COMMERCIAL RELATION KOREA (REP. OF)–COLOMBIA 2014–2019: ECONOMIC OVERVIEW OF MERCHANDISE TRADE

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF EQUATIONS

INTRODUCTION

Over the last two decades, Asia Pacific has become one of the most influential regions for the global economy. The countries in this region, including China, Japan, India, and South Korea, have become epicenters for global trade, consolidating as world-class exporters and importers. Thus, many countries around the world, including Colombia, have become increasingly interested in boosting their trade and investment flows from and towards the Asia Pacific. This region has become Colombia's second most important trade partner behind the Americas, surpassing more traditional partners like the European Union. One of the milestones for Colombia in this process was the negotiation of a Free Trade Agreement (FTA) with Korea. This agreement came into force in 2016 and was the first between Colombia and an Asian market (Roldan & Viera, 2015, p. 21). As the agreement has already been in effect for five years, its impact on the Colombian and Korean economies can begin to be assessed. In consequence, the research question to be answered by this document is: what has been the nature, volume, composition, and variation of the trade relation of goods between Colombia and Korea from 2014 to 2019, and how has it been affected by the entry into force of the FTA between them?

Over this four-year period, after the treaty took effect, Colombian exports to this Asian market reached a historical peak in 2018 (627 million dollars) but declined the following year, while Korean exports to Colombia dropped to the lowest value of the decade (656 million dollars in 2019, data from Trade Map). This scenario raises questions related to an absence of sustained trade growth, despite facilitation measures and tariff reductions, and what has driven these variations. These inquiries make up the object of this study. However, it is essential to acknowledge that modern FTAs aim to positively impact the relationships between countries above and beyond market liberalization. In the case of Colombia and Korea, this instrument is the result of a transition in mutual relations from traditional friendship towards an association for strategic cooperation, a process originated by old diplomatic and political ties that have intensified since 2006–2008 (Jong Yun, 2015. p. 36).

To properly address this issue, I present a granular, industry-level description of how Korea–Colombia bilateral trade flows are constituted and how they differ from each party's trade profile towards the rest of the world. This overview works as an input for local policymakers in both countries to guide incentives and implement programs that will foster industries with the potential of entering or increasing their share of the counterpart's market. This analysis also serves as a diagnostic of trade relation soundness, providing evidence on concentration or diversification, the level of transformation of the main goods, price volatility exposures, and changes in economic indexes, providing firms interested in becoming a part of this trading scenario with an idea of the terrain they are stepping into.

The study brings up to date relevant information gathered and analyzed initially for the feasibility studies conducted before starting negotiations. Important changes have taken place as of that time and, although the intention of both parties to foster trade remains unchanged, the treaty's object has been altered by recent international dynamics and foreign market shocks. In consequence, this analysis can be used by diplomatic and

liaison officials from both sides as an updated blueprint for adjustments required by the cooperation agenda and the main challenges to sustained trade growth. Similarly, it provides an important baseline for the institutions and bodies created by the treaty who are responsible for defining its coverage, monitoring its implementation processes, and assessing its evolution.

The main objective of this study is to assess the evolution of Colombia–South Korea trade relations before and after the implementation of the FTA (2014–2019) between them, to provide insights into its effects.

Successfully achieving this objective requires examining its main characteristics, patterns, and dynamics by employing applied economic tools like indexes, empirical estimations, and descriptive statistics for indicators, with the following specific objectives:

1. Provide a general overview and lay out the most important tariff and non-tariff concessions under the FTA.
2. Examine the economic outlook of both countries during this period, providing the reader with an appropriate context to analyze its evolution.
3. Analyze the evolution of bilateral trade before and after the implementation of the agreement, including intra-industry trade.
4. Estimate the relationship between trade flows and the entry into force of the agreement
5. Develop a case study on the market concentration of fruit and nut exports from Colombia to Korea.

These objectives define the structure of this document. After this introductory segment that comprises the conventional literature review and methodological description, the first section describes the agreement between Colombia and Korea with a particular focus on market access conditions (including tariff and non-tariff concessions). The second section describes both nations' macroeconomic performance and foreign trade profiles in terms of their most important indicators and how they compare to relevant benchmarks, the evolution of such metrics, their market trends disaggregated at the section and chapter level of the Harmonized System, and their partners. The third section provides a snapshot of aggregated trade between the two countries over the entire period and its year-over-year evolution. This section also includes the results of an intra-industry trade analysis. The fourth section assesses the impact of trade liberalization on the volume of trade between Colombia and Korea by regressing yearly exports on tariffs among clustered headings (HS at the four-digit level), controlling for time-varying and unit-fixed characteristics, and defining a counterfactual third country. The fifth section of the study analyzes the effects of trade liberalization —considering the heterogeneity of exporting firms— on market share concentration and the number of participants in the edible fruits and nuts (HS-08) export market from Colombia to Korea, which is the chapter that

experienced the highest growth during the reference period. The results and observations obtained throughout these five sections are discussed at the end of this document, providing the reader with conclusions and recommendations for getting the greatest benefit out of the agreement and understanding its impacts.

1. LITERATURE REVIEW

This work is influenced by three different economic, trade, and policy literature strains: the broadest one, which serves as the primary source of inspiration for the narrative part of the study, comprises congressional reports and policy briefings. The second bibliography stream builds on geographical criteria to incorporate elements of studies for which the object are trade flows between East Asia and Latin America, particularly between South Korea and Colombia. The third one is a methodological standpoint guided by empirical studies that use product categories instead of countries as unit of analysis for their econometric foundation and detach from the traditional gravity approach.

From the first type of publications, the main baselines are the Policy Briefs of the Peterson Institute for International Economics (PIIE), distinctly *An Assessment of the Korea-China Free Trade Agreement* (Cimino-Isaacs et al., 2015.), and *The Korea-US Free Trade Agreement: A Summary Assessment* (Schott, 2007); and documents issued by the Congressional Research Service for members and committees of the United States Congress; particularly, *The North American Free Trade Agreement (NAFTA)* by Villarreal & Fergusson (2017) served as a guideline for the overview of provisions.

The aforementioned report by Villarreal & Fergusson (2017) explains trade trends and patterns in regional commercial flows after NAFTA entered into force. Instead of establishing a causal effect between the agreement and trade patterns, it characterizes them at the partner and product level, emphasizing key sectors of the previous years' developments. Using a similar approach, Cimino-Isaacs et al. (2015) read on the dept of liberalization of the Korea–China FTA while providing background on the two countries' trade relation between 2000 and 2014 in services and merchandise. They decompose the study by sector and summarize each party's investment position compared to the global trend. The FTA analysis centers on trade liberalization, the pace at which it happens, the description of the sensitive list of goods and tariff lines excluded from liberalization, and how it compares to other FTAs signed by Korea. It also includes notes on the rules of origin and criteria for benefiting from the agreement, which paths the selection of normative topics explored under this study.

Along with the descriptive narrative, Kang (2017) reviews Korea and the European Union economic relations, emphasizing the FTA between the nation and the Economic Area, which entered into force in July, 2011. The research sets out the background, both political and economical; provides a briefing on the negotiations; and examines trade statistics for the years 2011–2015, analyzing important metrics such as trade balance, total imports from the world, and overall economic performance of studied subjects.

From the second typology of studies, Roldán et al. (2013) characterize the commercial dynamics between the Asia Pacific (ASEAN +6) and the Pacific Alliance (Chile, Colombia, México, and Perú) through the lenses of intra-regional, inter-regional, and intra-industrial commerce. They compute the Grubel-Lloyd index (GLI) on country pairs and make a sectorial analysis of nine key industries for 2007–2011, which serves as the foundation for the second part of Objective 3. This work also provides structure for Objective 2, as it summarizes the trade and commercial profile of the two regions through many relevant indicators for this research. The conclusions present Asia Pacific's strong tendency to export highly value-added products, while the Pacific Alliance's exportable offer centers around primary goods, but recognizes the potential for intra-industry trade in the automobile, information and communications technology (ICT), electrical and healthcare sectors (p. 58).

Ariza (2020) recently studied the particular trade flows between Colombia and South Korea. The author develops a literature review on the causes of trade and summarizes the main currents and authors on international trade. Then synthesizes the features of the commercial profiles of both countries over the last century; performs a more in-depth analysis on the sectoral level for the years 1993 and 2013; depicts the trade flows for the same period; and computes the Revealed Comparative Advantage index for three periods (1993, 2003 and 2013) at the chapter —two-digit— level. The researcher briefly lists some aspects of the agreement, such as tariffs, sanitary and phytosanitary measures. Finally, she estimates the impacts of a series of factors (GDP, distance, trade costs, adding dummies for a common language, colonial ties, landlocked countries, and free trade agreements) on both the exports and imports of Korea to the world, using data from 1993 to 2013. The empirical study on both the import and export regressions showed no significant correlation between the dummy variable FTA and the dependent one when employing a FE estimation model with autocorrelation correction, the study's baseline estimation.

Sector-specific studies like those conducted by Peláez & Núñez (2020) for vegetable categories (avocadoes) evidenced difficulties for Colombian agricultural products to enter the Korean market due to strict regulatory conditions associated with risk analysis, even after the treaty's entry. In a different study, Castillo (2018) compared quarterly imports of vehicles and their parts a year prior and posterior to the FTA's enforcement. The author highlighted a reduction of the share of South Korean automobiles in Colombian imports and concluded that the FTA had affected only some Korean exports of parts, the most variation being accounted for by fluctuations on the business cycle, rather than by the FTA effects.

The most comprehensive work on the relations between Korea and Colombia, edited by Roldan & Viera (2015), brings a broad compilation of studies that summarize the Korean context over the last 60 years, the role of the country in the Pacific region, the figure of association for strategic cooperation, as well as the treaty and its main features. For Objective 1, this project builds on the comparative analysis of the FTA *vis-à-vis* other agreements between Korea and Latin American nations developed by Pérez & Roldán in Chapter V and the description of the main features of the agreement made by Gamboa & Saldarriaga in Chapter VI.

Regarding the third literary source, while international trade literature focuses on discriminatory trade policy, mainly preferential trade agreements (PTAs) (Gnutzmann-Mkrtchyan & Henn, 2018), the majority of studies base their empirical strategy on the gravity model and its different strains. Among the vast, empirical gravity literature, aggregated trade flows are expected, and disaggregating data at highly-specific sector levels is a less usual practice; however, works that do so find great variance on the effects of PTAs across sectors (Anderson & Yotov, 2016), higher effects when tariffs drop to zero (Gnutzmann-Mkrtchyan & Henn, 2018), as well as different product-level —proxied by the six-digit level of the Harmonized System— elasticities (Fontagné et al., 2020).

Yotov et al. (2016) conclude that aggregation practices should be avoided, as many trade policy sources are negotiated and conceived at the sector level, and policy instruments' effects may vary across sectors. Limão (2016) emphasizes the heterogeneity of the impact of PTAs and points as alternative approaches to minimize sample problems, while allowing for heterogeneous effects, to use disaggregated data to specific agreements, an example being the methodology of Clausing (2001) for the Canada–US Free Trade Agreement (CUSFTA). Although multi-dimension structural gravity captures cross-product variations, there is not enough data available for this work's object study to compute such a model. However, as Clausing's sector-specific approach fits this project's objectives, it is clear and has provided significant evidence in previous studies; it will be employed as the empirical strategy to assess the effects of eliminating tariff barriers across different products or sectors for a particular FTA, this method is further explained in Section 6.2 to allow through some other pertinent material in this review.

One of the first studies that set a precedent for this exercise was elaborated by Kreinin (1961) over products that experienced tariff reductions due to the GATT negotiations of 1955 and 1956 and its immediate substitutes, not subjects to such a benefit. One of the main advantages of this research is that there was available data for the Free on Board (FOB) prices. For this reason, the author examined variations in trading volume, quantities, and prices. The analysis concluded that foreign suppliers captured the most benefits associated with concessions granted by tariff reductions. At the same time, there was a limited impact for the final consumer in the US.

Some authors have chosen to analyze a limited number of chapters from the HS system. Roldán (2018) adopts such an approach to studying the impacts of FTAs on agricultural exports of México, Chile, and Perú to Japan, China, and Korea from a gravitational framework. Her findings show that, at the product level, agreements have only had positive effects on certain agricultural products, while in other cases, the effects were negative. These results accentuate the need for more cross-product studies, like this proposal.

2. METHODOLOGY

The project has a mixed, multi-staged approach, incorporating both quantitative and qualitative analysis. These stages were defined considering both the best practices in the current literature about free trade agreements and the defined objectives.

During the first stage, I provide a comprehensive overview of the FTA, including its most important tariff and non-tariff benefits to firms, all enclosed by Objective 1. This overview is based on the qualitative analysis of the regulation retrieved from the Foreign Trade Information System of the Organization of American States (http://www.sice.oas.org/) and some concordances and related norms.

Through a second stage, comprised mainly of Objectives 2 and 3, I rely on the World Bank's Development Indicators and build on the tools provided by the Observatory of Economic Complexity (OEC) —particularly Vizbuilder, the remaining figures are created on Excel— to construct a narrative steered by descriptive statistics of parallelistic nature, i.e., comparing a country to a reference group, to its counterparty, or a general aspect to a particular one within a nation.

The third stage, which encompasses the quantitative analysis, comprises three main estimations: the Grubel-Lloyd index (GLI) of intra-industry trade in Objective 3, the econometric models from Objective 4, and the Herfindahl-Hirschman index (HHI) for Objective 5. These computations are analyzed in light of the FTA provisions from the first stage and information obtained during the second stage to provide conclusions. The most important findings of the previous stages are included in a case study that illustrates the industry-specific benefits of the FTA and outlines strategies for Colombian exporters. The data sources are provided in each section.

Distortive effects of inflation are set aside whenever possible, measures of currencies in current values are taken only when there is unavailable data, when informatic instruments work only with them —such is the case of graphs built with visualization tools of the Observatory of Economic Complexity— or when it is required for comparison purposes. Constant 2010 USD are used to estimate aggregated trade, trade as a percentage of GDP, and yearly growth rates of exports and imports.

Variables that display continuous growth throughout an analyzed period take their most recent value. In contrast, those that fluctuate over the timespan take the period's average, unless otherwise indicated.

3. THE FREE TRADE AGREEMENT BETWEEN KOREA AND COLOMBIA: BACKGROUND, TARIFF, AND NON-TARIFF CONCESSIONS

The treaty between Colombia and Korea, which entered into force in July 2016, is a last-generation agreement of broad scope divided into 22 chapters. It encompasses a broad

assortment of topics ranging from market access to industrial and agricultural goods to technical barriers to trade and sustainable development.

The first part of this section, through this introduction, defines the broader bond into which this instrument circumscribes and gives origin to it. Secondly, I highlight the most important aspects of the negotiation process with emphasis on the conclusions of the feasibility studies conducted prior to the formal beginning of the negotiations (3.1 *Background*). The study then introduces tariff concessions (3.2), non-tariff measures (3.3.), such as rules of origin and sanitary and phytosanitary measures, and finally, some remarks about the preceding analysis (3.4).

The FTA is motivated and framed within a broader dynamic: the association for strategic cooperation established in 2011 between the two nations, which entails a wide-ranging spectrum of components such as academic, cultural, and economic exchanges (Roldan & Viera, 2015, p. 28); increasing rates of development aid; constant dialogues between high-profile government officials; and actions to foster investment flows (Mejía Arango, p. 25).

The materialization of this dynamic comes after Colombo-Korean relations deepened and heightened swiftly through 2006–2008, a period Jong Yun (2015, p. 36) —former Ambassador of Korea in Colombia— identifies as the trend-breaking drift from traditional friendship towards substantial cooperation; although the former bonds can be traced back to Colombia's participation on the Korean War (1950–1953) and the subsequent establishment of permanent representation relations since 1962 (Seoul National University, 2009, p. 8), the latter had taken place only recently, when Colombia was granted acknowledgment as a prioritized country from Korea's foreign policy (Gamboa & Saldarriaga, 2015, p. 197).

Colombia's strategy of progressive rapport-building with the Asia Pacific Region —first a Government's initiative incorporated into the National Plans for Development (*Plan Nacional de Desarrollo*)— has evolved to become a State Commercial Policy through the last decades. Further developments on this line include the formation of the Pacific Alliance —acting as a block with Chile, México, and Perú— to jointly access markets in East Asia, as well as the negotiation of an economic association with Japan since 2012 (Gamboa & Saldarriaga, 2015. p. 197). Aligned with Colombia's strategy to diversify its export destinations and enter Asian markets, Korea wanted to establish its presence as a good, service, and investment provider in emerging markets (pp. 198–202). The interests of the two states served as a synergic convergence towards a common agenda to benefit firms from both parties and enhance overall economic performance.

