

2015

# Topology of Reciprocal Trade Agreements – A New Perspective

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## Recommended Citation

Singh, Suresh and Dorai, Sundaram, "Topology of Reciprocal Trade Agreements – A New Perspective" (2015). *Management and Marketing Faculty Publications*. 2.

<https://neiuvc.neiu.edu/mm-pub/2>

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## TOPOLOGY OF RECIPROCAL TRADE AGREEMENTS – A NEW PERSPECTIVE

### ABSTRACT

*The topology of the worldwide network of reciprocal trade agreements is evolving in ways that defy conventional wisdom. It is at odds with the triad hypothesis, that is, a view of the world consisting of three mutually isolated major blocs, structured in a hub and spoke fashion - Americas with US as the hub, Europe with European Union as the hub and Asia with Japan as the hub. Moreover, many new agreements, traditionally called 'regional', are actually inter-regional. In order to make sense of these developments, we charted the evolution of the network using social network analysis and arrived at a new perspective on its topology.*

**Keywords:** *Regional Trade Agreements, Social Network Analysis, Stumbling Blocks*

### 1. INTRODUCTION

In an ironic turn of events, ever since the General Agreement on Trade and Tariffs (GATT) was replaced by the World Trade Organization (WTO) in 1995 to create a formal institution to facilitate multilateral trade agreements, the reverse has actually happened. While the latest round of multilateral trade negotiations under the aegis of WTO - the Doha round - lingers on, more than a decade after its official launch in 2001, reciprocal trade agreements (RTAs), negotiated directly by individual countries, have proliferated at a stupendous pace.

The growth in the number of RTAs has been a source of bewilderment, even disappointment, to some economists. These agreements have been seen as “stumbling blocks” (Limao, 2006) to global free trade, or worse as “termites in the trading system” (Bhagwati, 2008). The reason for this disappointment is that RTAs, unlike multilateral trade negotiations, have an ambiguous if not negative impact on international trade and the welfare of the world. In international economics jargon, RTAs can lead to trade diversion and are therefore considered inferior to multilateral agreements that lead to trade creation.

This sense of bemusement has been exacerbated by the fact that RTAs have evolved in ways that defy conventional wisdom. Traditionally, RTAs are called ‘regional’ trade agreements because these agreements are expected to be signed between countries that are in the same geographic region. Many of the earliest RTAs were indeed regional. However, a new breed of trade agreements has emerged that are not regional but rather inter-regional (Baldwin, 2006). Moreover, the network of RTAs does not correspond well with the conventional view of a world divided into three distinct regional blocs (Krugman, 1991), namely Americas, Europe and Asia, organized in a hub and spoke fashion with United States at the center of the American bloc, European Union at the center of the European bloc and Japan at the center of the Asian bloc (Baldwin 2006; Poon, Thompson and Kelly, 2000).

Absence of a systematic method of visualizing all the RTAs together has proven to be a major deterrent against a good understanding of the topology of the network of RTAs and its evolution (see Crawford & Fiorentino, 2005 for the only attempt). Social network analysis can overcome this handicap. In this paper, we have used this technique to develop a new perspective on the evolving configuration of RTAs.

### 2. ERSTWHILE PERSPECTIVES ON THE TOPOLOGY OF RECIPROCAL TRADE AGREEMENTS

In early to mid nineties, two contrasting perspectives originated regarding the configuration of RTAs. The first, triad view, raised the possibility that RTAs will evolve such that the world will eventually be divided into three distinct regional blocs (Krugman, 1991), namely Americas, Europe and Asia, and further that each bloc will be organized in a hub and spoke configuration, with US as the hub of Americas, EU as the hub of Europe and Japan as the hub of Asia (Baldwin 2006; Poon, Thompson and Kelly, 2000). The triad view was based on the proposition that geographically close countries are “natural partners” for trade (Wonnacott & Lutz 1989; Krugman, 1991; Summers, 1991) due to transportation costs (Frankel, Stein, and Wei, 1995). The corollary was that the positive effect of trade agreements (trade creation) between

regional neighbors will outweigh their negative effect (trade diversion), providing an incentive for countries to sign regional rather than inter-regional trade agreements. The second perspective, on the other hand, viewed the network of RTAs as a nebulous “spaghetti bowl” (Bhagwati, 1995), that is a network in which countries are related in an arbitrary crisscross fashion without any identifiable pattern.

