국제학석사학위논문

Deep Integration and Global Value Chains: An empirical analysis on the impact of preferential trade agreement depth on GVC-related trade

깊은 경제적 통합과 글로벌 가치사슬: 무역협정의 통합수준이 글로벌 가치사슬 무역에 미치는 영향에 대한 실증분석

2018년 8월

서울대학교 국제대학원

국제학과 국제통상전공

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Master's Thesis

Deep Integration and Global Value Chains: An empirical analysis on the impact of preferential trade agreement depth on GVC-related trade

Thesis by

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A Thesis Submitted in Fulfillment of the Requirements for the Degree of Master of International Studies, International Commerce Major

August 2018

Graduate School of International Studies
Seoul National University
International Commerce Major

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이 논문을 국제학 석사학위 논문으로 제출함

2018년 8월

서울대학교 국제대학원
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장윤아의 석사학위 논문을 인준함

2018년 8월

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Deep Integration and Global Value Chains: An empirical analysis on the impact of preferential trade agreement depth on GVC-related trade

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Abstract

Deep Integration and Global Value Chains: An empirical analysis on the impact of preferential trade agreement depth on GVC-related trade

The main purpose of this thesis is to show how the depth of preferential trade agreements (PTAs) impacts trade related to global value chains (GVCs), defined as imports of parts and components and foreign value added in gross exports.

The importance of GVCs has grown over the last few decades; at the same time, the number of PTAs has increased dramatically since the 1990s. In this period, there has also been a shift in the agenda of PTAs towards deeper integration policies, from the traditional focus on reducing tariffs to an emphasis on behind-the-border policies such as trade-related investment issues, services, competition, intellectual property rights, etc.

This paper presents empirical evidence on how PTA depth impacts GVC-related trade using a gravity model with multiple fixed effects. A panel data set consisting of observations on 191 countries from 1995 to 2015 is constructed when the dependent variable is designated as imports of parts and components while another set on 61 countries for the period of 1995, 2005, 2008 – 2011 is collected for foreign value added in gross exports. Overall, the findings show that PTA depth has a significant and positive influence on GVC-related trade. Furthermore, the results of an analysis to test this relationship, with countries categorized as developed or developing, reveal that only deeper agreements between developed countries lead to increased GVC trade.

Keywords: global value chains; preferential trade agreements; design of international trade agreements; trade; panel data analysis

Student Number: 2016-23819

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I. Introduction

1.1 Background and Overview of the Study

Global Value Chains (GVCs) increasingly characterize global production, trade and investment, in which different stages of production occur across a wide array of countries. As the scope of GVCs has increased, there has been a steady rise in the trade of intermediate goods, with more imported parts and components being integrated into exports. In fact, global exports of intermediate goods surpassed the total export values of final and capital goods for the first time in 2009 (Gereffi 2015).

Simultaneously, preferential trade agreements (PTAs) have been on the rise since the 1990s. While there were only around 70 PTAs in force in 1990, this number increased drastically to 287 by May of 2018; in terms of notifications, there are currently 459 PTAs when distinguishing goods, services and accessions.[1] This is seemingly at odds with the growth of GVCs, which because of their global nature, should encourage multilateral negotiations; however, the reality is that these negotiations have progressed at an extremely slow pace, leading to bilateral and plurilateral trade agreements taking their place. Moving away from traditional PTAs that focused on the reduction of tariffs, recent PTAs include commitments that go considerably beyond the traditional trade rules of multilateral agreements, incorporating behind-the-border policies related to dimensions such as competition, investment, and intellectual property rights (Bruhn 2014). It is vital that these policies are sufficiently addressed in trade agreements in order

[1] From the WTO Regional Trade Agreements website.

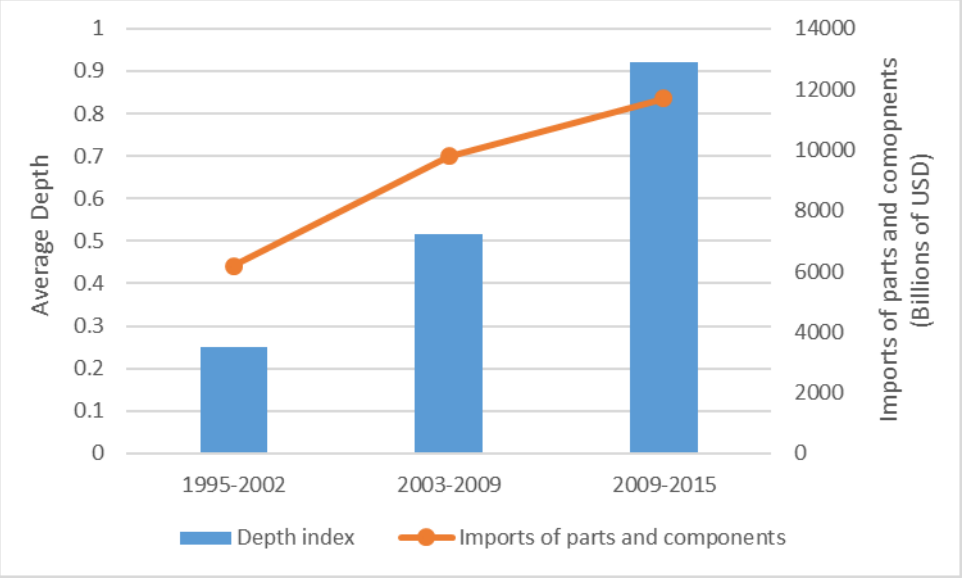
to lower costs of coordinating regulations and standards, which will allow GVCs to operate efficiently (Ruta 2017).

Researchers have long studied the impact of PTAs on members' trade flows; however, the majority of research was lacking in that all agreements were considered equal, despite significant differences in their content and design (Dür, Baccini, and Elsig 2014). Some agreements are more encompassing, including provisions that allow for broad liberalization while others are narrow, in which only modest concessions are made. The design of PTAs matter in empirical studies researching the effects of PTAs for largely three reasons: (i) PTAs should boost trade in the products for which tariffs are cut; (ii) the higher the number of policy instruments covered by a PTA, the greater the policy reforms that favor trade; and (iii) PTAs can encourage regulatory convergence (Dür, Baccini, and Elsig 2014). Therefore, it is important to take these differences into account when investigating the effect of PTAs on trade, which has been the trend in recent research.

Descriptive evidence suggests there is a positive association between GVC-related trade[2] and deep trade agreements (see <Figure 1.1> and <Figure 1.2>). While this relationship can go in two directions, the analysis in this study will be focused on the influence of deep integration on trade associated with GVCs.

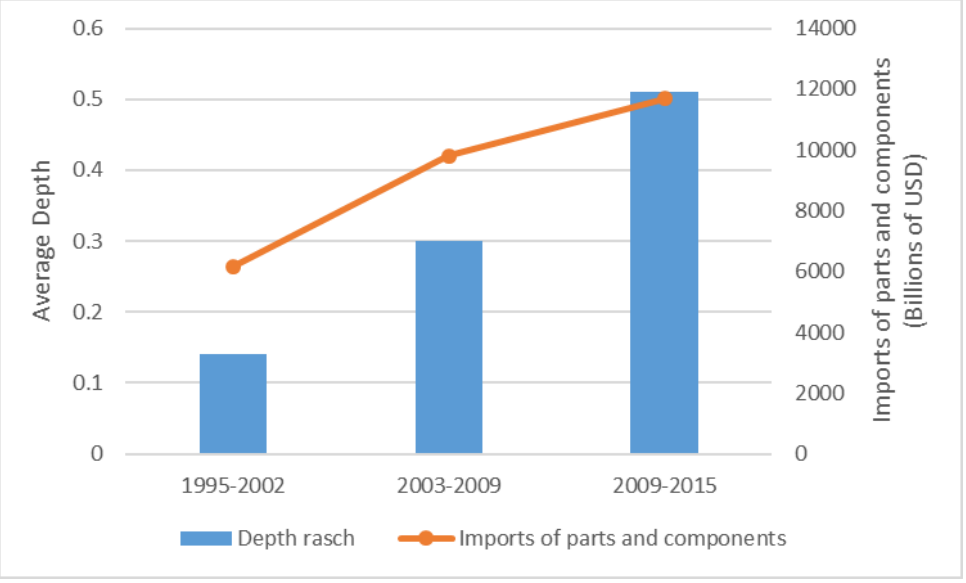
[2] GVC-related trade defined as imports in parts and components for these figures since data on foreign value added in gross exports is not available for the overall period of 1995-2015.

Figure 1.1 Imports of parts and components and depth index



Source: Author's calculations using the UN Comtrade Database and the DESTA Database

Figure 1.2 Imports of parts and components and depth rasch



Source: Author's calculations using the UN Comtrade Database and the DESTA Database

1.2 Hypotheses Formulation

This thesis adds to existing studies examining how design features of PTAs, such as depth, flexibility and others impact international trade flows related to GVCs; in particular, it focuses on the role of depth. The purpose is to provide empirical evidence that signing deeper agreements has a positive impact on GVC-related trade. Furthermore, the paper will analyze whether this also holds for agreements signed between developed countries (North-North agreements), developed and developing countries (North-South agreements), and developing countries (South-South agreements). In sum, the hypotheses to be tested in this paper are as follows.

H1: *GVC-related trade will be positively affected by the depth of preferential trade agreements.*

Data on PTA depth is taken from the Design of Trade Agreements (DESTA) Database; its depth measures incorporate information on six policy areas that have the potential to impact GVC-related trade; services, trade-related investment, standards, public procurement, intellectual property rights (IPR), and competition (see Section 3). For instance, liberalization of services (an agreement that includes a provision on this topic would be considered a deeper one than one without), would allow firms in a country to have access to services at cheaper prices; this encourages further fragmentation of production as services, particularly transport, communication and computing services, are an important component of production (Bruhn 2014). The inclusion of investment provisions in an agreement would be a step towards creating a

more favorable environment for foreign investors, which is particularly important for countries with weak domestic regulations concerning investment. Furthermore, since the adoption of competition policy prevents the abuse of market power, multinational enterprises would engage in production fragmentation to take advantage of differences in costs among countries (Orefice and Rocha 2014).