Against this backdrop, Bradford Sicard (2015, p. 22) has identified an outstanding opportunity for Colombia to capitalize on the opportunities offered by this association for strategic cooperation: to make use of available technological, human, and financial resources from the Asian nation, to exploit learning-transfer processes, and to add value to its productive structure. For many others (Procolombia, 2016; Cámara Colombo Coreana de Comercio e Industria, 2009; and Legiscomex, n.d.-a), the first treaty that Colombia signs with a country from the Asia-Pacific region is envisioned as an access door into new markets in the most dynamic part of the world.

3.1. BACKGROUND

Negotiations between Korea and Colombia to establish a free trade zone began in Seoul on December 7, 2009, following the signature of multiple memorandums of understanding for cooperation in industrial, energy, and information technology matters. In this first meeting, both countries' chief negotiators defined the agreement's structure, modalities, and coverage. After seven rounds and multiple negotiation tables, the process culminated in June 2012 (Legiscomex, n.d.-b). Trade ministers of both parties signed the agreement on February 21, 2013, and it entered into force on July 15, 2016 (Organization of American States, Foreign Trade Information System).

Before formally starting the negotiation, the parties' governments commissioned independent academic institutions and representatives of the private sector to conduct studies to determine a doable agreement's mutually beneficial nature. From Korea's perspective, Seoul National University (2009) identified Colombia's economy as relatively stable compared to the region since it did not report hyperinflation nor experienced the paroxysmal moratorium effect suffered through the 1980s debt crisis (p. 9). It also counted, the report asserted, with a steady exchange rate, enhanced macroeconomic indicators on the financial sector (p.25), and an improved business environment (p.53).

Despite well-known public order concerns, the study acknowledged that the country's democratic institutions prevail, and recent government efforts have improved security conditions, diminished violence rates, and weakened illegal armed groups.

The university characterized the trade relationship between the two countries as inter-industry —taking 2003–2008 as reference period— for imports from Colombia were mainly crude materials, food, and live animals. At the same time, products exported by Korea were highly technology-intensive, like telephones and vehicles (p.43).

Through the potentiality matrix, the study showed that from 630 products Colombia was an efficient producer (measured as a Revealed Comparative Advantage index above 1) only 108 were exported to Korea, mainly coffee (excluding roasted and decaffeinated), light oils and preparations of petroleum or bituminous minerals, ferronickel, and bananas. Among the listed group, 286 goods were being exported to neighboring Asian countries but not Korea, which implies low technical impediments (p.120) and high trade potential once tariff barriers are lowered or removed; this list includes crude petroleum and bituminous oils, bituminous coal, shrimps, and roses.

From Korea's viewpoint, the country has a comparative advantage over 798 products, from which 502 were being exported to Colombia, mainly motor cars and other vehicles, medium preparations from oil and bituminous minerals, and parts and accessories of automatic data-processing machines. Dimethyl terephthalate, elevators, ethanediol, and caustic soda were some of the products traded between Korea and Colombia's neighbors but not Colombia; these products were also likely to enter the bilateral flow once trade barriers lower (pp. 128–135).

The study uses a Computable General Equilibrium Model (CGE) to estimate the impact of tariff reductions; the predicted outcome suggests a small but positive effect of 0.018% of Korea's real GDP, a 0.035% rise in imports, and a 0.030% increase in exports. Korean sectors most benefited by the FTA included machinery and transport equipment, textiles, chemicals, rubbers, and plastic. For Colombia, it forecasts a positive effect of 0.022% in the GDP, a 0.12% increase in imports, and a 0.12% rise in exports (pp. 137–141), with higher gains for agro-industrial products, fishing, wearing apparel, and ferrous and non-ferrous metal products.

Seoul National University's work concludes that both countries' economic structures complement each other, as Colombia's main imported products —machinery and transportation equipment— are Korea's top exports to the world, and Korea's main imports are Colombia's main exports —natural resources (pp. 142–143). It found that primary investment opportunities for Korean capital in Colombia are also linked to natural resources availability, specifically, oil and gas (p.93). These hold potential for further exploitation due to the abundance of under-explored basins, accompanied by a decent infrastructure of refineries, pipelines, and export terminals (p.94).

From Colombia's side, the *Feasibility analysis of a Free Trade Agreement Between Colombia and the Republic of Korea* (Forero et al., 2009) elaborated by Fedesarrollo, explained that approximations for trade enhancement originated, among other reasons, by the interest of both countries in accessing the regional markets within each counterparty was immersed. In this sense, Colombia's strategy of entering Asia-Pacific markets met Korea's intention to stimulate the transfer of know-how as an instrument of economic integration with other regions of the world (p.66).

This study highlights Colombia's advantages as an attractive partner for Korea, mainly through its growth over the region's average for the study's previous years. This accelerated phase has different sources, driven by exports and inward investment, partly due to enhancing the business environment and security conditions (pp. 3–6). Diversified growth reduced exposure to international shocks and presented an advantage against other countries in Latin America. Colombia, Fedesarrollo reported, is also an attractive investment option in areas where Korea is interested, such as oil exploration.

As for the FTA's potential effects, through a CGE, the work estimated an increase of over 0.5% of Colombia's GDP in a 10-year period (p.63). Finally, the document concluded high complementarity between the two economies and trade opportunities through the Revealed Comparative Advantage measure. Such prospects are linked to coal, refined sugar items, crude oil and gas, and steel for Colombia. For Korea, they are concentrated on telephone, radio and television transmission electronics, textiles and basic chemicals, cars, and special-use machinery industries (p. 67).

Among the main challenges faced through the negotiations were differences concerning the treatment of Colombian milk exports. After several debates, both parties' representatives decided to grant the tariff elimination through 10 to 16 years for dairy products such as cheese and whey, and a quota of 100 tons for powdered milk (Polanía, n.d.).

3.2. TARIFF BARRIERS AND LIBERALIZATION SCHEDULE

Section B of the agreement's Chapter II governs market access for goods through the progressive elimination of customs duties. Efforts in this direction frame the prohibition, unless otherwise indicated by the treaty, to increase existing customs duties on originating goods or create new ones (Article 2.3. numeral 1) and the mandate to follow the liberalization schedule (Article 2.3 numeral 2). To fulfill this purpose, the agreement sets one category of immediate tariff removal, listed as category 0; 12 common categories of progressive elimination through equally distributed reductions of escalated stages in 3, 5, 7, 10, 12, 15, 16, and 19 years; and a cluster for which goods remain at base rate, labeled as category E (Annex 2-A, literal j). All progressive elimination categories' escalation begins the day the treaty comes into force and ends duty-free effective January 1 of the relevant year. The treaty enters into force, pursuant to article 22.4, 30 days after the written notification receipt by the counterparty, indicating legal procedures have met on whoever is last on fulfilling domestic approval, or any other agreed by the parties. The reported date of enforcement on the Foreign Trade Information System is July 15, 2016.

Additional to common categories, five party-specific staging lists are applied only by Korea: 12-A, 13, 16-A, 16-S, and X. For the first two, subscripted by A, customs duties remain through a two-year grace period at base rates, after which they are progressively removed through equally distributed annual reductions, either of 10 —for 12-A— or 14 years —for 16-A. Category 13 functions the same way common categories for progressive elimination do. Category 16-S subjects tariff rates to the moment they enter Korean territory. For goods listed within this group that enter from May to October, customs duties remain at base rate; for those entering from November to April, tariff rate lowers in the same way common categories for progressive elimination do, through 16 annual stages. Goods listed in category X are entirely excluded from the customs duties obligations derived from the treaty.

Among Korean primary imports from Colombia on the liberalization schedule, category 0 included coffee and 98% of tariff lines of industrial goods, while coffee preparations, extracts, and essences, such as instant coffee, were placed in category 3. Flowers were distributed among categories 3 and 5; fruits among 5, 7, 10, 12, and 16; most vegetables were located among categories 5, 7, 10, and 16; cigarettes and tobacco in 10 and 16; and alcohol in 18-A (Gamboa & Saldarriaga, 2015, pp. 209–222).

Table 1 displays the variation of Korean customs duties on Colombian goods from 2015 to 2018 at the four-digit level, both as the number of product categories and as a percentage from the entire tariff universe, clustered by ranges.

Table 1. Korean Tariffs on Colombian Goods (2015 and 2018)

Tariff	2015		2018	
	No. of product categories	Percentage	No. of product categories	Percentage
Free trade	155	12.77%	985	81.27%

Tariffs under 5%	149	12.27%	83	6.85%
Tariffs between 5% and 10%	714	58.81%	41	3.38%
Tariffs between 10% and 25%	12	9.23%	50	4.13%
Tariffs over 25%	84	6.92%	53	4.37%

Note. Tables 1 and 2 do not include 2019 due to the unavailability of information for Korean tariffs this year. Data from Market Access Map.

Colombia's tariff Schedule has four party-specific categories: 9, 18, 18-A, and 20. For goods listed in category 18-A, customs duties remain through a five-year grace period at base rates, after which they are progressively removed through equally distributed reductions in annual stages. Categories 9, 18, and 20 function the same way common categories for progressive elimination do.

Article 2.3.3. states that a party's Most Favored Nation customs duty shall be applied to bilateral trade if it goes below the rate resulting from the schedule's computation. Colombia shall apply a preferential costumes duty rate 0.5% inferior to MFN in such a case (General notes of the Tariff Schedule of Colombia, numeral 4).

Among Colombia's main imports from Korea, vehicle parts were included into categories 0 and 5, while vehicles were assigned to category 10, cellphones to category 0, and freezers and refrigerators to category 12 (Gamboa & Saldarriaga, 2015, pp. 209–222).

Table 2. Colombian Tariffs on Korean Goods (2015 and 2018)

Tariff	2015		2018	
	No. of product categories	Percentage	No. of product categories	Percentage
Free trade	415	33.93%	641	52.50%
Tariffs under 5%	241	19.71%	234	19.16%
Tariffs between 5% and 10%	176	14.39%	216	17.69%
Tariffs between 10% and 25%	318	31.15%	123	10.07%
Tariffs over 25%	10	0.82%	7	0.57%

Note. Data from Market Access Map.

As both Tables 1 and 2 display, Korea has been faster than Colombia at reducing and suppressing tariffs, setting 81.27% of goods as free trade for 2018, while the latter assigned 0 duties only to 52.50% of Korean imports for the same year; although Colombia has further reduced very high tariffs, keeping only 0.57% of tariff lines subjected to customs duties over 25%, by 2018 while Korea still applies such margin to 4.37% of Colombian goods.

Pérez & Roldán (2015, pp.176–184) provide a comparative outlook of the Colombo-Korean tariff liberalization schedules at the six-digit level *vis-à-vis* the FTAs signed with Perú and Chile. Being more disaggregated, these results yield different values than the ones set forth previously, particularly higher when tariffs are reduced to zero. From this standpoint, 1.4% of excluded goods from the liberalization schedule applied to Colombia is relatively high against 0.2% for Chile and 0.9% for Perú, although in

absolute terms still very low. Conversely, Korea granted broader immediate liberalization to Colombia (82.4% of subheadings), when compared to Chile (81.7%) but less than Perú (84.5%).

As for access for Korean access into Latin American markets, Colombia's immediate removal of tariffs (60.6%) was much higher than Chile (41.4%) and a little smaller than Perú (67.9%). Conversely, Colombian excluded categories (0.7%) were more than those by Perú (0.1%) and less than those by Chile (0.9%).

3.3. NON-TARIFF MEASURES

Section D of Chapter II regulates *'Non-tariff measures'* such as import licensing procedures (Article 2.9) and export duties (Article 2.11). The former are defined through Article 2.17 (definitions) as administrative procedures or documentation, additional to those usually required for clearance, needed to submit before importing. Import licensing procedures shall be notified to each counterparty after the treaty's entry and be consistent with the Agreement on Import Licensing Procedures. Export duties were prohibited, unless they apply to the good also when destined for domestic consumption (Article 2.11). Even in this case, some contributions charged to coffee (Law No. 101 of 1993) and emeralds (Law No. 488 of 1998) were exempt through Annex 2.11.

An essential set of controls listed as *'Other Measures'* in section E of Chapter II are agricultural safeguard measures (Article 2.13); these take the form of increased duties once imports from origin exceed a yearly benchmark. According to Annex 2-B schedule, triggering levels in agricultural products increase their volume annually until year 20 or 21 —this last period applies only to mandarins entering Korea, coded 0805.20.9000 of the Harmonized Tariff Schedule of Korea, henceforth HSK— when suppressed. Once triggered, agricultural safeguard measures raise tariffs to the lesser option between (a) the prevailing MFN applied rate; (b) the MFN rate of the day immediately preceding the entry into force of the agreement; or (c) the duty rate of schedule Annex 2-B (Article 2.13.2 literals a, b and c). The treaty lists agricultural safeguard measures by Korea in beef (HSK 0201.30.0000, 0202.30.0000) and mandarin (HSK 0805.20.9000); by Colombia only in beef (HTSC 0201.30.00, 0202.30.00)

Among other measures in Section E, agricultural export subsidies are prohibited by Article 2.14, and this chapter's review and implementation are in charge of the Committee on Trade in Goods created by Article 2.16.

The regime on tariff rate quotas (TRQs) is partly modified by the treaty as Colombia and Korea's originated products are excluded from the in-quota count of each counterparty's Harmonized Tariff Schedule (Appendix 2-A-1, numeral 1). The agreement also allows duty-free importation to Colombia from Korea of 100 metric tons yearly of goods listed under lines 04021010, 04021090, 04022111, 04022119, 04022199, and 04022199 (Milk and cream concentrated or containing added sugar or other sweetening matter in packing of a net content not exceeding 2.5 kg and others) of the Harmonized Tariff Schedule of

Colombia (Appendix 2-A-1, numeral 2) and to Korea from Colombia of 100 metric tons of duty-free importations of goods listed under lines 0402101010, 0402101090, 0402109000 (skimmed milk powder and others) and 0402211000, 0402219000 (whole milk powder and others) of the Harmonized Tariff Schedule of Korea, once these goods exceed these quantities they receive category E treatment.

Chapter VI seeks to prevent standards, technical regulations, and the processes to verify accordance with such requirements —conformity assessment procedures (CAP)— from constituting unnecessary trade obstacles; to this end, the treaty incorporates the Technical Barriers to Trade Agreement (Article 6.2); requires each party to base its technical regulations and CAP on relevant international standards, guides, and recommendations (Article 6.4. numeral 1); fosters transparency (Article 6.7) by calling each signatory to notify its counterparty of the amendments and new technical regulations or proposals thereto; and creates the Committee on Technical Barriers to Trade (Article 6.9) to facilitate, monitor the chapter's implementation, and address issues derived from it.

The agreement devotes particular attention to Rules of Origin, some of the most challenging NTMs to trade. Under Section A of Chapter III, a good's treatment as originating follows the satisfaction of one condition among being wholly obtained or produced in one or both parties' territory (Article 3.1., lit. a, i); fulfilling all specific requirements applicable from Annex 3-A pertaining processes conducted in one or both parties' territory (Article 3.1., lit. a, ii); being produced entirely in one or both parties' territory out of originating materials only (Article 3.1., lit. a, iii), or satisfying all other requirements of the chapter.

The first category of goods, wholly obtained or produced in the parties' territories, comprise mostly natural resources such as mineral goods extracted from the land of either parties (Article 3.2., lit. a), vegetables grown and harvested within national borders (Article 3.2., lit. b), live animals born and raised in one or both parties and the goods they produce (Article 3.2., lit. c), and marine life taken from outside the territories when captured by a registered or recorded vessel under a party and entitled to its flag (Article 3.2., lit. f).

For the second category, goods that fulfill all product-specific requirements of processing, qualification as originating relies on different criteria, such as a determined level of regional value content, computed through either: (a) the ratio of the difference between the adjusted value of the good and the value of non-originating materials to the adjusted value, for the build-down method (Article 3.3, numeral 1, lit. a), or (b) the value of originating materials to the adjusted value for the build-up method (Article 3.3, numeral 1, lit. b) or (c) the performance of specific processes inside the parties' territories.

For goods under the third category, the complete production process occurs within the parties' territories from originating materials.