A more nuanced version of the triad view has been proposed recently. It is similar to the triad view in that it envisages the network of RTAs to evolve into a network of three large blocs. However, it characterizes the blocs as “fuzzy” and “leaky” (Baldwin, 2006), in contrast to the clearly identifiable and largely isolated blocs proposed by the traditional triad view. The fuzziness refers to the absence of clear boundaries of these blocs while leakiness refers to the fact that members of a particular bloc do not restrict themselves to that bloc only and sign deals with countries that are outside the bloc too. The fuzzy and leaky triad is deemed to be driven by a “domino” or “contagion” effect (Baldwin, 1993; Baldwin & Jaimovich, 2012). The domino effect suggests that as new members join a regional bloc, non-members in the same region find it even more compelling to join the same bloc. The implication is that regional blocs will expand quickly until three large blocs remain.

Unfortunately, all the perspectives mentioned above fall short of explaining the actual network of RTAs. In the following pages, we present a more realistic perspective, derived from a social network analysis of the RTAs currently in force.

### 3. ANALYSIS AND RESULTS

The latest list of RTAs that have been notified to the WTO and are in force was obtained from the WTO regional trade agreements database. Only reciprocal agreements (agreements involving commitments from all the signatories) were considered. Preferential trade agreements (PTAs), where commitments are one sided, were not included because PTAs do not represent any mutual relationship among the parties involved. WTO also makes a clear distinction between regional and preferential agreements for the same reason. The agreements involve goods or services or both, and were filed under different WTO provisions, namely GATT XXIV, GATS V and the Enabling Clause. This paper is concerned with the structure rather than the nature, terms or the depth of relationships among countries; therefore, individual differences of the sort mentioned above were ignored.

Social network analysis was performed on the data using the *igraph* package of R, a software environment for performing statistical analysis. Each country was represented as a node. An edge from one country to the other represented their membership in a reciprocal trade agreement (Figures 1 to 3). When three or more countries were involved in a particular trade agreement, the relationship was represented as a set of edges between each pair of signatories. For example, NAFTA, a trilateral agreement between US, Canada and Mexico, was represented as a set of three edges namely US-Canada, US-Mexico and Canada-Mexico. Only European Union (EU) was not broken down in this manner for two reasons. First, EU is perhaps the only multilateral trade agreement whose members do not sign trade agreements with non-EU countries as individual countries. Not only that, once a country becomes a member of EU, all the previous agreements signed by that country are cancelled. In other words, EU countries behave strictly as a unit, unlike most if not all other multilateral trade agreements. Second, EU consists of a large number of countries; therefore, representing it as a single entity saved space and should make visualization easier for the reader. For easy comparison between figures and to avoid confusion, the earlier incarnation of EU, the European Economic Community, was also denoted as EU in all the figures.

Using the year when each agreement came into force, snapshots of the network of RTAs were constructed as on 1985, 1995 and 2014, that is at roughly ten year intervals. This was done to show the evolution of the network over time. Communities or blocs of countries in each snapshot were detected using the *edge betweenness* algorithm. The algorithm is based on the idea that countries forming a community will have more relationships with each other than with countries outside the community. This algorithm was chosen among other alternatives based on its ability to generate communities that correspond well with actual deals signed. For example, Norway, Iceland and Switzerland are members of

EFTA and should be part of the same community, unless each individual country has signed many deals on its own. Each community was shown with a different color while white color was reserved for countries that did not belong to any community. The size of each node was determined by its degree or the number of relationships it had, and its betweenness centrality or the degree to which a particular node served as a go-between. The distance between nodes is indicative of the closeness of their relationship.

Figure 1 shows the network as on 1985. Five different and mutually isolated communities were detected, four of which were regional while the fifth was inter-regional. The four regional communities can be labeled as EU and Friends, Australia-New Zealand and Neighboring Islands, Caribbean Islands, and Central America. The inter-regional community consisted of an assorted group of Latin American countries, Asian countries, Israel, Turkey, Egypt, Tunisia, Romania and US. None of the communities contained identifiable hubs. Japan was not even in the picture and US had only one agreement at the time. Also, the continent of Africa was largely absent except for Egypt and Tunisia.

