

The history of the gravity model economics essay

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2. 0 Introduction

Bilateral trade between countries in ESA and the countries' efforts towards regional integration have for a long time attracted the interest of researchers. Current membership of regional integration in Africa is so wide spread that there exists no country on the Continent that does not belong to at least one grouping. Among the major regions of the world, Africa has the utmost concentration of economic integration arrangements. RTAs in the ESA have been depicted by countries' multiple and overlapping membership in diverse regional integration initiatives. Various researches have written on the issue of RTAs and overlapping memberships. However, today a great threat posing is the overlap of membership among Regional Economic Communities (RECs) in the ESA region to an extent incomparable anywhere else in the world. Additionally, it is argued that membership in more than one Customs Union (CU) is impossible. Legally, a country cannot operate under two different common external tariffs (CET) and for that reason cannot be a member of more than one CU. Because a number of extensive and useful reviews of early quantitative studies of regional integration arrangements have been undertaken, the discussion here is devoted mainly to examining quantitative studies of overlapping trade arrangements undertaken since the early time. The literature is swamped with articles which have tried to study the constraints caused by overlapping organised as follows: Section 2. 1 illustrates the various steps of regional integration. Section 2. 2 reviews the theoretical literature on RTAs and their implication on trade. Section 2. 4 reviews the empirical literature on overlapping

membership and RTAs; whereby the gravity model is applied. 2. 1

Theoretical Review

2. 1. 1 The Viner model

The usual point of departure for explaining the economics of regional integration is Viner's partial equilibrium model. Regional integration arrangements have been the theme of extensive economic investigation, beginning with the inspiring contributions to the "customs union issue" by Viner (1950) and Meade (1955). Viner (1950) was the first one to come up with the theory of preferential trade agreement. Viner (1950) introduced the concept of trade creation and trade diversion. The Vinerian concept presumed that trade creation would be more significant than trade diversion when trade barriers were removed. Thus, it is appropriate to begin our assessment with the traditional and static welfare analysis initiated by Viner (1950). However, he made limiting presumptions of zero demand and supply elasticity. Eventually, Meade (1955) relaxed the notion of zero price elasticity of demand and Lipsey (1957) relaxed the assumptions of zero supply elasticity also. The basic Viner model offers a partial equilibrium framework for studying the effects of customs unions. The framework consists of economic relationships illustrating demand, supply, and trade in identical goods by three countries: the home country (X), a partner member country (Y) and a non-member country (Z) representing the rest of the world. Trade creation occurs when X's imports increase following the formation of an RTA. It corresponds to the production and consumption gains from additional imports at a lower domestic price-X import more from its lower-cost RTA partner, Y, while its own higher-cost domestic production declines. Trade

diversion occurs when RTA members' imports from partner countries (less efficient) replace imports from more efficient non-member countries, as a result of the RTA's tariff preferences. An RTA improves welfare for its members if the benefits of trade creation dominate the losses from trade diversion. An illustration of the above argument can be found in Appendix 1. The main conclusion of these studies has been that if trade creation or trade expansion exceeds the trade diversion, regional integration would be welfare promoting and vice-versa. The analysis undertaken by Viner, Meade and Lipsey has characterized by a static concept and it is debated that dynamic gains are superior to that of the static advantages. However, most studies which have investigated the applicability of the Viner framework have made use of the gravity model of trade. During the 1980s and 1990s, the majority of work in this region has been in relation to studying the dynamic impacts of trade blocs [Bhagwati (1993); Bhagwati and Panagariya (1996); Krugman (1993) and Srinivasan (1991)].