Procedurally, section B specifies (Article 3.18 num.1) that certificates of origin shall support claims of eligibility for preferential tariff purposes, either at the time of importation or within at least one year or a more extended period if specified by domestic laws and regulations of the importing party; therefore, the exporter shall apply for the refund of excess duties (Article 3.20). The agreement also states that origin verification by customs

authorities may include written requests for additional information and visits to the premises of exporters or producers, along with customs authorities of the counterparty (Article 3.25, num. 1, lits. a and d).

With respect to Sanitary and Phytosanitary measures, Chapter V's objective is to protect human, animal, and plant life and health within the signatories territories with minimum impacts on trade derived from sanitary and phytosanitary measures (Article 5.1). Therefrom, Article 5.3 affirms mutual rights and obligations from the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), among other multilateral instruments (the International Plant Protection Convention, Codex Alimentarius Commission, etc.). Article 5.5 creates a Committee on Sanitary and Phytosanitary Measures composed by representatives of domestic authorities whose remit is related to SPS matters, to monitor the implementation of the agreement (numeral 1, literal a), liaise measures and foster their understanding (numeral 1, literal b), constitute communication and cooperation vessels (numeral 1, literal c), and enhance transparency (numeral 1, literal e).

According to a recent study (Peláez & Núñez, 2020. p. 101), the Animal and Plant Quarantine Agency of Korea, encharged of performing risk assessment on imports according to the guidelines of the Ministry of Food and Drug Safety (MFDS), still required quarantines on Colombian exports, among other measures like clinical inspections or demanding information on harvesting methods and procedures, which pose a challenge for local producers.

Furthermore, Korean households' second most important expenditure, which accounts for 13.4% of its consumption, is food and beverages, preceded only by accommodation. The average Korean consumer of edibles is a very demanding one and considers it important to eat healthy and organic food, which has translated to increasing growth of bio-stores within the country and growing segments of fair trade within stores (Creutzfeldt, 2015, p. 110). Against this backdrop, in addition to tight import clearance procedures and quarantines, quality certifications and standards on produce are becoming crucial to compete in the Korean market.

3.4. CONSIDERATIONS ABOUT THE KOREA–COLOMBIA FTA

The FTA that governs commercial relations between Colombia and Korea results from the consolidation and growing interest of the former to explore markets in the Asia Pacific and the latter's instrumentalization of knowledge transfer as a tool for economic integration with other regions of the world.

Academic studies highlighted the mutually beneficial nature of enhancing trade between the signatories due to the high complementarity of the two economies, based mainly Revealed Comparative Advantage measures and CGE estimations. These models forecast small but positive effects on real GDP, exports, and imports for both parties, although estimates cannot be compared, for the period of the results from the Korean

study is not specified. However, both works coincide on pointing among the most benefited segments by the agreement the mineral sector for Colombia and Korea's machinery and equipment sector.

The FTA sets a liberalization schedule for the progressive tariff elimination through equally distributed reductions in stages of 3, 5, 7, 10, 12, 15, 16, and 19 years, and one category of goods that remain at their base rate. It also encompasses nine party-specific categories, five for Korea's schedule and four for Colombia's one, which may have a term different to those of common categories or grant grace periods where tariffs remain at base rates before starting progressive de-escalation. Two categories are completely different from the enlisted above, and they apply only to Korea's schedule; these are categories X and 16-S. The former exclude goods from customs duties obligations derived from the treaty while the latter conditions tariffs on the moment of the year goods enter Korean territory.

Other important measures are listed as non-tariff measures, like import licensing and export duties, and *'Other measures'*, like agricultural safeguards, which represent a higher tariff once imports reach a determined level. For this last category, triggering levels shall augment over 20 or 21 years and be suppressed afterward. Finally, the treaty modifies the TRQ for bilateral trade of originating products, which are excluded from the Harmonized Tariff Schedule of each part. There is also duty-free importation of 100 metric tons of some goods like milk powder.

Technical standards and CAP shall not be utilized as trade obstacles; to prevent such risk, the agreement requires a solid foundation for their utterance and grounds on international standards.

Rules of origin determine the originating nature of goods for tariff reduction purposes; goods with this status shall either be entirely produced and obtained within the parties' territories, made up by originating materials, or fulfill all product-specific requirements. Rules on sanitary and phytosanitary measures are broadly defined and refer to WTO instruments such as the SPS Agreement.

4. THE ECONOMIC OUTLOOK OF KOREA AND COLOMBIA

This section sets out the evolution of Korea and Colombia's most important macroeconomic indicators, compares them to relevant reference groups, outlines their international trade patterns, and presents some considerations.

4.1. KOREA

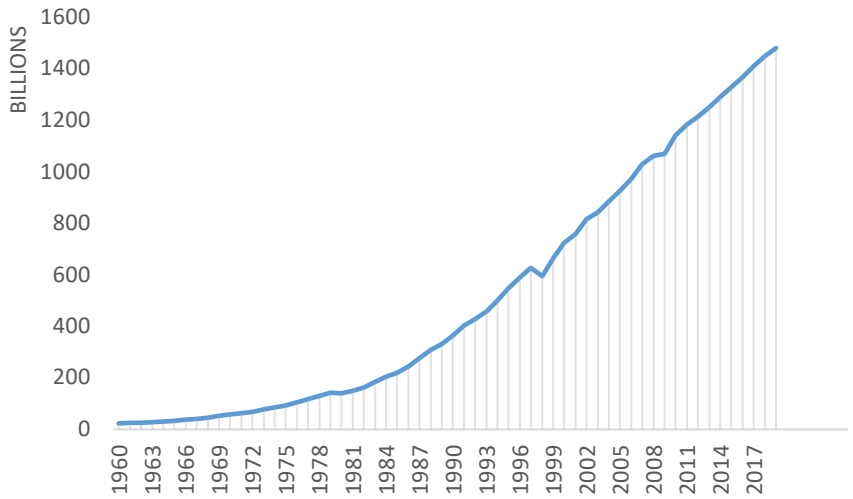
The Republic of Korea is a global benchmark for its quick transformation from a low-income country to one of the world's largest economies, the 12th by gross national income in 2019; this year the country closed with a GDP of 1,483B constant 2010 USD. It is an

example of sustainable development, continued growth, poverty reduction, and a leader in technology and innovation (World Bank Group, 2021). Its economic performance and dynamics after the Korean War enclose important information for the growth of underdeveloped countries (Mejía Arango, 2015, p.25).

Through the following lines, I exceed the reference period succinctly to reinforce Creutzfeldt's affirmation (2015, p. 93) that Korea's economic growth over the past 50 years has been almost linear; and Gamboa & Saldarriaga's (2015, p. 202) claim that the country's economic development has been both dynamic and stable.

Korea's annual GDP growth from 1960 to 2019 averaged 7.3% (World Bank and OECD data files) and was mainly sustained. As Figure 1 displays, year-to-year increases are interrupted only through two periods: 1979–1980, declining from 142.61B to 140.26B; and 1997–1998, falling from 628.28B to 596.05B. Historically, the first period corresponds to the assassination of Park Chung-hee —the sole President of Korea's Third Republic— which violently concluded a 16 year-long continuous mandate amidst a national crisis triggered by political tensions (Ick et al., 2021); the second one coincides with the Asian financial crisis, the contagion of which caused a banking and currency recession in Korea.

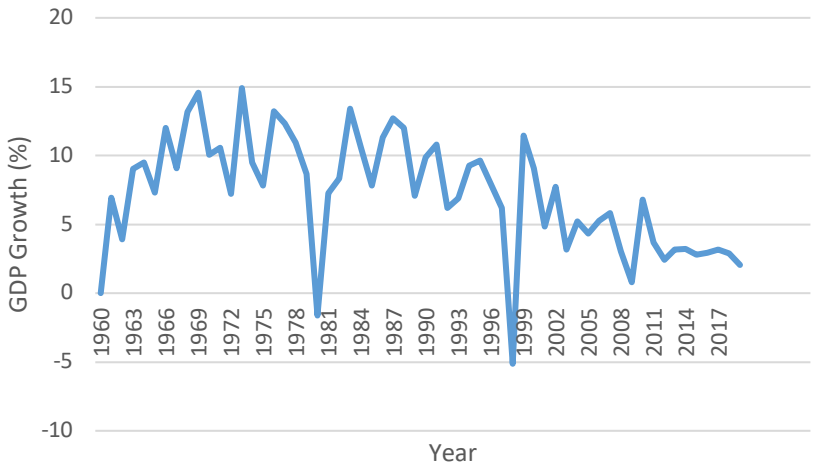
Figure 1. Korea's GDP in Constant 2010 USD (1960–2019)



Note. Figure built with World Bank national accounts data and OECD National Accounts data provided by DataBank.

The percentual annual GDP growth reached its historic peak in 1973 (14.89%) and its lowest value in 1998 (-5.12%). The yearly growth rate variation has decreased in magnitude, predominantly since 2011, which reflects as a flatter line from that point onward in Figure 2.

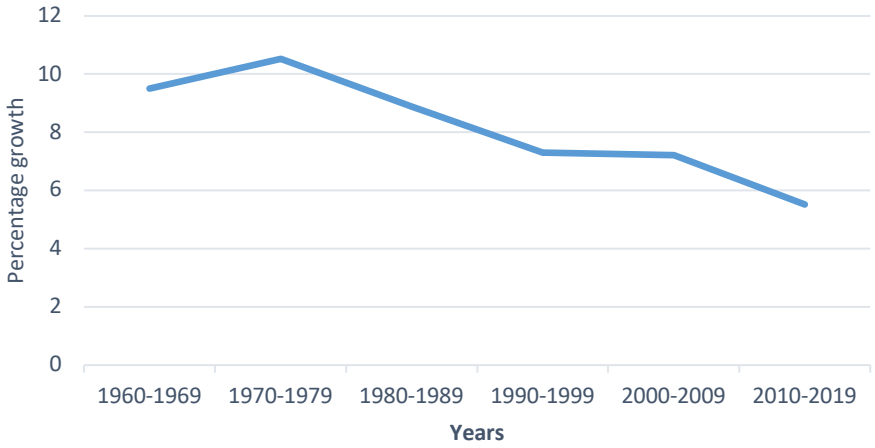
Figure 2. Korea's Percentual Annual GDP Growth



Note. Figure built with World Bank national accounts data and OECD National Accounts data provided by DataBank.

Figure 3 takes each decade's average rate; it depicts how Korea's growth rate has diminished over time, in line with neoclassical growth models' steady-state *à la* Solow and convergence theories' tenets that poorer countries should grow faster.

Figure 3. Korea Decades' Average GDP Growth

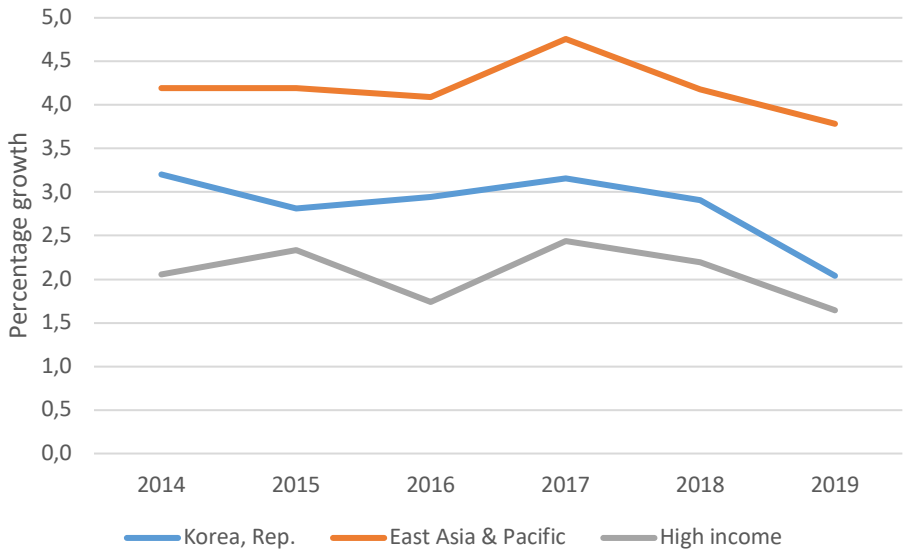


Note. Figure built with World Bank national accounts data and OECD National Accounts data provided by DataBank.

Reframing into the study's proposed period (2014–2019), the mean yearly GDP growth of Korea has been 2.84%, which is 1.35 percentage points lower than the experienced in East Asia and the Pacific Region (4.2%) —as classified by the World Bank Country and Lending Groups— but 0.77 percentage points higher than the high-income economies (2.06%). Figure 4 displays a comparison between Korea's growth rate and that of the

relevant country groups; it shows that regional growth and high-income group's rate have set a corridor within which Korea moves, although it has tended to converge with the latter rather than with the former.

Figure 4. Korea and Relevant Country Groups' Growth (%) 2014–2019



Note. Figure built with World Bank national accounts data and OECD National Accounts data provided by DataBank.

Regionally, Korea represented 6.16% of East Asia and the Pacific's income for the reference period. This measure steadily decreased from 6.37% in 2014 to 5.94% in 2019, showing that the region's growth rates exceeded the country's. However, compared to the high-income group, Korea has represented every passing year a higher share of the total group's income, from 2.66% in 2014 to 2.75% in 2019. This comparison shows that although Korea does not have the same growth phase as the region, it is still quite a dynamic economy vis-à-vis the rest of the high-income countries. As for the size of the economy, Korea is much larger than both the high-income group's average (2.24 times larger) and that of East Asia and the Pacific (2.34 times larger). However, the difference is getting more extensive in the first case and compressing in the second.

Total labor force measured as those who supply labor for production from age 15 onward, both employed or currently unemployed (seeking work and first-time job-seekers), increased steadily from 27,156,844 in 2014 up to 28,541,663 in 2019.

The GDP per capita in purchasing power parity (constant 2010 international USD) has grown uninterruptedly from $38,109 in 2014 to $42,878 in 2019. As GDP is mainly driven by household consumption (final consumption expenditure represented 65.78% of GDP in 2019), a growing labor force accompanied by low unemployment, which averaged 3.04% throughout the reference period, displays an attractive market for Colombia's exportable offer.

The urban population is very high, and slightly decreased from 81.70% in 2014 to 81.43% in 2019 (all of the above from World Bank data). A study conducted by the Canadian Government (2011, cited in Creutzfeldt, 2015) showed that the agricultural sector represents only 3% of Korea's GDP and provides employment to 7% of the population. As a result of this, given the land limitations and strategic industry priorities, the Country imports 60% and 70% of its food products with a trade deficit above 16B USD every year.

Yearly exports of goods and services averaged 730.67 billion in constant 2010 USD through 2014–2019. The country was no stranger to the turmoil caused by the USA–China trade war escalation in 2019, although its effects depend significantly on how they are measured. According to the Korea Herald (2020) —based on data compiled by the Ministry of Trade, Industry, and Energy— the economy experienced a 10.3% drop in exports compared to the previous year. While estimated from World Bank data (current USD), the decline was of 61.664B, representing a fall of 9.37% (from 719.49B to 657.83B). However, a depreciated currency increased vehicle exports and maintained a positive trade balance, offsetting the shock. Conversely, Korea's export growth measured in constant 2010 USD —although decreased from 3.97% to 1.71%— did not reach negative values in that year nor the rest of the reference period, the lowest rate being 0.23% in 2014. In point of fact, exports increased from 762.6B to 775.7B from 2018 to 2019. Still, 2019 exports represented only 39.94% of the country's GDP, the lowest share of the sample.

Exports in current USD averaged 664B throughout the reference period. As Figure 5 displays, they started falling from 709.97B in 2014 until 2016, the sample lowest value (602.04B); increased again from that point onward until their peak in 2018 at 719.49B. The last year reported a fall to 657.83B.

This section takes each chapter from the HS (two-digit level) to build bilateral trade disaggregated figures (6, 7, 9, and 10) using the Vizbuilder tool of the Observatory of Economic Complexity. This specification provides the baseline for the descriptive analysis; however, it further decomposes through two additional digits (four-digit level) to describe each heading or commodity group's behavior and, it adds up whole groups of chapters to conform sections, the broadest level of classification, represented in the figures as colors; Table 10A of the Appendix provides the convention for each section. The dataset used is the HS Nomenclature 2012 Edition and the timespan 2014–2019.

Following Figure 6, 41.2% of Korea's export composition for the reference period was accounted by the machines section. From the four-digit level perspective, the machines' cluster main exported headings were electronic integrated circuits and telephone sets; the rest of the section's share was dispersed through different categories of goods with percentages inferior to 4% each. Transport goods accounted for 17.42% of total exports, being vehicles other than railway and tramway the most extensive chapter. Both metals and chemical products represented an almost identical fragment of exports, a little over and below 8%, respectively. Mineral fuels, oils, waxes, and bituminous substances mounted 6.68% of exports; in this category, 89% belonged to the heading of petroleum and bituminous oils and their preparations, not crude. Plastic and its articles accounted for 5.55% and optical, photographic, cinematographic, measuring, checking, medical

instruments, and apparatus for 4.91%. The remaining categories held shares inferior to 3%.

