i^c}{X_{ii} / E_i} \right)^{\frac{1}{1-\sigma}} \tag{4.18}$$

The 'tariff-revenue' effect can also be calculated using the estimates of the general equilibrium trade analysis. According to trade theory, tariff revenue is given as a product of the tax rate and the value of imports. For this study, the counterfactual scenario is a case where the PTA was not formed, thus the 'tariff-revenue' effect will be given by:

$$TR_i = \sum_j t_{ij}^c X_{ij}^c \tag{4.19}$$

Where t_{ij}^c is the counterfactual tariff rates of country i on imports from country j and X_{ij} is the counterfactual volume of imports by country i from country j. The counterfactual tariff rates are those assumed to be prevailing if the PTA was never formed.

4.3 Data

The study makes use of the Historical Bilateral Trade and Gravity Dataset (TRADHIST) from the CEPII (Fouquin, Hugot, et al. 2016). It is one of the most extensive

database of bilateral trade flows with the largest possible number of countries and the longest possible number of years. Its data on bilateral trade flows is sourced from the IMF DOTs database complemented with UN-COMTRADE database. This study will focus on the period 1948 – 2014 where data for most countries in the world are available. Data on various covariates known to impact trade including PTAs, geographical distance, common borders, common languages and colonial linkages are sourced from the GEODIST database of the CEPII. Central to our study is data on PTAs but the GEODIST dataset does not extensively cover PTAs in Africa. Therefore, its data on PTA membership is supplemented with that sourced from the Jeffery Bergstrand's EIA Dataset and the WTO database.

For the general equilibrium analysis, data on intra-national trade will be required. Intra-national trade amounts to expenditure on domestic goods which is a critical share of the total output and aggregate expenditure. The data are not readily available but can be calculated as the difference between a country's total production and total exports ($X_{ii} = Y_{ij} - \sum_{j \neq i} X_{ij}$) due to market clearing (Mayer and Thoenig 2016; Novy 2013; Wei 1996). The data on gross domestic production is sourced from the United National Accounts Database while the total exports are calculated from the bilateral trade data in the TRADHIST dataset. Total gross domestic production can be computed as the sum of the total output for agriculture, mining and manufacturing sectors. Since production data is not available for some countries for all years, we employ a novel procedure by Nitsch (2000) of multiplying a country's GDP with the average production-to-GDP ratio of two previous or next years for which production data is available. The total goods production data from both sources is then converted into British Pounds by the annual exchange rate data taken from TRADHIST dataset. This study will focus on the period 1995-2014 and consider 50 countries (see Appendix 1 for a list) who are among the largest trading partners of the EAC countries. The study is limited to these countries due to availability of intra-national trade data and the variable limitations of the general equilibrium procedure.

To estimate the tariff-revenue effect, the study draws the tariff-line level data from the UNCTAD Trade Analysis Information System (TRAINS) dataset. The data sourced is the six-digit level of (Harmonized System (HS) 1992 for the 5 EAC countries. In the database, all possible tariff schemes are included, that is MFN schemes, PTA schemes, and GSP schemes. Since the EAC countries were members of the WTO and other PTAs before formation of the EAC, the study will first consider PTA tariffs and for any missing data, the prevailing MFN rates will be considered. These six-digit level tariffs are then aggregated to national tariff line level using the weighted average method. Since all member countries removed majority of their tariffs on intra-regional trade after formation of the EAC, the tariff data sourced will be that for the year prior to the respective country joining the EAC. It is assumed that if the EAC was not formed, these tariffs would have prevailed. Table 4.1 gives a summary of all the sources data for this analysis.

4.4 Results

4.4.1 Partial Equilibrium Trade Effects of the EAC

The first part of the analysis is to estimate the partial equilibrium trade effects which will give us the trade creation effects of the formation of the EAC. The study employs OLS as the primary estimator and, in addition, solves an equivalent gravity estimate using PPML as a robustness check. Following the definition by Baier and Bergstrand (2007), the gravity estimate β will be interpreted as the trade volume effects of forming a PTA.

To assess the impact of the EAC against other trade agreements, the PTA_{ijt} dummy variable will be estimated for a number of trade agreements. Besides for comparison purposes, proper estimation of the effects of the EAC will require control for participation of the EAC countries in other trade agreements due to the multiplicity in membership (Limao 2016). The trade agreements to be considered will include African PTAs that are comparable to the EAC such as the Common

Variable	Definition	Years	Source
Imports	Total merchandise imports from country i to country j in year t	1948 – 2014	CEPII
GDP	The annual GDP of each country in year t	1948 – 2014	CEPII
Distance	Logarithm of the weighted average distance between country i and country j	-	CEPII
Contiguity	Dummy variable for country pairs that share a common land border	-	CEPII
Common Colonizer	Dummy variable for country pairs that were colonized by the same power	-	CEPII
Common Language	Dummy variable for country pairs that have a common official language	-	CEPII
PTA	Dummy variable for country pairs that are members of the same PTA in year t	1948 - 2014	Jeffrey Bergstrand's EIA Dataset, WTO
Total Goods Production	Sum of the total output for agriculture, mining and manufacturing sectors	1995 – 2014	UN National Accounts Official Country Dataset
Tariff	Weighted-average tariff rate for imports sourced from the EAC by each member country	1995 – 2014	UNCTAD-TRAINS

Table 4.1: Data Sources

Market for East and Southern Africa (COMESA), Southern Africa Development Community (SADC), Economic Community for Central African States (CEMAC), Economic Community for West African States (ECOWAS) and the West African Economic and Monetary Union (WAEMU). Other trade agreements incorporated will be the World Trade Organization (WTO) and General System of Preferences (GSP) for which all EAC countries participate.

Table 4.2 presents the results of estimating the impact of the EAC using various forms of the gravity equations to underscore the effects of controlling for multilateral resistances, endogeneity and omitted variable bias. The first column gives the results of the naïve gravity equation which replaces the exporter-time, importer-time and country-pair fixed effects in equation 4.8 with the size proxies that account

for GDP and standard bilateral trade cost variables. Thus, the naïve estimation does not adequately control for multilateral resistances, endogeneity of the PTA_{ijt} variables with other bilateral cost variables and omitted variable bias but allows for measurement of the size and various trade cost variables. The gravity equation to estimate the first column will take the form:

$$\begin{aligned} lnX_{ijt} =& \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 lndist_{ij} + \beta_4 contig_{ij} + \beta_5 comlang_{ij} \\ &+ \beta_6 comcol_{ij} + \beta_7 EAC_{ijt} + \beta_8 COMESA_{ijt} + \beta_9 SADC_{ijt} + \beta_{10} CEMAC_{ijt} \\ &+ \beta_{11} ECOWAS_{ijt} + \beta_{12} WAEMU_{ijt} + \beta_{13} WTO_{ijt} + \beta_{14} GSP_{ijt} \\ &+ \gamma_t + \varepsilon_{ijt} \end{aligned} \tag{4.20}$$

The findings are in line with trade literature; economic size effects exhibit elasticities of close to 1 and the distance reduces trade with an elasticity of close to -1. All other time-invariant bilateral variables such as common border, common language and common colonizer are seen to significantly promote trade with an elasticity of close to 1. Most PTA variables, which are the variables of interest for this study, are seen to strongly promote trade with the exception of COMESA and CEMAC.

The second column introduces country-pair fixed effect to account for endogeneity and omitted variable bias. In such a case, all the time-invariant bilateral variables are dropped. The gravity equation to estimate the second column will take the form:

$$\begin{aligned} lnX_{ijt} =& + \alpha_{ij} + \gamma_t + \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 EAC_{ijt} + \beta_4 COMESA_{ijt} \\ &+ \beta_5 SADC_{ijt} + \beta_6 CEMAC_{ijt} + \beta_7 ECOWAS_{ijt} + \beta_8 WAEMU_{ijt} \\ &+ \beta_9 WTO_{ijt} + \beta_{10} GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{4.21}$$

The results indicate a drop in the effects for most PTA variables while COMESA and CEMAC have an increase in their magnitude and become statistically significance. This is expected since the country-pair fixed effect controls for all time-invariant variables that may have been omitted in the naïve gravity model. The changes can also be associated with the control of endogeneity of the trade variable

	Naïve Gravity	Naïve Gravity with Dyad FE	Structural Gravity without Dyad FE	Structural Gravity with 3-way FE
$GDP_{exporter}$	1.061***	0.788***		
	(0.005)	(0.016)		
$GDP_{importer}$	0.854***	0.715***		
	(0.005)	(0.014)		
Distance	-1.093***		-1.384***	
	(0.015)		(0.015)	
Contiguity	0.569***		0.397***	
	(0.072)		(0.070)	
Common language	0.741***		0.558***	
	(0.031)		(0.029)	
Common colonize r	0.980***		1.294***	
	(0.074)		(0.072)	
PTA	0.628***	0.202***	0.537***	0.210***
	(0.026)	(0.017)	(0.027)	(0.018)
EAC	1.616***	0.916***	2.371***	1.511***
	(0.303)	(0.212)	(0.307)	(0.302)
COMESA	-0.231	0.298***	0.543***	0.702***
	(0.143)	(0.106)	(0.135)	(0.104)
SADC	1.048***	0.487***	1.105***	0.996***
	(0.206)	(0.144)	(0.189)	(0.157)
CEMAC	-0.244	-0.764*	0.851*	-0.165
	(0.427)	(0.392)	(0.447)	(0.351)
ECOWAS	0.489***	0.476***	0.409**	0.851***
	(0.178)	(0.166)	(0.181)	(0.159)
WAEMU	0.701*	-0.280	1.595***	-0.072
	(0.376)	(0.272)	(0.328)	(0.240)
WTO	0.144***	0.228***	0.426***	0.183***
	(0.019)	(0.017)	(0.037)	(0.030)
GSP	0.480***	0.154***	0.509***	0.047**
	(0.025)	(0.023)	(0.025)	(0.023)
Observations	807,186	807,186	885,238	883,770
R^2	0.615	0.413	0.845	0.845
exporter-year and importer-year FEs	-	-	Yes	Yes
country-pair FE	-	Yes	-	Yes
Year FE	Yes	Yes	-	-

Table 4.2: Gravity Regression Results
Notes: ***,** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis

with the bilateral trade costs which is now controlled by the country-pair fixed effect. This confirms the importance of incorporating country-pair fixed effects.

The third column introduces exporter-time and importer-time fixed effects to the naïve gravity equation to control for multilateral resistances while the standard bilateral trade cost variables are included. In this case the size variables are dropped. The gravity equation to estimate the third column will take the form:

$$\begin{aligned} lnX_{ijt} =& \alpha_{it} + \alpha_{jt} + \beta_1 lndist_{ij} + \beta_2 contig_{ij} + \beta_3 comlang_{ij} + \beta_4 comcol_{ij} \\ &+ \beta_5 EAC_{ijt} + \beta_6 COMESA_{ijt} + \beta_7 SADC_{ijt} + \beta_8 CEMAC_{ijt} \\ &+ \beta_9 ECOWAS_{ijt} + \beta_{10} WAEMU_{ijt} + \beta_{11} WTO_{ijt} + \beta_{12} GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{4.22}$$

All other time-invariant bilateral variables are seen to significantly promote trade as expected while distance reduces trade with an elasticity of close to -1. Control of multilateral resistances causes all PTAs to be significant and their magnitudes larger than in the naïve gravity estimation. This confirms the importance of controlling multilateral resistances.

The fourth column is the theoretical-consistent estimate of structural gravity model which incorporates the 3-way fixed effects; exporter-time, importer-time and country-pair fixed effects. The gravity equation to estimate the third column will take the form:

$$\begin{aligned} lnX_{ijt} =& \alpha_{it} + \alpha_{jt} + \alpha_{ij} + \beta_1 EAC_{ijt} + \beta_2 COMESA_{ijt} + \beta_3 SADC_{ijt} \\ &+ \beta_4 CEMAC_{ijt} + \beta_5 ECOWAS_{ijt} + \beta_6 WAEMU_{ijt} + \beta_7 WTO_{ijt} \\ &+ \beta_8 GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{4.23}$$

The biggest challenge of estimating equation 4.23 is the computation time due to the numerous of high-dimensional fixed effects with a long-time dimension. To remedy this, we use the reghdfe Stata command for OLS estimation developed by Correia (2017) which has been seen to effectively reduce the computation time and is highly recommended by a number of researchers (Mayer and Thoenig 2016) (Shepherd 2013).

All PTAs have large and positively significant trade effects except for CEMAC

and WAEMU. WTO and GSP agreements are also seen to significantly increase trade but their impacts are relatively smaller than those of PTAs. These results indicate that pursuing a PTA is likely to be more beneficial than multilateral and non-reciprocal trade agreements. Focusing on the EAC, the results indicate that its formation has quadrupled trade between its member countries (gravity coefficient of 1.511). The impact of the EAC is also seen to be larger than those of other African PTAs. This indicates that EAC countries have enjoyed higher trade gains from their integration than from other comparable PTAs that they are signatories.

Different dimensions of the EAC trade integration

Different dimensions of the trade created effects of the EAC can also be assessed by adding a number of controls to equation 4.22. The first dimension is the expansion of the EAC membership. The EAC initially comprised of three members (Kenya, Uganda and Tanzania) but later expanded in 2007 to include Rwanda and Burundi. The expansion of the EAC can be assessed by inclusion of a dummy variable that takes the value one if the year is ≥ 2007 and zero otherwise as follows:

$$\begin{aligned} lnX_{ijt} =& \alpha_{it} + \alpha_{jt} + \alpha_{ij} + \beta_1 EAC_{ijt} + \beta_2 EACexpansion_{ijt} + \beta_3 COMESA_{ijt} \\ &+ \beta_4 SADC_{ijt} + \beta_5 CEMAC_{ijt} + \beta_6 ECOWAS_{ijt} + \beta_7 WAEMU_{ijt} \\ &+ \beta_8 WTO_{ijt} + \beta_9 GSP_{ijt} + \beta_{10} GSP_{jit} + \varepsilon_{ijt} \end{aligned} \tag{4.24}$$

The second dimension to be analysed is the impact of deepening the EAC trade agreement. The EAC integration has followed a linear integration model, starting with a Free Trade Agreement (FTA) in 2000 followed by a fully-fledged Customs Union (CU) in 2010. The deepening of the EAC into a CU can be assessed by including an additional dummy variable for the presence of the CU that takes the

value one if the year is ≥ 2010 and zero otherwise as follows:

$$\begin{aligned} lnX_{ijt} =& \alpha_{it} + \alpha_{jt} + \alpha_{ij} + \beta_1 EAC_{ijt} + \beta_2 EACexpansion_{ijt} + \beta_2 EACcu_{ijt} \\ &+ \beta_3 COMESA_{ijt} + \beta_4 SADC_{ijt} + \beta_5 CEMAC_{ijt} + \beta_6 ECOWAS_{ijt} \\ &+ \beta_7 WAEMU_{ijt} + \beta_8 WTO_{ijt} + \beta_9 GSP_{ijt} + \beta_{10} GSP_{jit} + \varepsilon_{ijt} \end{aligned} \tag{4.25}$$

Table 4.3 presents results of the different dimension of the trade creation effect of the EAC. The first column reproduces our preferred regression results for the EAC from table 4.2. The second column shows the results of expansion of the EAC agreement while the third column is the assessment of the impact of deepening the EAC. Both significantly contributed to the increase in trade among the member countries but the expansion of the EAC generated larger gains compared to implementation of a CU. These results show that the impact of the EAC integration strengthened with time with its gradual implementation process. The deepening of its integration to a Customs Union can also be the reason for its larger trade impact compared to the other African PTAs who have only implemented an FTA. These findings resonates in other studies for example Baier et al. (2014) and Mayer et al. (2019).

Dependent Variable	(1)	(2)	(3)
EAC	1.512***	0.650***	0.650***
	(0.302)	(0.363)	(0.363)
EAC expansion		1.071***	0.876***
		(0.330)	(0.332)
EAC customs union			0.312*
			(0.168)
Observations	883,770	883,770	883,770
R^2	0.845	0.845	0.845

Table 4.3: Different dimesnions of EAC Integration
Notes: ***,** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; the results for other PTA variables are not shown but were included in the estimation; controls for exporter-time, importer-time and country-pair FE included.