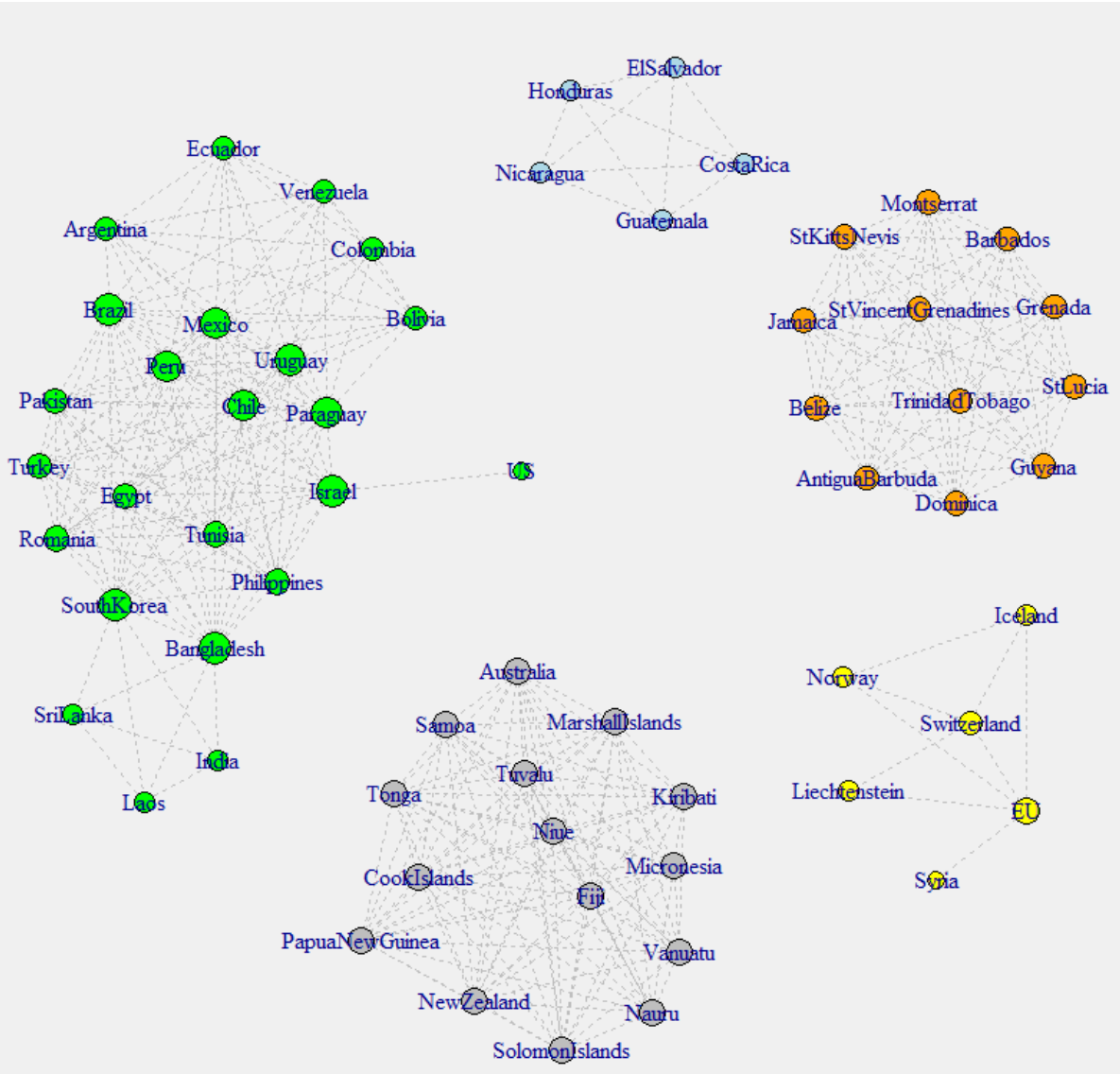


Figure 1. Network of reciprocal trade agreements in 1985

By 1995, the inter-regional community grew in size considerably, adding mostly developing countries, primarily from Asia and Africa (Figure 2). Moreover, it got connected to previously isolated EU and Friends community through Turkey and Israel, Central America community through Nicaragua, and the Caribbean Islands community through Guyana and Trinidad & Tobago. Two new African communities were detected and these were also connected to the large inter-regional community through connectors like Nigeria, Ghana, Guinea, Benin, Zimbabwe, Sudan and Tanzania. The community that remained isolated was Australia-New Zealand and Neighboring Islands. A new isolated community arose, consisting of countries formed by the division of USSR. Once again, there were no identifiable hubs in any of the communities. Moreover, both US and EU were largely isolated from the rest of the world and Japan was still absent from the scene. These facts contradict the triad view entirely. The inter-regional community was serving as a hub, connecting various other regional communities.