2. 2 The Gravity Model

International trade is one of the most expedient economic factors in pushing economies to transition and integration. Significant changes in international trade patterns have attracted economists to pay attention to the development of theoretical considerations and empirical approaches that enable to explore international trade flows and the role of regional integration in developing bilateral trade relations between countries. However, the gravity model has its origins in Newton's law of gravitation in seventeenth century. Newton's law of gravity in mechanics states that two bodies are subjected to a force of attraction that depends positively on the

product of their masses and negatively on their distance. Contrary to what is often stated, the empirical gravity equations do not have a theoretical foundation due to the fact that it omitted multilateral resistance in its equation and that "distance" as the sole measure of resistance was limited. This led to bias estimation that could not be used for policy formulation and thus limiting the use of the gravity model. The gravity model has been extensively and successfully used to support international trade flows. It has become an elemental instrument in the simulations of international trade flows. In its simplest form, the gravity equation states that bilateral trade between two countries is directly proportional to their economic sizes and inversely proportional to the geographic distance between them, in equivalence to the Newtonian gravity equation. Aiming to measure frictions to trade between countries, the basic requirement of the gravity equation is often augmented in empirical studies by including other variables that are assumed to be connected to the bilateral volume of trade. These dummy variables can be anything that capture the elements of sharing a common border, using a common language, or sharing membership in an integration agreement. Below is a simple way of writing the trade equation model:

Theoretical support for research in this field was originally very poor and without substantial theoretical claims, but since the second half of the 1970s several theoretical developments have appeared in support of the gravity model and they are backed up by sound theory. The antecedents of using the gravity approach to model international trade flow date back to Beckerman (1956), Tinbergen (1962), Linnemann (1966) and Pöyhönen (1963). From then, the gravity model has become a pervasive tool in the study of empirical foreign trade. Anderson (1979) and Bergstrand (1985) try to give

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some theoretical as legitimacy to the gravity model. The former derived a gravity model from expenditure equations on the assumption that goods are to be distinguished by location of production while the latter achieved such a concept by assuming trade in differentiated commodities. Deardorff (1998), on its part, demonstrated that an appropriate modelling of transport costs produces the gravity equation as an approximation even for the Heckscher-Ohlin model. Inspired by McCallum (1995), Anderson and Wincoop (2003) postulated that bilateral trade is still a function of size and bilateral distance but they added multilateral resistance as an additional variable. The authors attempted to solve the "Border Puzzle" as discussed in McCallum and found that their augmented gravity model was more efficient in analysis the US-Canada trade levels. Various other studies further added to the refinement of the gravity model, with regards to other explanatory variables. The most ambitious and successful of these early empirical studies was Linneman (1966), which extended the gravity model by incorporating the population variable to depict economies of scale; Aitken (1973) who used the gravity model approach to explain bilateral trade flows econometrically by, among other variables, transportation cost, income levels between trading partners and institutional factors such as the formation of regional trade diversion as well as trade creation. In the same way, Geraci and Prewo (1977) used distance as a substitute for the total transactions cost. Relatively few studies applied the gravity model to identify the main determinants of bilateral trade between ESA countries. The impact of regional arrangements on the welfare of member countries and the world at large has been widely debated.

Generally mentioned among the early theoretical works are Carrère (2004), and Musila (2005); Kemp and Wan (1976); Bhagwati (1971, 1993); Anderson
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and Blackhurst (1993); Bhagwati and Panagariya (1996); Vamvakids (1998) and Panagariya (1999, 2000)]. 2. 3 Empirical Review

2. 3. 1 Empirical Literature on Overlapping Membership and RTAs

Empirical studies on the application of the gravity model in the trade literature are non-exhaustive, with each yielding manifold results and conclusion. Aitken and Obutelewicz (1976) was the first gravity study on developing country RIAs and they found that the 1959-71 association agreements between 18 African countries and the EEC significantly boosted mutual trade. Similarly, Frankel and Wei (1993), Frankel, Stein, and Wei (1997), Martinez-Zarzoso (2002), Rahman (2004) and Martinez-Zarzoso and Nowak-Lehmann (2006) applied the gravity model in various scenarios pertaining to regional trade agreements in Europe, MERCOSUR, Bangladesh amongst others with everyone agreeing on the tremendous improvement brought forward by the gravity model to the current literature. However, this thesis has as main objective to investigate the effect of overlapping membership on regional trade flows and thus providing a detailed summary of all literature related to successful application of the gravity model of trade is outside of its mandate. Hence, the empirical review presented is more focus on achieving the set objectives as depicted in the previous chapter. According to Krueger (1997), with overlaps, more protection for export and disputes with Customs are likely to arise. The political economy of PTAs is less favourable to further trade liberalisation than is that of customs union. Thus, simply because of the greater complexity of RoO in FTAs than under the context of the CU, they are more debatable. Overlapping FTAs are more