Lastly, according to Baier et al. (2014), the effects of deep agreements are not fully realized immediately. Most trade agreement have long implementation phases and the actual impact of the deepening of a trade agreement may not be felt im-

mediately. Since the overall percentage change in trade due to a PTA may not be evenly distributed over the years, the effect of a PTA can be assessed over time. This is done interacting the EAC dummy variable in equation 4.23 with the year dummies from 2000 to 2014. The results are presented graphically on figure 4.1 which measures the cumulative effects of the EAC on trade from year of inception. The figure shows the gravity coefficients for the impact of EAC and the 95 percent confidence intervals.

The results show that the EAC trade effect strengthens over time as expected from its gradual implementation and expansion. The increase is seen to be erratic between the first years of implementation but smoother in its later years. This is expected since the EAC treaty allowed for a phased reduction of reduction of some tariffs for the least developed member countries in the first five years of implementation. The expansion of the EAC in 2007 is seen to have the largest impact on intra-regional trade while the implementation of the Customs Union in 2010 had a modest impact.

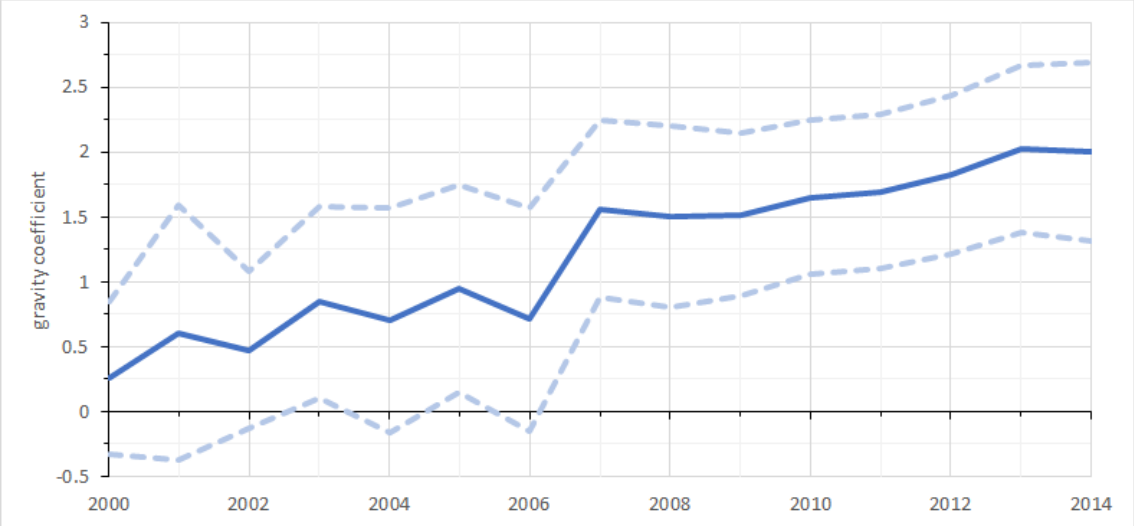

Figure 4.1: Trade Effects of the EAC over time
Notes: Solid and dashed lines show point estimates and 95 percent confidence intervals respectively

Comparing OLS and PPML

As a robustness check, we present the results obtained from estimating the effects of the EAC using the PPML estimator with the same control variables as in equation 4.23. Similar to OLS, we remedy the computational challenges of estimating the theoretically consistent gravity model using recent advances in estimation of high-dimensional fixed effects with PPML estimator. The *ppml panel sg* Stata command of Larch et al. (2017) has been recommended as a theory-consistent and time saving estimation procedure (Mayer et al. 2019).

Table 4.4 compares the results of OLS and PPML estimators. The first column replicates our preferred estimation of OLS from Table 4.2, the second column is the results of PPML estimation where zeroes have been kept out of the equations, and the third column is the results of PPML where zeroes are maintained in the sample. As expected, the OLS and PPML estimations yield slightly different estimates for all PTAs. However, a comparison of column two and three indicates that maintaining zeros in the sample doesn't change the trade effects substantially across all PTAs. This indicates that the presence of zero trades does not have a significant effect in the model.

Comparing the first and second columns shows the pure effect of switching from OLS to PPML since both have relatively similar number of observations. The PPML coefficient estimates for COMESA, SADC and ECOWAS are larger than their OLS counterparts but maintain the same high level of significance. However, the PPML coefficient is significantly lower for the EAC, WTO and GSP. Since the presence of zero trades have been seen to have an insignificant impact, this may be caused by either heteroskedasticity or biasness of the PPML when a number of small countries are included in the sample. Prompted by this findings, we investigate whether the presence of small countries is likely to be a concern when estimating the impact of EAC.

Table 4.4 compares the findings of the OLS and PPML with respect to various subsamples of the EAC. The first two columns compare the results from estimating

	OLS	PPML ($X_{ijt} > 0$)	PPML
Dependent Variable	lnX_{ijt}	X_{ijt}	X_{ijt}
PTA	0.210***	0.113	0.009
	(0.018)	(0.034)	(0.035)
EAC	1.511***	0.635*	0.593*
	(0.302)	(0.338)	(0.340)
COMESA	0.702***	0.768***	0.726***
	(0.104)	(0.189)	(0.196)
SADC	0.996***	1.111***	1.144***
	(0.157)	(0.177)	(0.170)
CEMAC	-0.165	-0.177	-0.267
	(0.351)	(0.373)	(0.387)
ECOWAS	0.851***	1.223***	1.093***
	(0.159)	(0.223)	(0.225)
WAEMU	-0.072	-0.091	-0.193
	(0.240)	(0.268)	(0.262)
WTO	0.183***	-0.150	-0.052
	(0.030)	(0.109)	(0.121)
GSP	-0.047**	0.010	-0.037
	(0.023)	(0.069)	(0.046)
Observations	883,770	885,609	1,698,332
R^2	0.845	0.966	0.966

Table 4.4: OLS vs. PPML specifications

Notes: ***,** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; controls for exporter-time, importer-time and country-pair FE included.

the impact of the EAC with only the 3 largest partners (Kenya, Uganda and Tanzania). The third and fourth columns include Rwanda to the sample while the last two columns incorporate all 5 EAC countries (Kenya, Uganda, Tanzania, Rwanda and Burundi). The first two columns have comparable point estimates which are both insignificant. However, adding smaller countries into the sample leads to a larger increase in the magnitude and significance of the OLS estimate compared to the PPML estimate. These results are inline with theoretical literature since PPML is expected to have significant effects for PTAs with larger trade flows. Due to the nature of the countries in the EAC, the OLS will be the most appropriate estimator.

	OLS	PPML	OLS	PPML	OLS	PPML
EAC: 3 countries	0.663	0.426				
	(0.446)	(0.412)				
EAC : 4 countries			1.203***	0.511		
			(0.374)	(0.348)		
EAC: 5 countries					1.511***	0.593*
					(0.302)	(0.340)
Observations	883,770	1,698,332	883,770	1,698,332	883,770	1,698,332
R^2	0.845	0.966	0.845	0.966	0.845	0.966

Table 4.5: OLS and PPML specification for different subsamples of EAC
Notes: ***,** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; the results for other PTA variables are not shown but were included in the estimation;controls for exporter-time, importer-time and country-pair FE included.

4.4.2 General Equilibrium Trade Effects of the EAC

The second part in the analysis is estimating the general equilibrium trade effects which will give us the ability to estimate both trade creation and trade diversion effects of formation of the EAC. The study will adopt the General Equilibrium Poisson Pseudo-Maximum Likelihood (GEPPML) procedure by Anderson et al. (2015) to performs the general equilibrium counterfactual analysis. The Stata codes for implementing the GEPPML procedure provided by Yotov et al. (2016). Since the previous section pointed out to OLS estimator as being more suitable for the dataset, we will employ equation 4.8 for to retrieve the baseline trade cost elasticities. For the counterfactual simulations, we use data for 2014 which is the most recent in our database and South Africa as the reference country whose importer fixed effect is omitted. The value of the elasticity of substitution used is $\alpha = -5.03$ which Head and Mayer (2014) found as the median estimate from a meta-analysis on trade elasticity in gravity equations.

Table 4.6 reports the main results for changes in exports and imports for the EAC countries from the counterfactual analysis. All the results are the percentage changes between the baseline and the counterfactual scenarios. The first three columns report the changes in country's exports to other EAC members and to the rest of the world (RoW). It is seen that the formation of the EAC led to an overall

increase in exports for all EAC countries with huge expansion being seen on intra-EAC trade. Kenya and Uganda had the largest increases in exports, and this may be attributed to their dominance in EAC trade. On the other hand, Kenya is the only country whose exports to the RoW reduced after formation of the EAC. Since it has the largest increase in intra-EAC exports, this may indicate that Kenyan producers switched to serving the EAC market after trade liberalization. For a clearer comparison, these counterfactual changes in exports are graphically depicted on figure 4.2.

	Exports			Imports		
	EAC	RoW	Total	EAC	RoW	Total
Burundi	9.74	4.21	13.95	52.50	-51.31	1.19
Kenya	688.26	-138.33	549.94	120.38	629.71	750.09
Rwanda	44.98	14.05	59.03	143.19	-123.00	20.19
Tanzania	79.73	16.20	95.94	319.29	-266.77	52.52
Uganda	118.17	31.06	149.23	305.53	-197.47	108.06

Table 4.6: Change in Exports and Imports (volume changes in GBP millions)

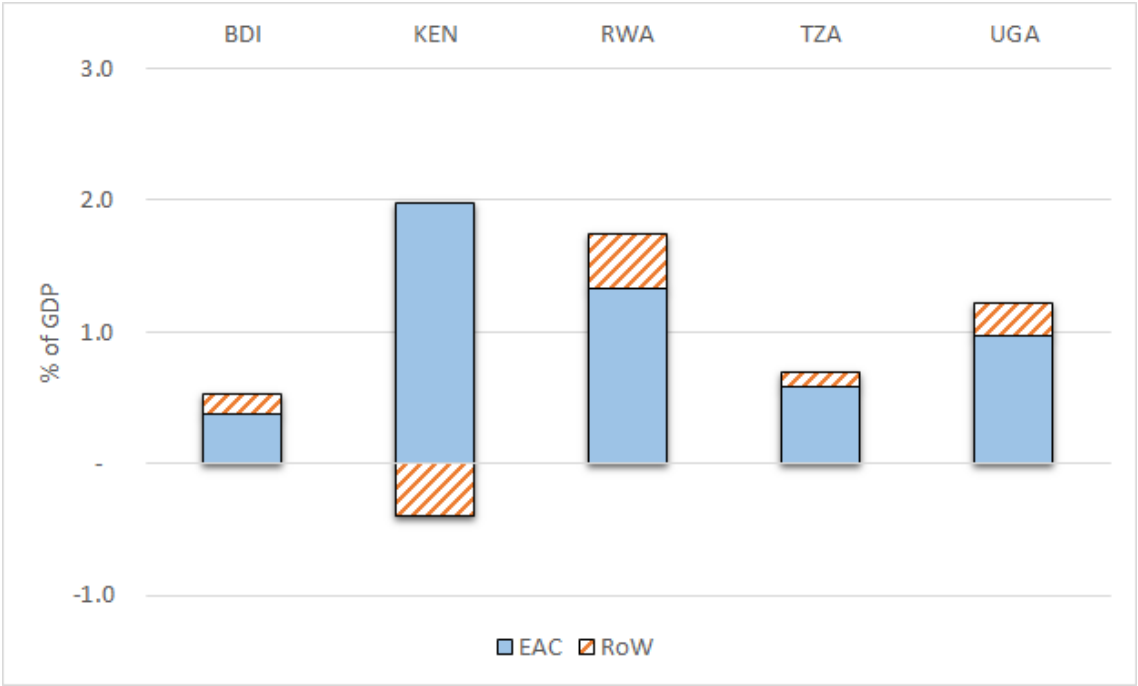

Figure 4.2: Change in Exports

The last three columns of table 4.6 report the changes in imports with other EAC members and the RoW. All countries had a net increase in imports due to

the formation of the EAC comprising of an increase in intra-EAC imports for all countries and a reduction in imports from the RoW for most countries with the exception of Kenya. This indicates that trade liberalization may have led to EAC countries switching their source of imports from RoW to other EAC countries, especially to Kenya. Tanzania and Uganda had the largest increase in imports from the EAC while Kenya had a significant increase in imports from the RoW. For a clearer comparison, these counterfactual changes in imports are graphically depicted on figure 4.3.

The changes in exports and imports can be used to deduce the trade creation and trade diversion effects. For this study, trade creation is the increase in imports due to formation of the EAC while trade diversion is the displacement of imports previously sourced from a non-member country by imports sourced from an EAC country. The formation of the EAC led to both trade creation and trade diversion effects for most of the countries while Kenya was the only country that did not witness a trade diversion effect. This can be explained by the difference in trade compositions of the EAC countries.

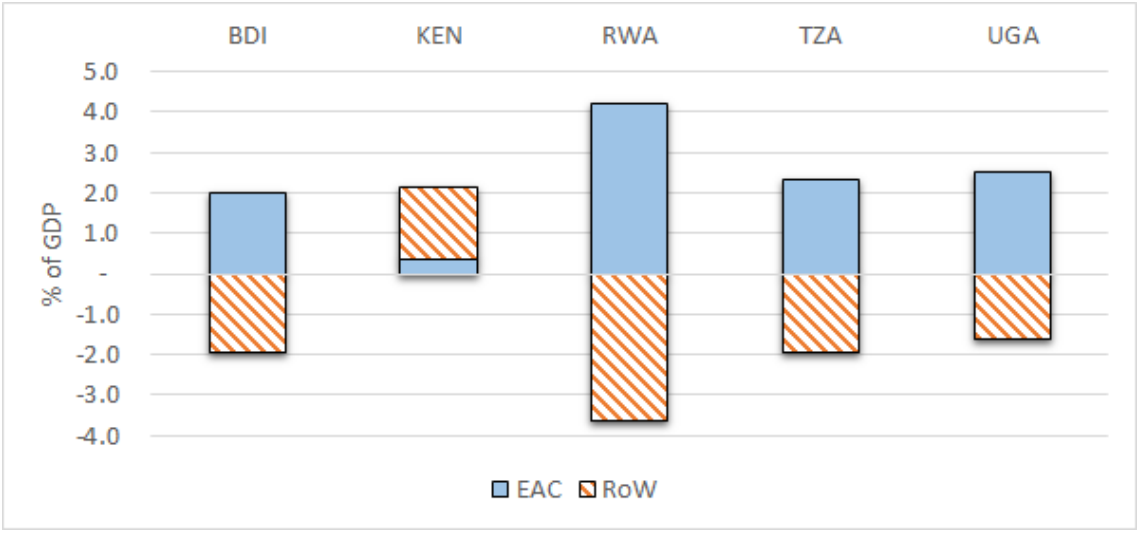

Figure 4.3: Change in Imports

The main export of the EAC countries are primary goods (agriculture and minerals) while their imports are predominantly industrialized goods. Kenya is the most industrialized country in the region with a higher diversified export base com-

pared to that of the other EAC countries, which included industrialized goods. The removal of tariffs for all tradable goods from EAC countries made Kenya's industrialized goods to be regarded as a cheaper option compared to those sourced from the rest of the world. This made Kenya a preferred source of imports for other EAC countries, causing its producers to increase intra-EAC exports and reduce exports to the RoW. The other EAC countries also reduced their imports from the RoW in favour of regional production. However, Kenya couldn't change its import patterns significantly in favour of intra-EAC trade due to the homogeneity of exports by the EAC countries. Kenya's increase in imports from RoW may also be attributed to the demand for intermediate goods that are essential for production of industrialized goods.