Provisions calling for cooperation or harmonization of standards such as Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary (SPS) measures will lower the cost of testing and product certification, facilitating firms' participation in value chains (WTO 2011). In addition, provisions that allow for a high level of IPR protection would be helpful in convincing multinational firms to include such countries in their production networks as they provide more certainty in resolving potential IPR breaches. Finally, provisions on public procurement would make it possible to source inputs efficiently, which is crucial to achieve competitiveness in GVCs (Bruhn 2014).

H2: *The depth of preferential trade agreements will positively impact GVC-related trade in the case of North-North agreements and North-South agreements.*

A possible explanation for North-South agreements is that developed countries have the upper hand in trade negotiations as they can convince developing countries to make concessions in terms of PTA provisions, that is, sign deeper trade agreements, by offering valuable access to their markets (Bruhn 2014). Another argument made by Manger (2009) is that developed countries sign PTAs in order to secure preferential access to low-cost production sites in their supply chains, which keeps out third-country

firms, thus giving them a competitive advantage.

The rest of the paper is structured as follows. Section 2 reviews various PTA depth databases and discusses research analyzing the effects of depth on international trade flows. Section 3 covers the empirical analysis part of the thesis, which includes a description of data sources and variable definitions as well as an explanation of the empirical model and interpretation of results. The thesis is concluded with a discussion of its contribution to literature and its limitations.

II. Literature Review

There is a wealth of literature investigating the effect of trade agreements on trade flows (for a review, refer to Baier and Bergstrand 2007). However, earlier studies did not consider the heterogeneous nature of PTAs; generally, a dummy variable was included, given the value of 1 if an agreement exists between a country pair and 0 if otherwise. Around 2010, scholars began to publish their research codifying the depth of PTAs; after combing through the extensive text of trade agreements and creating a list of common provisions, trade agreements were assigned values based on whether they covered those provisions or not. The first part of this section will examine the various efforts to code the depth of PTAs, followed by a review of studies that investigate how international trade flows as well as more specifically, GVC-related trade flows are impacted by PTA depth.

2.1 Depth of Preferential Trade Agreements

In recent years, a growing number of scholars have started to examine the content of PTAs and differentiate them based on the types of provisions included. As it is a formidable task to inspect the large number of trade agreements all containing numerous provisions, there is a limited number of databases that cover the design features of PTAs. However, the ones created are quite comprehensive, making them significant tools to analyze the differential impact of PTAs depending on their design, particularly depth.

In their 2010 paper, Horn, Mavroidis and Sapir (hereafter referred to as "HMS") analyze the content of 14 EC and 14 US trade agreements with WTO partners, notified to the WTO as of October 2008. 52 policy areas in PTAs are identified based on the article headings of EC agreements and chapter headings in US agreements, which are further separated into two categories: 14 WTO plus (or "WTO +") provisions and 38 WTO extra (or "WTO-X") provisions. The WTO+ provisions are those that come under the current mandate of the WTO, whereas WTO-X provisions are ones that fall outside the WTO's mandate. In addition, HMS determine the legal enforceability of each of these PTA areas based on whether the legal language is sufficiently clear enough to ensure that parties are committed to undertaking the obligation. As a result of their analysis, they find that a significant number of WTO+ and WTO-X obligations are contained in both EC and US agreements, signifying that these agreements go significantly beyond WTO agreements. However, only a small number of WTO-X provisions are legally enforceable, which are mainly limited to regulatory issues such as investment, capital movement and intellectual property. This seems to suggest that EC and US agreements "effectively serve as a means for the two hubs to export their own regulatory approaches to their PTA partners" (Horn, Mavroidis, and Sapir 2010).

Borrowing the methodology from HMS, the WTO Secretariat conducts a detailed analysis on the content of PTAs for an extended number of 96 PTAs for the period of 1958 – 2010, including agreements signed with non-member countries (published in the World Trade Report 2011). Whereas only free trade agreements (FTAs) were considered in HMS, this study expands the scope of analysis to include customs

unions and partial scope agreements. Based on this analysis, the report inspects particular provisions in detail, such as those related to services, investment, and standards, discussing their structure and the range of activities they cover to ascertain the depth of certain obligations.

The Design of Trade Agreements (DESTA) Database, developed by Dür, Baccini and Elsig, adopts an approach to measuring depth that differs from HMS; it is the most extensive database to date. It provides information on PTAs that were signed between 1945 and 2017, including not only those notified to the World Trade organization, but those part of a list held by the World Trade Institute, the Organization of American States' Foreign Trade Information System, the Asia Regional Integration Center, the World Bank, and reported on government websites. Coding on design features such as market access commitments, flexibility instruments, depth measures, and enforcement tools is offered for more than 620 agreements. Coverage is limited to ten policy areas but for each of those areas, the coding covers a number of aspects ranging from the simple inclusion of a chapter in the PTA to details on national treatment or harmonization of policies (Hofmann, Osnago, and Ruta 2017).

Two measures of depth are available on DESTA: an additive index and a measure of depth relying on latent trait analysis. These measures will be discussed in more detail in Section 3 as they are chosen as the main independent variables of interest in this study. All updated data is available on the website.[3]

[3] DESTA: https://www.designoftradeagreements.org/

The latest database on the content of PTAs was published by Hofmann, Osnago and Ruta (2017), made available on the WTO website.[4] It covers 279 PTAs signed in 1958-2015 among 189 countries. As was the case of HMS, 52 policy areas are covered, which are divided into two categories of 14 WTO+ and 38 WTO-X areas. WTO+ measures include tariffs on industrial goods as well as agricultural goods, customs administration, SPS measures, TBT, anti-dumping, the General Agreement on Trade in Services (GATS) and others, whereas WTO-X measures consist of anti-corruption, competition policy, IPR, environmental laws, etc. A policy area is considered as being covered "if the agreement contains an article, chapter or provision, providing for some form of undertaking in this field, which includes policies mentioned more indirectly" (Hofmann, Osnago, and Ruta 2017). Furthermore, the researchers determine whether a policy area is legally enforceable in a certain agreement depending on whether "the language used is sufficiently precise and committing and if it has not been excluded from dispute settlement procedures under the PTA" (Hofmann, Osnago, and Ruta 2017).

Various measures of depth are suggested based on the information collected. "Total depth," a simple sum of provisions included in the PTA regardless of whether they are legally enforceable or not is one. Another is "core depth," defined as the simple sum of core provisions[5] included in a PTA. The last is "PCA depth," constructed using principal component analysis (PCA).[6] They adopt these depth indices as variables in a

[4] Content of Deep Trade Agreements: https://datacatalog.worldbank.org/dataset/content-deep-trade-agreements

[5] Authors define core provisions as WTO+ provisions and four of the WTO-X provisions: investment, competition policy, intellectual property rights and movement of capital.

[6] For more information on how this variable was constructed, refer to Appendix B of Hofmann,

forthcoming paper that estimates the effect of PTA depth on global value chain participation.

2.2 Preferential Trade Agreement Depth and Trade Flows

There is a small but growing area of research covering the relationship between PTA design features, in particular depth, and international trade flows. The newly developed measures of depth mentioned above are incorporated into empirical models to demonstrate that deeper agreements lead to increased international trade in contrast to shallow ones. Some studies choose bilateral exports as a measure of international trade, whereas because others are interested in the phenomenon of global value chains, use measures that capture activity in those value chains. Both categories of research will be reviewed henceforth.

With regard to studies that designate bilateral exports as the dependent variable, research consistently shows that the depth of PTAs matter in increasing trade flows between countries. The gravity model in Dür, Baccini, and Elsig (2014) uses depth data from DESTA and incorporates dyad fixed effects to control for distance and contiguity, and year fixed effects. The central finding is that the deeper a PTA, the greater its effect on bilateral trade flows, which is supported by robustness checks; this relationship is analyzed using different models and by changing the operationalization of variables. In another more recent paper (Ahcar and Siroën 2017), the relationship between deep agreements and bilateral trade is confirmed, using the Poisson Pseudo Maximum

Osnago, and Ruta (2017).

Likelihood (PPML) method to estimate the gravity model. The authors resort to the dataset created by the WTO (2011) as well as DESTA to collect information on whether a particular provision exists in a PTA; based on this information they construct a depth measure using Multiple Correspondence Analysis (MCA) in addition to an additive depth measure.

As global production is increasingly characterized by its organization within global value chains, there is growing interest in the impact of deep integration on GVC-related trade. There are gaps in the data rendering it difficult to find a measure that accurately represents international fragmentation of production. Therefore, most studies employ proxy measures such as trade in parts and components[7], following the approach of Yeats (1998) and Hummels, Ishii, and Yi (2001).

WTO (2011) finds that countries with deep agreements trade more than countries with shallow ones by estimating an augmented gravity equation with country-pair fixed effects along with importer and exporter fixed effects. Specifically, an additional provision in an agreement will lead to an increase in trade by nearly 2 percentage points on average. The depth of an agreement is captured by two indices, an additive measure and another one generated via the principal factors component (PCA) methodology using data compiled in WTO (2011). Orefice and Rocha (2014) investigate the impact of deep integration on production networks using an augmented gravity equation with country-pair fixed effects, country and time fixed effects, and a linear time

[7] "Parts and components" is defined as intermediate goods or manufactured items combined with other items and materials to produce finished goods (Yueh 2010).

trend. They come to conclusion that countries can benefit from an increase of nearly 12 percentage points in production network trade by signing deeper agreements.