suspicious because of the greater complexity and opacity lead to trade measures and also to competition between producers. Studies have revealed that intra-regional trade in COMESA is a little weak and slow. Using trade data from 1980 to 1997 in a gravity model exercise, Geda and Kibert (2002) assess the determinants for trade using COMESA as a case study. Their findings revealed that regional integration arrangements did not succeed to positively affect intra-regional trade and concluded that intra-COMESA trade is not significantly different from trade with non-member countries. They further argue that the existence of subset groups within a larger group, sometimes referred to as variable geometry approach, has not enjoyed the consensus. Some argue that multiple memberships are a hindrance to regional integration since it introduces duplication of effort. For instance, Aryeetey and Oduro (1996) quote McCarthy as arguing that, " It is difficult to envisage how SADC and COMESA, given their convergence to both sectoral cooperation and trade integration, can live and prosper with the overlapping membership of the Southern African countries". Flatters (2003) points out that SADC highly applies restrictive RoO in several sectors, as a consequence of certain interests within the RTA. COMESA overlaps partly with SADC and has quite simple RoO. Flatters argue that lately COMESA has adopted RoO that are more like the SADC trade regime in complexity. For the countries that are members of both COMESA and SADC, the increased intricacy of rules might make it hard for policy makers to implement the integration agreements properly and to reap benefits from preferential integration. As pointed out by Baldwin (1995), the cost of being a non-PTA member increases when your trading partners enter PTAs. Hence the relative competitiveness of non-member countries decreases compared to the

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member countries that trade on a preferential basis. Consequently, a domino effect of PTAs is observed as more and more countries enter PTAs. Baldwin (2006) suggests that the proliferation in the number of PTAs can be termed as a spaghetti bowl of trade agreements and the trend seems to stay. Hence, assessing the potential problems caused by PTA proliferation becomes therefore imperative. Overlapping memberships and conflicting set of rules are examples on such problems. Given the fact that the African continent is generally suffering from poor institutions, these overlaps could generate significant problems. The report of the UNECA on regional integration clearly indicates that overlaps in membership limits the member-states benefits. Yang and Gupta (2005) in their IMF policy report, argue along the same lines writing that overlapping of membership in regional blocs in SSA actually weakens commitment and implementation resulting in reduced benefits accrued by the bloc. In the case of overlapping CUs the complexity is caused by different tariff applications and non-tariff barriers, as according to Yang and Gupta may be a challenge for the countries that are members of both the EAC and the COMESA. When it comes to FTAs, the rise in the number of rules of origin can cause additional difficulties in form of trade deflection. Among the many conclusions from the perspective associated with the overlapping of COMESA and SADC, Khandelwal (2004) writes that with low product complementarities among African countries, even three of the largest, most diversified economies in the region—South Africa, Egypt, and Kenya might not function as growth poles in COMESA and SADC. Though low intra-African trade flows point to extreme growth potential in the long run, it also advocates that the paramount enhancement to African trade in the short to medium term must derive from policies stimulating trade with the <https://assignbuster.com/the-history-of-the-gravity-model-economics-essay/>