4.4.3 Welfare Effects of the EAC

'Home-Price' Effect

The 'home-price' effect can be analysed as gains from producer and consumer surpluses. According to trade theory, implementation of the trade agreement will open up a wider market for producers in each country since they will enjoy lower trade restrictions to other member countries thanks to the reduction or elimination of tariff and non-tariff barriers. However, they will also be face competition from other producers in the region, both for their home markets and the regional market. This increased competition to a country's domestic market will lead to an increase in the quality, quantity and variety of goods produced and as a result the country's GDP increases as its consumer price decreases. For each country, the welfare effect will be different depending on how the improvement in regional competitiveness impacts on its producers and consumers. The impact of the producer and consumer surpluses can be assessed using the outward and inward multilateral resistance terms respectively.

The outward multilateral resistances are the incidence of trade costs on each country's producers, as if they ship to a unified world market (Yotov et al. 2016).

A positive outward multilateral resistance indicates that producers are faced with higher trade costs in all their markets and thus are forced to reduce their factory-gate prices to ensure they remains competitive. The inward multilateral resistances are the incidence that measure the trade costs on each country's importers, as if they were buying from a unified world market and can be interpreted as the ideal consumer price indexes (Yotov et al. 2016). A positive inward multilateral resistance will indicate an increase in the overall prices of goods for a country which is attributed to a drop in consumer surplus. Therefore, a positive outward multilateral resistance can be attributed to a loss in producer surplus and a positive inward multilateral resistance can be attributed to a loss in consumer surplus.

Table 4.7 reports on the 'home-price' welfare effects for each EAC country where these effects are measured as the percentage change in real GDP [7]. The results show that Kenya is the only country with a gain in producer surplus while all other EAC countries had a loss. This may be attributed to the superior industrial structure of the Kenyan economy which makes it a more efficient producer compared to the other EAC countries. It is also the only country that has an increase in its factory gate prices indicating that its producers found it ideal to increase their production prices since they are the likely to be the most efficient producers in the region. On the other hand, it is the only country that witnesses a loss in consumer surplus while all other EAC countries had a gain.

The last column shows that all EAC countries had a welfare gain from the 'home-price' effect. The overall welfare gains for Kenya are attributed to producer surpluses while that of the other EAC countries are attributed to consumer surpluses. The magnitude of these welfare gains are small, but this is expected with trade models since the gains arise directly from the total amount of trade created. In a scenario such as the EAC where most countries trade less among themselves than with the rest of the world, a strong increase in trade flows after trade liberalization is bound to have a very small impact on real income. These impacts are also in line with

[7] A summary of the welfare effects of the EAC on all countries considered in the analysis is shown in Appendix 2

recent trade literature. A comparable recent estimate is one by Mayer and Thoenig (2016) who estimated the welfare effects of the EAC using the General Equilibrium Trade Impact (GETI) procedure by Head and Mayer (2014). They found out that the impact on individual countries was between 0.18 – 0.7 percent [8].

Country	Inward Multilateral Resistance (P_i)	Outward Multilateral Resistance (Π_i)	Factory-gate prices (p_i)	Real GDP (Y_i/P_i)
Burundi	-4.39	5.56	-4.42	0.16
Kenya	1.38	2.81	2.26	0.91
Rwanda	-7.34	8.84	-7.01	0.85
Tanzania	-0.92	0.87	-0.69	0.23
Uganda	-3.13	3.42	-2.73	0.49

Table 4.7: Home-Price Effect (percent changes)

'Tariff-Reveue' Effect

The tariff rates to be affected are those related to imports from the trade liberalizing countries only. Since all member countries remove tariffs on intra-regional trade after formation of the EAC, estimation of the tariff revenue effects will employ equation 4.19. The t_{ij}^c will be the weighted-average tariff rate for the year prior joining the EAC. It is assumed that if the EAC was not formed, these tariffs would have prevailed.

Table 4.8 reports on the 'tariff-revenue' welfare effects for each EAC country. The weighted average applied tariffs in the first column are the tariffs that each country applied to imports from other members immediately before joining the EAC. It is assumed that if the EAC was not formed, these tariffs would have prevailed. Kenya is seen to have been the most restrictive country with a weighted tariff of 8.46 percent while Rwanda was the least restrictive with a weighted tariff of 2.13 percent. The second column presents the counterfactual level of imports in 2014 if

[8]The GEPPML and GETI procedures have a lot of similarities, but they differ quantitatively with the GETI basing its calculations on observed trade flows while the GEPPML is based on predicted trade flows which control for measurement errors in trade flow data. Anderson et al. (2015) showed that the GEPPML delivered the same results to the GETI when the predicted values of trade are replaced with the observed values. Appendix 3 presents the alternative approach to estimate the welfare effects of the EAC on individual countries using the GETI procedure.

the EAC had not been formed. This shows that Burundi, Rwanda and Uganda are traditionally most dependant on intra-regional trade. This may be because of them being landlocked and economically smaller than Kenya and Tanzania.

The third and fourth column presents the impact of revenue loss on government expenditure and real GDP respectively. All EAC countries have a welfare loss with the smaller economies of Rwanda and Burundi having the highest loss in revenue. This loss may be attributed to the high dependency on intra-EAC trade by both countries. In addition, the significant loss for Burundi is also due to its initially high level of tariffs on EAC goods. In terms of leeway for government expenditure, the two countries also have the greatest loss.

Country	EAC Imports (pct. of total imports)	Pre-EAC Weighted Avg. Applied Tariff (pct.)	Direct Revenue loss (pct. of govt. spending)	Direct Revenue loss (pct. of real GDP)
Burundi	33.14	7.78	-0.90	-0.15
Kenya	2.05	8.46	-0.06	-0.01
Rwanda	55.42	2.13	-0.74	-0.12
Tanzania	8.76	2.69	-0.29	-0.05
Uganda	33.84	3.30	-0.31	-0.08

Table 4.8: Tariff-Revenue Effect

Net Welfare Effect

The net welfare effects shown in table 4.9 is the sum of the welfare gains from 'home-price' effect and the welfare losses from the 'tariff-revenue' effect. All countries have a net welfare gain of between 0.01 and 0.9 percent. Kenya and Rwanda have the largest gains in welfare while Burundi has the smallest gain in welfare. The net welfare effect is graphically depicted on figure 4.4.

4.5 Conclusion

This chapter has used the recent developments in gravity model literature by employing the GEPPML procedure of Anderson et al. (2015) to analyse the trade

Country	Home-Price Effect	Tariff-Revenue Effect	Total Welfare Effect
Burundi	0.16	-0.15	0.01
Kenya	0.91	-0.01	0.90
Rwanda	0.85	-0.12	0.73
Tanzania	0.23	-0.05	0.18
Uganda	0.49	-0.08	0.41

Table 4.9: Tariff-Revenue Effect

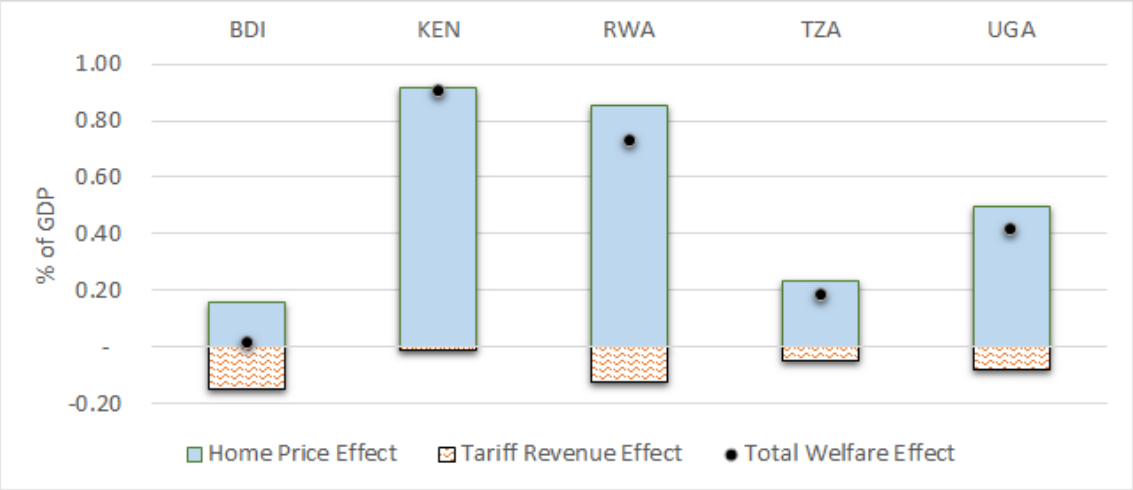

Figure 4.4: Net Welfare Effect

and welfare effects of the EAC. The procedure combines the structural gravity regressions with general equilibrium simulations. The analysis estimated the partial equilibrium effects, general equilibrium effects and the welfare effects of the EAC on member countries.

First, the results of the partial equilibrium analysis indicate that the EAC has led to significant trade creation effects. Its effects are larger than those of comparable African PTAs. Moreover, the expansion and further deepening of the EAC are also seen to have contributed additional trade creation effects. In policy terms, this analysis offers some guidance on the form of trade integration strategies that African countries can adopt. Compared to other African PTAs, the EAC has a deeper trade agreement and is currently regarded as the most integrated region in Africa (Koami et al. 2016). So, from the experience of the EAC, this chapter shows that deepening of trade agreements can produce substantial trade benefits for African countries. Likewise, expansion of trade agreements such as the formation of the Tripartite Free

Trade Agreement (TFTA) between COMESA, EAC and SADC is may also produce additional trade benefits.

Second, the results general equilibrium analysis indicates that the EAC led to both trade creation and trade diversion effects. Kenya is the only country that had no trade diversion effects and this can be explained by its comparative advantage in industrialised goods compared to other EAC countries. Kenya is competing against more industrialized countries in terms of sales into the other EAC countries. Therefore, formation of the EAC is good for Kenya since it benefits from other EAC countries' trade diversion. A key finding from this analysis is that the benefits of trade liberalization among developing countries will be inclined to the most industrialized countries. This is because most developing countries have complementarity in their production of goods with the main exports being primary goods and imports being industrialized goods. So, trade liberalization among developing will make PTA countries to switch their source of imports from non-member countries to the member countries who have the capacity of producing industrialized goods.

Third, the EAC generated net welfare gains for its member countries of between 0.01 - 0.9 percent of real GDP. Kenya and Rwanda have the largest gains while Burundi has the least gain in welfare. The welfare gains for Kenya are due to producer surpluses while the welfare gains in all other countries are due to consumer surpluses. Therefore, this study can conclude that the formation of the EAC has achieved its objective of generating welfare gains for its member countries.

In terms of further research, the general equilibrium analysis can be extended to incorporate the dynamic aspects of the structural gravity model where investment and capital accumulation are included (Yotov et al. 2016). The economic objectives of the PTAs are usually long term so it is possible that incorporation of investment and capital accumulation in the analysis will lead to higher effects of real GDP. Another extension of the analysis will be the estimation of trade-related welfare gains from the services channel. As seen in Chapter 2, most EAC countries are net exporter of services so it is possible to offer additional welfare gains.

Chapter 5

Estimating the Impact of the East African Community on Trade Costs

5.1 Introduction

Trade costs are defined as the set of factors driving a wedge between producer prices in exporting countries and the consumer prices in importing countries. They are of great importance to policymakers since they have a significant impact on the welfare of a country. High trade costs have a potential of curtailing producer profits by rendering a country's exports uncompetitive. High trade costs also erode consumer welfare by narrowing down the range of goods and services available in the domestic market. Therefore, reduction of trade costs is one of the economic objectives of PTAs.

Trade costs are broadly categorised as tariffs and non-tariff measures (NTMs). A tariff is a tax levied on imports of a good at the border. Its effect is to raise the price of the imported good above the price of a similar domestically produced good. NTMs are defined as policy measures other than tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices

or both (UNCTAD 2013). NTMs include a wide range of instruments such as sanitary and phytosanitary (SPS) measures, technical barriers to trade (TBTs), quotas, licenses, price control, export restrictions, anti-dumping measures, anti- competitive measures and trade-related investment measures. Despite their potentially negative effects on international trade, some NTMs address market failures such as the protection of public health using SPS measures and environmental protection measures using TBTs.

The focus by World Trade Organization (WTO) and PTAs has been on the reduction on both tariffs and NTM. Over the recent decades, their efforts have led to tariffs levels for most countries to substantially reduced. Tariffs now pose significant barriers for a small amount of international trade, mostly between developing countries. However, the same does not apply to NTMs with their use to regulate trade increasing over the same period, both in terms of the number of countries adopting them and their variety. Recent estimates indicate that the ad valorem equivalents (AVEs) of trade costs for NTMs are more than double that of tariffs (Kee et al. 2009). Therefore, despite the elimination of tariffs still being one of the main objectives of current PTAs, their largest economic impact will be associated with reductions of NTMs.

This paper focuses on the impact of the East African Community (EAC) on both tariffs and NTMs. The EAC has put in policies to address both tariff and NTMs with the objective of economically developing various sectors of the regional economy. This assessment will first calculate the associated tariffs and NTMs for the agriculture, manufacturing and mining sectors. Thereafter, it will empirically investigate the extent to which the EAC has lowered these trade costs in each sector. This analysis will help in making the interpretation of the trade and welfare effects of the EAC from Chapter 4 more convincing by providing an assessment on the impact of the policies implemented on tariffs and NTMs. To our knowledge, no other study has examined the impact of EAC on tariffs and NTMs. Thus, the works presented in this paper, while within the purview of existing studies, extends the

associated literature.

Arvis et al. (2013) points out to two approaches to calculate trade costs: the bottom-up approach and the top-down approach. The bottom-up approach calculates the size of each component of trade costs from observable data. Often, these trade costs are estimated at sector-level using detailed micro data such as firm-level surveys and product-level data, and then converted into AVEs. The top-down approach is an all-inclusive measure of trade costs based on the observed patterns of trade and production. It calculates trade costs by comparing bilateral trade flows to domestic trade flows, with the deviations being attributed to trade costs. Both approaches have desirable capabilities and drawbacks so the decision on the most appropriate method will depend on the focus of study and data availability. The bottom-up approach has the advantage of calculating the size of each component of trade cost, but its main drawback is the huge data requirement. On the other hand, the top-down approach requires a lighter dataset but cannot be used to measure the contribution of each component.

This paper will utilize a hybrid of the two approaches to measure trade costs. It estimates the comprehensive trade costs using the top-down approach and tariffs using the bottom-up approach. It uses the two datasets to estimate a measure of non-tariff trade costs. The trade costs will be separately constructed for agriculture, manufacturing and mining sectors. The paper then employs the gravity model to empirical estimate the effects of the EAC on these trade costs following the procedure by Chen and Novy (2011).

The remainder of the paper is organized as follows. Section 5.2 reviews the theory on trade costs, its measurement and construction of the database for tariffs and NTMs. Section 5.3 presents the data. Section 5.4 presents the empirical results on the effects of EAC on trade costs. Section 5.5 concludes.

5.2 Measures of Trade Costs

5.2.1 Comprehensive Trade Costs

Novy (2013) derived a top-down approach of measuring trade costs based on the structural gravity model of trade Anderson and Van Wincoop (2003). The intuition behind this is that gravity models explain how consumer expenditure on products from different countries is determined by bilateral trade costs. Anderson and Van Wincoop (ibid.) showed that structural gravity model derived under the assumption of identical Constant Elasticity of Substitution (CES) preferences across countries for national varieties differentiated by place of origin takes the form:

$$X_{ij} = \frac{Y_i}{\Pi_i^{1-\sigma}} \frac{Y_j}{P_j^{1-\sigma}} \Phi_{ij}^{1-\sigma} \tag{5.1a}$$

$$\Pi_i^{1-\sigma} = \sum_j \frac{Y_j}{P_j^{1-\sigma}} \Phi_{ij}^{1-\sigma} \tag{5.1b}$$

$$P_j^{1-\sigma} = \sum_i \frac{Y_i}{\Pi_i^{1-\sigma}} \Phi_{ij}^{1-\sigma} \tag{5.1c}$$

Where X_{ij} represents the nominal trade flows from country i to country j, Y_i and Y_j is the nominal incomes of countries i and j respectively, $\Phi_{ij}^{1-\sigma} \geq 1$ is the bilateral trade costs, $\Pi_i^{1-\sigma}$ is the outward multilateral resistance term, $P_j^{1-\sigma}$ is the inward multilateral resistance term and $\sigma > 1$ is the elasticity of substitution among goods from different countries. Equation 5.1 show that the multilateral resistance terms are weighted-average trade costs facing the producers and consumers respectively. Therefore, they are important in the proper computation and interpretation of bilateral trade costs.