In addition to using trade in parts and components as a measure for GVC trade, an upcoming paper by Osnago, Rocha, and Ruta[8] employs foreign value added in gross exports as a proxy for bilateral GVC integration. Using depth measures from Hofmann, Osnago, and Ruta (2017), it finds that countries that sign deep trade agreements see an up to 25 percent increase in trade in parts and components and 23 percent rise in foreign value added in gross exports. When breaking down the provisions into WTO+, WTO-X, as well as core WTO-X (investment and competition policy) and border and behind-the-border provisions, the results reveal that investment and competition provisions are particularly important components of deep agreements that lead to more trade.

[8] Results reported in World Bank Background Paper prepared for the conference, "Making Global Value Chains Work for Economic Development and Shared Prosperity."

III. Empirical Analysis

3.1 Data Sources and Variable Definitions

3.1.1 GVC-related trade variables

Two measures are selected as indicators of the dependent variable, GVC-related trade: imports of parts and components and foreign value-added in gross exports (henceforth referred to as FVA). The former is in gross terms, whereas the latter is in value-added terms.

Indicators for trade in value-added terms were developed because the increasing fragmentation of production means that traditional trade statistics are not as reliable anymore; double-counting occurs due to intermediate inputs crossing borders numerous times. Therefore, various initiatives, such as the World Input-Output Database (WIOD), the OECD-WTO Trade in Value-added (TiVA) Database, and the Global Trade Analysis Project (GTAP), were launched to create databases that disaggregate trade flows into value-added terms to better capture the reality of international trade.

While FVA is a more accurate measure, data is available for only a small number of countries; therefore, imports of parts and components is also selected as a measure of GVC-related trade.

Table 3.1 Summary of GVC-related trade variables

Variable	Definition	Source	Period	Countries
Imports of parts and components	5-digit SITC 7 and 8 equivalent of codes 42 and 53 in the BEC classification[9]	UN Comtrade Database	1995 – 2015	191
Foreign value added in gross exports	Value of imported intermediate goods and services embodied in a domestic industry's exports	UIBE GVC Index System	1995, 2005, 2008 – 2011	61

Imports of parts and components

Earlier studies examining international production fragmentation (Athukorala and Yamashita 2006; Kimura, Takahasi, and Hayakawa 2007; Baldwin and Taglioni 2011; and Hayakawa and Yamashita 2011) use trade in parts and components to measure this phenomenon. While it does not precisely represent a country's trade flows related to global value chains, it is an approximation of the fragmentation of trade. In this study, imports of parts and components is chosen as one of the dependent variables, following the approach of Hummels, Ishii, and Yi (2001), Yeats (2001), and Orefice and Rocha (2014), as it captures the extent to which a country uses offshoring.

Data on annual imports of 191 countries[10] was drawn from the UN Comtrade database for the period of 1995 to 2015. In order to identify parts and components, the UN's Broad Economic Categories (BEC), which categorizes traded goods according to

[9] Many of the other studies define parts and components as the following: SITC Rev. 3 equivalent of codes 42 and 53 in the broad economic categories (BEC) classification and unfinished textile products in division 65 of the SITC classification.
[10] List of countries in Appendix A.

their main end use and is defined in terms of the SITC system, was utilized. There are seven major categories, further divided into sub-categories that indicate end use. Among these categories, industrial supplies (BEC 2), capital goods (BEC 4) and transport equipment (BEC 5) have sub-categories for "parts and accessories," which are BEC 22, 42 and 53.

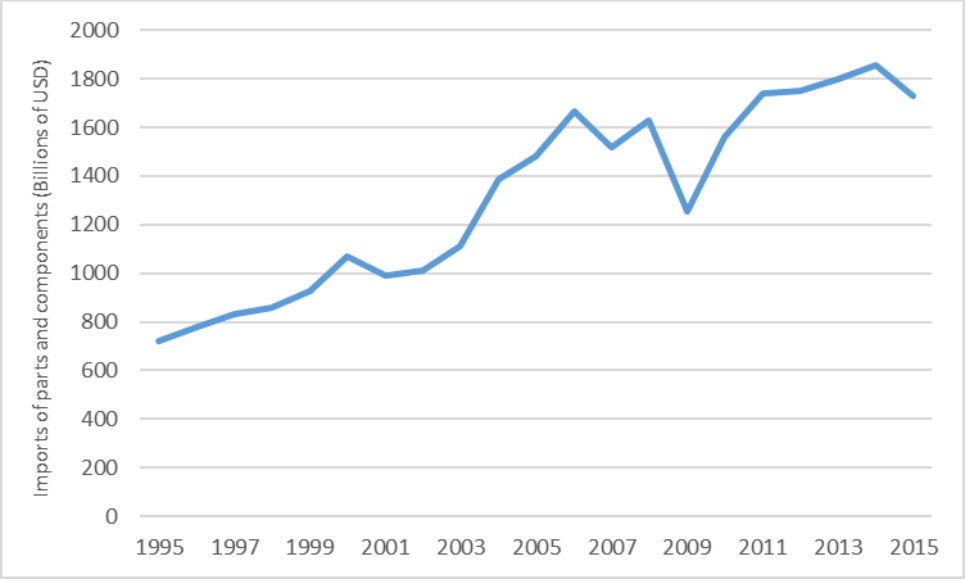
However, not all items in these categories can be regarded as parts and components. According to Yamashita (2010), only items from BEC 22, 42 and 53 that correspond to 5-digit product levels[11] of SITC 7 (machinery and transport equipment) and SITC 8 (miscellaneous manufacturing) should be defined as such because this successfully excludes components traded as "products in their own right," such as automobile tires (Yamashita 2010)[12]. The resulting list is composed of 274 items[13].

Using data compiled for this study, a clear upward trend in imports of parts and components (<Figure 3.1>) is observed; there has been a drastic increase in imports by approximately 2.5 times from 1995 to 2015. However, there have been periods of decline such as the particularly stark drop in 2009, which could most likely be explained by the "great trade collapse" — the steepest fall of world trade in recorded history — that occurred between 2008 and 2009 (Baldwin 2009). The cause of this collapse was the swift, severe, and globally synchronized postponement of purchases, particularly of

[11] Products need to be examined at the 5-digit level, the most detailed level, to be able to distinguish parts and components from other types of trade (Yueh 2010).
[12] Unfortunately, not all categories can be separated as precisely as SITC 7 and 8. So while SITC 5 (pharmaceutical and chemical products) and SITC 6 (machine tools and various metal products) also contain parts and components, they are excluded from the parts and components variable in this analysis.
[13] Listed in Appendix D.

durable consumer and investment goods, as well as their parts and components.

Figure 3.1 Pattern of imports of parts and components, 1995-2015



Source: Author's calculation using the UN Comtrade Database

Foreign Value Added in Gross Exports

The other variable taken as a proxy for a GVC-related trade flows is foreign value added in gross exports, which estimates the value added of foreign goods and services that are used as intermediates to produce goods and services for export. There are two ways countries participate in global value chains: by importing foreign inputs to produce the goods and services to export (backward GVC participation) and by exporting domestically produced inputs to partner countries for further processing (forward GVC participation). The measure used in the estimation of the model is the former, chosen to be parallel with the first dependent variable, imports of trade and components.

FVA data is not available on the WTO-OECD's Trade in Value Added (TiVA) database; while it provides each country's foreign value added content in gross exports to the world, this information is not available in its bilateral form (from country *i* to country *j*). Therefore, data was downloaded from the UIBE[14] GVC Index System, created by the Research Institute for Global Value Chains (RIGVC) at the University of International Business and Economics. This is a secondary database that takes data from Inter-Country Input-Output (ICIO) tables,[15] then employs widely used GVC accounting methods to calculate GVC indicators ranging from decomposed components of bilateral gross trade such as domestic value added, foreign value added, etc. to GVC length.

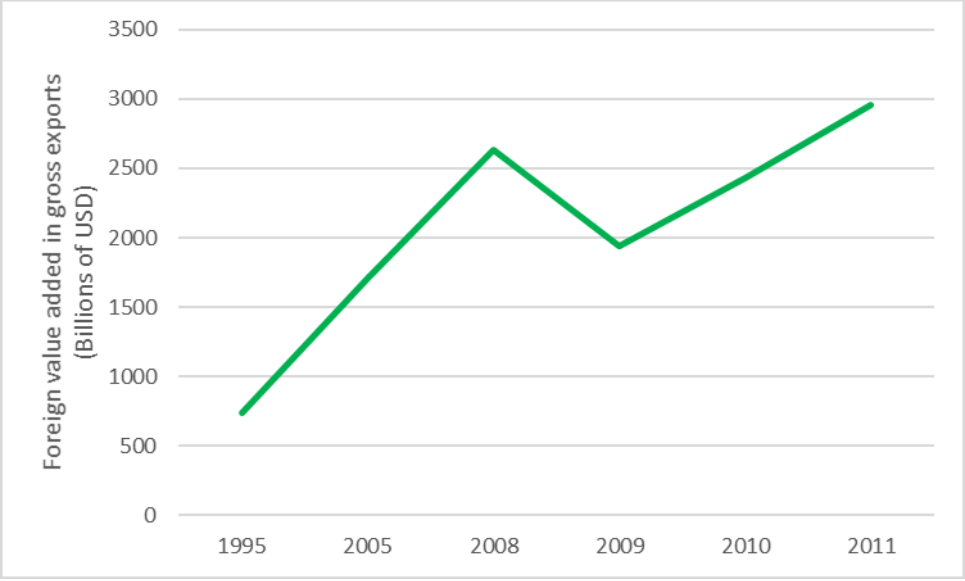
Data on FVA embodied in final exports and in intermediate exports[16] based on the OECD-ICIO for a total of 61 countries[17] covering the years 1995, 2005, and 2008 – 2011 (due to data availability) was acquired. The dataset is completely balanced, in that it includes all possible bilateral pairs.