Korea's imports measured in constant 2010 USD averaged 677.44B along 2014–2019. This flow reached its summit in 2018 at 728.48B, which comes after continuously positive growth rate experienced since the beginning of the reference period that reached its uppermost value in 2016 (8.85%). The growth rate's margin compressed against the zero lines through the following years and became negative in 2019 (-0.63%), representing a fall of 4.62B. Imports as a percentage of Korea's GDP were the lowest in 2016 (33.47%) and the highest in 2014 (42.78%).

Diversely, imports in current USD, which averaged 585B, started falling from 635.03B to 502.11B in 2016. They recovered for the following years, reaching their peak in 2018 at 642.95B, and decreased the next year to 610.11B.

Compositionally, —see Figure 7— minerals represented more than a quarter (28.06%) of imports, driven mainly by mineral fuels, oils, and bituminous substances (24.9%). Clustered machinery, appliances, and equipment accounted for 27.9% of total imports. Within this group, the most intensively imported HS four-digit category goods were electronic integrated circuits (24.1% of the section) and telephones sets (9.59%). Metals (8.37%) were mainly constituted by iron and steel (3.41%), chemicals held 8.55%, and transportation goods mounted jointly for 4.55% of imports. The instruments section (4.25%) was highly concentrated in optical, photographic, cinematographic, measuring, checking, medical or surgical instruments. Textiles made up 3.2%, while plastics and rubber accounted jointly for 2.82%. Among animal products (2.12%), fish and crustaceans were the main good (0.95%), followed by meat (0.92%) and dairy (0.18%). Vegetable products (1.8%) were principally made up of cereals (0.69%); fruit and nuts (0.36%); oil seeds (0.33%); roots and edible tubers (0.15%); and coffee, tea mates and spices (0.14%).

In terms of trade partners, 25.3% of Korean exports were destined to China from 2014 to 2019. Within this particular trade flow, electrical machinery, sound and television recorders, reproducers, and accessories made up 39.5%, while nuclear reactors, boilers, mechanical appliances, and their parts were 12%. Chemicals mounted to 12.47%, driven by a share of 8.2% from organic chemicals. Optical, photographic, cinematographic, measuring, checking, medical instruments, and apparatus were 11%.

The second destination of Korean exports was the USA (12.6%), the main chapter sold to this market was motor car and vehicles (30.58%), followed by electrical machinery and equipment (20%) and nuclear machinery and mechanical appliances (18.2%). Other important consumers of Korean products include Vietnam (6.24%), Hong Kong (5.44%), and Japan (4.85%).

From the import's perspective, China was also the largest partner (20.3%). Korea bought from it mainly electrical machinery and equipment (34.2%), nuclear machinery and mechanical appliances (13%), and iron and steel (6.45%) with their derived products (3.57%). Machines section and metals accounted jointly for 60% of China's sales to Korea, followed by chemicals (9%), textiles (6.3%), and instruments (4.06%).

The second most important origin was Japan (10.6%) who sold mainly nuclear reactors, boilers, machinery and mechanical appliances (20.6%), electrical machinery and equipment (16%), iron and steel (10.8%), and instruments (7.72%).

In third place, the USA represented the source of 10.5% of the total imports. From 2014 to 2019, nuclear reactors, boilers, machinery, and mechanical appliances were the main product category (16.2%), followed by electrical machinery and equipment (12.9%) and mineral fuels and oils (11.9%). The transportation section represented 8% of imports, divided almost equally through aircraft and spacecraft, and vehicles.

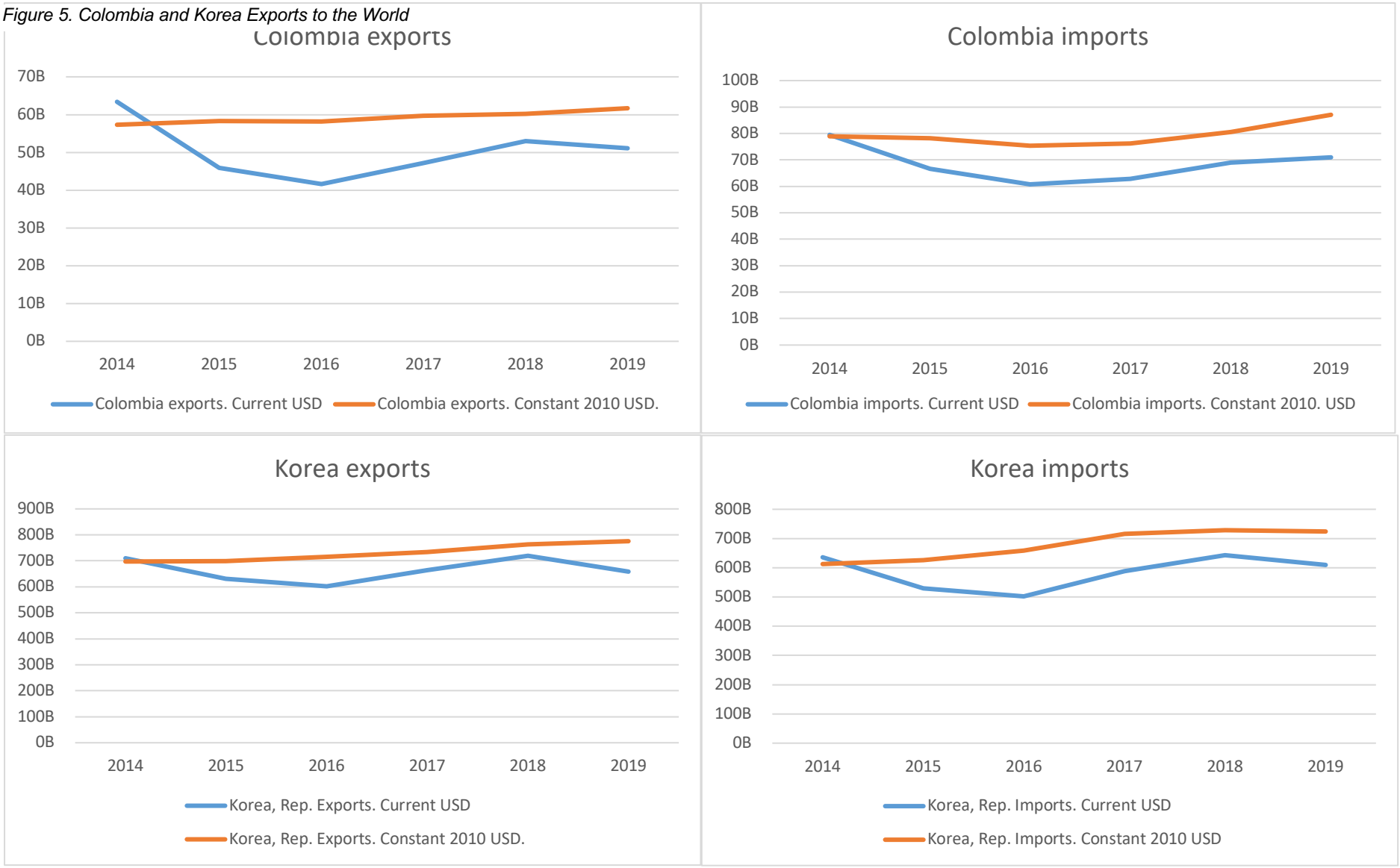
4.2. COLOMBIA

Colombia closed 2019 with a GDP of 371B (constant 2010 USD), accounting for 25.01% of Korea's one. Regionally, across 2014–2019, the nation represented an average of 6.14% of Latin America and the Caribbean's income. This national GDP to Latin America ratio augmented 0.5 percentage points from 2014 (5.87%) to 2019 (6.36%), meaning that Colombia's income has increasingly represented a higher share of the region's total. This trend has been sustained, excepting 2016–2017, when it decreased slightly from 6.19% to 6.16%. Colombia also had a GDP of 2.58 times the regional average. The difference between Colombia's GDP and the region's average has widened from 1.46 in 2014 to 1.67 in 2019.

Throughout the reference period, Colombia has accounted for 1.69% of the upper-middle-income group's total income. This measure has been steadily declining, from its initial participation of 1.76% in 2014 to 1.63% in 2019. Accordingly, Colombia's GDP has represented a smaller fraction of the upper-middle-income group's average through the reference period (from 0.99 in 2014 to 0.91 in 2019).

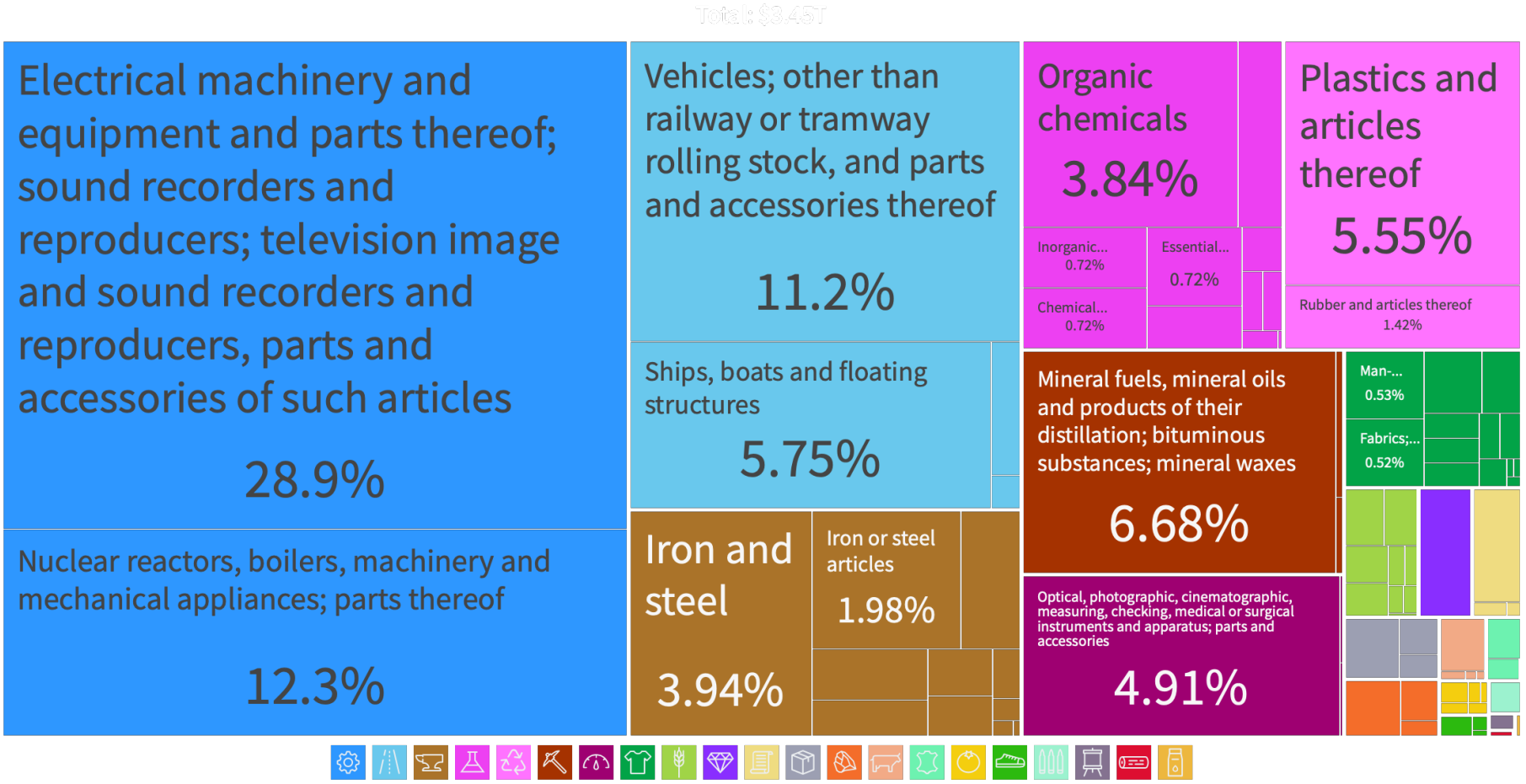
Colombia's average growth from year to year was of 2.78% for the reference period, which is 1.96 percentage points higher than that of the region but 1.27 percentage points lower than the upper-middle-income lending group. The region grew at a higher phase than Colombia only in 2017 (1.8% against 1.4%) by 0.4 percentage points, as Figure 8 displays. It also shows that the region and the upper-middle-income group followed a similar path, although through different ranges (all of the above from World Bank data).

Figure 5. Colombia and Korea Exports to the World



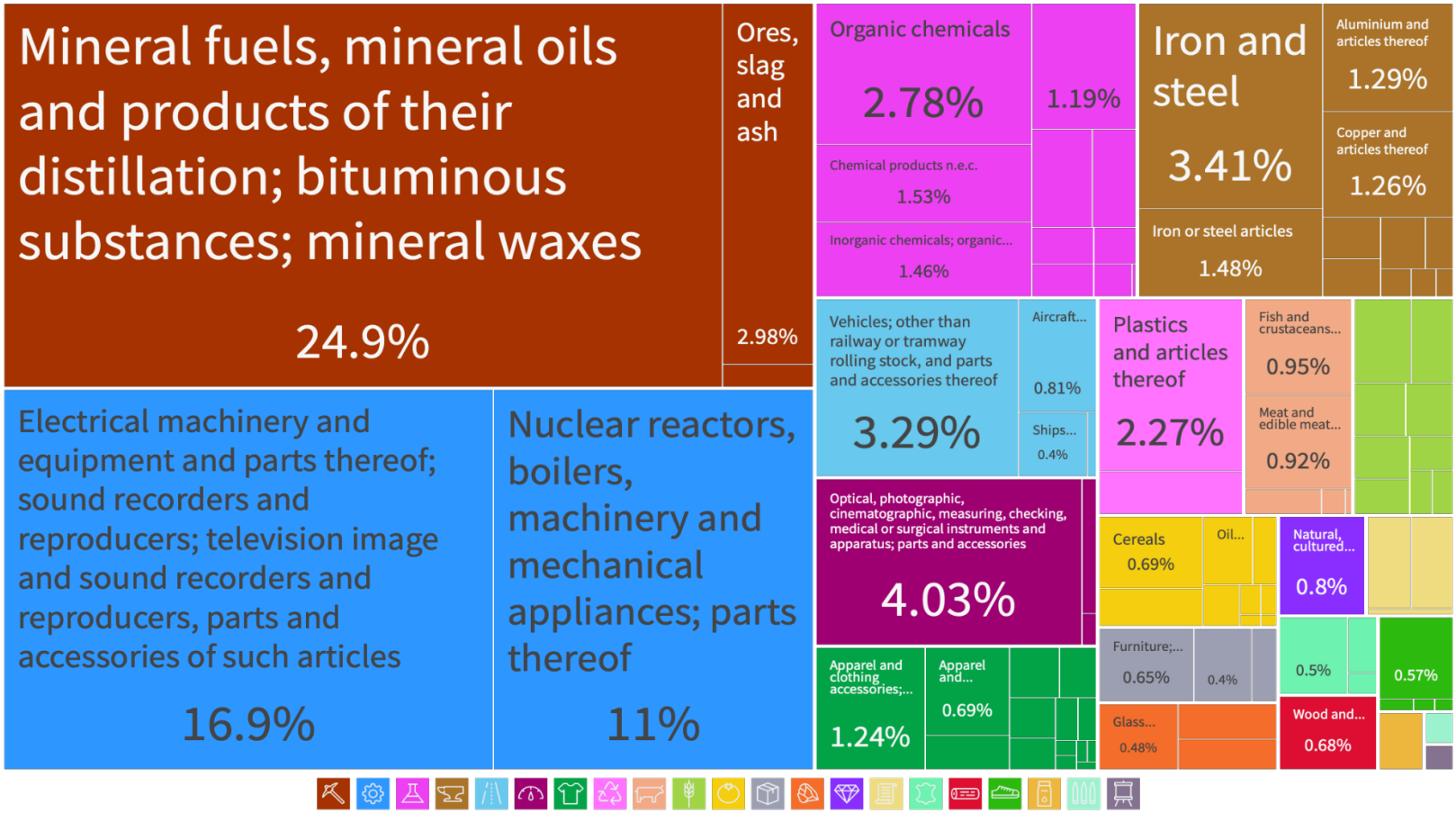
Note. Figure built with World Bank national accounts data and OECD National Accounts data provided by DataBank.