Since the multilateral resistance terms are theoretical constructs and not directly observable by research, Novy (2013) proposed a method of deriving an analytical solution for trade costs. He recovers the theory-consistent bilateral trade costs directly from trade data by eliminating the multilateral resistance terms. Intuitively, his method makes use of the insight that changes in bilateral trade costs do not only affect international trade but also intra-national trade. For example, if country

i bilateral trade costs with country j falls, some of the goods it used to consumer domestically (intra-national trade) will be start being exported to country j. The extent to which intranational trade depends on trade costs can be seen formally by estimating equation 5.1 for the intranational trade of countries i and j. The equations will be solved for the product of the multilateral resistance terms as follows:

$$\Pi_i P_i = \left(\frac{Y_i^2}{X_{ii}}\right)^{\frac{1}{1-\sigma}} \Phi_{ii} \tag{5.2a}$$

$$\Pi_j P_j = \left(\frac{Y_j^2}{X_{jj}}\right)^{\frac{1}{1-\sigma}} \Phi_{jj} \tag{5.2b}$$

So if both countries are of the same size ($Y_i = Y_j$), face the same domestic trade costs $\Phi_{ii} = \Phi_{jj}$ but country i has higher intra-national trade ($X_{ii} > X_{jj}$), then the product of the multilateral resistance terms will be higher for country i ($\Pi_i P_i > \Pi_j P_j$). Novy (2013) exploited this explicit solution for the multilateral resistance terms to solve for the bilateral trade costs.

Since equation 5.1 has the product of the outward multilateral resistance term for country i and the inward multilateral resistance term for country j ($\Pi_i P_j$), it can be multiplied by the corresponding gravity equation for trade flows in the opposite direction (X_{ji}) to obtain a bi-directional gravity equation with outward and inward multilateral resistance terms for both countries as follows:

$$X_{ij}X_{ji} = Y_i^2 Y_j^2 \left(\frac{\Phi_{ij}}{\Pi_i P_j} \times \frac{\Phi_{ji}}{\Pi_j P_i}\right)^{1-\sigma} \tag{5.3}$$

Substituting the solutions for the products of the multilateral resistance terms from equation 5.2 into equation 5.3 and rearranging yields:

$$\frac{\Phi ij \Phi ji}{\Phi ii \Phi jj} = \left(\frac{X_{ii}X_{jj}}{X_{ij}X_{ji}}\right)^{\frac{1}{\sigma-1}} \tag{5.4}$$

Since the trade costs between countries i and j can be asymmetric ($\Phi_{ij} \neq \Phi_{ji}$) and the domestic trade costs across countries can also differ ($\Phi_{ii} \neq \Phi_{jj}$), it is important

to take the geometric average of the trade barriers in both directions. The resulting geometric average trade cost (τ_{ij}) is expressed as an ad-valorem tariff equivalence by subtracting one as follows:

$$\tau_{ij} = \left(\frac{\Phi ij \Phi ji}{\Phi ii \Phi jj}\right)^{\frac{1}{2}} - 1 = \left(\frac{X_{ii} X_{jj}}{X_{ij} X_{ji}}\right)^{\frac{1}{2(\sigma-1)}} - 1 \tag{5.5}$$

The intuition behind equation 5.5 is that, if bilateral trade flows ($X_{ij}X_{ji}$) increase relative to the domestic trade flows ($X_{ii}X_{jj}$), this should be due to a reduction in bilateral trade costs ($\Phi_{ij}\Phi_{ji}$) relative to domestic trade costs ($\Phi_{ii}\Phi_{jj}$). This will be captured by a decrease in the geometric average trade costs. Therefore, keeping all other factors constant, if a country shifts part of its production towards serving another market rather than its domestic market, it must be because the cost of reaching that other market has fallen relative to the cost of reaching its domestic market. Further, because the trade costs are derived from a ratio of bilateral trade flows as a denominator, any country that do not trade at all will record infinite trade costs. Such observations will be dropped when constructing the trade cost dataset.

Novy (2013) showed that this measurement of trade costs is consistent with a large variety of trade models and highly robust to possibility of measurement errors since it is based on mathematical operations and theoretical identities. Apart from the structural gravity model, he derived similar trade costs using the Ricardian model by Eaton and Kortum (2002) and the Heterogenous firms' models by Chaney (2008) and Melitz and Ottaviano (2008). Across all models, he noted that the trade cost measure was quite sensitive to the parameter denoting degree of heterogeneity across firms or across countries but not to changes over time. Taking the case of the structural gravity model, a higher elasticity of substitution (σ) corresponds with a lower level of trade costs. There is no consensus in literature concerning the exact value of σ with a survey by Anderson and Van Wincoop (2003) concluded that the size of σ falls between the range of 5 to 10. For his study, Novy (2013) chose $\sigma = 8$ since it was the middle of this empirical range while a meta-analysis by Head and Mayer (2014) found the median value as $\sigma = 5.03$. There is also a possibility that the

elasticity of substitution is different across sectors, countries and years. However, if the elasticity of substitution is assumed to be constant, it will only affect the level of the ad valorem trade costs and not their relative values across countries and over time (Novy 2013).

When interpreting the total trade costs, another point to consider is that the geometric average trade costs are bi-directional so it will be difficult to determine which of the two countries contributes a larger part of the trade costs. From a policy perspective, it is not possible to directly measure the impact of an individual country's policy on trade cost or identify the contributions of different components of trade costs. Therefore, the trade cost measure should be interpreted as an all-inclusive measure and individual country policies will only affect a fraction of the total trade costs. The trade cost can be decomposed to retrieve the measure of various components using the theoretical gravity equation as discussed in the next section.

A number of recent researches have employed this approach to estimating trade costs. Jacks et al. (2011) used it to study the importance of bilateral trade costs in explaining the trade booms and trade busts over the last century. They found that decline in trade costs had an important role in the pre-World War I trade boom and in the interwar trade bust. However, post-World War II had changes in output as the dominant force with the role of trade costs gradually diminishing. Novy (2013) used the approach to decompose the growth of the US trade with its major trading partners between 1970 and 2000. The paper finds out that the trade cost measure on average declined by 40 percent with income growth and bilateral trade costs played substantial roles. Ackah et al. (2013) measured trade costs for ECOWAS countries and inferred their impacts on trade flows for the period 1980 to 2003. They found out that ECOWAS countries traded among themselves at a tariff equivalent trade cost of 268.2 percent, which was higher than most other PTAs.

Arvis et al. (2013) inferred the estimates of trade costs for a sample of 178 countries that included developing countries. They found that the ad valorem equivalent

of trade costs were at least 100 percent for manufactured goods and 200 percent for agricultural goods. Their findings also point out to higher trade costs for developing countries and that the rate of change in trade costs is unfavourable for them. They then use a gravity model to examine the determinants of bilateral trade costs. Their findings indicate that PTAs are significant in reduction of trade costs. Miroudot et al. (2012) also used the approach to measure the impact of PTAs on trade costs in services. They constructed a trade cost database for services covering 55 countries for the period 1999 to 2003. They then used a gravity model too examine the impact of PTAs on trade costs in services. They found that PTAs had a significant reduction in trade costs across most service sectors. Hayakawa and Kimura (2015) empirically investigated how far FTAs successfully lowered tariffs and NTMs for the manufacturing industry. They constructed a tariff and NTM database for manufactured goods covering 178 countries for 1997 – 2010. Their findings showed that FTAs significantly reduced both tariffs and NTMs.

5.2.2 Decomposition of Trade Costs

The measure of total trade cost includes all factors that contribute to the standard iceberg trade costs in gravity models. This means that it not only captures the observable factors that are believed to influence trade costs such as geographical distance and tariffs, but also unobservable factors such as NTMs and other behind-the-border barriers. Therefore, the measure should be regarded as a comprehensive measure that captures all trade cost elements that can make international trade more costly relative to domestic trade. Since tariffs data can be easily estimated using the bottom-up approach, the total trade costs can be further decomposed into tariffs and non-tariff components.

Extensive bilateral tariff data can be accessed from the World Bank's World Integrated Trade Solutions (WITS) database. Since the comprehensive trade costs are bi-directional, the bilateral tariff costs should also be expressed in a bi-directional nature. Thus, they are measured as a geometric average of the tariffs imposed by

two partner countries on each other's imports. The resulting geometric average tariff costs (T_{ij}) is expressed as an ad valorem tariff equivalence by subtracting one as follows:

$$T_{ij} = \sqrt{(1 + t_{ij})(1 + t_{ji})} - 1 \tag{5.6}$$

Where t_{ij} is the simple average effective tariff rate imposed by country i on goods from country j, and t_{ji} is the simple average effective tariff imposed by country j on goods from country i.

Following Anderson and Van Wincoop (2004), the non-tariff related trade cost is measured as the comprehensive trade costs excluding tariff costs. That means it encompasses all additional costs other than tariff costs involved in trading goods bilaterally rather than domestically. The non-tariff related trade costs (NT_{ij}) is calculated at an ad-valorem equivalent by subtracting one as follows:

$$NT_{ij} = \left(\frac{\tau_{ij} + 1}{T_{ij} + 1}\right) - 1 \tag{5.7}$$

From equation 5.7, it is noted that the measure of non-tariff related trade costs encompasses not only NTMs but also all other non-policy related trade costs such as geographical distance and other behind-the-border barriers. This should be taken into consideration when interpreting the estimates.

5.2.3 Estimating the Impact of PTA on Trade Costs

Measurement of the impact of a PTA on trade costs can be undertaken using a gravity model with the necessary controls for other variables that can contribute to trade costs. The gravity model expresses bilateral trade flows as a function of the economic sizes of the countries and the variables that are believed to influence trade costs, one being the presence of a PTA between the two countries. The paper follows the procedure by Chen and Novy (2011) that solves the gravity model for the trade costs instead of trade flows and express it as a function of variables that

influence trade costs. The equation will take the following log-linear form:

$$ln\tau_{ijt} = \gamma_t + \beta_1 lndist_{ij} + \beta_2 contig_{ij} + \beta_3 comlang_{ij} + \beta_4 comcol_{ij} + \beta_5 PTA_{ijt} + \varepsilon_{ijt} \quad (5.8)$$

Where $dist_{ij}$ is the geographical distance between the two countries, $contig_{ij}$ is a dummy variable denoting whether the two countries share a common (contiguous) border, $comlang_{ij}$ is a dummy variable denoting whether the two countries have a common official language, $comcol_{ij}$ is a dummy variable denoting whether the countries share common colonial ties and PTA_{ijt} is a dummy variable denoting whether the two countries are members of a PTA. γ_t is a year dummy variable that controls for unobservable time-specific variable while ε_{ijt} is the standard error term.

Since there are numerous variables that determine trade costs, the estimates of the PTA variable can be unreliable due to endogeneity biases. Baier and Bergstrand (2007) proposed the use of country-pair fixed effects to control for these linkages between the endogenous trade policy term and the error term. The country-pair fixed effects also control for all observable and unobservable time-invariant variables. Therefore, its biggest downside is that when incorporated, one cannot be able to measure the contribution of any time-invariant variables on trade costs. However, it will not have an effect when focus is on estimation on the impact of PTAs since they are time-varying. Equation 5.8 can be re-written with country-pair fixed effects α_{ij} as follows:

$$ln\tau_{ijt} = \alpha_{ij} + \gamma_t + \beta PTA_{ijt} + \varepsilon_{ijt} \quad (5.9)$$

The same format of controlling for all time-invariant variables will also be important in estimating the impact of PTAs on tariff and non-tariff trade costs due to possible endogeneity bias. In the case of non-tariff, the country-pair fixed effects will control for all non-policy related trade costs making it possible to assess the impacts of PTAs on NTMs. Therefore, equation 5.9 can be estimated for tariffs and

non-tariff trade costs as follows:

$$lnT_{ijt} = \alpha_{ij} + \gamma_t + \beta PTA_{ijt} + \varepsilon_{ijt} \tag{5.10a}$$

$$lnNT_{ijt} = \alpha_{ij} + \gamma_t + \beta PTA_{ijt} + \varepsilon_{ijt} \tag{5.10b}$$

Furthermore, the impact of PTAs can be assessed by sector or industry. This is done by constructing the trade costs for each sector/industry (k) and using in estimation of equations 5.9 and 5.10.

5.3 Data

To compute the total trade costs as provided for in equation 5.5, the paper sources sectoral bilateral trade data (X_{ij}^k) for agriculture, manufacturing and mining sectors from BACI dataset provided by the CEPII. The BACI data sourced is the four-digit level of Harmonised System (HS) 1992 for 200 countries over the period 1995 – 2016. This data is converted to the three broad sectors as per the International Standards Industrial Classification (ISIC) Revision 3 using the conversion tables provided by the United Nations Statistical Division (UNSD).

Data for sectoral intra-national trade (X_{ii}^k) are not directly available but can be calculated as the difference between a country's total production and total exports for each sector ($X_{ii}^k = Y_i^k - \sum_{j \neq i} X_{ij}^k$) due to market clearing (Novy 2013; Wei 1996). The data on sector-level gross domestic production is sourced from the United National Accounts Database while the total sectoral exports are calculated from the BACI dataset. Since the gross domestic production data is presented in each country's local currency, they are converted into US dollars using the nominal exchange rate from the World Bank's World Development Indicators. Using this procedure, data on intra-national trade is constructed for 121 countries (see Appendix 4 for a list). The study is limited to these countries due to availability of intra-national trade data.

The calculation of the level of trade costs is sensitive to the choice of the elasticity

of substitution. We follow Novy (2013) in assuming the elasticity is constant across the sectors, countries and years. The value of the elasticity of substitution used is $\sigma = -5.03$ which Head and Mayer (2014) found as the median estimate from a meta-analysis on trade elasticity in gravity equations.

To compute the bilateral tariff trade costs in equation 5.6, the study draws tariff data from the WITS database. It includes detailed data on tariff-rates applied for each good imported by each country. In the database, all possible tariff schemes are included i.e. MFN schemes, PTA schemes, and GSP schemes. For this study, it is assumed that the exporter will always use the scheme with the lowest tariff rates. Therefore, for every tariff-line level, the lowest rate among all schemes is selected for each country pair. The tariff data sourced is the six-digit level of HS1992 for 121 countries over the period 1995 – 2016. For consistency with the total trade cost data, the tariff rates are aggregated into the three sectors as per the ISIC Revision 3 using conversion tables provided by the UNSD. The tariffs are aggregated using the simple average aggregation method. This is preferred for this study to the import-weighted average method since the study focuses on reduction in tariff rates rather than measuring the effect of tariff reduction on international trade. For missing data, the closest historical rates available are applied.

To estimate the gravity model, data on various covariates are sourced from GEODIST database CEPII. These include PTAs, geographical distance, common borders, common languages and colonial linkages. Central to our study is data on PTAs but the GEODIST dataset does not extensively cover PTAs in Africa. Therefore, its data on PTA membership is supplemented with that sourced from the Jeffery Bergstrand's EIA Dataset and the WTO database. Table 5.1 gives a summary of all the sources data for this analysis.

Variable	Definition	Years	Source
Trade	Total merchandise imports from country i to country j in year t for agriculture, manufacturing and mining sectors	1995 – 2016	CEPII
Distance	Logarithm of the weighted average distance between country i and country j	-	CEPII
Contiguity	Dummy variable for country pairs that share a common land border	-	CEPII
Common Colonizer	Dummy variable for country pairs that were colonized by the same power	-	CEPII
Common Language	Dummy variable for country pairs that have a common official language	-	CEPII
PTA	Dummy variable for country pairs that are members of the same PTA in year t	1995 - 2016	Jeffrey Bergstrand's EIA Dataset, WTO
Total Goods Production	Sum of the total output for agriculture, mining and manufacturing sectors	1995 – 2016	UN National Accounts Official Country Dataset
Tariff	Weighted-average tariff rate for imports sourced from the EAC by each member country	1995 – 2016	UNCTAD-TRAINS

Table 5.1: Data Sources

5.4 Results

5.4.1 Impact of EAC on total trade costs

This section estimates the impact of the EAC on total trade costs. The model is estimated separately for agriculture, manufacturing and mining sectors. To assess the impact of the EAC, the PTA_{ijt} dummy variable will be estimated for a number of trade agreements. Besides for comparison purposes, proper estimation of the effects of the EAC will require control for participation of the EAC countries in other trade agreements due to the multiplicity in membership (Limao 2016). The trade agreements to be considered will include the Common Market for East and Southern Africa (COMESA), Southern Africa Development Commu-

nity (SADC), World Trade Organization (WTO) and General System of Preferences (GSP). The study employs the OLS as the estimator. Following the definition by textcitechen2011gravity, the gravity estimate β will be interpreted as the impact of a PTA on trade cost.