An examination of the FVA trend in <Figure 3.2> reveals there was an increase until 2008 followed by a sharp fall in 2009, but a recovery back to the 2008 level by 2011. This sudden decline in FVA can likewise be attributed to the "great trade collapse." Nagengast and Stehrer (2015) found that the decline in value added exports in this period was due to the drop in the overall level of demand and compositional changes in final

[14] University of International Business and Economics located in Beijing, China.
[15] World Input-Output Database (WIOD), OECD-ICIO, Global Trade Analysis Project (GTAP) ICIO, Eora-MRIO (Multi-region input-output table)
[16] Foreign value added in gross exports was not available directly, so FVA in final exports was combined with FVA in intermediate exports to create this variable.
[17] Listed in Appendix B.

demand. Overall, it is possible to conclude that trade related to GVCs, whether measured by imports of parts and components or FVA, has been on an upward trajectory since 1995.

Figure 3.2 Pattern of FVA, 1995, 2005, 2008-2011



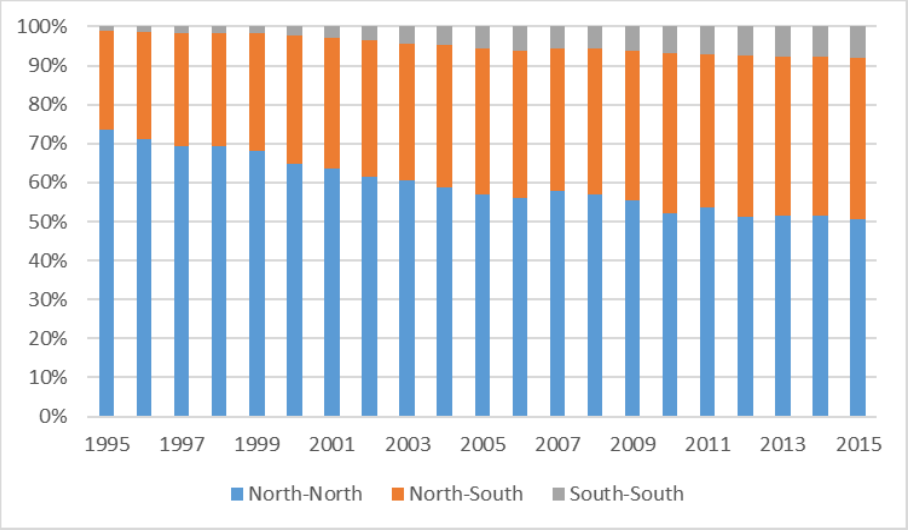
Source: Author's calculation using the UIBE GVC Index System

GVC-related Trade by Country Group

Viewing the trends in GVC-related trade by country group (developed and developing countries) in <Figure 3.3> and <Figure 3.4>, reveals that in 1995, developed countries were more highly integrated into GVCs in contrast to developing countries, with their share of imports of parts and components as well as FVA accounting for more than 70% of overall trade. However, in the last two decades, developing countries became more integrated into GVCs; as result, North-South trade represented more than 40% in terms of imports of parts and components in 2015 up from 25% in 1995 while

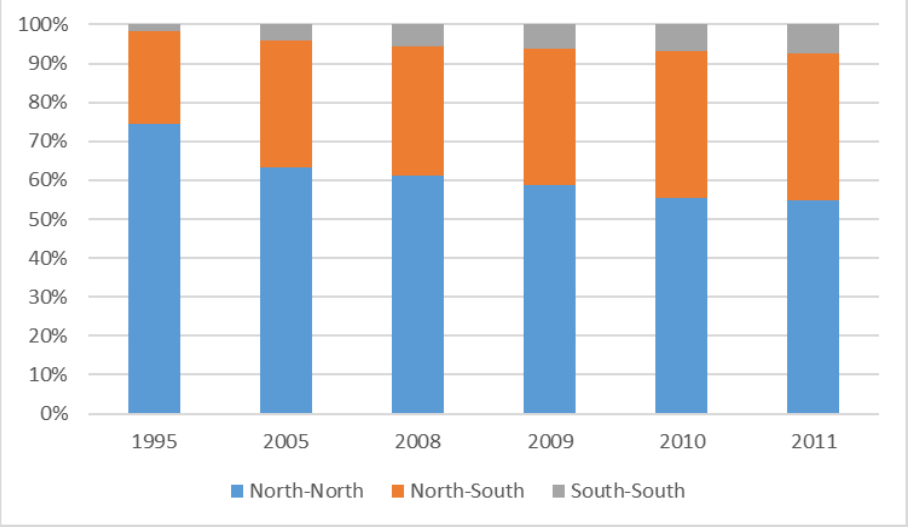
South-South trade also incrementally increased.

Figure 3.3 Imports of parts and components by country group



Source: Author's calculation using the UN Comtrade Database

Figure 3.4 FVA by country group



Source: Author's calculation using the UIBE GVC Index System

3.1.2 PTA depth variables

The main independent variable of interest is the depth of PTAs, which is taken from the DESTA database. 620 agreements are coded based on content, which include discontinued trade agreements without specifying the exact year of suspension, rendering it difficult to determine precisely which agreements are in effect for certain country pairs in a particular year. Therefore, a total of 237 agreements[18] that were reported to the WTO from 1958 to 2015 are considered in the model estimated in this study. Both measures of depth provided in DESTA are used to run the analysis.

Table 3.2 Summary of depth measures

Variable	Definition	Range	Source
Depth rasch	Derived using the rasch model; 48 variables theoretically related to depth are used (relating to liberalization of services, trade-related investment measures, intellectual property rights, standards, competition, and public procurement)	0 – 3.697	DESTA
Depth index	Additive index that combines 7 key provisions: (i) all tariffs are to be reduced to zero; and cooperation in (ii) services; (iii) investments; (iv) standards; (v) public procurement; (vi) competition; (vii) intellectual property rights	0 – 7	DESTA

Depth Rasch

The primary depth measure of interest, depth rasch, is derived using a technique called latent trait analysis, similar to factor analysis with the advantage that it can be applied to binary data. Specifically, the Rasch model, for which a core assumption is that all items capture a single underlying latent dimension, is employed (Baccini, Dür, and

[18] List of agreements in Appendix C.

Elsig 2015). Six policy areas, which are services trade, investments, standards, public procurement, competition and IPR, are considered in the construction of this measure.[19]

A total of 48 variables[20] in these six policy areas that are theoretically related to PTA depth are included to derive this measure of depth. As not all items seem to be of equal importance in establishing the extent of a country's commitments, the measure of depth would be inflated in case of a simple additive index of all these items (Dür, Baccini, and Elsig 2014). Depth rasch ranges from -1.43 to 2.4, but was rescaled to remove negative values by adding the absolute minimum to all values; the resulting measure ranges from 0 to 3.697.[21]

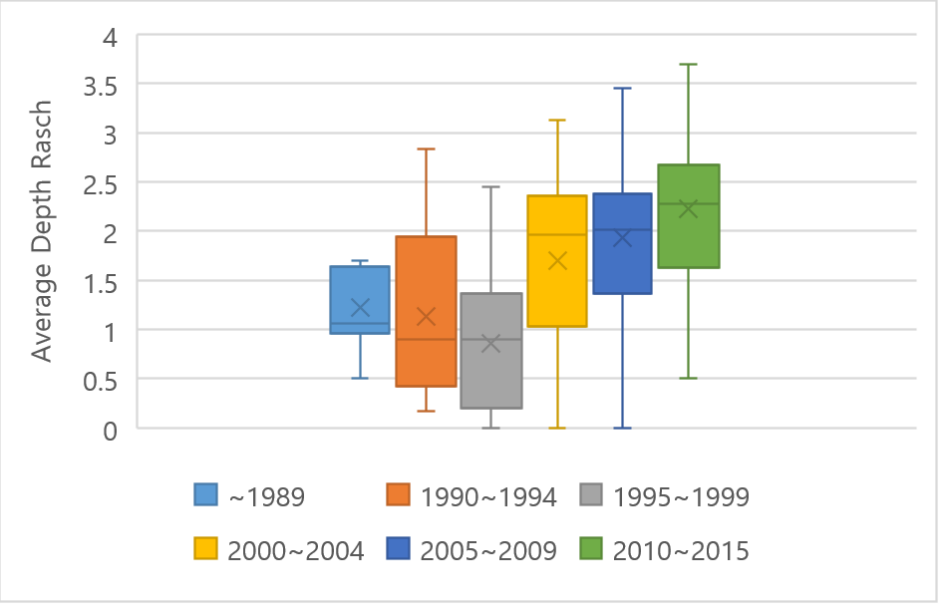
Descriptive evidence shows that the average depth of trade agreements (measured by depth rasch) that entered into force has increased over time (see <Figure 3.5>), excluding the period of 1995-1999. All trade agreements that came into force in this period were those signed between CIS (Commonwealth of Independent States) countries, which have relatively shallower agreements compared to other regions.

[19] These areas were chosen by the scholars who developed DESTA because they are the six most prominent areas of cooperation covered by PTAs, illustrated most clearly by NAFTA. Some agreements include other areas, but cooperation in these areas is not very deep or deep cooperation in that area is limited to only a handful of agreements. For this index to be applicable to a large number of agreements, the authors opted for areas that are covered by at least some agreements, to allow them to differentiate among agreements (Explanation obtained through email correspondence with Dür).

[20] For the list of variables, refer to Dür, Baccini, and Elsig (2014).

[21] This method to rescale depth rasch was used in Baccini, Dür and Elsig (2015) and confirmed by Dür through email correspondence.