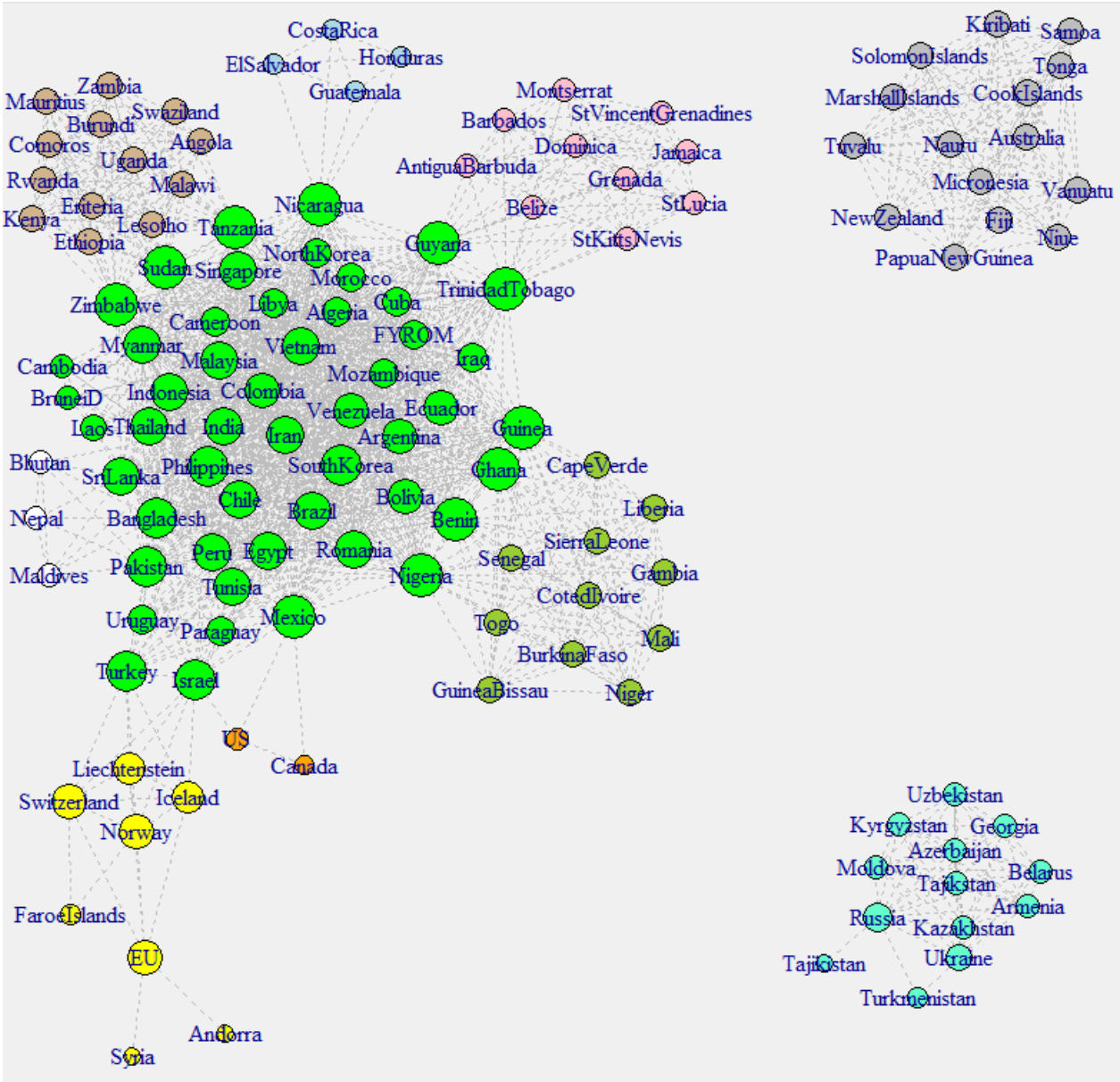


Figure 2. Network of reciprocal trade agreements in 1995



By 2014, none of the communities were completely isolated (Figure 3). All major economies, namely US, EU, Japan and China became active participants in the network and all of them got connected to the largest community, the inter-regional community of largely developing countries. A large number of countries, including major economies of EU, US, and Japan and China were independent and were not part of any particular community. The inter-regional community did not grow much but was the hub binding all the other communities or independent countries together, either directly or through connectors. Once again, there was no sign of a triad and of any hubs within each community. EU did, however, play the role of a small hub connecting countries in multiple regions of the world.