Table 5.2 presents the results of estimating the impact of the EAC on trade costs. The first, third and fifth columns gives the results of equation 5.8 which uses the standard variables that affect trade costs instead of country-pair fixed effects. Despite not adequately controlling for endogeneity, this equation allows for the measurement of the various variables that affect trade costs. It is noted that since the trade cost data is a bilateral geometric, all gravity variables included in the analysis should represent a country-pair. Since most gravity datasets comprise of uni-directional variables, only one direction for each country pair is be retained in the sample. The equation estimated will take the form:

$$\begin{aligned} ln\tau_{ijt}^{k} =& \gamma_t + \beta_1 lndist_{ij} + \beta_2 contig_{ij} + \beta_3 comlang_{ij} + \beta_4 comcol_{ij} + \beta_5 EAC_{ijt} \\ &+ \beta_6 COMESA_{ijt} + \beta_7 SADC_{ijt} + \beta_8 WTO_{ijt} + \beta_9 GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{5.11}$$

Most time-invariant trade cost variables across all sectors have expected signs and magnitudes in line with trade literature. Geographical distance increases trade costs in a statistically significant manner while a common border and having a colonial relationship is associated with lower trade costs across all sectors. Most coefficients for trade agreements also indicate that they are associated with a reduction in trade costs. Interestingly, before controlling for all bilateral trade costs variables, the EAC is seen to significantly increase trade costs for agriculture sector while COMESA is associated with an increase in trade costs across all sectors.

However, some time-invariant variables have different implications on trade costs depending on the sector. Countries with common language have lower trade costs except for trade in minerals while having a common colonizer is associated with lower trade costs for agricultural goods only. This may be attributed to the nature of trade in these sectors. Colonial administration developed their colonies as regions where

they could tap raw materials and secure markets for their industries. Therefore, countries with colonial relationships were likely not to trade in manufactured goods and minerals. The creation of new markets in emerging economies such as China has increased the demand for minerals so their trade is likely not to follow linguistic relationships.

The second, fourth and sixth columns gives the results of equation 5.9 which employs country-pair fixed effects. The equation estimated will take the form:

$$\begin{aligned} ln\tau_{ijt}^{k} =& \alpha_{ij} + \gamma_t + \beta_1 EAC_{ijt} + \beta_2 COMESA_{ijt} + \beta_3 SADC_{ijt} + \beta_4 WTO_{ijt} \\ &+ \beta_5 GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{5.12}$$

All PTA variables are now associated with a drop in trade costs across all sectors and the model's explanatory power also increases for all sectors. This is expected since the country-pair fixed effects controls for all time-invariant variables that may have been omitted in the naïve gravity model. The changes can also be associated with the control of endogeneity of the PTA variable with other variables that positively impacted on trade costs.

The trade agreements have different implications on trade costs depending on the sector. The impact of the EAC is statistically significant for agriculture and manufacturing sectors. This may be attributed to the dominance of the two sectors in intra-EAC trade. The impact of COMESA is statistically significant for the manufacturing and mineral sectors while that of SADC is statistically significant across all sectors. As expected, the impact of the WTO is statistically significant for the agriculture and manufacturing sectors since they have been the main focus of multilateral trade negotiations. The GSP agreements are associated with a statistically significant reduction of trade costs for the agriculture sector. This is also expected since GSP agreements are non-discriminatory preferences by developed countries to developing countries with the aim of promoting their participation in world trade. Since the dominant export for most developing countries are agricultural goods, the GSP agreements would likely focus on reducing their trade costs.

	Agriculture		Manufacturing		Minerals	
	$ln\tau_{ijt}^{k}$	$ln\tau_{ijt}^{k}$	$ln\tau_{ijt}^{k}$	$ln\tau_{ijt}^{k}$	$ln\tau_{ijt}^{k}$	$ln\tau_{ijt}^{k}$
Distance	0.165***		0.275***		0.198***	
	(0.005)		(0.005)		(0.007)	
Contiguity	-0.288***		-0.219***		-0.28***	
	(0.02)		(0.171)		(0.022)	
Common Language	-0.06***		-0.021*		0.07***	
	(0.013)		(0.011)		(0.017)	
Common Colonizer	-0.099***		0.082***		0.028	
	(0.016)		(0.138)		(0.025)	
EAC	0.119**	-0.156**	-0.056	-0.114***	0.132	-0.036
	(0.048)	(0.064)	(0.043)	(0.027)	(0.083)	(0.046)
COMESA	0.221***	-0.052	0.191***	-0.111***	0.218***	-0.156**
	(0.034)	(0.038)	(0.023)	(0.024)	(0.052)	(0.061)
SADC	-0.142***	-0.107**	-0.199***	-0.067**	-0.022	-0.157**
	(0.045)	(0.046)	(0.037)	(0.034)	(0.044)	(0.046)
WTO	-0.188***	-0.042**	-0.202***	-0.066***	-0.115***	-0.02
	(0.009)	(0.017)	(0.007)	(0.011)	(0.014)	(0.023)
GSP	-0.086***	-0.061**	-0.208***	-0.025	-0.013	-0.003
	(0.012)	(0.029)	(0.01)	(0.016)	(0.017)	(0.05)
Observations	134,422	133,338	225,396	224,886	85,354	84,226
R^2	0.185	0.856	0.262	0.905	0.171	0.822
Country-pair FE	-	Yes	-	Yes	-	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5.2: Impact of EAC on Total Trade Costs by sectors
Notes: ***,** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; the results for other PTA variables in equations 9, 10 and 11 are not shown but were included in the estimation

5.4.2 Impact of EAC on tariffs and NTMs

To provide a greater detail of the impact of the EAC, this section presents the results for tariffs and NTMs for each sector. Tables 5.3, 5.5 and **??** presents results of the agriculture, manufacturing and mineral sectors respectively. In each table, the first column reproduces the impact of EAC on total trade costs from equation 5.12 while the second column and third columns show the results for bilateral tariffs and NTMs

given by the following equations:

$$\begin{aligned} lnT_{ijt}^{k} =& \alpha_{ij} + \gamma_t + \beta_1 EAC_{ijt} + \beta_2 COMESA_{ijt} + \beta_3 SADC_{ijt} + \beta_4 WTO_{ijt} \\ &+ \beta_5 GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{5.13}$$

$$\begin{aligned} lnNT_{ijt}^{k} =& \alpha_{ij} + \gamma_t + \beta_1 EAC_{ijt} + \beta_2 COMESA_{ijt} + \beta_3 SADC_{ijt} + \beta_4 WTO_{ijt} \\ &+ \beta_5 GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{5.14}$$

The results in Table 5.3 indicate that the EAC is associated with a reduction in both tariffs and NTM for the agriculture sector. Interestingly, magnitude and the significance level for the two coefficients are quite different. The EAC appeared to reduce NTMs relatively more than tariffs, but the reduction was only statistically significant for tariffs. This points out to the likelihood that the EAC countries had more NTMs than tariffs on their bilateral trade. Therefore, the implementation of the EAC agreement saw reduction in both trade costs but the percentage change in tariffs was higher than the percentage change in NTMs. This is expected since agriculture is a key sector in the economies of all EAC countries, so they are likely to protect their domestic producers from regional competition. A reduction in tariffs meant that EAC countries adopted NTMs for protection of their domestic agricultural sector. This means that there is still high prevalence of NTMs in intra-EAC trade of agricultural goods.

	Total Trade Cost	Tariffs	NTMs
Dependent Variable	$ln\tau_{ijt}$	lnT_{ijt}	$lnNT_{ijt}$
EAC	-0.156**	-0.037***	-0.093
	(0.064)	(0.004)	(0.062)
Observations	133,338	207,628	117,968
R^2	0.856	0.712	0.840
exporter-year, importer-year, country-pair FEs	Yes	Yes	Yes

Table 5.3: Impact of EAC on Agriculture Sector Trade Costs
Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; the results for other PTA variables in all equations are not shown but were included in the estimation

For the manufacturing sector, the impact of the EAC is associated with reduction

of both bilateral tariffs and NTMs in a statistically significant manner. The magnitude of the EAC coefficient is larger for NTMs than bilateral tariffs indicating that member countries have more NTMs. This is the only sector that has a significance in its reduction of NTMs indicating that most of the implemented policies were those that affected trade in manufactured goods. This is expected since Kenya has the most advanced manufacturing sector in the region while it is under-developed in most other EAC countries. Since they have no domestic industries to protect, it is of economic benefit for most EAC countries to reduce both tariffs and NTMs for manufactured goods.

	Total Trade Cost	Tariffs	NTMs
Dependent Variable	$ln\tau_{ijt}$	lnT_{ijt}	$lnNT_{ijt}$
EAC	-0.114***	-0.027***	-0.061**
	(0.027)	(0.003)	(0.029)
Observations	224,886	275,364	204,818
R^2	0.905	0.849	0.892
exporter-year, importer-year, country-pair FEs	Yes	Yes	Yes

Table 5.4: Impact of EAC on Manufacturing Sector Trade Costs
Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; the results for other PTA variables in all equations are not shown but were included in the estimation

Lastly, the EAC is associated with reduction of trade costs for both tariffs and NTMs in the mining sector but the impact is only statistically significant for tariffs. Since this is the least traded sector in the region, the magnitudes of the EAC coefficient are seen to be the smallest as expected. Similar to the agriculture sector, the impact of the EAC is only statistically significant for tariffs and not for NTMs indicating that they are still prevalent in intra-EAC trade of minerals.

5.4.3 Impact of deepening the EAC Agreement

The baseline model analyses focus on the overall impact of the effects of the EAC on trade costs. These effects can be assessed further by analysing the extent of trade liberalization undertaken. The EAC integration has followed a linear integration model, starting with a Free Trade Agreement (FTA) in 2000 followed by a fully-

	Total Trade Cost	Tariffs	NTMs
Dependent Variable	$ln\tau_{ijt}$	lnT_{ijt}	$lnNT_{ijt}$
EAC	-0.036	-0.016***	-0.012
	(0.046)	(0.004)	(0.05)
Observations	84,226	173,112	71,406
R^2	0.822	0.965	0.821
exporter-year, importer-year, country-pair FEs	Yes	Yes	Yes

Table 5.5: Impact of EAC on Mining Sector Trade Costs
Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; the results for other PTA variables in all equations are not shown but were included in the estimation

fledged Customs Union (CU) in 2010. The impact of deepening of the EAC on bilateral tariffs and NTMs is assessed by including an additional dummy variable for the presence of the CU as follows:

$$\begin{aligned} ln\tau_{ijt}^{k} =& \alpha_{ij} + \gamma_t + \beta_1 EAC_{ijt} + \beta_2 EACcu_{ijt} + \beta_3 COMESA_{ijt} + \beta_4 SADC_{ijt} \\ &+ \beta_5 WTO_{ijt} + \beta_6 GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{5.15}$$

$$\begin{aligned} lnT_{ijt}^{k} =& \alpha_{ij} + \gamma_t + \beta_1 EAC_{ijt} + \beta_2 EACcu_{ijt} + \beta_3 COMESA_{ijt} + \beta_4 SADC_{ijt} \\ &+ \beta_5 WTO_{ijt} + \beta_6 GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{5.16}$$

$$\begin{aligned} lnNT_{ijt}^{k} =& \alpha_{ij} + \gamma_t + \beta_1 EAC_{ijt} + \beta_2 EACcu_{ijt} + \beta_3 COMESA_{ijt} + \beta_4 SADC_{ijt} \\ &+ \beta_5 WTO_{ijt} + \beta_6 GSP_{ijt} + \varepsilon_{ijt} \end{aligned} \tag{5.17}$$

Tables 5.6, 5.7 and 5.8 presents results of the impact of deepening the EAC on agriculture, manufacturing and mineral sectors respectively. In each table, the first and third columns reproduces the impact of EAC on bilateral tariffs and NTMs while the second and fourth columns shows the effects of deepening the EAC. The results shows that the deepening of the EAC had a significant impact on both tariffs and NTMs across all sectors. This suggests that implementation of the CU successfully reduced trade costs among EAC countries.

For the agriculture sector, the implementation of the CU is associated with reductions in tariff and NTMs in a statistically significant manner. A comparison

of the generic impact of the EAC and the complementary impact specific to the CU indicates that reduction in tariffs was statistically significant in both pre-CU and post-CU while reduction in NTMs is only statistically significant in the post-CU period. The magnitude of the impact of EAC on tariffs is equal for the pre-CU and post-CU periods indicating tariffs on agricultural goods were removed in equal measure over both periods. This is shows that the EAC countries still maintained considerably large level of tariffs on some agricultural goods after formation of the CU contrary to the requirements of the EAC treaty. On the other hand, most NTMs for trade in agricultural goods were implemented during the post-CU period.

	Tariff		NTM	
Dependent Variable	lnT_{ijt}	lnT_{ijt}	$lnNT_{ijt}$	$lnNT_{ijt}$
EAC	-0.037**	-0.023***	-0.093	-0.011
	(0.004)	(0.005)	(0.062)	(0.063)
EAC		-0.023***		-0.14***
		(0.005)		(0.036)
Observations	207,628	207,628	117,968	117,968
R^2	0.712	0.712	0.840	0.840
exporter-year, importer-year, country-pair FEs	Yes	Yes	Yes	Yes

Table 5.6: Impact of deepening the EAC on Agriculture Sector Trade Costs
Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; the results for other PTA variables in all equations are not shown but were included in the estimation

For the manufacturing sector, the implementation of the CU is also associated with a statistically significant reduction in both tariffs and NTMs. Similar to the agricultural sector, reduction in tariffs is statistically significant in both pre-CU and post-CU periods while reduction in NTMs is only significant in the post-CU period. The magnitude of the impact of EAC on tariffs is lower in the post-CU period indicating that most tariffs on the manufactured goods had been removed before implementation of the CU. On the other hand, most of the NTMs in the sector were reduced after implementation of the CU.

Lastly, implementation of the CU also led to reductions in both tariffs and NTMs for the mining sector, but the impact was mildly significant (at 10 percent level of

	Tariff		NTM	
Dependent Variable	lnT_{ijt}	lnT_{ijt}	$lnNT_{ijt}$	$lnNT_{ijt}$
EAC	-0.027***	-0.02***	-0.061**	-0.021
	(0.003)	(0.003)	(0.029)	(0.03)
EAC		-0.012***		-0.066***
		(0.003)		(0.021)
Observations	275,364	275,364	204,818	204,818
R^2	0.849	0.849	0.892	0.892
exporter-year,				
importer-year,	Yes	Yes	Yes	Yes
country-pair FEs				

Table 5.7: Impact of deepening the EAC on Manufacturing Sector Trade Costs
Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; the results for other PTA variables in all equations are not shown but were included in the estimation

significance). Comparing the impact of the EAC in pre-CU and post-CU periods, reduction in tariffs is higher and more significant for the pre-CU period while reduction in NTMs is more significant in the post-CU period. This indicates that most tariffs were removed before implementation of the CU while most NTMs were removed in the post-CU period.