Figure 6. Korea's Export Composition (%) 2014–2019



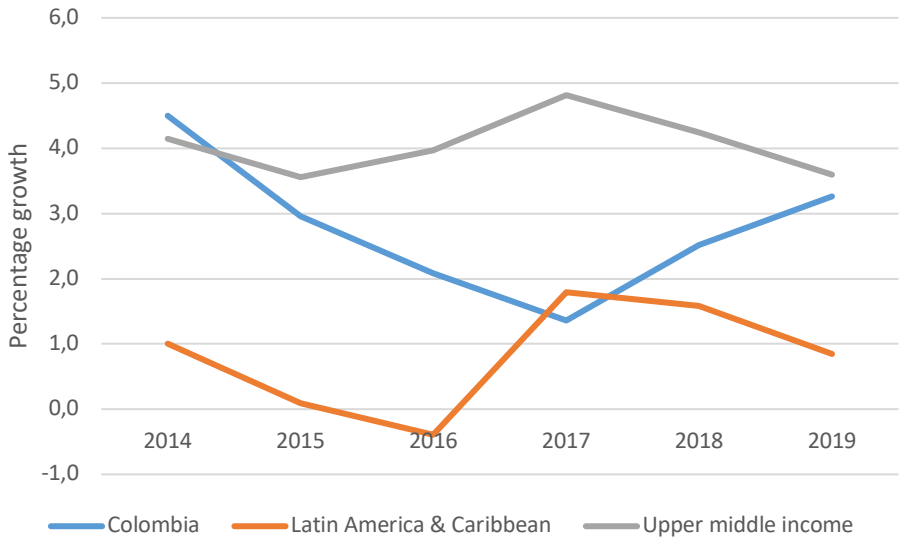
Note. Figure built with the visualization tool from the Observatory of Economic Complexity (OEC)

Figure 7. Korea's Import Composition (%) 2014–2019



Note. Figure built with the visualization tool from the Observatory of Economic Complexity (OEC).

Figure 8. Colombia and Relevant Country Groups' Growth (%) 2014–2019

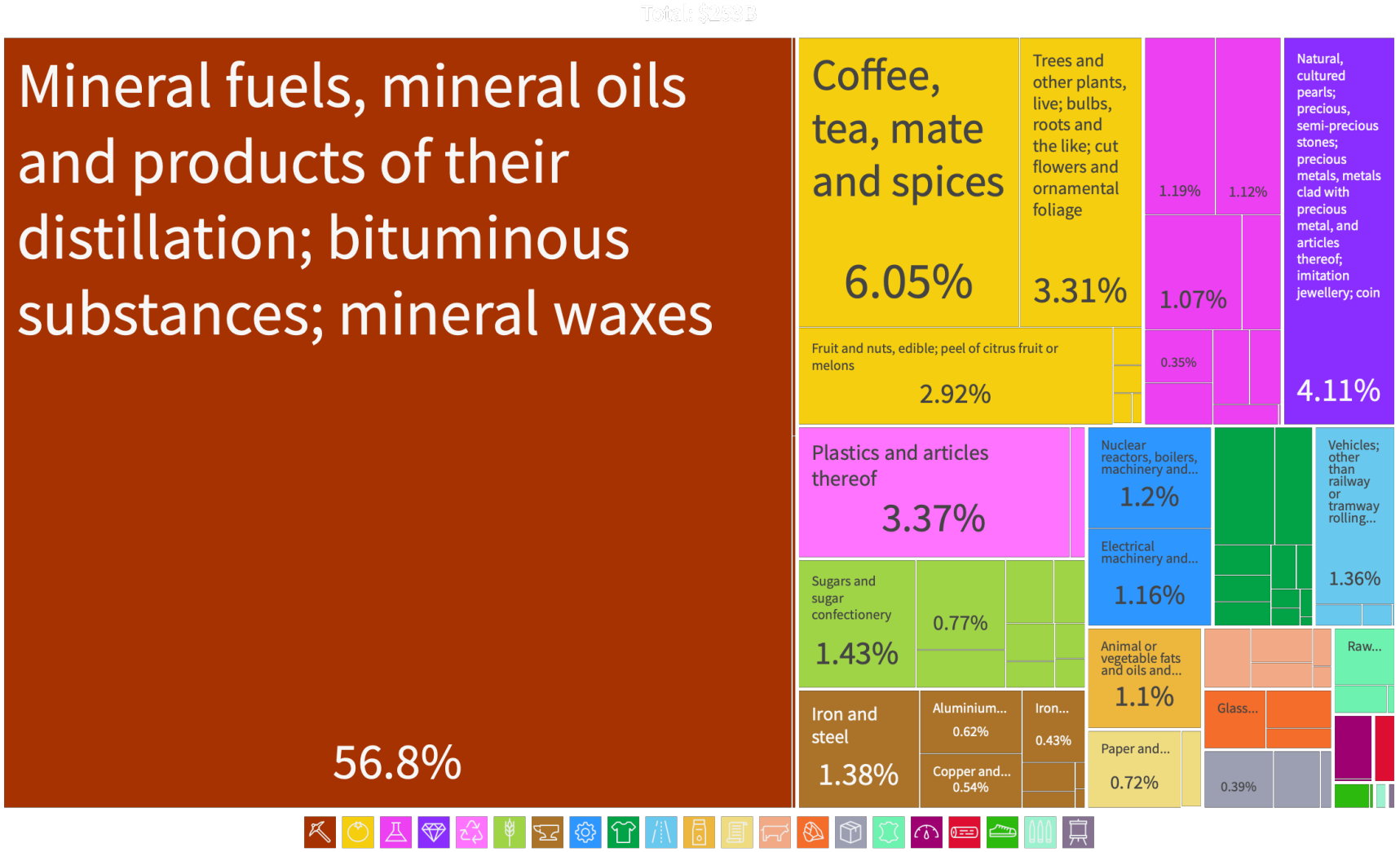


Note. Figure built with World Bank national accounts data and OECD National Accounts data provided by DataBank.

Exports of goods and services from Colombia in constant 2010 USD averaged 59.21 billion through 2014–2019. As shown in Figure 5, they increased almost steadily through the reference period, except from 2015 to 2016, which reported a slight decrease of 0.13 billion (-0.21%). The period's most considerable value was reported in 2019, with 61.69 billion exported. As a percentage of GDP, exports were the highest in 2014 (16.63%) and the lowest in 2016 (14.71%). The trade balance has been negative the entire period; it showed the lowest deficit in 2017 (-49.173 trillion COP) but has grown to its highest magnitude (-68.536 trillion COP) in 2019 (information only available in constant LCU, World Bank data). Measured in current USD, exports of goods and services of Colombia averaged 50B. They decreased from 63.39B in 2014 to 41.62B in 2016. From that moment, they recovered until 2018 at 53.01B and decreased slightly the next year to 51.12B.

Figure 9 shows that the main section exported from Colombia to the world for the reference period was composed of mineral products, which accounted for more than half (56.8%); headings of crude petroleum oils and bituminous minerals explained almost 60% of the section (and 33.9% of the total), coal 27.4% (15.6%), and preparations and non-crude oil for 9.57% (5.46%). Vegetable products accounted for 12.5% of the export basket, from this share, half was made up of coffee and its substitutes (48% of vegetable products and 6.05% of total exports), a quarter from flowers and plants (26% of vegetable products and 3.31% of the total) and a fifth of fruits and nuts (23.3% and 2.92%), from this last group mainly bananas (20.1% and 2.52%). Chemical products represented just over 5% of exports, while natural, cultured pearls, precious and semi-precious stones, precious metals, metals clads and their derived articles, and imitation jewelry represented 4.11%. Foodstuffs, machinery and appliances, textiles, transportation, and metals —mainly iron and steel— were all categories that accounted for less than 3.5% each; followed by paper goods, stone and glass, miscellaneous articles, and animal products, each of one which represented less than 1%.

Figure 9. Colombia's Export Composition (%) 2014–2019



Note. Figure built with the visualization tool from the Observatory of Economic Complexity (OEC).

Imports of goods and services of Colombia in constant 2010 USD decreased for the first part of the sample period (2014–2016) down to 75.367 billion, as Figure 5 shows. They have grown steeply since then, up to their peak of 87.071 billion in 2019. The annual growth rate increased since its lowest value in 2016 (-3.54%), up to the highest one in 2019 (8.01%). Imports as a percentage of GDP reached their summit in 2015 (22.71%) and decreased linearly to their lowest value in 2017 (20.13%); they have been growing since but have not reached their previous levels yet.

As for current USD, imports started the reference period decreasing from 79.47B in 2014 to 60.76B in 2016. After this year, they have grown until 2019, which closed at 70.90B.

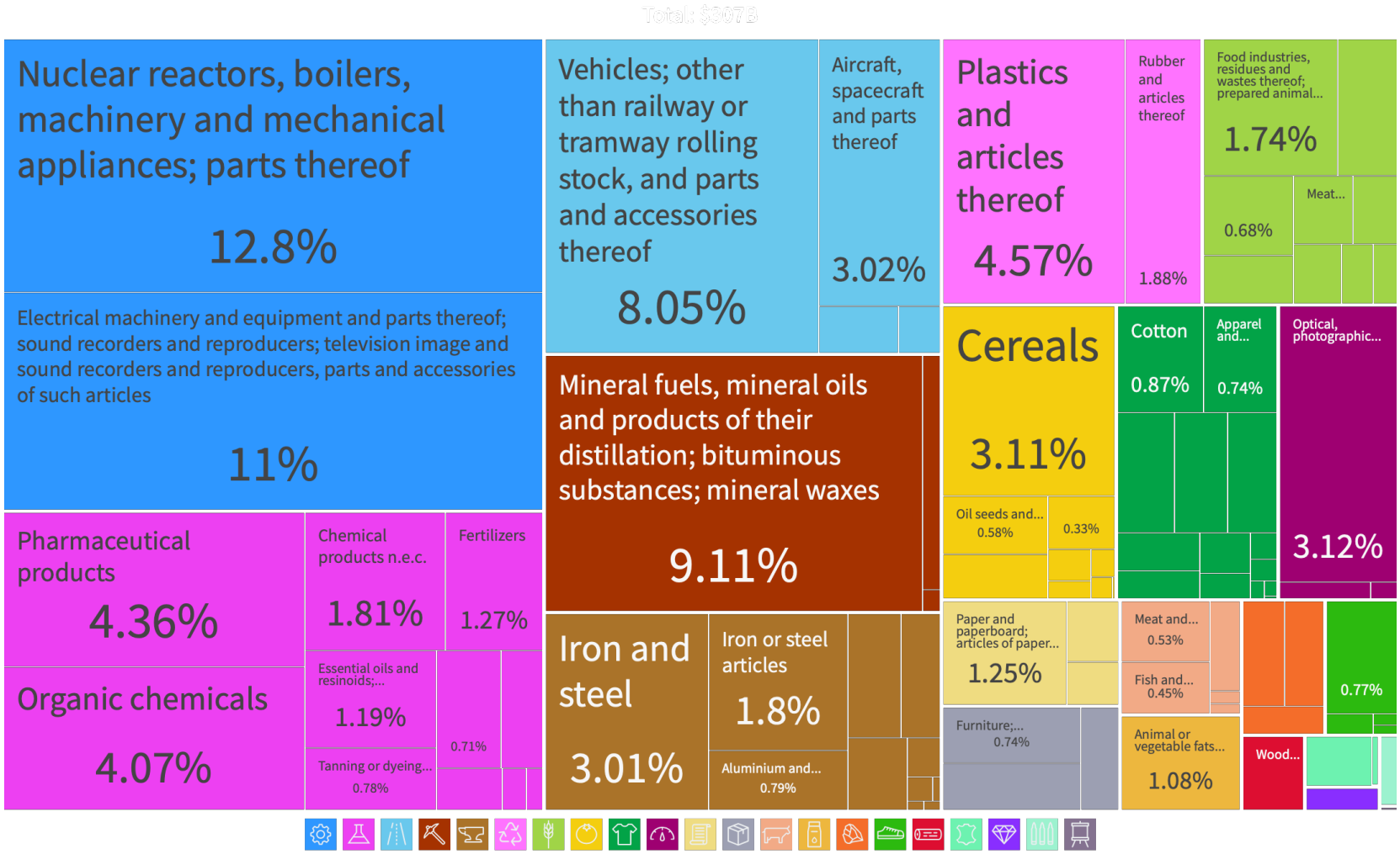
The machines section represented the main import from Colombia for the reference period (23.8%), as Figure 10 shows. The section analyzed at the sub-heading level shows that telephones had the largest share (18.9% of the section and 4.49% of the total). Chemicals accounted for 15.04% of total imports and transportation for 11.59%. Mineral fuels, oils, waxes, and bituminous substances accounted for most mineral products imported (9.11%); within this group, 86.9% were preparations and not crude oils or substances; followed by metals (7.29%), plastic and its products (4.57%), and instruments (3.33%). Foodstuffs, vegetable products, and textiles accounted each for a share between 3% and 5% of imports, followed by paper goods, miscellaneous and animal products, between 1% and 2% each.

From 2014 to 2019, Colombia's leading export destination, the United States, represented 28.5% of the total goods and services sold abroad, followed by China (7.89%), Panamá (6.32%), the Netherlands (4.07%), and Ecuador (3.92%).

More than half of products sold to the USA were mineral and bituminous fuels, oils, and products of their distillation (57.83%); coffee, tea, mate, and spices accounted for 9.01%; and plants and flowers for 8.78%. Exports to China were even more concentrated. For this market, mineral fuels, oils, and bituminous substances accounted for 87%, iron and steel represented 6.71%, and copper 3.46%. Panamá shared a similar profile to that of the USA and China, with 87.4% of Colombian exports being of mineral origin, although the remaining 12.5% is distributed among various product categories in similar shares. Exports to the Netherlands were also mainly mineral products (73.5%), followed by animal or vegetable fats, oils and waxes (10.2%), and fruits and nuts (6.69%). Unlike other destinations, exports to Ecuador were extremely diverse; vehicles accounted for the HS2 largest share with only 12.6%; followed by plastic and articles thereof (8.44%); minerals (8.08%) and pharmaceutical products (6.81%).

From the import's perspective, 27.5% originated in the United States; 19.3% in China; 7.66% in Mexico; and 5.01% in Brazil. The main product category the United States sold to Colombia were minerals and fuels (25.6%), composed almost entirely of not crude and preparations n.e.c. The chemicals' section, mainly organic (6.8%), pharmaceutical (3.3%), n.e.c. (2.35%) and fertilizers (1.02%), accounted jointly for almost 17% of the United States sales to Colombia. Nuclear reactors, boilers, machinery, and mechanical appliances (10.4%); and electronic machinery and equipment (4.18%) build up 14.58%. Cereals (7.84%) and plastics (5.06%) were the main products of vegetables and plastic and rubber sections, respectively.

Figure 10. Colombia's Import Composition (%) 2014–2019



Note. Figure built with the visualization tool from the Observatory of Economic Complexity (OEC).

China's prevailing product category was electrical machinery and equipment (28%), followed by mechanical appliances, nuclear reactors, and boilers (18.3%). Mexico's exports to Colombia were composed of vehicles other than railway and tramway (24%); electrical machinery and equipment (20.2%); and mechanical appliances, nuclear reactors, and boilers (10.2%). From 2014 to 2019, the highest share of Colombia's imports from Brazil was accounted by vehicles (16.7%), followed by reactors, boilers, machinery, and mechanical appliances (12.7%), and plastics (7.83%).

4.3. CONSIDERATIONS ABOUT THE MACROECONOMIC OVERVIEW OF KOREA AND COLOMBIA

Korea's economy is solid and dynamic. Its growth has tended to stabilize over time and to decrease its phase as it becomes wealthier, converging towards the high-income lending group of the World Bank.

Korea's international trade patterns vary significantly depending on their measurement in constant, current USD, or as a percentage of GDP. In constant 2010 USD, export growth has been sustained and remained between 0.23% (2015) and 3.98% (2018). Measured in current USD, exports began the period with yearly contractions which extended until 2016; over the next two years the growth rate was positive, but fell again to negative values in 2019.

Imports measured in constant USD enlarged from the beginning of the spell until 2018, where they reported a small contraction. Imports in current USD follow quite a different path, one very similar to that of exports measured in current USD. They began the sample dropping until 2016, recovered until 2018, and fell again for the final year.