Figure 3.5 Depth rasch trend



Source: Author's calculation using the DESTA Database

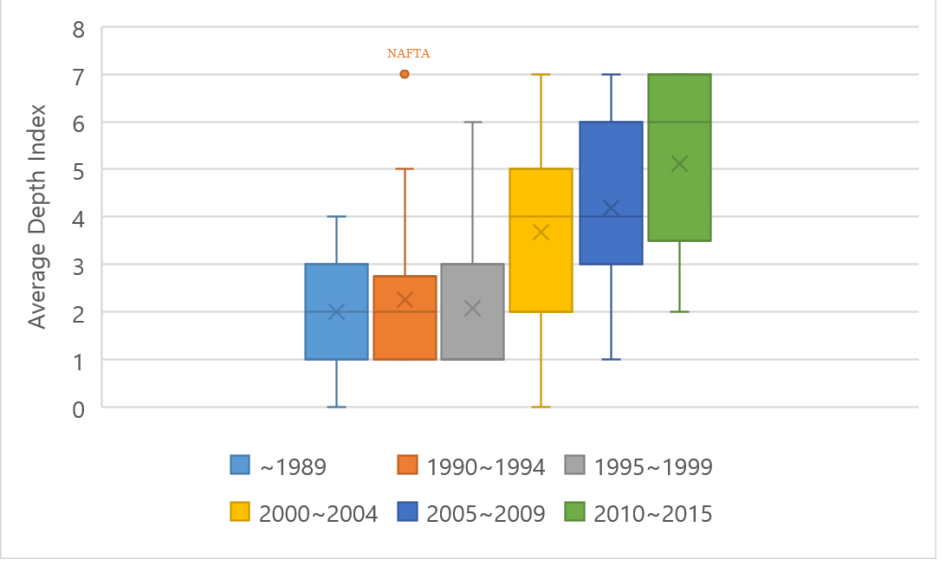
Depth Index

Analyses using the additive index, depth index, is conducted as a cross-check. It ranges from 0 to 7, which captures whether there are "substantive" provisions in seven different policy areas. The first is whether all tariffs are to be reduced to 0 and the six other areas are identical to those included in the derivation of depth rasch. The expression "substantive" is best explained using an example: an agreement that contains a vague provision stating that its members strive to liberalize trade in services, but without any further specification on how this should be done, would be coded 0 for the services variable. By contrast, an agreement containing a national treatment provision or an MFN clause on services would be coded 1. Therefore, "substantive" means a provision that

can actually be implemented exists: a provision stating that the parties to the agreement shall better protect intellectual property rights cannot be implemented (not "substantive"), but a provision stating that the parties to the agreement shall accede to the WIPO copyright treaty can be implemented ("substantive").[22] The two measures of depth are closely related with a correlation coefficient of 0.972.

Descriptive evidence in <Figure 3.6> shows that the average depth of trade agreements (measured by depth index) has increased over time. In the recent ten-year period, the shallowest agreements have the depth equivalent to the deepest agreements in the 1990s.

Figure 3.6 Depth index trend



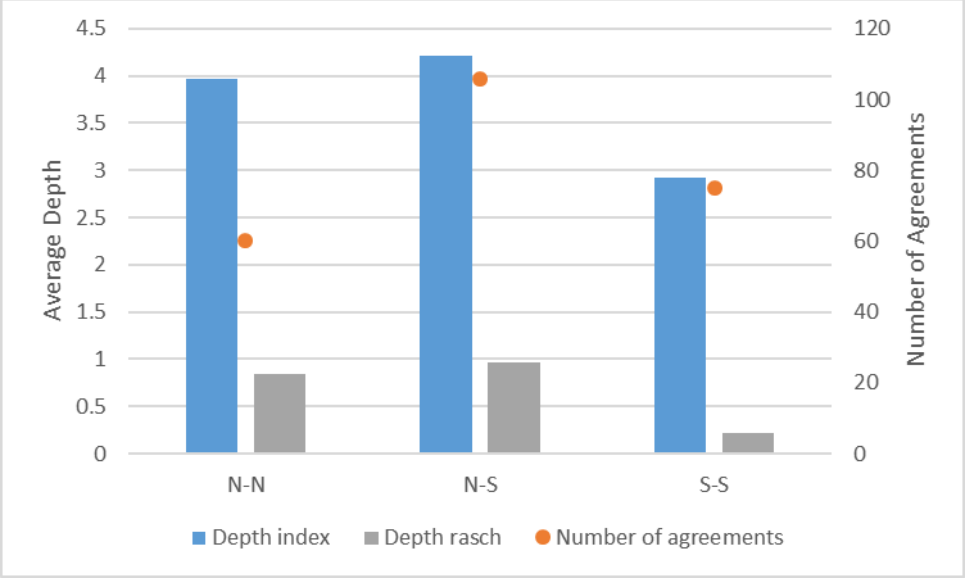
Source: Author's calculations using the DESTA Database

[22] Explanation obtained via email correspondence with Dür.

Depth by Country Group

<Figure 3.7> exhibits the number of PTAs and average depth of those PTAs by country group. A large number of PTAs are signed by developed and developing countries: there are 106 North-South, 75 South-South, and 60 North-North agreements. Among agreements by country groups, those signed between developed and developing countries are the deepest with on average 4 provisions (out of 7) in terms of depth index, which is slightly deeper than PTAs signed between developed countries. South-South agreements are much shallower, having on average a little less than 3 provisions that indicate depth.

Figure 3.7 Number of PTAs and average depth by country group



Source: Author's calculation using the DESTA Database

3.1.3 Other variables

This study also includes variables commonly used in gravity models that are known to have an impact on levels of trade. Data for these variables were taken from the CEPII Gravity Dataset, which is a gravity dataset for all pairs of countries that covers the period of 1948 to 2015. The following are the variables included.

i) **GDP per capita**: logged GDP per capita of importing and exporting countries (in current US$), which indicates their purchasing power.

ii) **Population**: the population variable (logged) represents country size.

iii) **Distance**: the weighted bilateral distance between origin and destination in kilometers (population weighted).

iv) **Contiguity**: a dummy variable that takes a value of 1 if the exporting and importing countries share a common border and 0 if they do not.

v) **Common language**: a dummy variable that takes a value of 1 if the exporting and importing countries share a common official or primary language and 0 if they do not.

Table 3.3 Variable Description

	Variable	Description	Source
Dependent	**FVA**	(log) Foreign value-added in gross exports (in US$)	UIBE GVC index system
	Imports of parts and components	(log) Imports of parts and components (in US$)	UN Comtrade
Independent	**Depth index**	Additive depth index	DESTA
	Depth rasch	Depth measure derived with Rasch model	DESTA
	GDP per capita (importing and exporting country)	(log) Gross domestic product per capita of importing and exporting countries (current US$)	CEPII
	Population (importing and exporting country)	(log) Population of importing and exporting countries	CEPII
	Distance	(log) Weighted bilateral distance between importing and exporting countries in kilometers (population weighted)	CEPII
	Contiguity	Dummy variable indicating whether importing and exporting countries share a border	CEPII

3.2 Empirical Model

To examine the impact of deep PTAs on global value chain integration, the study estimates the following model, which is adopted from Orefice and Rocha (2014) with some adjustments:

$$\text{Ln(imports)}_{ijt} = \alpha + \varphi_{ij} + \varphi_{it} + \varphi_{jt} + \beta PTAdepth_{ijt} + \varepsilon_{ijt} \quad \cdots (1)$$

where the subscripts *i*, *j*, *t* correspond to the importer, exporter and the year, respectively. The dependent variable is the log of imports of parts and components from country *i* to country *j* at time *t*. PTA$depth_{ijt}$ denotes the depth of an agreement signed between country *i* and country *j* at time *t*. This variable is given a value of zero for country pairs that have never implemented an agreement. For countries that have entered into an agreement during the time period 1995-2015, this variable is equal to zero before the agreement enters into force and takes a positive value from the year in which the agreement comes into effect onwards. φ_{it} and φ_{jt} capture time varying characteristics of importers and exporters like their GDP per capita and population; φ_{ij} captures characteristics that are specific to the country pair, such as geographical distance and whether they share the same official language or border.

The second model with FVA as the dependent variable, is as follows:

$$\text{Ln(FVA)}_{jit} = \alpha + \varphi_{ji} + \varphi_{it} + \varphi_{jt} + \beta PTAdepth_{ijt} + \varepsilon_{ijt} \quad \cdots\cdots (2)$$

where the dependent variable is the log of FVA from country *j* to country *i* at

time *t* and the rest of the variables are defined as in equation (1).

Recent papers estimating gravity models introduce various fixed effects to more accurately analyze trade flows. One type of fixed effect frequently specified is country-time specific fixed effects, or exporter-time and importer-time specific fixed effects in this case. It is essential because not only are trade flows influenced by the barriers to trade between country pairs, otherwise known as bilateral trade resistance, but also by multilateral trade resistance (MTR), the barriers to trade that a country faces with all of its trade partners. The issue with MTR is that it is not directly observable, therefore alternatives are proposed to proxy for it. Introduced by Anderson and van Wincoop (2003), one alternative is to construct estimates of the price-raising effects of barriers to multilateral trade using iterative methods. However, since this requires estimating the gravity equation using non-linear squares, it is not commonly employed (UN 2012). Another more widely used method involves using country fixed effects (Rose and van Wincoop 2001; Feenstra 2003; Baldwin and Taglioni 2006) in the case of cross-sectional data and country-year fixed effects for panel data.

Another fixed effect often used is the country-pair fixed effect. Baier and Bergstrand (2007) devise this as a solution to deal with the endogeneity problem that arises due to omitted variables bias when estimating the effect of trade policies, like PTAs, on trade flows. If the error term is correlated with some unobservable country-specific policy variables, which simultaneously affect both trade and the probability of forming a PTA, omitted variables bias may occur (Orefice and Rocha 2014). Hence, it is common to incorporate country-pair fixed effects to account for unobserved country-

pair heterogeneity and country-time fixed effects to deal with unobserved factors such as multilateral price terms.