	Tariff		NTM	
Dependent Variable	lnT_{ijt}	lnT_{ijt}	$lnNT_{ijt}$	$lnNT_{ijt}$
EAC	-0.016***	-0.014***	-0.012**	0.06
	(0.004)	(0.004)	(0.05)	(0.063)
EAC		-0.004***		-0.129*
		(0.002)		(0.072)
Observations	173,112	173,112	71,406	71,406
R^2	0.965	0.965	0.821	0.821
exporter-year,				
importer-year,	Yes	Yes	Yes	Yes
country-pair FEs				

Table 5.8: Impact of deepening the EAC on Mining Sector Trade Costs
Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent respectively; robust standard errors clustered for intra-country correlation in parenthesis; the results for other PTA variables in all equations are not shown but were included in the estimation

5.4.4 Evolution of the EAC impact on trade costs

Lastly, the paper explores the time-series impact of the EAC on the reduction in bilateral tariff and NTMs across the three sectors. This is done interacting the

EAC dummy variable with the year dummies from 2000 to 2016. The results are presented graphically to measure the cumulative effects of the EAC on trade costs from year of inception.

The gravity coefficients for the impact of EAC on tariff for each sector and the 95 percent confidence intervals are depicted in figures 5.1, 5.2 and 5.3. The findings show that the tariff-reduction effect of the EAC on all sectors was not felt immediately after its entry into force. This is expected since, the EAC treaty allowed for a phased reduction of some tariffs for the least developed member countries in the first five years of implementation. The results also indicate that the peaks of the EAC's effect on tariff varies across all sectors. This may be associated with the differences in the timing and speed of implementation of the tariff-reduction policies by member countries.

All countries were to remove most of their tariffs on intra-EAC trade by 2005 and this explains the large reductions in tariffs across all sectors for 2005 and preceding years. The tariffs are seen to have slightly increased in 2007 and this can be attributed to the expansion of the EAC by inclusion of Rwanda and Burundi. The tariffs then gradually reduced after 2007 for agriculture and manufacturing sectors while that of mining sector remains relatively constant. This is expected since intra-EAC trade is dominated by agricultural and manufactured goods so there is little incentive in increased reduction of tariffs for mineral products.

The impact of EAC on NTMs for each sector and the 95 percent confidence intervals are depicted in figures 5.4, 5.5 and 5.6. The graphs indicate that implementation of the EAC led to an immediate reduction in NTMs in all sectors. However, there was a gradual increase in NTMs in all sectors within a few years after the region was established. A possible explanation to this is that, just like many other countries, the EAC members adopted NTMs to protect their industries after tariffs were reduced. The phased reduction of tariffs discussed above led to a gradual adoption of NTMs. Significant reduction of NTMs across all sectors can be seen after implementation after 2009. This is seen to coincide with the set-up of the EAC NTM

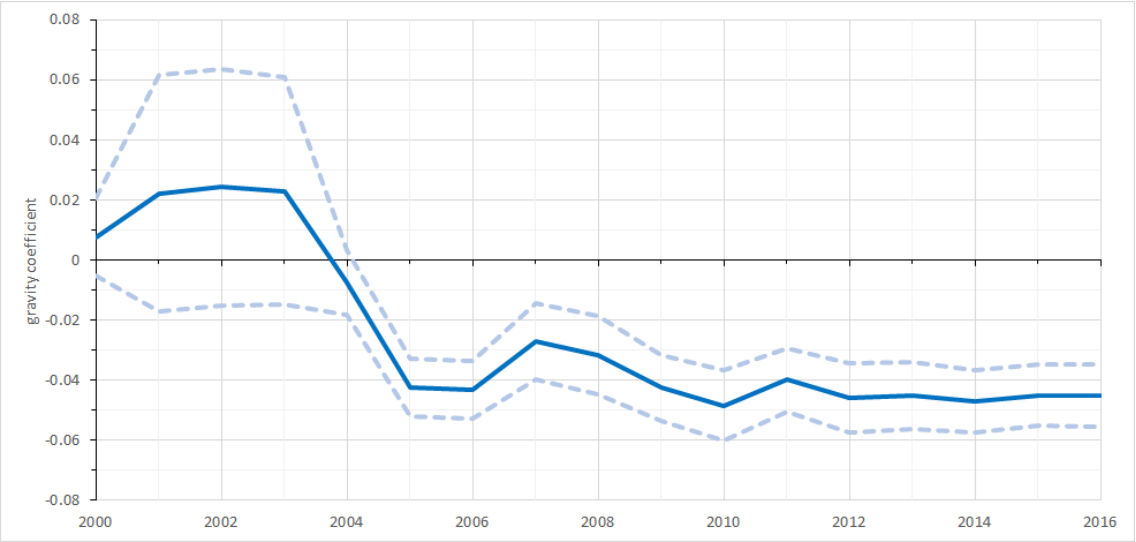

Figure 5.1: Cumulative Effects of EAC on tariffs for Agriculture
Notes: Solid and dashed lines show point estimates and 95 percent confidence intervals respectively

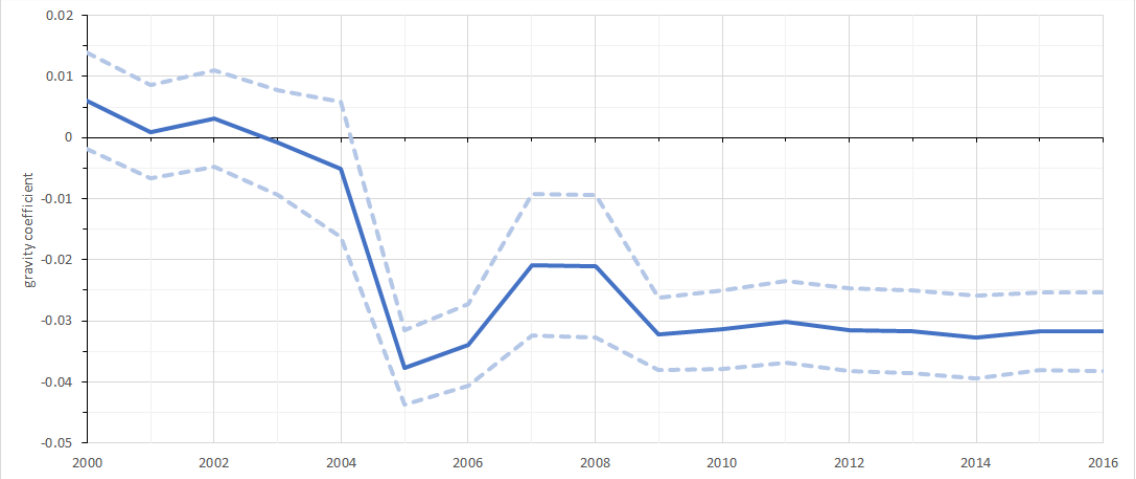

Figure 5.2: Cumulative Effects of EAC on tariffs for Manufacturing
Notes: Solid and dashed lines show point estimates and 95 percent confidence intervals respectively

monitoring mechanism in 2009 to identify and monitor the removal of NTMs and the implementation of the CU in 2010 that provided additional measures to address NTMs. The largest reductions in NTMs across all sectors are seen in 2012 but then increase thereafter. This indicates that the recent measures put in place to address NTMs seem not to be effective and EAC countries are increasingly adopting NTMs.

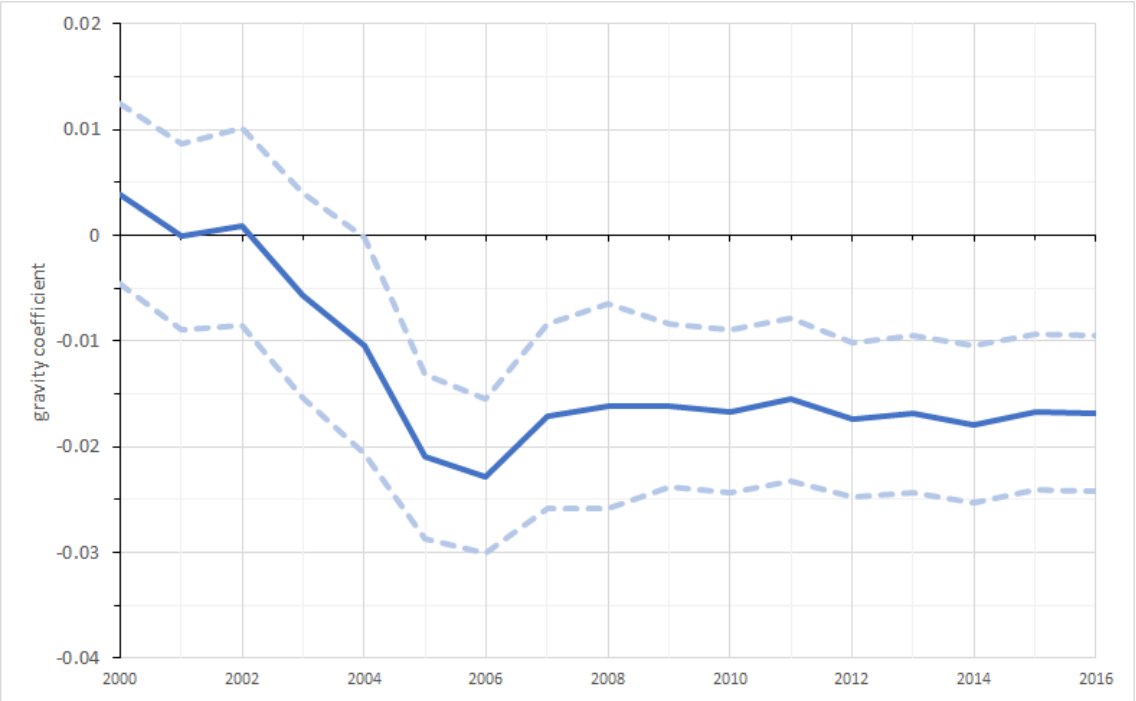

Figure 5.3: Cumulative Effects of EAC on tariffs for Minerals
Notes: Solid and dashed lines show point estimates and 95 percent confidence intervals respectively

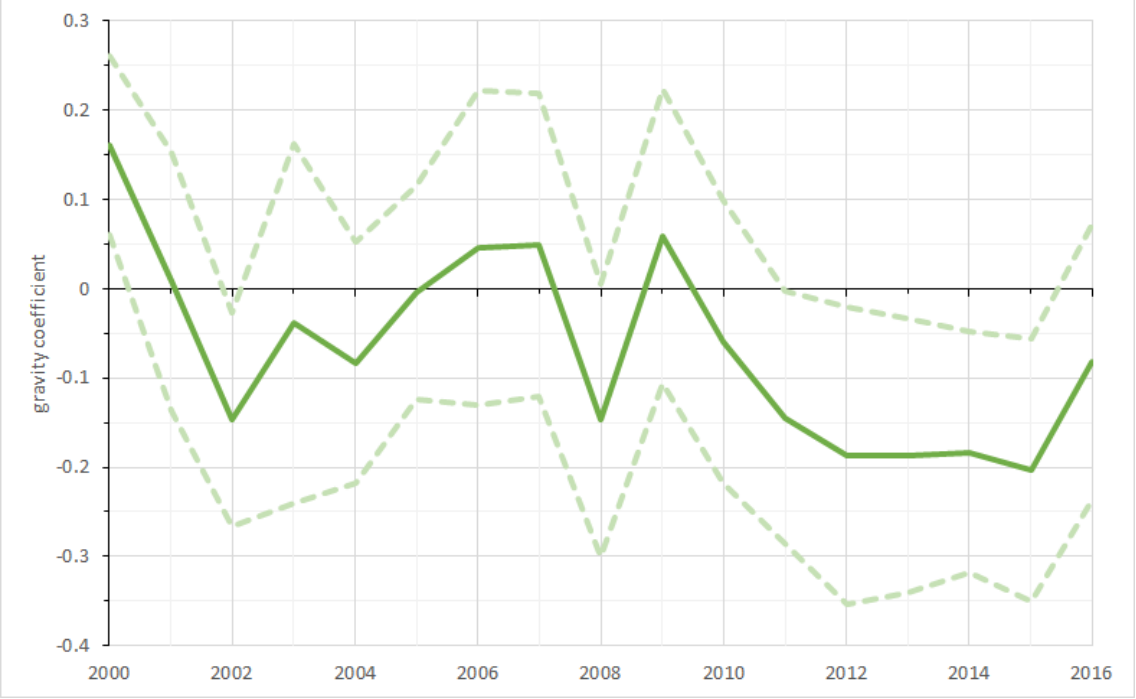

Figure 5.4: Cumulative Effects of EAC on NTM for Agriculture
Notes: Solid and dashed lines show point estimates and 95 percent confidence intervals respectively

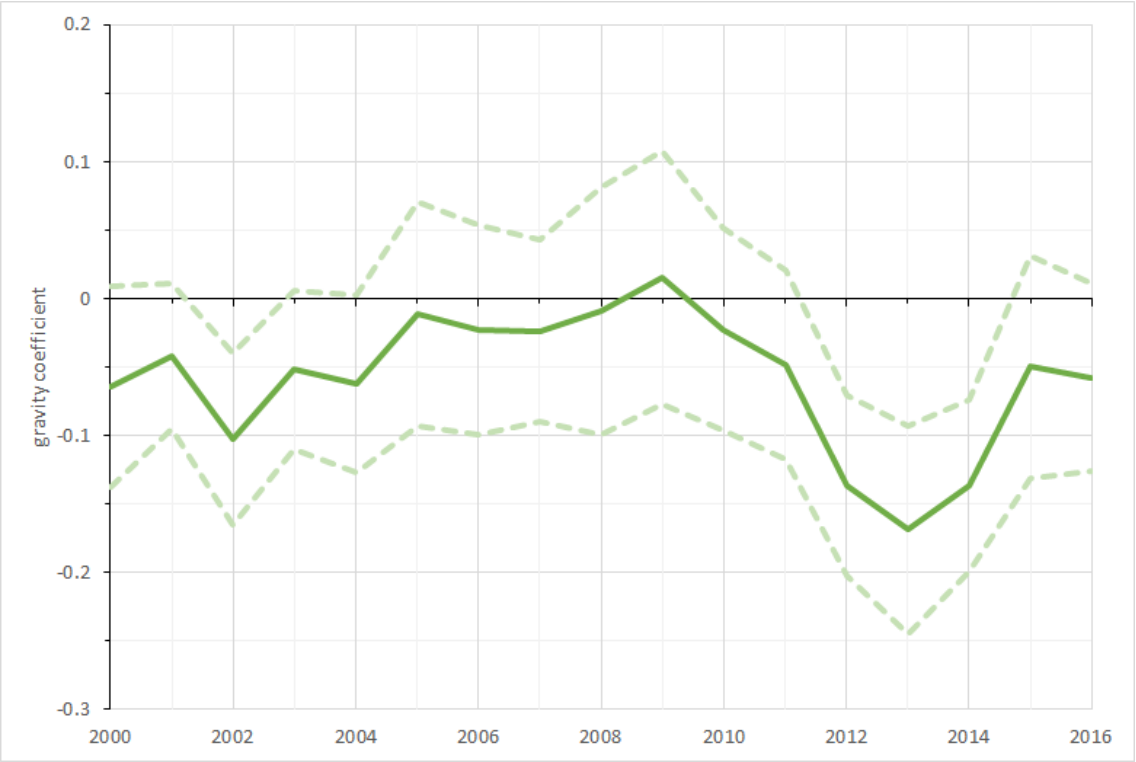

Figure 5.5: Cumulative Effects of EAC on NTM for Manufacturing
Notes: Solid and dashed lines show point estimates and 95 percent confidence intervals respectively

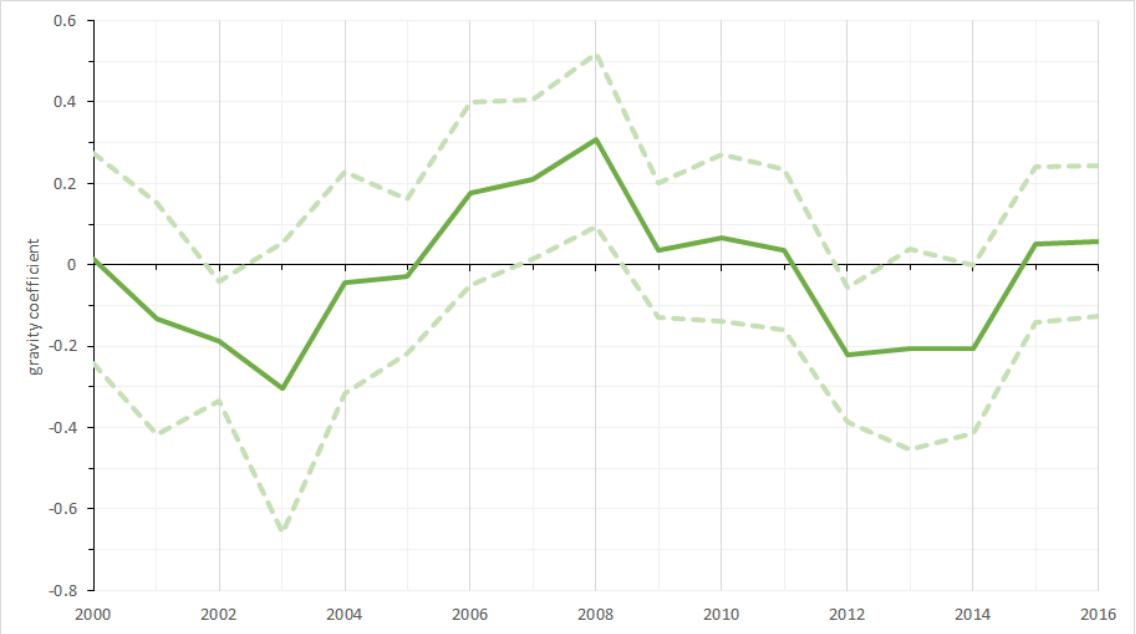

Figure 5.6: Cumulative Effects of EAC on NTM for Minerals
Notes: Solid and dashed lines show point estimates and 95 percent confidence intervals respectively

5.5 Conclusion

This chapter empirically investigates the extent to which the EAC has succeeded in lowering trade costs for the agricultural, manufacturing and mining sectors. It estimates the comprehensive trade costs using an approach by Novy (2013), calculates tariffs using data from World Bank WITS database, then uses the two datasets to estimate a measure of non-tariff trade costs. Using these measures of trade costs, the paper then employs the gravity model to empirical estimate the effects of the EAC on tariffs and NTMs following the procedure by Chen and Novy (2011).