Korea's main exported chapters are electrical machinery and equipment, nuclear reactors and mechanical machinery and appliances, vehicles other than railway, floating structures, chemicals, iron and metals, mineral fuels, and instruments. This export composition is largely replicated through the particular export flows to its main partners individually considered, with little variation. The most important changes are smaller shares of vehicles sold to Japan, China, and Vietnam compared to the average.

Korea's import composition is very similar to that of its exports, displaying intra-industry trade. Mainly, sections with similar shares of outward and inward flows comprise machines (41.2% of exports and 27.9% of imports), metals (8.46% of exports and 8.37% of imports), chemicals (7.62% of exports and 8.55% of imports) and instruments (4.91% of exports and 4.25% of imports). Conversely, the sections for which exports exceed imports pronouncedly were transportation goods (17.4% against 4.55%) and plastics (5.55% against 2.27%); the ones that were intensively imported when compared to their exports are mineral and bituminous fuels and oils

(6.8% of exports against 24.9% of imports), vegetables (0.16% against 1.7%) and animal products (0.28% and 2.12%).

Colombia's economy was roughly a quarter of Korea's in 2019. Its growth rate through the reference period has remained positive but is much wider-ranging than Korea's, meaning that it occurs at varying phases on a year-to-year basis. It also grows faster, on average, than Latin America and the Caribbean but slower than the upper-middle-income countries.

Colombia's trade patterns are characterized by a sustained negative trade balance that has increased over the last few years. Exports in constant USD have almost continuously grown through the reference period, excepting a small contraction in 2015. Differently, exports in current USD decreased through the first half of the sample and recovered between 2016 and 2018, with a fall of 2B in 2019.

Imports in constant USD decreased modestly until 2016 but have risen since then at a much steeper rate than exports. In current USD the fall at the beginning of the sample was much more pronounced.

Colombia's main exported categories are mineral ones; vegetables; chemicals; and natural, cultured pearls, precious and semi-precious stones, precious metals, metals clads, and its derived articles. The global export basket is similar to that of its main partners individually considered. However, in some of them, different individual products are particularly important, such as metals for China or animal and vegetable fats for the Netherlands, although they never surpass the exports of mineral goods. The only exception to this pattern is exports to Ecuador, a market composed principally of products with some level of transformation (vehicles, chemicals, plastics); however, minerals saw unparallel growth over the sample's last year for this destination.

Principal imports include the machines and equipment cluster, chemicals, vehicles, minerals, and metals. Unlike Korea, Colombia's import composition varies significantly from its exports, tending towards inter-industry trade. Only chemicals (5.05% of exports and 15.04% of imports) and minerals (56.8% of exports and 9.50% imports) are repeated in the main imported and exported lists, and for the latter, the exported value is more than six times the imported one; those categories with the highest differences on import-export shares include the machines section (2.3% of exports against 23.8% of imports), transportation (1.52% against 11.59%) and instruments (0.24% against 3.30%). Conversely, those with similar shares include foodstuffs (3.49% against 4.82%), animal vegetable bi-products (1.1% against 1.29%) and plastics (6.45% against 3.56%).

5. TRADE BETWEEN KOREA AND COLOMBIA 2014–2019: CHARACTERIZATION, EVOLUTION AND INTRA-INDUSTRY TRADE

5.1. KOREA EXPORTS TO COLOMBIA

For the reference period, Korea's principal exports to Colombia were transport goods, which accounted for over 30% of total sales, as Figure 11 shows. Taking it into more detail (HS four-digit level), 72.9% of the section (22.1% of total) was made up by the heading of motor cars and vehicles for the transport of people (excluding those for the transport of 10 or more people, 8703), 15.6% (4.73%) of vehicle parts and accessories (8708), 4.97% (1.5%) of vessels (8906), and 3.93% (1.19%) of vehicles for the transport of goods (8704). Machine's section accounted for 22%. The most important headings of the section were telephone sets (8517) with 13.9% (3.06% of total). Plastic and its articles (39) represented 12.3% of the total, while rubber and derivates (40) 5.3%. From the metals section (10.7%), iron and steel with its articles (72 and 73) jointly build up 9.38% of exports, and aluminum (76) accounted for 0.77%. Chemical products were 9.83%, and instruments held 2.83% of exports, followed by textiles (2.43%), minerals (1.36%), and weapons (1.14%). Paper goods and miscellaneous items accounted for 0.4% each.

Table 3. Exports of Korea to Colombia in Current USD (2014–2019)

Year	2014	2015	2016	2017	2018	2019
Exports	1.55B	1.18B	894M	803M	888M	764M

Note. Data from the Observatory of Economic Complexity.

Through the six years of the study, Korea exported to Colombia 6.08 billion USD out of the 3.45 trillion it exported to the world. Consequently, Colombia acquired only 0.18% of Korean exports, falling behind neighboring countries like Brazil (1.01%), Chile (0.33%), and Perú (0.2%) (data from the Observatory of Economic Complexity). Korean exports to Colombia had a negative growth rate for most of the reference period, excepting 2018, which showed a small recovery.

Figure 12 displays evolution of Korean exports to Colombia through the reference period in current USD. The transportation section, mainly through the chapter of vehicles and their parts and accessories other than railway and tramway (87), was the most intensively exported chapter by Korea to Colombia from 2014 to 2017. The section experienced declining values from 579M in 2014 down to 148M in 2019. At the chapter level, one of the sharpest drops takes place within the floating structures (89), with sales of 59.7M in 2014; they declined steadily until reaching 0 values from 2016 onward. Further, into the headings, motor cars and vehicles (8703) contracted from 406M in 2014 to little more than the fourth part of that value (104M) in 2019, while parts and accessories remained relatively stable with an average of 48M (Observatory of Economic Complexity data).

Colombia relies heavily on Korean vehicles when compared to its average partner. Still, this category has decreased dramatically through the reference period. Although 2016

was marked by a drastic drop in car imports from the world, most importers have been able to recover at a faster rate than Korea after that, making it lose market shares on the market composition.

The machines section surpassed transportation sales in 2018, accounting for 275.8M, after recovering since 2017 from a contraction that began at the start of the reference period; from that moment onward, it has remained the largest exported section.

The fall in minerals was pronounced, from 22.8M in 2014 down to 6.26M in 2019. Plastic and rubber have also absorbed the decrease in exports, falling from 280M in 2014 to 120.7M in 2019. Textiles, iron and steel, and instruments have seen more minor variation, but all closed 2019 with values up to 30% inferior to 2014, while chemicals saw a slight increase.

5.2. COLOMBIA EXPORTS TO KOREA

Korea imported from Colombia mainly minerals (54.6%), principally coal and fuels made from it (39.7%), and crude petroleum and bituminous oils (14.9%). Metals also held an important share (20.34%); their main components were copper, its derived articles, waste and scrap (9.94%); iron and steel (8.53%), and aluminum (1.77%). Unroasted coffee (17.4% of total) represented 94.9% of vegetable exports; while flowers (0.89%) mounted for 4.85%; edible fruits and nuts represented only 0.24% of the section's share and 0.045% of the total. Chemicals added up 2.15%, mainly through chemical products n.e.c. (2.07%). Foodstuffs (2%) principal exports were miscellaneous edible preparations (1.36%) followed by sugars and its confectionary (0.33%). With shares inferior to 1% were animal hides (0.59%); animal products (0.46%); transportation (0.32%); and machinery (0.26%) —all of the above displayed in Figure 13.

From 2014–2019, Colombia exported to Korea 2.88 billion USD out of the 253 billion it exported to the world. This means that Korea acquired 1.14% of Colombia's exports, located from a regional perspective after China (7.89%), and Japan (1.31%).

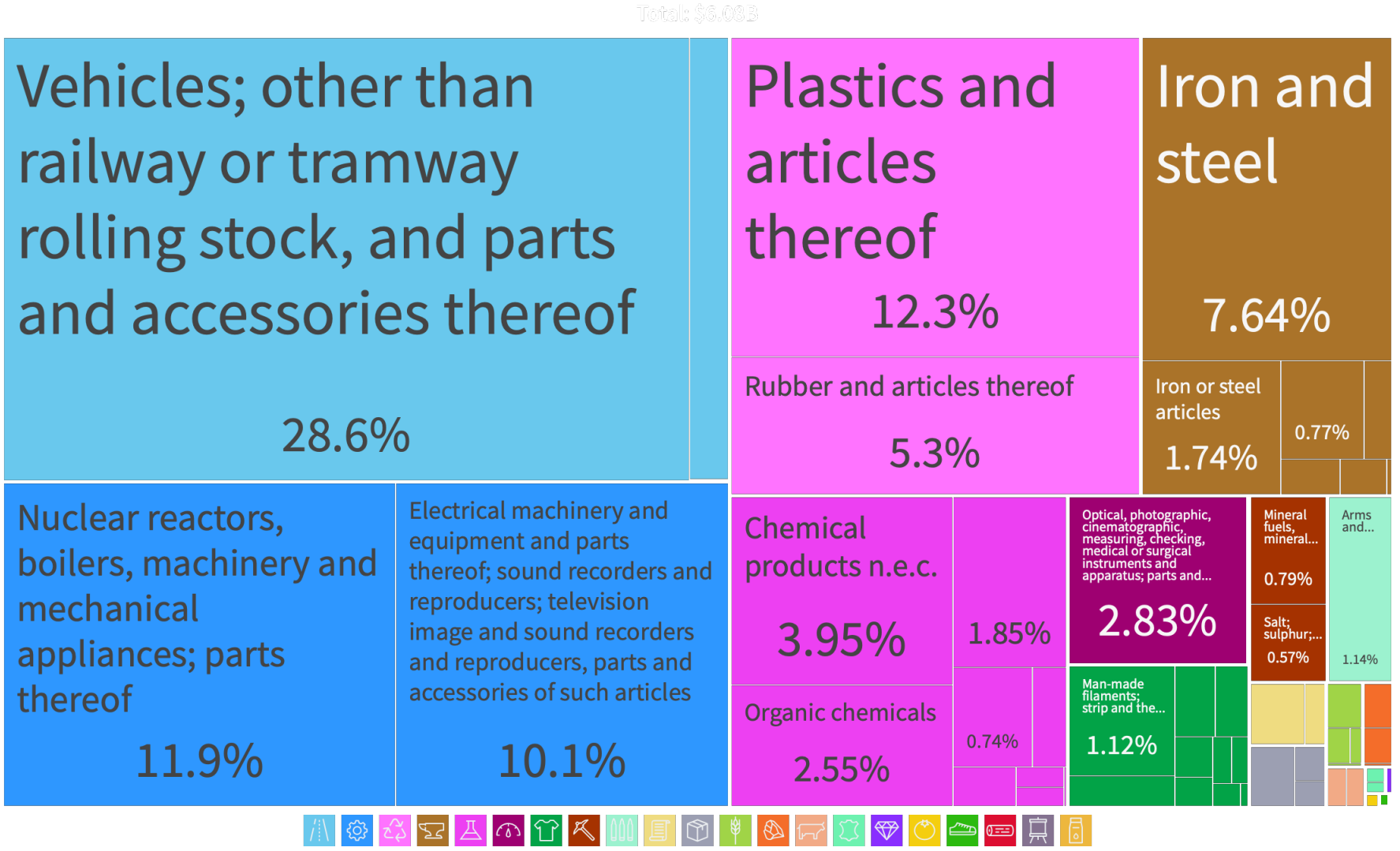
Table 4. Exports of Colombia to Korea in Current USD (2014–2019)

Year	2014	2015	2016	2017	2018	2019
Exports	540M	251M	413M	500M	662M	517M

Note. Data from the Observatory of Economic Complexity.

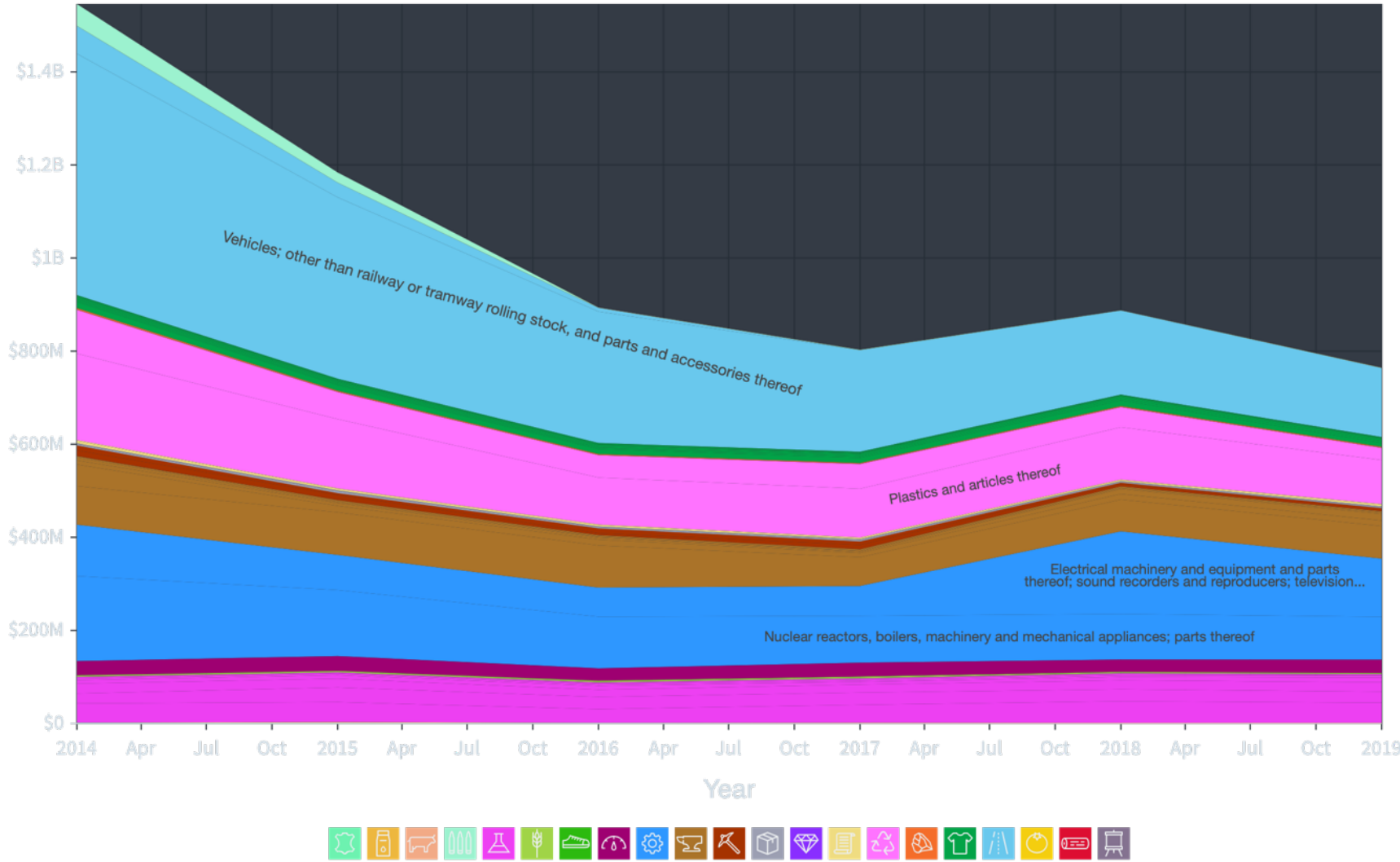
Figure 14 shows that throughout 2014 two of the leading export categories —minerals section (which accounted for 312M) and coffee, tea, mate, and spices (78.8M)— decreased until their lowest value for the reference period in 2015 (56.3M and 71.6M). From that point onward, minerals grew spectacularly, reaching their peak in 2018 at 442M, but falling drastically in 2019 to 330M. Coffee grew at a lower rate until 2017, when it accounted for 91.6M; it fell the following year to 84.5M and recovered through 2019.

Figure 11. Korean Exports to Colombia. Composition (%) 2014–2019



Note. Note. Figure built with the visualization tool from the Observatory of Economic Complexity (OEC).

Figure 12. Korean Exports to Colombia. Evolution (2014–2019)



Note. Figure built with the visualization tool from the Observatory of Economic Complexity (OEC).

Metals also experienced a drop from 2014 to 2015, although much less pronounced, from 114.9M to 89.62 and, as coffee, kept growing until 2017, reaching 111.06M. From that point onward it decreased steadily down to 66.16M for the last year. Chemical products, mainly n.e.c, almost doubled from 2016 (9.73M) to 2017 (17.8M) but have fallen steeply from that point down to the sample's lowest value in 2019 (5.44M).