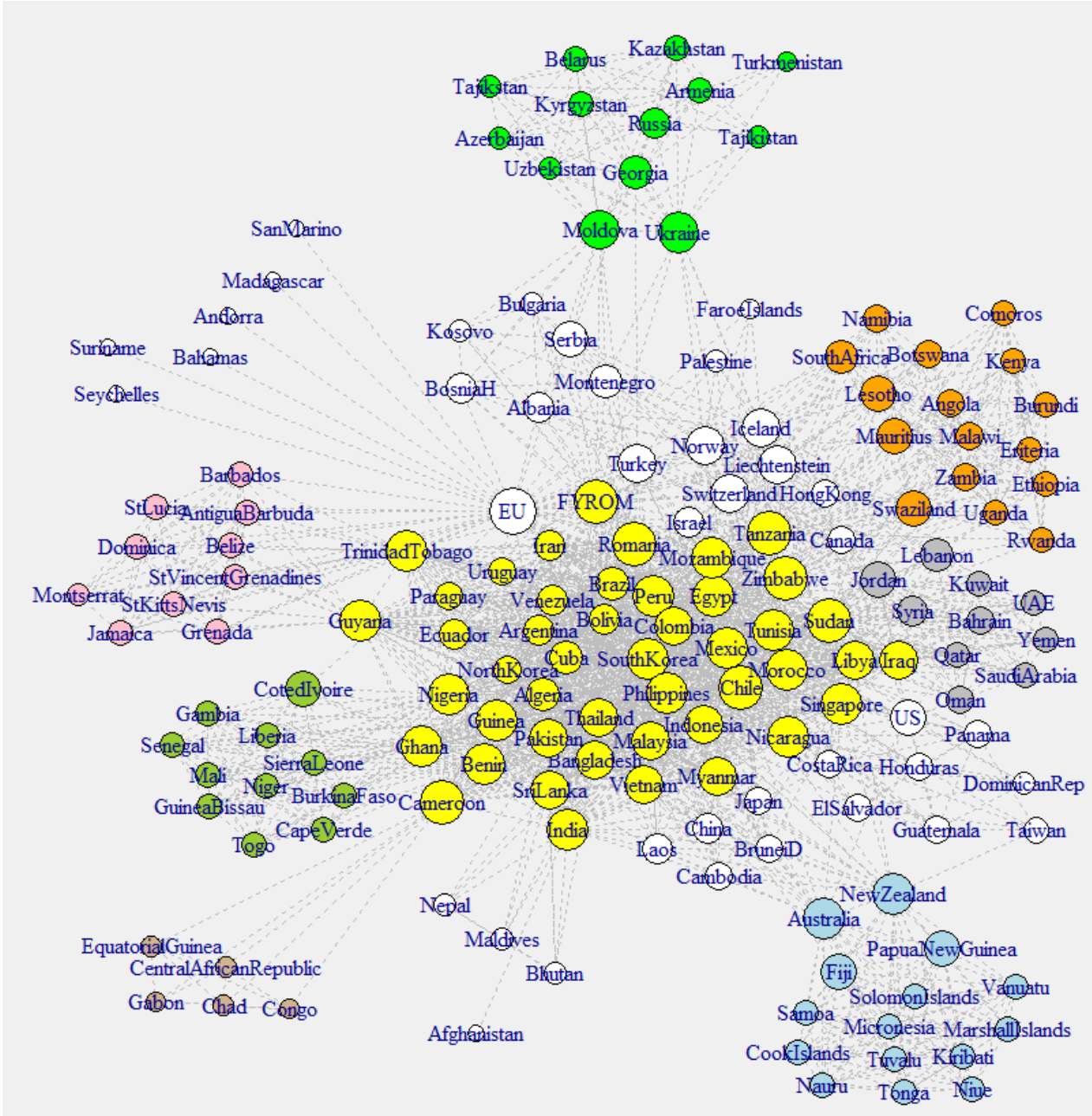


Figure 3. Network of reciprocal trade agreements in 2014

#### 4. CONCLUSION

In this article, we have presented a comprehensive view of the evolution of the network of RTAs. It is evident that the network has evolved in ways that defy conventional wisdom. Specifically, the network is at odds with both the triad view and the “spaghetti bowl” view. While distinct communities and patterns can be identified, there is little evidence of a triad, leave alone a triad of clearly identifiable blocs, each with a hub and spoke structure. US and Japan are both reluctant participants and play a peripheral role rather than being hubs. EU does play the role of a hub but connects countries and communities across various parts of the world and not just in Europe.

Further, the “natural partners” hypothesis was defied both by large and medium sized economies. These countries have completed many inter-regional RTAs. However, small economies do show a tendency to stay within their neighborhoods. Few examples of these are the Forum of the Caribbean countries (CARIFORUM), the Economic Community of West African States (ECOWAS) and the Southern African Development Community (SADC) in Africa, and the Pacific Island Countries Trade Agreement (PICTA) in the Pacific.