Our findings show that the EAC was associated with a reduction of trade costs across all the three sectors. The impact is highest and most significant on the agriculture and manufacturing sectors compared to that of the mining sector. This may be attributed to the dominance of the two sectors in intra-EAC trade. When compared to the COMESA and SADC, the impact of the EAC is highest for agriculture and manufacturers but lower for mining sector. Since the two sectors constitute bulk of the tradable goods in African countries, it can be concluded that the EAC has been more successful in reduction of trade costs than the other PTAs.

When the trade costs are further broken down into tariffs and NTMs, the impact of the EAC is seen to have been more successful in reduction of tariffs than NTMs across all sectors. This indicates that as EAC countries reduced tariffs, they adopted NTMs to protect their domestic industries from regional competition. The only sector with a significant reduction in NTMs is the manufacturing sector and this can be attributed to the lack of industries in most EAC countries, so protection is not necessary.

A time series analysis of the impact of the EAC indicates that effect of the EAC on all sectors was not felt immediately after its entry into force due to the nature of its implementation. The EAC countries adopted a phase reduction of some tariffs for the least developed member countries in its first five years of implementation. The peak of tariff reduction was in 2005 when the five-year implementation period lapsed. Significant reduction of NTMs across all sectors can be seen after imple-

mentation after 2009. This is seen to coincide with the setting up of the EAC NTM monitoring mechanism in 2009 to identify and monitor the removal of NTMs. The implementation of the CU in 2010 also had a significant impact on NTMs and this can be attributed to the additional measures it proposed to address NTMs. The largest reductions in NTMs across all sectors are seen in 2012 but then they increase thereafter. This indicates that the recent measures put in place seem not to have effectively address NTMs. EAC countries seem to be increasingly adopting NTMs so future direction of policies should be on reduction of NTMs.

Chapter 6

Concluding Remarks

The aim of this thesis is to understand how formation of the EAC affected the economies of its member countries and whether it is the best trade liberalization strategy for them. The thesis undertook both a theoretical and empirical analysis to examine the trade and welfare effects of the EAC through the goods channel. The specific objectives of this thesis are as follows: (i) To determine the type of PTA that will offer the highest welfare gains for its member countries when they differences in the sizes of their markets, (ii) To assess the trade and welfare effects of the EAC on each member country, and (iii) To investigate the impact of the EAC on tariffs and Non-Tariff Measures (NTMs).

Chapter 3 analysed the conditions under which there are welfare gains from joining either a PTA where the member countries have differing market sizes. It used an oligopoly model where the welfare gains from a country are sourced from consumer surplus, firm profits and tariff revenues. The conditions are shown to be determined by the type of trade agreement, either an FTA or a CU, and the degree of market asymmetry between the member countries. The study found out that a CU is welfare improving as long as the market size asymmetry is not too large. Given an option between a CU and an FTA with optimal tariffs, a country will prefer a CU regardless of the market size since it offers higher welfare gains. However, between a CU and an FTA with MFN tariffs, a small country will prefer the FTA while a larger country will prefer a CU. The decision of the smaller country is based on fact

that the profits gains for the firm outweighs the forgone gains in consumer surplus and tariff revenue due to lower tariffs in a CU. On the other hand, a larger country's population makes it prefer a CU since the lower tariffs generate higher consumer surplus and tariff revenue.

Chapter 4 used the recent developments in gravity model literature by employing the GEPPML procedure of Anderson et al. (2015) to analyse the trade and welfare effects of the EAC. The results of the partial equilibrium analysis indicates that the EAC has led to significant trade creation effects. Its effects are larger than those of comparable African PTAs. Moreover, the expansion and further deepening of the EAC are also seen to have contributed additional trade creation effects. From the experience of the EAC, this paper shows that deepening and expansion of trade agreements can produce substantial trade benefits for member countries. The results general equilibrium analysis indicates that the EAC led to both trade creation and trade diversion effects. However, trade creation effects were larger than the trade diversion effect for most of the countries. Kenya is the only country that had no trade diversion effects and this can be explained by its superior level of industrialization as compared to other EAC countries. A key finding from this analysis is that the benefits of trade liberalization among developing countries will be inclined to the most industrialized countries. Lastly, the chapter showed that the EAC generated net welfare gains for all its member countries of between 0.01 - 0.9 percent of real GDP. Kenya and Rwanda have the largest gains while Burundi has the least gain in welfare. The welfare gains for Kenya are due to producer surpluses while the welfare gains in all other countries are due to consumer surpluses. Therefore, this study can conclude that the formation of the EAC has achieved its objective of generating welfare gains for its member countries.

Chapter 5 empirically investigated the extent to which the EAC has succeeded in lowering trade costs for the agricultural, manufacturing and mining sectors. It estimates the comprehensive trade costs using an approach by Novy (2013), calculates tariffs using data from World Bank WITS database, then uses the two datasets

to estimate a measure of non-tariff trade costs. Using these measures of trade costs, the paper then employs the gravity model to empirical estimate the effects of the EAC on tariffs and NTMs following the procedure by Chen and Novy (2011). The findings show that the EAC was associated with a reduction of trade costs across all the three sectors. The impact is highest and most significant on the agriculture and manufacturing sectors compared to that of the mining sector. This may be attributed to the dominance of the two sectors in intra-EAC trade. When the trade costs are further broken down into tariffs and NTMs, the impact of the EAC is seen to have been more successful in reduction of tariffs than NTMs across all sectors. This indicates that as EAC member countries reduced tariffs, they adopted NTMs to protect their domestic industries from regional competition. The only sector with a significant reduction in NTMs is the manufacturing sector and this can be attributed to the lack of industries in most EAC member countries, so protection is not necessary.

In terms of further research, the general equilibrium analysis undertaken in Chapter 4 can be extended to incorporate the dynamic aspects of the structural gravity model where investment and capital accumulation are included Yotov et al. (2016). The economic objectives of the PTAs are usually long term so it is possible that incorporation of investment and capital accumulation in the analysis will lead to higher effects of real GDP. Another extension of the study will be the estimation of trade-related welfare gains from the services channel.

Bibliography

Ackah, Charles, Festus Ebo Turkson, and Kwadwo Opoku (2013). "Measuring Trade Costs in Economic Community of West African States (ECOWAS)". In.

Aloo, Leonard Obura (2017). "Free Movement of Goods in the EAC". In: *East African Community Law*. Brill Nijhoff, pp. 303–325.

Anderson, James E (1979). "A theoretical foundation for the gravity equation". In: *The American Economic Review* 69.1, pp. 106–116.

Anderson, James E, Mario Larch, and Yoto Yotov (2015). "Estimating general equilibrium trade policy effects: GE PPML". In.

Anderson, James E and Eric Van Wincoop (2003). "Gravity with gravitas: a solution to the border puzzle". In: *American economic review* 93.1, pp. 170–192.

— (2004). "Trade costs". In: *Journal of Economic literature* 42.3, pp. 691–751.

Arkolakis, Costas, Arnaud Costinot, and Andres Rodriguez-Clare (2012). "New trade models, same old gains?" In: *American Economic Review* 102.1, pp. 94–130.

Arvis, Jean-François et al. (2013). *Trade costs in the developing world: 1995–2010*. The World Bank.

Baier, Scott L and Jeffrey H Bergstrand (2007). "Do free trade agreements actually increase members' international trade?" In: *Journal of international Economics* 71.1, pp. 72–95.

Baier, Scott L, Jeffrey H Bergstrand, and Michael Feng (2014). "Economic integration agreements and the margins of international trade". In: *Journal of International Economics* 93.2, pp. 339–350.

Balassa, Bela (1961). "The Theory of Economic Integration (Homewood". In: *IL: Richard*.

Baldwin, Richard (2008). *Big-think regionalism: a critical survey*. Tech. rep. National Bureau of Economic Research.

Baldwin, Richard and Dany Jaimovich (2012). "Are free trade agreements contagious?" In: *Journal of international Economics* 88.1, pp. 1–16.

Baldwin, Richard and Daria Taglioni (2006). *Gravity for dummies and dummies for gravity equations*. Tech. rep. National bureau of economic research.

Baldwin, Richard E and Anthony J Venables (1995). "Regional economic integration". In: *Handbook of international economics* 3, pp. 1597–1644.

Berglas, Eitan (1979). "Preferential trading theory: The n commodity case". In: *Journal of Political Economy* 87.2, pp. 315–331.

Bergstrand, Jeffrey H (1985). "The gravity equation in international trade: some microeconomic foundations and empirical evidence". In: *The review of economics and statistics*, pp. 474–481.

— (1989). "The generalized gravity equation, monopolistic competition, and the factor-proportions theory in international trade". In: *The review of economics and statistics*, pp. 143–153.

Bhagwati, Jagdish (1995). "US Trade Policy: The Infatuation with Free Trade Areas," in Jagdish Bhagwati and Anne O. Krueger (eds.), The Dangerous Drift to Preferential Trade Agreements. Washington, DC: American Enterprise In-stitute for Public Policy Research". In.

— (2008). *Termites in the trading system: How preferential agreements undermine free trade*. Oxford University Press.

Bhagwati, Jagdish and Arvind Panagariya (1996). "The theory of preferential trade agreements: historical evolution and current trends". In: *The American Economic Review* 86.2, pp. 82–87.

Brada, Josef C and Jose A Mendez (1988). "An estimate of the dynamic effects of economic integration". In: *The Review of Economics and Statistics*, pp. 163–168.

Brander, James and Paul Krugman (1983). "A 'reciprocal dumping'model of international trade". In: *Journal of international economics* 15.3-4, pp. 313–321.

Brander, James A (1981). "Intra-industry trade in identical commodities". In: *Journal of international Economics* 11.1, pp. 1–14.

Brown, Andrew Gardner (2009). *Reluctant partners: a history of multilateral trade cooperation, 1850-2000*. University of Michigan Press.

Buigut, Steven (2016). "Trade effects of the East African Community Customs Union: hype versus reality". In: *South African Journal of Economics* 84.3, pp. 422–439.

Calabrese, Linda and Andreas Eberhard-Ruiz (2016). "What types of non-tariff barriers affect the East African Community". In: *Briefing. Overseas Development Institute, London, United Kingdom*.

Capling, Ann and Patrick Low (2010). *Governments, Non-state Actors and Trade Policy-making: Negotiating Preferentially Or Multilaterally?* Cambridge University Press.

Chaney, Thomas (2008). "Distorted gravity: the intensive and extensive margins of international trade". In: *American Economic Review* 98.4, pp. 1707–21.

Chen, Natalie and Dennis Novy (2011). "Gravity, trade integration, and heterogeneity across industries". In: *Journal of international Economics* 85.2, pp. 206–221.

Clarke, Roger and David R Collie (2003). "Product differentiation and the gains from trade under Bertrand duopoly". In: *Canadian Journal of Economics/Revue canadienne d'économique* 36.3, pp. 658–673.

Cooper, Charles A and Benton F Massell (1965). "A new look at customs union theory". In: *The economic journal* 75.300, pp. 742–747.

Corden, Warner Max (1972). "Economies of scale and customs union theory". In: *Journal of Political Economy* 80.3, Part 1, pp. 465–475.

Correia, Sergio (2017). "reghdfe: Stata module for linear and instrumental-variable/GMM regression absorbing multiple levels of fixed effects". In: *Statistical Software Components s457874, Boston College Department of Economics*.

Costinot, Arnaud and Andres Rodriguez-Clare (2014). "Trade theory with numbers: Quantifying the consequences of globalization". In: *Handbook of international economics*. Vol. 4. Elsevier, pp. 197–261.

De Melo, Jaime and Arvind Panagariya (1995). *New dimensions in regional integration*. Cambridge University Press.

EAC (1984). *Agreement for the Division of Assets and Liabilities of the former East Africa Community*. East Africa Community (EAC).

— (1999). *East African Community Treaty*. East Africa Community (EAC).

— (2004). *Protocol on the Establishment of the East African Customs Union*. East Africa Community (EAC).

— (2009). *Protocol on the Establishment of the East African Community Common Market*. East Africa Community (EAC).

— (2013). *Protocol on the Establishment of the East African Community Monetary Union*. East Africa Community (EAC).

— (2014). *Towards Political Federation in the East African Community: Achievement and Challenges*. East Africa Community (EAC).

— (2016). *East African Community Vision 2050*. East Africa Community (EAC).

Eaton, Jonathan and Samuel Kortum (2002). "Technology, geography, and trade". In: *Econometrica* 70.5, pp. 1741–1779.

Eken, Sena (1979). "Breakup of the East African Community". In: *Finance and Development* 16.4, p. 36.

Fally, Thibault (2015). "Structural gravity and fixed effects". In: *Journal of International Economics* 97.1, pp. 76–85.

Fouquin, Michel, Jules Hugot, et al. (2016). *Two centuries of bilateral trade and gravity data: 1827-2014*. Tech. rep. Universidad Javeriana-Bogota.

Haaland, Jan I and Ian Wooton (1991). *Market integration, competition, and welfare*. IIES.

Harrison, Glenn W, Thomas F Rutherford, and Ian Wooton (1993). "An alternative welfare decomposition for customs unions". In: *Canadian Journal of Economics*, pp. 961–968.

Hayakawa, Kazunobu and Fukunari Kimura (2015). "How much do free trade agreements reduce impediments to trade?" In: *Open Economies Review* 26.4, pp. 711–729.

Hazlewood, Arthur (1979). "The end of the East African Community: What are the lessons for regional integration schemes?" In: *JCMS: Journal of Common Market Studies* 18.1, pp. 40–58.

Head, Keith and Thierry Mayer (2014). "Gravity equations: Workhorse, toolkit, and cookbook". In: *Handbook of international economics*. Vol. 4. Elsevier, pp. 131–195.

Helpman, Elhanan (1987). "Imperfect competition and international trade: evidence from fourteen industrial countries". In: *Journal of the Japanese and international economies* 1.1, pp. 62–81.

Helpman, Elhanan and Paul R Krugman (1985). *Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy*. MIT press.

Hertel, Thomas et al. (2007). "How confident can we be of CGE-based assessments of Free Trade Agreements?" In: *Economic Modelling* 24.4, pp. 611–635.