The act of introducing fixed effects into the gravity model creates restrictions on the model since the effect of variables that vary in the same dimension as the fixed effects cannot be estimated due to their perfect collinearity with the fixed effects; therefore, it is impossible to measure the effect of variables that are time-invariant country-pair specific, exporter-time or importer-time specific (Shepherd 2016). However, as depth, the variable of interest, varies across time and is country-pair specific, introducing fixed effects does not pose a problem.

In addition, the relationship between PTA depth and GVC-related trade flows is analyzed based on whether trade agreements are categorized into North-North agreements, North-South agreements, or South-South agreements.

3.3 Results and Interpretation

3.3.1 The Effect of PTA depth on GVC-related Trade

Before introducing PTA depth indices, the model is estimated using a dummy variable (PTA_{ij}) assigned a value of 1 if a trade agreement exists between two countries and a value of 0 if otherwise, to assess the average PTA effect. Columns (1) and (4) of <Table 3.3> show that the coefficients are statistically significant and positive, which indicate that the presence of a trade agreement between countries leads to a greater volume of imports of parts and components as well as a higher level of foreign value added in gross exports. Other variables are omitted because of fixed effects; the parameters for country-pair time invariant variables (distance, common language, contiguity) cannot be estimated due to the inclusion of country-pair fixed effects whereas the effect of time-varying importer or exporter specific variables cannot be estimated as a result of including exporter and importer time fixed effects.

Next, depth measures (either depth rasch or depth index) are introduced into the model, the results of which are illustrated in columns (2), (3) for imports of parts and components and (5), (6) for FVA. The findings show that the coefficients in all four cases are significant and positive, meaning that a deeper agreement leads to a greater amount of GVC-related trade. When depth is defined as depth rasch, it seems to have a slightly greater effect than when measured by depth index.

In addition, the relationship between depth and trade is analyzed limiting the observations to those where countries are bound by a trade agreement. The results clearly

exhibit (see <Table 3.4>) that depth has a positive impact on imports of parts and components to a much greater degree when all observations are included.[23]

Table 3.4 Effect of PTA depth on GVC-related trade

Dependent variable (log)	(1)	(2)	(3)	(4)	(5)	(6)
	Imports of parts and components			Foreign value added in gross exports		
PTA_{ij}	0.095***			0.107***		
	(0.018)			(0.024)		
Depth rasch_{ij}		0.027***			0.047***	
		(0.007)			(0.009)	
Depth index_{ij}			0.012**			0.023***
			(0.004)			(0.005)
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	265258	265258	265258	21901	21901	21901
R-squared	0.873	0.873	0.873	0.967	0.967	0.967

Notes:
(i) FE short for fixed effects
(ii) Standard errors in parentheses
(iii) ***p<0.001, **p<0.01, *p<0.05

Table 3.5 Effect of PTA depth on GVC-related trade (Only PTA dyad years)

Dependent variable (log)	(1)	(2)
	Imports of parts and components	
Depth rasch_{ij}	0.364***	
	(0.076)	
Depth index_{ij}		0.174***
		(0.036)
Country-pair FE	Yes	Yes
Exporter-time FE	Yes	Yes
Importer-time FE	Yes	Yes
Observations	46079	46079
R-squared	0.937	0.937

Notes:
(i) FE short for fixed effects
(ii) Standard errors in parentheses
(iii) ***p<0.001, **p<0.01, *p<0.05

[23] The results for FVA were not significant.

3.3.1 The Country Group Effect of PTA depth on GVC-related Trade

The results of estimations by country group (developed and developing countries) are presented in <Table 3.5> and <Table 3.6>. In both cases, the relationship between depth and trade is only significant and positive in the case of trade agreements signed between developed countries. There is no statistically significant relationship in the case of North-South agreements and South-South agreements except for a negative relationship for South-South agreements when depth is measured by depth index and the dependent variable is FVA.

Some possible explanations are offered for these seemingly counterintuitive results by taking a more detailed look into the data. One explanation for the insignificant or sometimes negative relationship for South-South agreements is that while deeper agreements have been signed, other factors could hinder these countries' integration into value chains. Based on its history of making ambitious commitments to open their markets in order to pursue regional economic integration, it is not surprising that 19 out of 24 deep trade agreements (depth index of 5 and above) are between Latin American countries. On the other hand, imports of parts and components among Latin American countries are lower, particularly more visible when compared to Asia-Pacific countries categorized as developing countries (see <Figure 3.8>).

Countries in Latin America still face significant obstacles in fully taking advantage of opportunities provided by trade. One of those obstacles is the overly complicated and overlapping rules and standards of their numerous trade agreements. In particular, a study conducted by the OECD found that Rules of Origin (RoO) in PTAs of

Latin American countries undo more than 15% of the positive trade effect created by these agreements and more so for intermediate products (30%) (Cadestin, Gourdon, and Kowalski 2016). Furthermore, there is a lack of quality infrastructure that makes distance a much costlier component of trade. According to a study conducted by the World Bank, 70 percent of roads in Latin American countries are unpaved, which makes transport by land expensive, in addition to low port efficiency driving up costs of maritime and air transport (Bown et al. 2017).

Table 3.6 Effect of PTA depth on imports of parts and components by country group

Dependent variable (log)	(1)	(2)	(3)	(4)	(5)	(6)
	Imports of parts and components					
Depth rasch N-N	0.070***					
	(0.011)					
Depth rasch N-S		0.008				
		(0.009)				
Depth rasch S-S			-0.006			
			(0.026)			
Depth index N-N				0.034***		
				(0.007)		
Depth index N-S					0.004	
					(0.004)	
Depth index S-S						0.002
						(0.014)
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	42413	139125	83720	42413	139125	83720
R-squared		0.8728			0.8728	

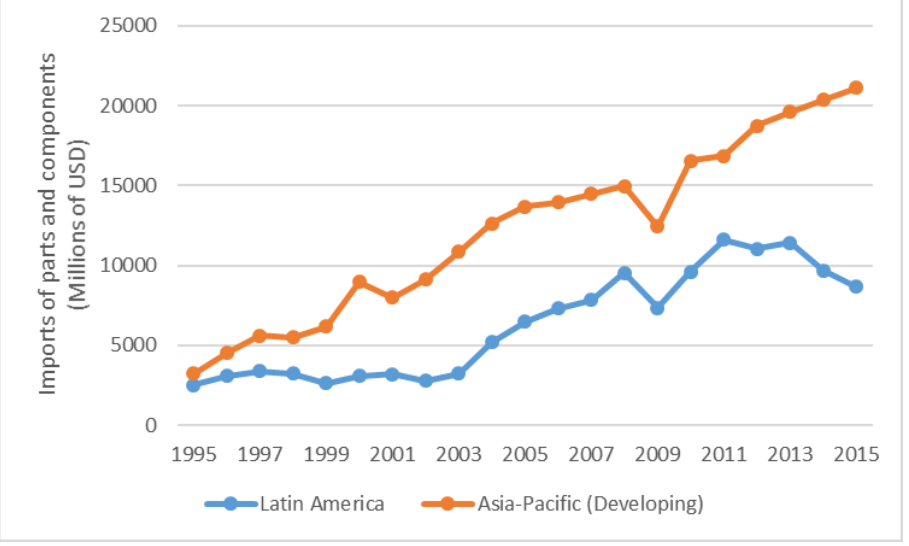
Notes:
(i) FE short for fixed effects
(ii) N short for North and S short for South
(iii) Standard errors in parentheses
(iv) ***p<0.001, **p<0.01, *p<0.05

Table 3.7 Effect of PTA depth on FVA by country group

Dependent variable (log)	(1)	(2)	(3)	(4)	(5)	(6)
	Foreign value-added in gross exports					
Depth rasch N-N	0.072***					
	(0.012)					
Depth rasch N-S		0.016				
		(0.014)				
Depth rasch S-S			-0.047			
			(0.045)			
Depth index N-N				0.038***		
				(0.007)		
Depth index N-S					0.009	
					(0.008)	
Depth index S-S						-0.049*
						(0.025)
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10835	9230	1836	10835	9230	1836
R-squared		0.9665			0.9665	

Notes:
(i) FE short for fixed effects
(ii) N short for North and S short for South
(iii) Standard errors in parentheses
(iv) ***p<0.001, **p<0.01, *p<0.05

Figure 3.8 Imports of Parts and Components:
Latin America & Asia-Pacific (Developing countries)



Source: Author's calculation using the UN Comtrade Database

IV. Conclusion

4.1 Conclusion and Contribution to Literature

This study provides evidence that the deeper the preferential trade agreement, the greater the scale of trade related to global value chains, by designating variables such as imports of parts and components and foreign value added in gross exports as measures of GVC-related trade and utilizing both depth measures from the Design of Trade Agreements (DESTA) Database. Using a gravity model with multiple fixed effects, it analyzes a panel data set of 191 countries for the period of 1995 – 2015 in the case of imports of parts and components and 61 countries for FVA over the period of 1995, 2005, 2008 – 2011.

The findings from the analysis suggest first, that the mere existence of a PTA between countries, without taking depth into consideration, increases trade. Then it proceeds to examine if PTA depth has a significant impact on GVC-related trade. Regardless of whether depth is measured using depth index or depth rasch and trade is represented by imports of parts and components or FVA, the results consistently show that signing deeper agreements leads to a greater volume of GVC trade. This implies that policymakers aiming to increase their activity in global value chains must consider behind-the border barriers to trade, as the depth measures incorporate various behind-the-border policies such as intellectual property rights, services, trade-related investment, and others.

However, when the study investigates whether the main hypothesis is supported

when agreements are categorized by country group (developed and developing country) into North-North, North-South, and South-South trade agreements, the results are quite surprising. It was hypothesized that deeper North-North and North-South agreements would be associated with a higher level of trade, particularly more so for the latter because the logic is that developing countries would be given access to developed countries' markets in return for concessions made in the negotiations process. Yet, the analysis reveals that the cause-and-effect relationship between depth and trade only holds for North-North agreements.

