ANALYSIS OF TRADE INTEGRATION OF MEXICO: A STUDY BASED ON GRAVITY MODELS AND NETWORK INDICATORS

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論　文　内　容　の　要　旨

Thesis Summary

In the field of international trade, trade integration has been one of the most central concepts used to explain why countries trade between them. The literature identifies the concept of integration as all agreements related to trade between countries that belong to the same territory, such as cases of the former North America Free Trade Agreement (NAFTA). However, the current economy has proved that countries trade even if they do not belong to the same territory, mainly because of the existence of the Global Value Chains (GVC). In that sense, we propose an extended concept of trade integration which refers to a two steps integration, going from a regional to a multi-regional integration, intending to explore trade opportunities in diverse sectors and locations. In addition, the concept states that this integration should exclude the major trading partner of members in order to diversify its trade structure.

To provide evidence of this extended concept, we identify that one of the key factors influencing the trade relationship between countries and present in the economic literature is the concept of distance.

In this sense, gravity models are one of the most practical methodologies to explain trade flows between diverse country pairs. The gravity equation states that the aggregate trade value between countries is directly proportional to the product of countries' economic size but inversely proportional to the distance between them. The specific characteristic of gravity models is that they use the physical "distance" to explain this relationship. That is, the more distance that exists between countries, the less they will trade.

On the other hand, by using economic structure analysis, network science has emerged as a new tool to explain an economic structure and its interaction between all the agents within the structure. A *network* can be defined as a structure that consists of nodes and edges. Nodes can represent different characteristics, such as an economy's industry, sectors, companies, or even individuals, whereas edges represent the flows between the nodes. This study will use the network indicators approach to explain the interaction between countries. Inside the network indicators, there exists the concept of distance. Nevertheless, contrary to the gravity models, this distance concept does not belong to the physical one but the "steps" needed to connect a node with another. In other words, it is the path an economy must pass through between other economies to deepen their trade relationship with a specific economy.

From this perspective, we reorganize step-by-step guidance on how to apply the extended version of the trade integration, going from the general trade structure analyzed by the gravity models at both country and firm levels to the more specific trade structure's analysis applied to an industry's value-added flows by using the network science. We use the Mexican perspective and its relationship with Asia and Pacific countries.

The thesis structure is as follows:

Chapter 1 provides this thesis's background, motivation, contributions, and the present study's general overview. Finally, it introduces the new trade integration concept.

Chapter two includes Mexico's trade trends and structure and explains why Asia and Pacific countries were targeted as the region to be studied. Moreover, it includes a research background focusing on Mexico-Asia and Pacific countries' trade relationship.

In chapter 3, we applied the proposed trade integration concept to the trade opportunities of Mexico with East Asia pacific countries at the trade aggregate level to identify if this integration can happen. We first model the task using the gravity model and explain the use of the "physical distance" concept. We use the UN Comtrade six digits trade flows database to run the estimation process. We then identify the key sectors that, from the Mexican perspective, would benefit from this trade integration. We concluded that there exists a possibility to deepen the trade relationship between Mexico and East Asian pacific countries and that these benefits are mainly in middle-high value-added manufacturing sectors, such as the transport equipment sector.

In chapter 4, we move forward to the role of Mexican firms in the manufacturing sector, which was identified by chapter 3 as the central sector of this integration. For this analysis, we make use of the gravity models to explain the intensive and extensive margins of trade on Mexican firms by regions, with the following objectives: 1) to understand the role of "physical" distance in both margins, 2) to compute firm's decision by different regional levels and support how Asia has noticeable good results to Mexico and 3) analyze the key factors that may influence Mexican manufacturing sector when exports. The data used for the estimation process is from the National Institute of Statistics and Geography of Mexico (INEGI from its Spanish acronym) and covers the manufacturing exports of Mexican firms by region. This chapter concludes the aggregate trade analysis and gives the step to move to an industry detail.

Chapter 5 uses the value-added flows from the UNCTAD-Eora Global Value Chain Database and a Multi-regional input-output level approach. We evaluate the network structure by applying properties such as degree, clustering, betweenness centrality, eigenvector centrality, and detecting communities to the transport equipment industry, the most prominent industry for Mexico. We demonstrate by applying the community detection algorithm that trade flows are not always consistent with the economy's geographical location, mainly because of the existence of the GVCs. This conclusion is led by contrasting the gravity model's "physical" distance concept, which groups countries according to their geographical location, versus the "path" (distance) concept, which groups countries according to the degree of relationships measured by the influence of its trade flows.

Chapter 6 summarizes the main results obtained from chapters 3 to 5 and shows the contribution of this thesis to the international trade field. Moreover, it includes the conclusion, and some policy implications are suggested based on the empirical evidence.