IMF (1979). *Finance and Development*. International Monetary Fund (IMF).

Impullitti, Giammario and Omar Licandro (2018). "Trade, firm selection and innovation: The competition channel". In: *The Economic Journal* 128.608, pp. 189–229.

Irwin, Douglas A, Petros C Mavroidis, and Alan O Sykes (2008). "The Genesis of the GATT". In.

Jacks, David S, Christopher M Meissner, and Dennis Novy (2011). "Trade booms, trade busts, and trade costs". In: *Journal of International Economics* 83.2, pp. 185–201.

Kahnert, F and P Richards (n.d.). "E. Stoutjesdijk y P. Thomopoulos (1969), Economic Integration Among Developing Countries". In: *Development Centre Studies, OECD, París* ().

Kee, Looi Hiau, Alessandro Nicita, and Marcelo Olarreaga (2009). "Estimating trade restrictiveness indices". In: *The Economic Journal* 119.534, pp. 172–199.

Kimbugwe, Kato et al. (2012). *Economic Development Through Regional Trade: A Role for the New East African Community?* Springer.

Koami, KA et al. (2016). "Africa Regional Integration Index: Report 2016". In: *African Union Comm. African Dev. Bank, Econ. Comm. Africa*, pp. 1–52.

Krauss, Melvyn B (1972). "Recent developments in customs union theory: An interpretive survey". In: *Journal of economic literature* 10.2, pp. 413–436.

Krugman, Paul (1980). "Scale economies, product differentiation, and the pattern of trade". In: *The American Economic Review* 70.5, pp. 950–959.

— (1995). "Increasing returns, imperfect competition and the positive theory of international trade". In: *Handbook of international economics* 3, pp. 1243–1277.

Larch, Mario et al. (2017). "The currency union effect: A PPML re-assessment with high-dimensional fixed effects". In.

Leahy, Dermot and J Peter Neary (2013). "Oligopoly and trade". In: *Palgrave handbook of international trade*. Springer, pp. 197–235.

Leamer, Edward E and James Levinsohn (1995). "International trade theory: the evidence". In: *Handbook of international economics* 3, pp. 1339–1394.

Limao, Nuno (2016). "Preferential trade agreements". In: *Handbook of commercial policy*. Vol. 1. Elsevier, pp. 279–367.

Lipsey, Richard G (1957). "The theory of customs unions: Trade diversion and welfare". In: *Economica* 24.93, pp. 40–46.

Lipsey, Richard G and Kelvin Lancaster (1956). "The general theory of second best". In: *The review of economic studies* 24.1, pp. 11–32.

Lipsey, Richard George (1970). *The theory of customs unions: A general equilibrium analysis*. Weidenfeld and Nicolson.

Lloyd, Peter John (1982). "3× 3 theory of customs unions". In: *Journal of International Economics* 12.1-2, pp. 41–63.

Markusen, James R (2004). *Multinational firms and the theory of international trade*. MIT press.

Mayer, Thierry and Mathias Thoenig (2016). "Regional trade agreements and the pacification of Eastern Africa". In: *International Growth Centre, Working paper*.

Mayer, Thierry, Vincent Vicard, and Soledad Zignago (2019). "The cost of non-Europe, revisited". In: *Economic Policy* 34.98, pp. 145–199.

McCallum, John (1995). "National borders matter: Canada-US regional trade patterns". In: *The American Economic Review* 85.3, pp. 615–623.

Meade, James Edward (1955). *The theory of customs unions*. North-Holland Publishing.

Melitz, Marc J and Gianmarco IP Ottaviano (2008). "Market size, trade, and productivity". In: *The review of economic studies* 75.1, pp. 295–316.

Miroudot, Sebastien, Jehan Sauvage, and Ben Shepherd (2012). "Trade costs and productivity in services sectors". In: *Economics Letters* 114.1, pp. 36–38.

Mukunoki, Hiroshi (2004). "On the optimal external tariff of a free trade area with internal market integration". In: *Japan and the World Economy* 16.4, pp. 431–448.

Mwithiga, Patricia Mukiri (2015). "The Challenges of Regional Integration in the East Africa Community". In: *Regional Integration and Policy Challenges in Africa*. Springer, pp. 89–108.

Neary, J Peter (2010). "Two and a half theories of trade". In: *World Economy* 33.1, pp. 1–19.

Nitsch, Volker (2000). "National borders and international trade: evidence from the European Union". In: *Canadian Journal of Economics* 33.4, pp. 1091–1105.

Novy, Dennis (2013). "Gravity redux: measuring international trade costs with panel data". In: *Economic inquiry* 51.1, pp. 101–121.

Nye, Joseph S (1968). "Comparative regional integration: Concept and measurement". In: *International organization* 22.4, pp. 855–880.

Ornelas, Emanuel (2007). "Exchanging market access at the outsiders' expense: the case of customs unions". In: *Canadian Journal of Economics/Revue canadienne d'économique* 40.1, pp. 207–224.

Panagariya, Arvind (2000). "Preferential trade liberalization: the traditional theory and new developments". In: *Journal of Economic literature* 38.2, pp. 287–331.

Ravenhill, John (1979). "Regional integration and development in Africa: lessons from the East African Community". In: *Journal of Commonwealth & Comparative Politics* 17.3, pp. 227–246.

Robson, Peter (2012). *Economic integration in Africa*. Routledge.

Sandrey, Ron et al. (2011). *Cape to Cairo: an assessment of the Tripartite free trade area*. Tralac.

Sapir, André (2011). "European integration at the crossroads: a review essay on the 50th anniversary of Bela Balassa's theory of economic integration". In: *Journal of Economic Literature* 49.4, pp. 1200–1229.

Segal, Aaron (1966). "The integration of developing countries: Some thoughts on East Africa and Central America". In: *J. Common Mkt. Stud.* 5, p. 252.

Shepherd, Ben (2013). *Gravity model of international trade: a user guide*.

— (2019). "Mega-regional trade agreements and Asia: An application of structural gravity to goods, services, and value chains". In: *Journal of the Japanese and International Economies* 51, pp. 32–42.

Shinyekwa, Isaac MB (2015). "Has the East African Community regional trade agreement created or diverted trade? A gravity model analysis". In: *Journal of Sustainable Development* 8.9, p. 129.

Silva, JMC Santos and Silvana Tenreyro (2006). "The log of gravity". In: *The Review of Economics and statistics* 88.4, pp. 641–658.

Summers, Lawrence et al. (1991). "Regionalism and the world trading system". In: *Policy implications of trade and currency zones*, pp. 295–301.

Tinbergen, Jan J (1962). “Shaping the world economy; suggestions for an international economic policy”. In.

Trefler, Daniel (1995). “The case of the missing trade and other mysteries”. In: *The American Economic Review*, pp. 1029–1046.

UNCTAD (2015). *Trends in Trade Policy 2015*.

UNCTAD, Geneva (2013). “Non-tariff measures to trade: economic and policy issues for developing countries”. In: *Developing Countries in International Trade Studies*.

Vaitsos, Constantine V (1978). “Crisis in regional economic cooperation (integration) among developing countries: A survey”. In: *World Development* 6.6, pp. 719–769.

Vanek, Jaroslav (1965). *General equilibrium of international discrimination: The case of customs unions*. 123. Harvard University Press.

Viner, Jacob (1950). “The customs union issue”. In: *Carnegue Endowment for Internationl Peace*.

Wei, Shang-Jin (1996). *Intra-national versus international trade: how stubborn are nations in global integration?* Tech. rep. National Bureau of Economic Research.

Wonnacott, Paul and Mark Lutz (1989). “Is there a case for free trade areas?” In: *Free trade areas and US trade policy* 59, p. 84.

Wooton, Ian (1986). “Preferential trading agreements: an investigation”. In: *Journal of International Economics* 21.1-2, pp. 81–97.

WTO (2011). *World Trade Report 2011: The WTO and Preferential Trade Agreements: From Co-Existence to Coherence*. World Trade Organization (WTO).

Yotov, Yoto V et al. (2016). *An advanced guide to trade policy analysis: The structural gravity model*. World Trade Organization Geneva.

Appendices

Appendix 1

Australia	Ghana	Oman	Ukraine
Brazil	Greece	Pakistan	United Kingdom
Burundi	Guinea	Poland	United States of America
Canada	India	Portugal	Zambia
China	Indonesia	Republic of Korea	Zimbabwe
Colombia	Italy	Romania	
Cote d'Ivore	Japan	Russia	
Croatia	Jordan	Rwanda	
Cyprus	Kenya	Saudi Arabia	
Denmark	Lebanon	South Africa	
Egypt	Madagascar	Spain	
Ethiopia	Mauritius	Sweden	
Finland	Morocco	Tanzania	
France	New Zealand	Turkey	
Germany	Norway	Uganda	

Table 1: Countries included in the general equilibrium analysis

Appendix 2

Country	ISO Code	% Δ exports	% Δ factory gate prices	% Δ Inward M.R.	% Δ Outward MR	% Δ Real GDP
Australia	AUS	0.0	0.0	0.0	-0.0	-0.0
Burundi	BDI	48.7	-4.4	-4.4	5.6	0.2
Brazil	BRA	0.0	0.0	0.0	0.0	0.0
Canada	CAN	0.0	0.0	0.0	0.0	-0.0
China	CHN	0.0	0.0	0.0	0.0	0.0
Cote d'Ivore	CIV	0.0	0.0	0.0	0.0	0.0
Colombia	COL	0.0	0.0	0.0	0.0	0.0
Cyprus	CYP	0.0	0.0	0.0	0.0	0.0
Germany	DEU	0.0	0.0	0.0	0.0	0.0
Denmark	DNK	0.0	0.0	0.0	0.0	0.0
Egypt	EGY	0.0	0.0	0.0	0.0	0.0
Spain	ESP	0.0	0.0	0.0	0.0	0.0
Ethiopia	ETH	0.1	0.0	0.0	0.0	0.0
Finland	FIN	0.0	0.0	0.0	0.0	0.0
France	FRA	0.0	0.0	0.0	0.0	0.0
United Kingdom	GBR	0.0	0.0	0.0	0.0	0.0
Ghana	GHA	0.0	0.0	0.0	0.0	0.0
Guinea	GIN	0.0	0.0	0.0	0.0	0.0
Greece	GRC	0.0	0.0	0.0	0.0	0.0
Croatia	HRV	0.0	0.0	0.0	0.0	0.0
Indonesia	IDN	0.0	0.0	0.0	0.0	0.0
India	IND	0.0	0.0	0.0	0.0	0.0
Italy	ITA	0.0	0.0	0.0	0.0	0.0
Jordan	JOR	0.0	0.0	0.0	0.0	0.0
Japan	JPN	0.0	0.0	0.0	0.0	0.0
Kenya	KEN	24.2	2.3	1.4	-2.8	0.9
Republic of Korea	KOR	0.0	0.0	0.0	0.0	0.0
Lebanon	LBN	0.0	0.0	0.0	0.0	0.0
Morocco	MAR	0.0	0.0	0.0	0.0	0.0
Madagascar	MDG	0.0	0.0	0.0	0.0	0.0
Mauritius	MUS	0.0	0.0	0.0	0.0	0.0
Norway	NOR	0.0	0.0	0.0	0.0	0.0
New Zealand	NZL	0.0	0.0	0.0	0.0	0.0
Oman	OMN	0.0	0.0	0.0	0.0	0.0
Pakistan	PAK	0.0	0.0	0.0	0.0	0.0
Poland	POL	0.0	0.0	0.0	0.0	0.0
Portugal	PRT	0.0	0.0	0.0	0.0	0.0
Romania	ROM	0.0	0.0	0.0	0.0	0.0
Russia	RUS	0.0	0.0	0.0	0.0	0.0
Rwanda	RWA	92.8	-7.0	-7.3	8.8	0.9
Saudi Arabia	SAU	0.0	0.0	0.0	0.0	0.0
Sweden	SWE	0.0	0.0	0.0	0.0	0.0
Turkey	TUR	0.0	0.0	0.0	0.0	0.0
Tanzania	TZA	15.2	0.7	0.9	0.9	0.2
Uganda	UGA	41.2	-2.7	-3.1	3.4	0.5
Ukraine	UKR	0.0	0.0	0.0	0.0	0.0
United States	USA	0.0	0.0	0.0	0.0	0.0
South Africa	ZAF	0.0	0.0	0.0	0.0	0.0
Zambia	ZMB	0.4	0.0	0.0	0.1	0.0
Zimbabwe	ZWE	0.0	0.0	0.0	0.0	0.0

Figure 1: General Equilibrium Effects of the EAC

Appendix 3

Tables 2 and 3 are the results of the changes in exports, imports and 'home-price' welfare effects from the GETI and GEPPML procedures respectively. The two procedures have relatively similar signs for changes across all variables. However, they differ in the magnitudes of these changes with GETI being more sensitive to the smaller countries in the EAC. For example, formation of the EAC leads to a reduction in exports for not only Kenya but also Tanzania, which is the second largest economy in the region. This indicates that Tanzania may have also experienced some form of trade diversion effect with respect to exports. The welfare effects from the GETI procedure are also seen to be lower for Kenya while it is higher for all other countries. However, apart from Kenya, the ordering of the smaller EAC countries is similar to the GEPPML with Rwanda having the highest welfare effect while Burundi has the lowest.

	Exports			Imports			Real GDP
	EAC	RoW	Total	EAC	RoW	Total	
Burundi	202.31	24.31	71.28	96.02	-23.77	3.69	0.22
Kenya	127.17	-4.46	14.89	176.60	3.06	5.50	0.51
Rwanda	180.93	13.90	52.96	108.96	-18.60	10.10	1.00
Tanzania	136.69	-0.46	8.06	144.70	-0.86	1.92	0.29
Uganda	118.17	2.89	35.13	32.38	-5.88	10.29	0.53

Table 2: Results from the GETI Procedure (percent changes)

	Exports			Imports			Real GDP
	EAC	RoW	Total	EAC	RoW	Total	
Burundi	151.27	18.94	48.70	106.15	-19.96	0.39	0.16
Kenya	101.36	-8.69	24.22	213.53	8.06	9.54	0.91
Rwanda	242.65	31.17	92.80	73.31	-31.11	3.42	0.85
Tanzania	136.49	2.82	15.15	126.96	-4.29	0.81	0.23
Uganda	131.91	11.39	41.21	102.05	-14.31	6.43	0.49

Table 3: Results from the GEPPML Procedure (percent changes)

Appendix 4

Albania	Eritrea	Oman
Algeria	Estonia	Pakistan
Angola	Ethiopia	Paraguay
Argentina	Finland	Peru
Armenia	France	Philippines
Australia	Germany	Poland
Austria	Ghana	Portugal
Azerbaijan	Greece	Qatar
Bangladesh	Honduras	Republic of Korea
Belarus	Hungary	Republic of Moldova
Belgium	Iceland	Romania
Benin	India	Russian
Bhutan	Indonesia	Rwanda
Bolivia	Iran	Saint Lucia
Bosnia and Herzegovina	Ireland	Saudi Arabia
Brazil	Italy	Senegal
Brunei Darussalam	Jamaica	Seychelles
Bulgaria	Japan	Slovakia
Burkina Faso	Jordan	Slovenia
Burundi	Kenya	South Africa
Cabo Verde	Kuwait	Spain
Cameroon	Kyrgyzstan	Sri Lanka
Canada	Latvia	Sudan
Central African Republic	Libya	Suriname
Chad	Lithuania	Sweden
Chile	Madagascar	Switzerland
China	Malawi	Tanzania
Colombia	Malaysia	Thailand
Comoros	Malta	Tunisia
Congo	Mauritius	Turkey
Congo, Dem. Rep.	Mexico	Uganda
Cote d'Ivoire	Morocco	Ukraine
Croatia	Mozambique	United Arab Emirates
Cyprus	Myanmar	United Kingdom
Czechia	Netherlands	United States of America
Denmark	New Zealand	Uruguay
Djibouti	Nicaragua	Venezuela
Dominican Republic	Niger	Yemen
Ecuador	Nigeria	Zambia
Egypt	Norway	Zimbabwe
El Salvador		

Table 4: Countries included in the trade costs analysis