This could indicate that while PTAs are an important means of participating in GVCs, there may be other factors that hinder the exchange of goods in developing countries. For instance, while many Latin American countries have signed deep trade agreements, fundamental barriers to trade still exist; the lack in basic infrastructure such as paved roads and efficient ports drives up trade costs while complicated rules of origin partially cancel out the positive effects of trade agreements.

Existing studies explored this topic by constructing measures of depth that could be considered "horizontal"; the data detail the "breadth" of trade agreements so that although the overall depth of an agreement can be defined, it is not possible to distinguish whether a particular provision in one PTA is deeper than that in another (Hofmann, Osnago, and Ruta 2017). The significance of this study is that the concept of "vertical" depth is incorporated by selecting depth rasch as a measure of depth; in its construction, diverse factors that could influence depth in a particular policy area are considered instead of simply assigning a value of 0 or 1 to a policy area based on whether

a substantive or legally enforceable provision exists[24]. Moreover, this is a relatively new field of study; therefore, it is important to test the relationship between deep integration and trade associated with GVCs using different measures of depth, as it is difficult to come to the conclusion that one measure of depth is categorically superior to the others.

4.2 Limitations and Further Research

Although the findings of this study are significant, there are some limitations that could be explored in future research. The first is the lack of a precise measure of GVC-related trade both in terms of definition and coverage. The definition of imports of parts and components adopted in this study is not rigorous since it ignores fragmentation of trade that occurs in industries other than those categorized under SITC 7 and 8. For instance, sectors such as pharmaceutical and chemical products (under SITC 5), machine tools and various metal products (under SITC 6), PC software manufacturing (SITC 9) also include goods that could be classified as parts and components but are omitted because SITC Revision 3 does not provide data on production fragmentation in these sectors (Athukorala 2003). Furthermore, data on FVA is currently only available for a total of 61 countries, which excludes many developing countries, as well as only for a limited number of years. Future research utilizing FVA will be more accurate when data on FVA is provided for a wider range of countries for a longer span of years.

[24] Taking services as an example, multiple factors are considered; whether the agreement contains a reference to the liberalization of trade in services, a reference to the GATS, an MFN clause and whether a negative list approach to services liberalization is foreseen, etc. (refer to DESTA for more detailed information).

Secondly, other models to prove robustness of results were not employed nor was reverse causality investigated. While many current papers inspecting factors that impact trade continue to utilize traditional trade models, a growing number of researchers have found that models such as Poisson Pseudo Maximum Likelihood (PPML) perform better because there are drawbacks to the gravity model related to the existence of zero trade flows. Future research should explore the cause-and-effect relationship using more than one model to confirm that the results are robust. Furthermore, reverse causality, that is, the impact of GVC trade on PTA depth, was not investigated. While deep agreements can encourage countries to participate in the international fragmentation of production, the reverse could also be true; countries that are already intricately intertwined in terms of trade, especially those with significant differences in laws and regulations, would be willing to sign PTAs with their trading partners to encourage further production sharing activities (Orefice and Rocha 2014).

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Appendix A. List of Countries (191) – Imports of parts and components

Afghanistan	Cabo Verde	Eritrea	Jamaica	Myanmar	Saint Vincent and the	Trinidad and Tobago
Albania	Cambodia	Estonia	Japan	Namibia	Grenadine	Tunisia
Algeria	Cameroon	Ethiopia	Jordan	Nauru	Samoa	Turkey
Andorra	Canada	Fiji	Kazakhstan	Nepal	San Marino	Turkmenistan
Angola	Central African Rep.	Finland	Kenya	Netherlands	Sao Tome and Principe	Tuvalu
Antigua and	Chad	France	Kiribati	New Zealand	Saudi Arabia	Uganda
Barbuda	Chile	FS Micronesia	Kuwait	Nicaragua	Senegal	Ukraine
Argentina	China	Gabon	Kyrgyzstan	Niger	Seychelles	United Arab Emirates
Armenia	China, Hong Kong	Gambia	Lao People's Dem.	Nigeria	Sierra Leone	United Kingdom
Australia	SAR	Georgia	Rep.	Norway	Singapore	United Rep. of
Austria	China, Macao SAR	Germany	Latvia	Oman	Slovakia	Tanzania
Azerbaijan	Colombia	Ghana	Lebanon	Pakistan	Slovenia	Uruguay
Bahamas	Comoros	Greece	Lesotho	Palau	Solomon Isds	USA
Bahrain	Congo	Grenada	Liberia	Panama	Somalia	Uzbekistan
Bangladesh	Costa Rica	Guatemala	Libya	Papua New	South Africa	Vanuatu
Barbados	Croatia	Guinea	Lithuania	Guinea	Spain	Venezuela
Belarus	Cuba	Guinea-Bissau	Luxembourg	Paraguay	Sri Lanka	Viet Nam
Belgium	Cyprus	Guyana	Madagascar	Peru	State of Palestine	Yemen
Belize	Czechia	Haiti	Malawi	Philippines	Sudan	Zambia
Benin	Dem. People's Rep.	Honduras	Malaysia	Poland	Suriname	Zimbabwe
Bhutan	of Korea	Hungary	Maldives	Portugal	Swaziland	
Bolivia	Dem. Rep. of the	Iceland	Mali	Qatar	Sweden	
Bosnia	Congo	India	Malta	Rep. of Korea	Switzerland	
Herzegovina	Denmark	Indonesia	Marshall Islands	Rep. of Moldova	Syria	
Botswana	Djibouti	Iran	Mauritania	Romania	Tajikistan	
Brazil	Dominica	Iraq	Mauritius	Russian	TFYR of Macedonia	
Brunei Darussalam	Dominican Rep.	Ireland	Mexico	Federation	Thailand	
Bulgaria	Ecuador	Israel	Mongolia	Rwanda	Timor-Leste	
Burkina Faso	Egypt	Italy	Morocco	Saint Kitts and	Togo	
Burundi	El Salvador		Mozambique	Nevis	Tonga	
Côte d'Ivoire	Equatorial Guinea			Saint Lucia		

Appendix B. List of Countries (61) – Foreign value added in gross exports

Australia	Portugal	Malaysia
Austria	Slovak Republic	Philippines
Belgium	Slovenia	Romania
Canada	Spain	Russian Federation
Chile	Sweden	Saudi Arabia
Czech Republic	Switzerland	Singapore
Denmark	Turkey	Thailand
Estonia	United Kingdom	Tunisia
Finland	United States	Chinese Taipei
France	Argentina	Vietnam
Germany	Bulgaria	South Africa
Greece	Brazil	
Hungary	Brunei Darussalam	
Iceland	China	
Ireland	Colombia	
Israel	Costa Rica	
Italy	Cyprus	
Japan	Hong Kong SAR	
Korea	Croatia	
Luxembourg	Indonesia	
Mexico	India	
Netherlands	Cambodia	
New Zealand	Lithuania	
Norway	Latvia	
Poland	Malta	

Appendix C. List of Preferential Trade Agreements

Albania-EC	Azerbaijan-Ukraine	Chile-EC
Albania-EFTA	Bahrain-US	Chile-EFTA
Albania-Turkey	Belarus-Russia	Chile-Hong Kong
Algeria EC Euro-Med Association Agreement	Belarus-Ukraine	Chile-Japan
Andean Group Cartagena Agreement	Bhutan-India	Chile-Korea
Andorra-EU	Bosnia and Herzogovina-EFTA	Chile-Malaysia
Armenia-Georgia	Bosnia and Herzogovina-Turkey	Chile-Mexico
Armenia-Kazakhstan	Bosnia Herzegovina-EC	Chile-Panama
Armenia-Kyrgyz Republic	Brunei-Japan	Chile-Peru
Armenia-Moldova	Canada -Peru	Chile-Turkey
Armenia-Russia	Canada-Chile	Chile-US
Armenia-Turkmenistan	Canada-Colombia	Chile-Vietnam
Armenia-Ukraine	Canada-Costa Rica	China-Costa Rica
ASEAN-Australia-New Zealand FTA (AANZFTA)	Canada-EFTA	China-Hong Kong
ASEAN-China	Canada-Honduras	China-Iceland
ASEAN-India	Canada-Israel	China-Macao
ASEAN-Japan	Canada-Jordan	China-New Zealand
ASEAN-Korea	Canada-Panama	China-Pakistan
Association of Southeast Asian Nations (ASEAN) FTA	CARIFORUM-EC	China-Peru
Australia-Chile	Carribean Community and Community Market (CARICOM)	China-Singapore
Australia-Japan	Central America-Chile	China-Switzerland
Australia-Korea	Central America-Dominican Republic	Chinese Taipei-El Salvador-Honduras
Australia-Malaysia	Central America-EU	Chinese Taipei-Guatemala
Australia-New Zealand (ANZCERTA)	Central American Common Market (CACM)	Chinese Taipei-New Zealand
Australia-Papua New Guinea	Central American Free Trade Agreement (CAFTA)-Dominican Republic	Chinese Taipei-Nicaragua
Australia-Singapore	Central European Free Trade Agreement (CEFTA)	Chinese Taipei-Panama
Australia-Thailand	Chile-China	Colombia and Peru-EU
Australia-US	Chile-Colombia	Colombia Northern Triangle
Azerbaijan-Georgia	Economic Community Of West African States (ECOWAS)	Colombia-EFTA
Colombia-Mexico	EC-South Africa	EU-Serbia
Colombia-US	EC-Switzerland-Liechtenstein	Faroe Islands-Iceland
Common Economic Zone	EC-Syria	Faroe Islands-Norway
Common Market for Eastern and Southern Africa (COMESA)		Faroe Islands-Switzerland
		Former Yugoslav Republic of Macedonia-Ukraine
		GCC-Singapore