Other chapters from the vegetable section, different from coffee, like plants, including flowers and roots (06), increased from 2.72M in 2014 up to 4.87M in 2017, they contracted slightly in 2018 but started growing again for the final year (data from OEC). Fruits and nuts (08) started the sample not being exported or holding negligible shares until 2017 when they rose to 227K, fell slightly in 2018, and in 2019 grew spectacularly; this year, Colombia sold 862K of these goods to Korea (data from Trade Map).

Foodstuffs, principally extracts, essences, and concentrates of coffee started the sample declining from 10.5M down to 9M in 2015. They recovered in 2016 but fell subsequently until 2018; from that point onward, there was a timid recovery into the sample peak in 2019.

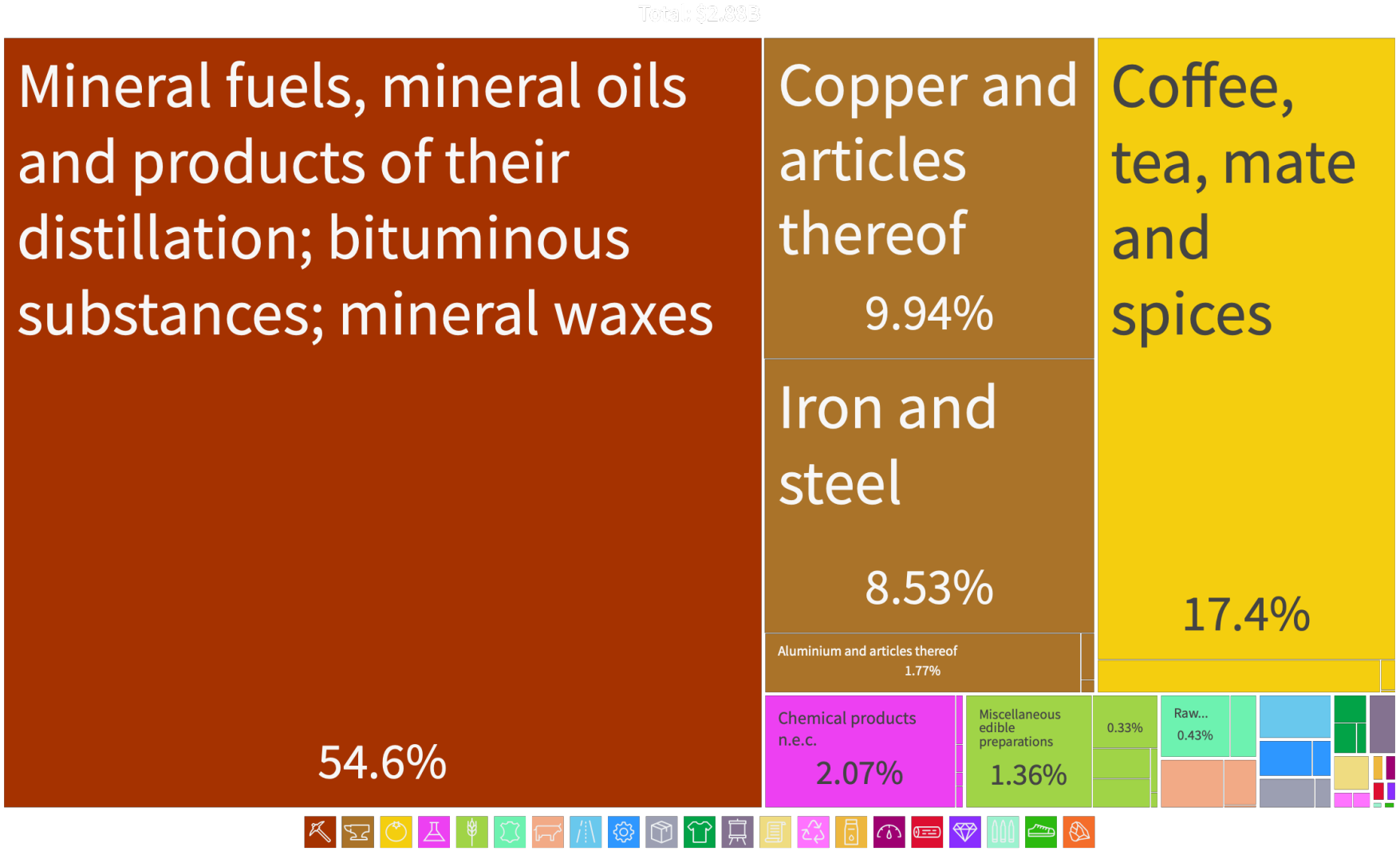
Animal products saw one of the biggest jumps from 1.10M in 2016 up to 4.43M in 2017, equally steep was their fall in 2018 down to 1.30M. In 2019, they recovered to 3.5M, driven by fish and crustaceans, which were only 6.21% of the section in 2014; they represented over 80% of the entire section in the last year.

Machines also declined from 2.29M in 2015 to 810K in 2019. Transportation started the sample with modest values (32.6K); in 2015, it experienced a steep increase up to 4.45M and remained mainly unaltered until 2018, when it dropped sharply again to end 2019 in 24K.

5.3. INTRA-INDUSTRY AND INTER-INDUSTRY TRADE BETWEEN KOREA AND COLOMBIA

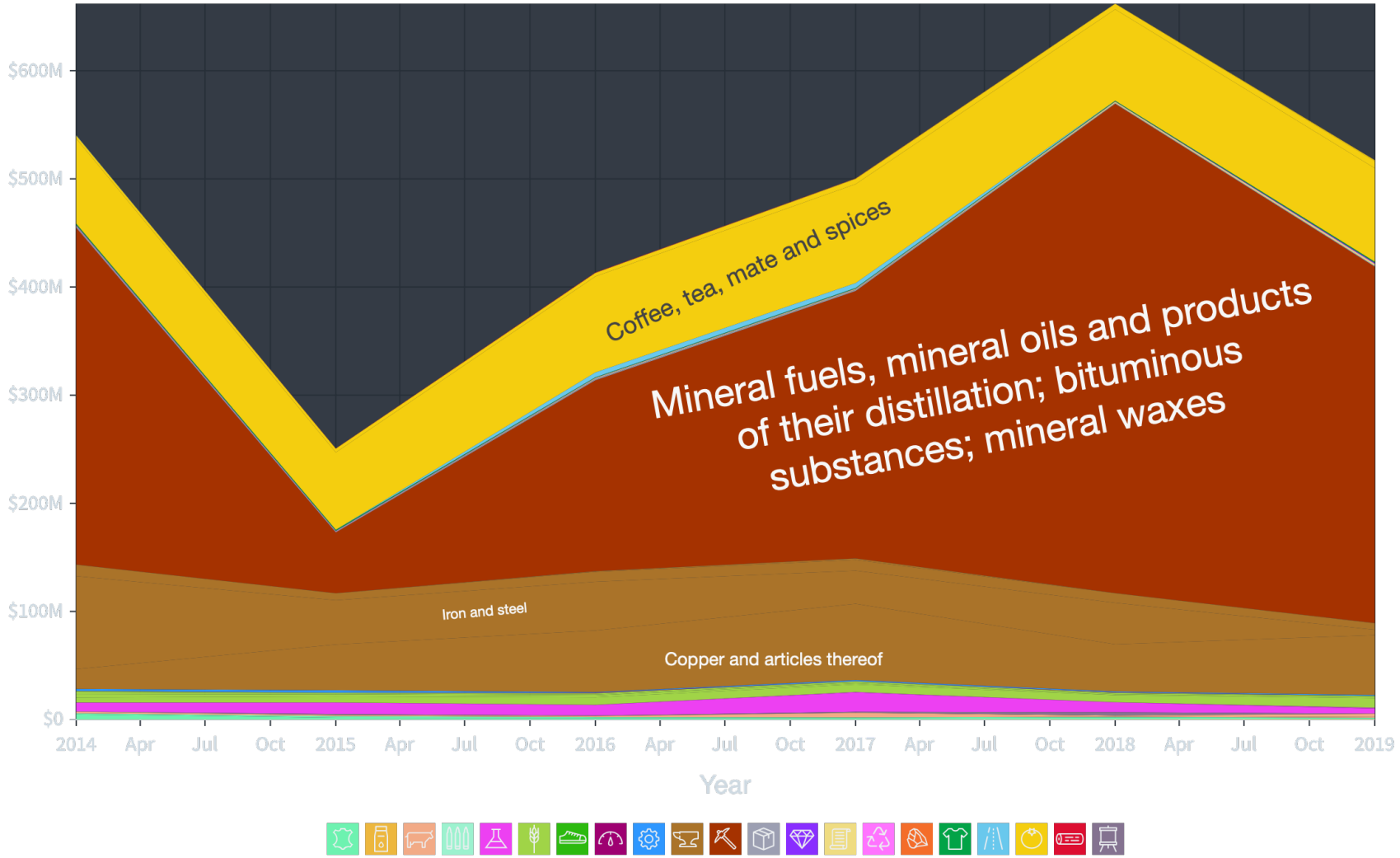
Intra-industry trade takes place when a country is at the same time importing and exporting similar types of goods or services, i.e., goods classified within a determined sector. Intra-industry trade is an interesting phenomenon from an economic perspective as it has been at the core of relevant concepts of New Trade Theory, such as love-of-variety and decreasing marginal returns at the variety level, incorporated into models *à la* Krugman (1979) to explain why countries sell and buy the same types of goods, it has also been associated with increases in FDI inflows (OECD, 2002), and to preferential trade agreements (Grubel & Lloyd, 2007, p.7).

Figure 13. Colombian Exports to Korea. Composition (%) 2014–2019



Note. Figure built with the visualization tool from the Observatory of Economic Complexity (OEC).

Figure 14. Colombian Exports to Korea. Evolution (2014–2019)



Note. Figure built with the visualization tool from the Observatory of Economic Complexity (OEC).

Through this section, I compute the most common measure of intra-industry trade —the method proposed by Grubel & Lloyd in 1975— to the bilateral trade relation of Colombia and Korea for the reference period, as Equation 1 displays:

Equation 1. Estimation of the GLI

$$GLI_{CK} = 1 - \frac{\sum_{i=1}^{N} |X_1 - M_1| \dots |X_N - M_N|}{\sum_{i=1}^{N} (X_1 + M_1) \dots (X_N + M_N)}$$

The GLI equation represents a whole unit minus the ratio of the absolute value of the difference between exports and imports of each same good category to the sum of all the goods categories imported and exported.

According to Grubel & Lloyd (2007), if a determined country only imports goods or services within the same sector, the second term on the right-hand side of the equation becomes 1, and the whole expression reduces to zero. Contrarily, if the value of exports equals the value of imports, the second term will equal zero, and the whole expression results in 1. Hence, the variation of the GL notes zero as pure inter-industry trade and one as pure intra-industry trade.

The data for this computation is provided by Trade Map, reported by the International Trade Centre, and the level of specification is the HS down to six digits. The index is computed for each year of the reference period. Table 5 displays the results along with the number of imported and exported subheadings.

Table 5. GLI Colombia–Korea (2014–2019)

Year	GLI	No. HS6 exported	No. HS6 imported
2014	0.001957	90	1,364
2015	0.000924	80	1,344
2016	0.002704	124	1,258
2017	0.002403	102	1,213
2018	0.001677	102	1,242
2019	0.002045	109	1,193

Note. Data from Trade Map

The GLI for the Korea-Colombia trade relation is, as expected due to the high level of disaggregation, very low at all periods, given that as the description of sectors further becomes more detailed, less trade is classified as intra-industry. Notably, the year the treaty took effect, the GLI reached its highest number for the sample.

Out of the 5,134 good categories listed in the HS six-digit level, 1,321 were traded by Korea and Colombia in 2016, while 1,399 were traded in 2015, so the number of traded goods decreased. From the goods traded in 2016, 1,259 categories had a GLI of 0, against 1,373 the previous year, meaning that they were either only imported or exported, but not both. In other words, one reason why intra-industry trade increased the year the treaty entered into force is that sub-headings with perfect inter-industry trade diminished.

From a different perspective, 62 good categories had a GLI larger than 0 in 2016, while only 26 reached this level in 2015, meaning that the number of good categories with at least some level of intra-industry trade (those being both imported and exported) increased in 2016, with respect to 2015. These categories with the highest sector-specific GLI corresponded in 2016 to commodities non elsewhere specified (GLI of 0.967); machinery for molding products of rubber or plastic (0.965); electric lamps and lighting fittings (0.908); printers, copying and facsimiles machines; and paper, cellulose wadding or webs of cellulose fibers (0.768).

5.4. CONSIDERATIONS ABOUT THE EVOLUTION OF TRADE BETWEEN KOREA AND COLOMBIA

Korea's exports to Colombia are similar to those to the world. Transportation and machinery account for roughly half of the total. However, vehicles have a much larger share for this specific market than for the world. Consequently, machinery has smaller participation, although the former has tended to decrease, and the latter has appropriated a larger share.

Plastic, rubber, and their derived articles are intensively sold to Colombia when compared to the world, while chemicals and textiles have similar shares in both baskets. Instruments, minerals, and foodstuffs are exported to the world in a larger proportion than to Colombia.

Korea has a diversified composition of exports both to the world and to Colombia, in which technology-intensive manufactures like vehicles, electronic and mechanical apparatus prevail.

Half of Colombia's exports to Korea are made up of minerals, a very similar proportion to that of the overall. Coffee, tea, mate, and spices are exported intensively to Korea compared to the world, but the rest of the chapters of the vegetable section have a much smaller share. Metals have a higher relative weight in the exports to Korea than to the world. Conversely, precious metals, machines, textiles, vehicles, chemicals, glass, miscellaneous articles, and vegetable and animal by-products were sold more to the world than to Korea, showing more diversification of sales of the former against the latter and comprising most sectors that involve some level of transformation or value-added activities.

The composition of the export basket of Colombia to Korea displays a higher concentration of primary products when compared to the world. Literature has stated that commodities experience greater volatility than manufactures or services (UNCTAD, 2008; Jacks et al., 2011), thus making the country vulnerable to higher fluctuation and uncertainty for that specific destination.

From the perspective of imports, Colombia acquires from Korea roughly the same share of machinery and instruments it gets from the world. Conversely, it acquires vehicles, arms and ammunition, as well as rubber and plastic in a much larger relative share from that

specific market. The import basket from the world had higher shares of chemicals, foodstuffs, minerals, cereals, textiles, animal products, paper goods, glass, and miscellaneous articles.

As for Korean imports, Colombia provides relatively more minerals, metals, and vegetable products (this last section principally by the headings of coffee and trees and plants, as the world basket accounts for a higher share of fruits). Foodstuffs have similar shares in both the world and Colombian imports. Conversely, the general import basket's share is higher for machinery, chemicals, vehicles, instruments, textiles, animal products, plastic and rubber, precious metals, glass, and miscellaneous articles.

Korean exports to Colombia follow a similar path to the country's overall exports in current USD: they decrease for the first part of the sample, recovered toward the middle, and fell in 2019, although exports to the world started to increase again since 2017, exports to Colombia took one additional year to start recovering, making their renewed growth just one year long. On the other side, Colombia's exports to Korea also followed a similar path to its overall exports, falling at the beginning, increasing until 2018, and falling through the last year, although exports to this market started recovering earlier, by 2016, while exports to the world got back on track after 2017.

The level of intra-industry trade between Korea and Colombia has remained at very low levels both before and after the entry of the FTA, however, after the treaty's enforcement (years 2017–2019) the GLI has been on average 41,63% higher than before (years 2014 and 2015). The year the treaty entered into effect (2016), the GLI reached its highest value, 2.926 times the one reported the previous year; this was due to a decrease in traded categories with perfect inter-industry trade and an increase in categories with at least some degree of intra-industry trade, some of them very close to perfect intra-industry, i.e., the same value being exported and imported.

6. EMPIRICAL MODELS TO ASSESS THE EFFECTS OF THE TREATY

This part of the study empirically assesses the effects of the FTA on bilateral trade between Colombia and Korea. I find that tariff liberalization has positively impacted Korean exports to Colombia through the reference period, but not vice-versa. The first results are robust to including time fixed effects, controls that account for variations on trade flows (e.g., exports to the ROW, real exchange rates, and the GDP of the country of destination), and an alternative way to estimate applied tariffs. In terms of magnitude of the overall effect, my baseline regression indicates an increase of Korean exports to Colombia of 1.95% due to tariff liberalization. The results also indicate that a marginal reduction of one percentage point in tariffs has a positive effect of between 0.59% and 0.69% on Korean exports. The analysis proceeds as follows: in the first place, Section 6.1. describes the data and variables. Section 6.2. details the empirical strategy and outlines the results for the baseline model and the robustness checks. Section 6.3 connects the main findings of this segment with the evolution of trade explained in Section 5 and describes narratively

the main affected industries. Finally, Section 6.4 presents the conclusions of the empirical exercise.