The biggest community of all was an inter-regional community of mainly developing economies. It was created through the Protocol on Trade Negotiations (PTN) of 1973 and later expanded by the Global System of Trade Preferences among Developing Countries (GSTP) of 1989. This community is not only the largest but also acts as the glue binding virtually all other countries or regional communities.

Based on the current network, RTAs are closer to being “building blocks” than being “stumbling blocks” to the global free trade. Our prediction is that the inter-regional community will eventually merge with other medium to large economies, forming a common core of RTAs. Small economies will continue to limit themselves in regional communities but will be connected to this common core via connectors (Figure 4). The main conclusion of this paper, therefore, is that a multipolar network of geography defying relationships is a more realistic perspective to think about RTAs than that of a geography driven triad dominated by regional hegemony.

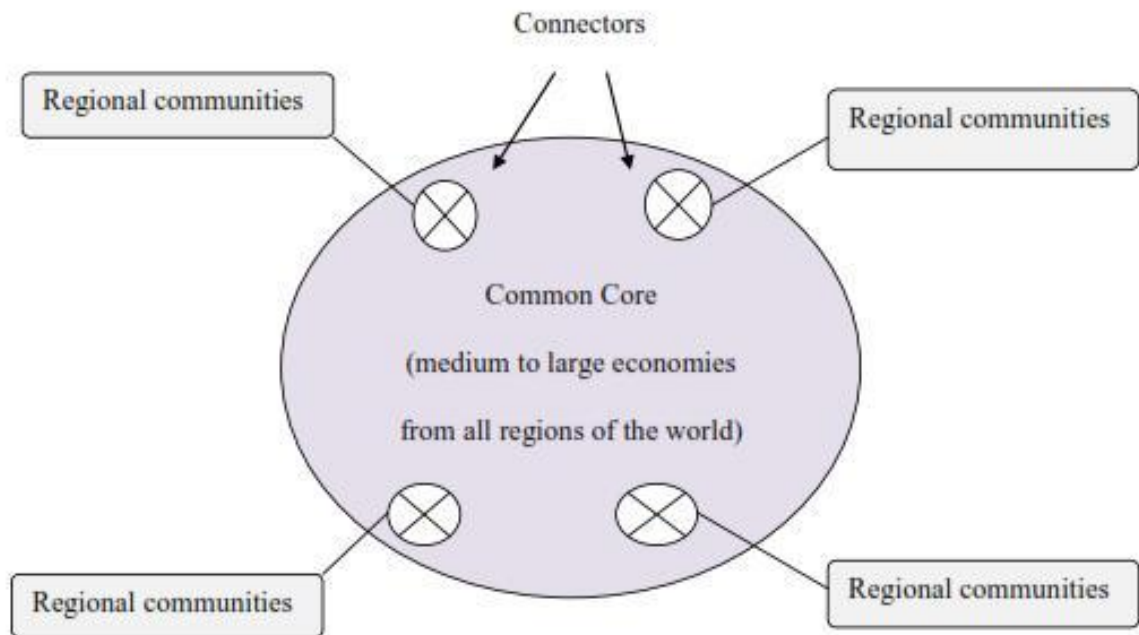


Figure 4. New perspective on the topology of reciprocal trade agreements

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