Commonwealth of Independent States (CIS)	EC-Turkey	Georgia-Kazakhstan
Costa Rica-Peru	EFTA Accession of Iceland	Georgia-Russian Federation
Costa Rica-Singapore	EFTA Israel	Georgia-Turkey
Cote d'Ivoire-EC	EFTA-Central America (Costa Rica and Panama)	Georgia-Turkmenistan
Croatia-EC	EFTA-Egypt	Georgia-Ukraine
East African Community (EAC)	EFTA-Former Yugoslav Republic of Macedonia	Gulf Cooperation Council (GCC)
East African Community (EAC) Accession of Burundi	EFTA-Hong Kong	Hong Kong-New Zealand
East African Community (EAC) Accession of Rwanda	EFTA-Jordan	India-Japan
EC (10) Enlargement	EFTA-Korea	India-Korea
EC (9) Enlargement	EFTA-Lebanon	India-Malaysia
EC Egypt Euro-Med Association Agreement	EFTA-Mexico	India-Singapore
EC Enlargement (12)	EFTA-Montenegro	India-Sri Lanka
EC Enlargement (15)	EFTA-Morocco	Indonesia-Japan
EC Enlargement (25)	EFTA-Peru	Israel-Mexico
EC Enlargement (27)	EFTA-Serbia	Israel-Turkey
EC Israel Euro-Med Association Agreement	EFTA-Singapore	Israel-US
EC Jordan Euro-Med Association Agreement	EFTA-Southern Africa Customs Union (SACU)	Japan-Malaysia
EC Lebanon Euro-Med Association Agreement	EFTA-Tunisia	Japan-Mexico
EC Morocco Euro-Med Association Agreement	EFTA-Turkey	Japan-Peru
EC Treaty	EFTA-Ukraine	Japan-Philippines
EC Tunisia Euro-Med Association Agreement	Egypt-Turkey	Japan-Singapore
EC-Faroe Islands	EU (28) Enlargement	Japan-Switzerland
EC-FYR Macedonia	EU-Georgia	Japan-Thailand
EC-Iceland	EU-Korea	Japan-Vietnam
EC-Mexico	Eurasian Economic Community (EAEC)	Jordan-Singapore
EC-Montenegro	EU-Republic of Moldova	Jordan-Turkey
EC-Norway	European Economic Area (EEA)	Jordan-US
Economic and Monetary Community of Central Africa (CEMAC)	European Free Trade Association (EFTA)	
Kazakhstan-Kyrgyz Republic	EU-San Marino	
Kazakhstan-Ukraine	Panama-Nicaragua (Panama - Central America)	
Korea-Peru	Panama-Peru	
Korea-Singapore	Panama-Singapore	
Korea-Turkey	Panama-US	
Korea-US	Pan-Arab Free Trade Area (PAFTA) or GAFTA (Greater Arab Free Trade Area)	
Kyrgyz Republic-Moldova	Peru-Singapore	
Kyrgyz Republic-Russian Federation	Peru-US	
Kyrgyz Republic-Ukraine	Russian Federation-Ukraine	

Kyrgyz Republic-Uzbekistan	Serbia-Turkey
Macedonia-Turkey	Singapore-US
Malaysia-New Zealand	South Asian Free Trade Area (SAFTA)
Malaysia-Pakistan	Southern African Development Community
Mauritius-Turkey	Southern Africa Customs Union (SACU)
MERCOSUR	Syria-Turkey
Mexico-Peru	Tajikistan-Ukraine
Mexico-Uruguay	Trans Pacific Strategic EPA
Moldova-Ukraine	Treaty on a Free Trade Area between members of the
Montenegro-Turkey	Commonwealth of Independent States (CIS)
Montenegro-Ukraine	Tunisia-Turkey
Morocco-Turkey	Turkmenistan-Ukraine
Morocco-US	Ukraine-Uzbekistan
New Zealand-Singapore	West African Economic and Monetary Union
New Zealand-Thailand	
North American Free Trade Agreement (NAFTA)	
Oman-US	
Pacific Island Countries Trade Agreement (PICTA)	
Pakistan-Sri Lanka	
Panama-Costa Rica (Panama - Central America)	
Panama-El Salvador (Panama - Central America)	
Panama-Guatemala (Panama - Central America)	
Panama-Honduras (Panama - Central America)	

Appendix D. List of Parts and Components

Division	SITC Rev. 3 Codes for Parts and Components
Power-generating machinery and equipment (SITC 71)	71191, 71192, 71280, 71311, 71319, 71321, 71322, 71323, 71332, 71333, 71391, 71392, 71441, 71449, 71481, 71489, 71491, 71499, 71690, 71819, 71878, 71899
Machinery specialized for particular industries (SITC 72)	72119, 72129, 72139, 72198, 72199, 72391, 72392, 72393, 72399, 72439, 72449, 72461, 72467, 72468, 72488, 72491, 72492, 72591, 72599, 72635, 72689, 72691, 72699, 72719, 72729, 72819, 72829, 72839, 72851, 72852, 72853, 72855
Metalworking machinery (SITC 73)	73511, 73513, 73515, 73591, 73595, 73719, 73729, 73739, 73749
General industrial machinery and equipment, n.e.s., and machine parts, n.e.s (SITC 74)	74128, 74135, 74139, 74149, 74159, 74172, 74190, 74291, 74295, 74380, 74391, 74395, 74419, 74491, 74492, 74493, 74494, 74519, 74529, 74539, 74568, 74593, 74597, 74610, 74620, 74630, 74640, 74650, 74680, 74691, 74699, 74710, 74720, 74730, 74740, 74780, 74790, 74810, 74821, 74822, 74839, 74840, 74850, 74860, 74890, 74991, 74999
Office machines and automatic data processing machines (SITC 75)	75910, 75980, 75990, 75991, 75993, 75995, 75997
Telecommunications and sound recording and reproducing apparatus and equipment (SITC 76)	76211, 76312, 76491, 76492, 76493, 76499
Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (SITC 77)	77129, 77220, 77231, 77232, 77233, 77235, 77238, 77241, 77242, 77243, 77244, 77245, 77249, 77251, 77252, 77253, 77254, 77255, 77257, 77258, 77259, 77261, 77262, 77281, 77282, 77311, 77312, 77313, 77314, 77315, 77316, 77317, 77318, 77322, 77323, 77324, 77326, 77328, 77329, 77423, 77429, 77549, 77557, 77579, 77589, 77611, 77612, 77621, 77623, 77625, 77627, 77629, 77631, 77632, 77633, 77635, 77637, 77639, 77641, 77642, 77643, 77644, 77645, 776446, 77649, 77681, 77688, 77689, 77812, 77817, 77819, 77822, 77823, 77824, 77829, 77831, 77833, 77834, 77835, 77848, 77869, 77879, 77883, 77885, 77886, 77889
Road vehicles (SITC 78)	78421, 78425, 78431, 78432, 78433, 78434, 78435, 78436, 78439, 78535, 78536, 78537, 78689
Other transport equipment (SITC 79)	79199, 79291, 79293, 79295, 79297
Furniture and parts thereof (SITC 82)	82111, 82112, 82119, 82180
Measuring, checking, analyzing and controlling instruments and apparatus, n.e.s. (SITC 874)	87412, 87414, 87424, 87426, 87439, 87449, 87454, 87456, 87469, 87479, 87490
Photographic apparatus, equipment and supplies and optical goods, n.e.s; watches and clocks (SITC 88)	88112, 88113, 88114, 88115, 88123, 88124, 88134, 88136, 88210, 88220, 88230, 88240, 88250, 88260, 88310, 88390, 88415, 88417, 88419, 88421, 88422, 88431, 88432, 88433, 88439, 88551, 88552, 88571, 88591, 88596, 88597, 88598, 88599

국문초록

깊은 경제적 통합과 글로벌 가치사슬: 무역협정의 통합수준이 글로벌 가치사슬 무역에 미치는 영향에 대한 실증분석

본 연구는 무역협정의 통합수준이 글로벌 가치사슬 무역에 미치는 영향을 실증적 분석을 통해 검증하는 것을 궁극적인 목표로 한다.

지난 수십년 간 글로벌 가치사슬이 확산·심화되는 것과 동시에 무역협정 체결 또한 1990년대부터 꾸준히 증가하고 있는 추세이다. 관세 같은 국경의 문제뿐 아니라 국경 너머의 지적재산권, 공공조달, 투자 등과 관련된 규정을 다룸으로써 더 깊은 통합을 꾀하고 교역을 활성화 시키려는 지역무역협정들이 더 많아지고 있다.

본 연구에서 글로벌 가치사슬 무역을 나타내는 두 가지 종속변수(부품수입, 총수출에 포함된 해외창출 부가가치)와 무역협정의 통합수준을 나타내는 독립변수(무역협정의 깊이)를 지정한 후 고정효과 패널모형을 사용하여 실증적으로 분석하였다. 종속변수가 부품수입인 경우 1995년부터 2018년까지 191개국에 대하여, 총수출에 포함된 해외창출 부가가치인 경우에는 1995년, 2005년, 2008 – 2011년의 기간에 걸쳐 61개국에 대하여 무역협정의 깊이가 글로벌 가치사슬 무역에 긍정적 영향을 미치는 것을 확인하였다. 또한, 선진국 간 무역협정, 선진국과 개발도상국 간 무역협정, 그리고 개발도상국 간 무역협정으로 구분한 분석에서 무역협정의 깊이가 선진국 간인 경우에만 글로벌 가치사슬 관련 교역에 긍정적인 효과가 있는 것으로 나타났다.

주요어: 글로벌 가치사슬; 무역협정; 무역협정 설계; 무역; 패널 데이터 분석

학번: 2016-23819