rest of the world (Yang and Gupta 2005). Furthermore, the African market seems too small to maintain high export growth. Khandelwal (2004) adds that multiple memberships bring with them disadvantages associated with large entry fees, administration fees and dissonances in their negotiations that can eventually lead to the complexity of conflicting objectives, lack of political will, effective commitment. These negative factors may contribute to less emphasis on progress in many areas and a greater chance for COMESA and SADC not effectively reach their goals. In parallel view, the policy report of Jakobeit et al. (2005) on overlaps in regional trade blocs in SSA highlights the effects of this phenomenon. Progress towards deeper integration is refuted by the continuation of multiple and overlapping membership in the region. They note that overlapping membership not only increases the stress on the regional bloc and member-states still at an early stage of integration but also increases legal uncertainty particularly when different trade arrangements apply to trade between two countries. Legal uncertainty hinders policies implementation engaged at promoting intra-regional trade, hence affecting trade levels. They also argued that membership in more than one CU is impossible. According to Charalambides (2005), these problems reveal the lack of information on trade arrangements and weak execution of RoO. However, the main impact of overlapping membership is the degree to which it hinders the transfer of sovereignty in some areas of trade policy to regional institutions. Given the multiple memberships in regional organisations and South-East Africa, COMESA finds itself re-working the efforts already made by SADC and EAC in enhancing regional integration of stock markets (Onyuma 2006). Instead of having one strong regional integration in Southern Africa, East, West, Central and North Africa, there are <https://assignbuster.com/the-history-of-the-gravity-model-economics-essay/>

overlapping memberships of various regional economic blocs such as ECOWAS, COMESA, SACU, SADC WAEMU and EAC. This has caused duplication of effort and conflicting objectives. By forming strategic alliances with foreign trade outside the sub-region, including trade in developed countries, African exchanges might benefit from access to better technologies and modern financial instruments. In the same vein, authors such as Yang and Gupta (2005), Gunning (2001) and Chacha (2008) argue that the disparities in the RoO and the overlaps in membership weaken the effectiveness of African RTAs. While we have witnessed the problems associated with multiple memberships, evidences also exist to show that overlapping memberships has a significant positive impact on bilateral trade. Afesorgbor et al (2011) investigate on the issue of multi-membership in Western and Southern Africa. Taking ECOWAS and SADC as case study, they use the gravity model involving a panel data for 35 countries and a time period running 1995-2006. It was observed that the two major RTAs in Africa had a positive and significant impact on bilateral intra-RTA trade. In the ECOWAS approach, overlapping multi-RTA membership does not represent a problem. In contrast to the SADC approach we have a hub and spokes setting and therefore inconsistencies that hamper the RTA's effectiveness are likely to occur. They find a positive impact if an extra membership complements the integration process. It was noted that overlapping memberships had a significant positive effect on bilateral trade within the ECOWAS bloc but it was insignificant for SADC. Rojid and Seetanah (2010) investigate whether the formation of overlapping RTAs creates more trade, concentrating on agricultural trade. Using a GMM model, the study concludes that in both single overlapping and multiple overlapping conditions, the

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joining of additional RTAs neither increases significantly trade nor divert trade. Referring to the work of Fergin (2011), the regression results from the empirical study were ambiguous and hence present no robust evidence of a negative effect of overlapping agreements on trade caused by the spaghetti bowl phenomenon on the PTA effect. Possible explanations to the unclear results are that it makes use of cross-sectional data which does not predict causal effect and it was hard to control for unobserved heterogeneity. In an attempt to study the effects of RTAs on trade flows of internal and external members, Soloaga and Winters (2000) found that for the entire bloc, import are almost always statistically significant. In addition, exports are almost always negative and statistically significant in five of the nine PTAs. Gravity model was applied to the 1980-1996 annual non-fuel imports data from 58 countries, to measure the impact of trade agreements created. They further adjusted the gravity equation to identify the separate effects of PTAs in intra-bloc trade, members' total imports and total exports and changes in trade patterns after the creation of the trade blocs. They found no sign of the new regionalism considerably increasing intra-bloc trade. Indication of trade diversion was found only for EU and EFTA. Rose (2003) used a standard gravity model of bilateral trade and a large panel data set covering over fifty years and 175 countries. Extensive research has shown little evidence that countries taking part in the trade structure of the GATT / WTO have different trade patterns than outsiders. He augmented the basic gravity equation with a number of additional variables that affect trade, in order to account for as many superfluous factors as possible which include: culture, geography, and history. The results show that the most distant countries trade less, while economically larger and richer countries trade more. In addition, countries

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belonging to the same regional trade more, such as the countries share a common language, or the land border. Landlocked countries trade less, as do physically larger countries. But no evidence was found for the accession to the GATT / WTO has a positive effect on international trade. Rahman (2004) applied the gravity model to analyse the Bangladesh trade flows with its trading partners using panel data. It is observed that the country's trade results are positively determined by the size of the economy, the per capita GNP differential of the countries concerned and the opening of the trading countries. The main determinants of Bangladesh's exports were found to be rate of exchange, partner countries' total import demand, and the opening of the economy of Bangladesh. All these factors affected the exports of Bangladesh positively. Cost of transportation proved to be an important factor in influencing the trade of Bangladesh negatively. Achay (2006) studied the determinants of trade flows between the different countries of the world. He applied the model of gravity on a sample of 146 countries over a time span of five years sub-periods between 1970 and 2000. Consequently, the determinants of trade are the GDP, the distance and the regional integration agreements. It is also found that all the estimated coefficients are statistically significant and their signs were in line with expectations. It was found that the GDP, GDP per capita, the common border, an official language, common currency or common colonial past have a positive impact on the volume of bilateral trade. On the other hand, the geographical distance has had a negative impact on the volume of trade. Using the gravity model, Simwaka (2006) examines Malawi's trade with its major trading partners including Zimbabwe, Zambia, South Africa, Mozambique, United Kingdom and USA. Precisely, Malawi's bilateral trade depends positively on <https://assignbuster.com/the-history-of-the-gravity-model-economics-essay/>

the size of the economies and similar participation to regional integration agreement. However, transportation cost, proxied by distance, is found to have a negative influence on Malawi's trade. In addition, the country's exchange rate volatility discourages trade. Regional economic group on bilateral trade flows had negligible effect. However, in the most recent writing of Riaz (2013), it was found that the gravity model a strong tool for the analysis of bilateral trade flows. Among his main argument, he argued on the cost of the border. Although the presence of a common border may facilitate bilateral trade between nations, the same border is also a hindrance to trade. This is the so called " border effect" as suggested by Anderson and van Wincoop (2003) where he argued that national borders pose on average a barrier to trade. Furthermore, Riaz found that the estimation of trade potentials within the gravity framework is a line of research that has been studied extensively. The more recent writings of Sannasse et al (2011) on African RTA's try to identify the main barriers faced by four regional grouping in SSA (namely SADC, SACU, EAC and COMESA), in order to understand the prime reasons behind their low-level of intra-regional exchanges. The methodology used is twofold; first with a typical log-linear gravity model to identify the direction of trade creation or trade diversion in a sample of 37 African countries. The gravity model acknowledges the existence of trade creation effects in the studied RTAs but with very small magnitudes. In fact, a closer look at the results only shows significant coefficients on the COMESA and EAC variables. In addition to that, an overlapping membership dummy is added to the equation with inconclusive results. The second step involves administrating a questionnaire survey to the different RTAs concerned in an attempt to isolate all obstacles

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hindering both inter-block and intra-block trade in the region. The result shows a lack of political willpower, absence of decision making consortiums and poor infrastructural networks are among the major factors identified by the interviewees as being the most plausible explanation for the poor performance of African RTAs. While some studies revealed that regional agreements produced significant positive effects on bilateral trade, others found non-significant effects. Among the studies concluding that bilateral trade is positively influenced by regional groupings is Foroutan and Pritchett (1993). These authors were the first to use an augmented version of the model for SSA countries to quantify the level of potential intra-SSA trade and to compare it with the current level. Their results confirmed that in general, the observed intra-SSA trade is weaker than expected. Among studies whose results indicated non-significant effects of regional preferential agreements on intra-regional trade are Elbadawi (1997), Ogunkola (1998), Longo and Sekkat (2004), and Avom (2005). To sum up, empirical results on the use of gravity approach in exploring international trade pattern allow us to conclude that despite its simplicity, the model explains the pattern of trade flows remarkably well and has been widely used in the applied literature. In addition, this literature has shown the negative and positive influence of overlapping membership and confirms the view that overlapping membership is a problem in the international trade.