6.1. DATA AND VARIABLES

In the following lines, I describe the data used for the empirical analysis along with the variables I construct to study the effects of tariff decreases in the Colombo-Korean trade relation.

I construct two sets of longitudinal data from 2014 to 2019 —one for each party to the agreement— where each unit of analysis is specified at the second-highest level of disaggregation (four-digit level of the Harmonized System or heading). The main dependent variable for each regression is the natural logarithm of exports by Colombia or Korea to each other, noted as ln X_{it}^{EI}. The subscript *i* indicates the HS heading. The superscript *EI* indicates the exporter (*E*) and the importer (*I*), specified as *CK* for Colombian exports to Korea and *KC* for Korean exports to Colombia.

I retrieved this information from Trade Map in current USD, sourced for Colombian exports in the United Nations' COMTRADE for 2014 and *Dirección de Impuestos y Aduanas Nacionales* (*DIAN*) from 2015 onward. The Korea Customs and Trade Development Institute (KCTDI) directly reports to Trade Map for Korean exports. In both cases, the data uses the latest HS Revision reported by each country for a given year.

A theoretical review by Martin & Pham (2015) suggests that the logarithmic transformation of the dependent variable poses a difficulty for many studies when there is no trade of certain goods, given the log of zero is undefined (zero trade flows bias, Rudolph, 2011). I follow the conventional solution for this problem by replacing the value of exports with the value of exports plus one, allowing non-traded items to be transformed to zero once their log is taken, instead of being dropped.

I construct the main independent variable, customs duties —noted as τ_{it}^{IE}— by retrieving data from the International Trade Center's Market Access Map on Colombian tariffs applied to Korean goods for years 2014, 2017, 2018 and 2019; and Korean tariffs applied to Colombian goods for 2015, 2017 and 2018. The remaining years being missing.

To fill the gaps, I use to good advantage the stability of MFN rates by proxying all pre-FTA missing custom duties by the year immediately before or after for which there is information available, i.e., Colombian duties on Korean goods for 2015 were proxied by 2014 rates; and Korean duties on Colombian-originated products for 2014 by those of 2015.

Tariff data for 2017 was only available at the six-digit level for both Colombia and Korea. Therefore, I collapsed observations by their mean as the main imputation procedure, in the way Equation 2 displays. Here $\boldsymbol{I}$ subindex a heading and i a subheading, s.t. $\forall\ i\ \{1\ldots N\} \in \boldsymbol{I}$.

Equation 2. Main Imputation Procedure of Tariffs for 2017

$$\bar{\tau}_{\mathbf{I},2017}^{HS4} = \sum_{i=1}^{N} \frac{\tau_{i,2017}^{HS6}}{N}$$

As the treaty entered into force in July 2016, I computed applied tariffs for this year as the arithmetic means of customs duties for 2015 and 2017. The resulting observations were matched with Trade Map's dataset.

To control for time-varying confounders, I retrieved exports from each country to the ROW and imports from each country originating at the ROW from the Trade Map dataset. The first variable introduces to the analysis the conditions of local supply and global demand, while the second one accounts for local demand and global supply for each good.

To avoid multicollinearity, I construct the variable ln XRW_i^E as the ln of exports originated in the country of interest, noted as *E* for exporter, which can be either Colombia or Korea (plus an additional unit to avoid dropping zero values), minus the ln of exports directed to the treaties' counterparty, noted as *I* for importer (plus one).

Equation 3. Estimation of Exports to the ROW

$$\ln XRW_{it}^{E} = \ln(1 + X_{it}^{EW}) - \ln(1 + X_{it}^{EI})$$

For clarity purposes, I specify the formula for each dataset, when the exporter is Colombia ($E = C$) in Equation 4 and when it is Korea ($E = K$) in Equation 5.

Equation 4. Colombian Exports to the ROW

$$\ln XRW_{it}^{C} = \ln(1 + X_{it}^{CW}) - \ln(1 + X_{it}^{CK})$$

Equation 5. Korean Exports to the ROW

$$\ln XRW_{it}^{K} = \ln(1 + X_{it}^{KW}) - \ln(1 + X_{it}^{KC})$$

I set the variable imports from the ROW (MRW_{it}^{I}) similarly, as the ln of total imports made by each country of interest considered as importer (*I)*, of good *i*, excepting those originating in the treaties counterparty.

Equation 6. Estimation of Imports from the ROW

$$\ln MRW_{it}^{I} = \ln(M_{it}^{WI} + 1) - \ln(M_{it}^{EI} + 1)$$

For further clarification, I also specify here the formula for each country, when the importer is Colombia ($I = C$) in Equation 7, and when it is Korea ($I = K$) in Equation 8.

Equation 7. Colombian Imports from the ROW

$$\ln MRW_{i}^{C} = \ln(1 + M_{it}^{WC}) - \ln(1 + X_{it}^{KC})$$

Equation 8. Korean Imports from the ROW

$$\ln MRW_{i}^{K} = \ln(1 + M_{it}^{WK}) - \ln(1 + X_{it}^{CK})$$

Concerning the additional controls, I averaged the monthly real exchange rate indexes from the Office of the Deputy Technical Governor of *Banco de la República de Colombia* per year to build the variable RER_t^{CK}. For the dataset of Korean exports, I estimated its inverse, RER_t^{KC}. In this way, results of the coefficient of RER_t^{EI} can be interpreted in terms of the valuation or devaluation of the exporter's currency. Finally, I retrieved the GDP of the importer in current USD from World Bank's World Development Indicators for the variable GDP_t^I.

6.2. EMPIRICAL STRATEGY

In this section, I address the issue of whether the agreement has impacted trade between Colombia and Korea, through two hypotheses: (i) Korean exports to Colombia have increased as a result of the FTA; and (ii) Colombian exports to Korea have increased as a result of the FTA. I test these hypotheses, first by introducing my benchmark results using a fixed-effects model and then showing the robustness of the main findings to alternative methodologies.

As I mentioned in the Literature Review —following the recommendation of Yotov et al. (2016) to avoid aggregation practices when analyzing international trade[1]— I rely on the methodology introduced by Clausing (2001), with some modifications. As the latter study asserted, the main concerns with aggregated data approaches are that they conceal changes occurring at a disaggregated level, they do not take into account the effect of changes in tariffs on trade flows, and that it is more difficult to isolate the effect of the agreement from other influences (p. 678), for these reasons her approach suits the objectives of this study.

With regard to the modifications to her strategy, in the first place, my approach takes as the dependent variable contemporaneous yearly exports in USD (current) instead of year-to-year percentual changes. I do this to avoid deleting information from the first year of the sample (2014), which would extremely reduce the time dimension of the analysis.

In the second place, Clausing does not specify the statistical method she applies to her study. However, the work above most likely employed an OLS methodology, with year dummies to control for the time dimension of the data, given computational limitations at the time. Conversely, I perform a fixed-effects regression at the heading level to allow the model to capture the variation of tariffs within each unit and control for time-invariant confounders. By taking product-level changes in tariffs, rather than comparing products with high tariffs against those with low ones, I mitigate a source of endogeneity that originates in reverse causality. The rationale behind this argument is that, when carrying the FTA's negotiations, each country exercises downward pressure on the tariffs of goods it has a comparative advantage at producing, systematically making intensively traded goods more likely to face faster and steeper decreases on rates. By comparing each

[1] Position supported by the evidence provided by Gnutzmann-Mkrtchyan & Henn (2018), Fontagné et al., (2020), and Limão (2016).

product with itself at an earlier time, every observation serves as its control, and variation in the outcome of interest must stem from individual-level or within-unit changes in tariffs over time.

In the third place, unlike her mainly control-free approach, I introduce the observable time-varying confounders $\ln XROW_i^E$, $\ln MRW_i^I$, RER_t^{EI} and GDP_t^I, directly into some of my estimations and use year-fixed effects for robustness checks.

6.2.1. Estimations and Results

To study the effects of tariff decreases on trade flows, I estimate the following set of regressions to each database specified in the previous section: Korean exports to Colombia and Colombian exports to Korea.

My starting point and most basic specification (1) includes only the applied tariffs to each heading and year fixed effects. This estimate, defined under Equation 9, follows Clausing's Methodology most closely:

Equation 9. First Approach

$$ln\, X_{it}^{EI} = \beta_0 + \beta_1 \tau_{it}^{IE} + \sum_{i=1}^{N} \gamma_i Industry_i + \sum_{t=2015}^{T} \delta_t Year_t + \varepsilon_{it} \quad (1)$$

where the dependent variable is the log of exports, $\ln X_{it}^{EI}$. The main variable of interest is τ_{it}^{IE} which represents the customs duty applied to heading *i* by the importer (*I*) to the exporter (*E*) at time *t,* industry or heading fixed effects —which are present in all the models— and year fixed effects, excluding the first year of the sample.

Through the second approach (2) —specified by Equation 10— instead of time fixed effects, I include observable time-varying controls directly into the regression, such as the Real Exchange Rate (RER_t^{EI}), the GDP of the importer ($\ln GDP_t^I$), exports to the ROW by the country of origin ($\ln ERW_i^E$) and imports of the country of destination from the ROW ($\ln MRW_i^I$).

Equation 10. Second Approach

$$\ln X_{it}^{EI} = \beta_0 + \beta_1 \tau_{it}^{IE} + \beta_2 RER_t^{EI} + \beta_3 \ln GDP_t^I + \beta_4 \ln XRW_{it}^E + \beta_5 \ln MRW_{it}^I + \sum_{i=1}^{N} \gamma_i Industry_i + \varepsilon_{it} \quad (2)$$

Finally, I build my benchmark specification (3) —Equation 11— integrating the two previous models: I include both time fixed effects and observable time-varying confounders. By doing this, the explanatory power of the model increases. I also verified that multicollinearity is not a cause of concern for my main variable of interest by estimating its variance inflation factor (VIF) for all three methods; the results ranged between 1.03 and 1.07, meaning all of them were well below the threshold values of tolerance (4, 5, 10, etc. O'Brien, 2007).

Equation 11. Benchmark Specification

$$ln\, X_{it}^{EI} = \beta_0 + \beta_1 \tau_{it}^{IE} + \beta_2 RER_t^{EI} + \beta_3\, ln\, GDP_t^I + \beta_4\, ln\, XRW_{it}^E + \beta_5\, ln\, MRW_{it}^I + \sum_{t=2015}^{T} \delta_t Year_t + \sum_{i=1}^{N} \gamma_i Industry_i + \varepsilon_{it} (3)$$

The results of these estimations, displayed in Table 6, prove that Korean exports to Colombia have increased due to tariff reductions. The coefficient of τ_{it}^{CK} was always negative and significant, which indicates that higher tariffs were associated with reductions in exports. The β_1 ranged from -0.9026 to -1.1715. The benchmark results (3) display a coefficient between these two values (-1.0544) significant at the 5% level.

Table 6. Effects of Tariff Decreases on Korean Exports

$\ln X_{it}^{KC}$	(1)	(2)	(3)
τ_{it}^{CK}	-1.1715**	-0. 9026*	-1.0544**
	(0.5288)	(0.4926)	(0.5209)
RER_t^{KC}		-0.0120***	-0.0093
		(0. 0026)	(0.0065)
$\ln GDP_t^C$		0.0194	0.4144
		(0.1566)	(0.9359)
$\ln MRW_{it}^C$		0.0337***	0.0317***
		(0.0117)	(0.0118)
$\ln ERW_{it}^K$		0.0073	0.0071
		(0.0104)	(0.0104)
Heading FE	Yes	Yes	Yes
Year FE	Yes	No	Yes
Observations	7,329	7,262	7,262
R^2	0.0130	0.0126	0.0131

Notes. The table reports the coefficients of the fixed effects models, with robust standard errors in parenthesis. ***, ** and * indicate statistical significance at the 1%, 5% and 10%, respectively.

Still, to obtain the exact association between logarithmic and percentage points (as I log-transformed the response variable), the coefficient must be exponentiated and subtracted by one (Ford, 2018), as Equation 12 shows:

Equation 12. Estimate of the Association Between Variables when the Dependent Variable is Log-Transformed

$$\%\Delta\, ln\, X_{it}^{EI} = exp(\beta_1) - 1$$

The result ranges between 59% and 69%, the coefficient of the benchmark model is between these two values at 65.1%. Because the main independent variable is set in decimals, coefficients are associated with one unit reduction on customs duties, which entails a decrease of 100 percentage points. Henceforth a one percentage point decrease in tariffs is associated with an average increase in exports between 0.59% and 0.69%.

To establish the overall effect of tariff reductions, I estimated the difference between the average tariff charged by Colombia to Korea before the FTA (6.2026%) and the one

corresponding to 2019 (3.1983%); I then multiplied the difference of 3.0043 percentage points (equivalent to a drop of 48.436% from the initial customs duty) by the coefficients resulting from Equation 12 and divided them by 100. According to this procedure, data shows that the tariff reductions account for an increase of Korean exports to Colombia between 1.78% and 2.07%. According to the benchmark specification (3), the overall effect was an increase of 1.95%.

The RER_t^{KC} also had a negative impact, highly significant under (2), which suggests that one index unit revaluation of the Korean Won (KRW) against the Colombian Peso (COP) decreased exports by 1.2% (after applying the procedure of Equation 12). This was, however, non-significant in my benchmark model.

The remaining independent variables are in logarithms so that they can be interpreted directly as elasticities. The coefficient on MRW_{it}^{C} indicates that a 1% increase of Colombian imports from the ROW was associated with a rise of Korean exports to Colombia between 0.0317% to 0.0337% through the reference period, significant at the 1% level in both (2) and (3).

Table 7 displays the results for models (1), (2), and (3) applied to the dataset of Colombian exports. The results are pretty different from those observed for Korea. The coefficient on tariffs was always positive but never significant. Hence, this analysis did not find significant evidence that a reduction in tariffs applied by Korea was associated with increased exports from Colombia.

Additional steps taken to capture some effect of tariff liberalization included dropping outliers, mainly from chapters 25 to 27, and reducing the sample only to agricultural products within chapters 01 to 24. However, these results did not display significance either, so I omitted to report them.

Table 7. Effects of Tariff Decreases on Colombian Exports

$\ln X_{it}^{CK}$	(1)	(2)	(3)
τ_{it}^{KC}	0.3713	0.2329	0.4013
	(0.2535)	(0.2113)	(2.2556)
RER_t^{CK}		-0.0008	0.0031
		(0.0013)	(0. 0038)
$\ln GDP_t^{K}$		0.3037**	-0. 2546
		(0.1587)	(0. 5303)
$\ln MRW_{it}^{K}$		0.0429**	0.0452***
		(0.0168)	(0. 0167)
$\ln ERW_{it}^{C}$		0.0153**	0.0161**
		(0.0077)	(0.0077)
Heading FE	Yes	Yes	Yes
Year FE	Yes	No	Yes
Observations	6,063	6,058	6,058
R^2	0.0017	0.0024	0.0035

Notes. The table reports the coefficients of the fixed effects models, with robust standard errors in parenthesis. ***, ** and * indicate statistical significance at the 1%, 5% and 10%, respectively.

However, I found a significant association with other variables: a marginal increase in Korean imports from the ROW involved a rise by between 0.0429% to 0.0452% of Colombian exports, significant at the 1% level under the benchmark specification (3).

Furthermore, a 1% increase in Colombian exports to the ROW was associated with increased Colombian exports to Korea by between 0.0153% and 0.0161%, significant at the 5% level. As for destination's income, a marginal increase in Korea's GDP was associated significantly (at the 5% level) with a 0.3037% rise in imports from Colombia under (2).

6.2.2. Robustness Checks

While closely analyzing the tariffs reported by Colombia for 2015 and 2017 (the first year after the FTA's enforcement), I observed that although the average customs duty decreased 30% from 6.2026 percentage points in 2015 to 4.28809 percentage points in 2017, a small group of 183 headings saw an average rise of 2.6 percentage points on their tariffs. The remaining 1,037 goods either decrease or stayed the same. From the data reported by Korean customs, only two observations increased their tariffs from 2015 to 2017, which is more in line with the expected effect of tariff liberalization due to an agreement. From the rest of the groups, 1,050 decreased and 159 remained the same.

To address the potential risk that some goods were not properly assigned to their categories, I reported the anomaly to both the Trade and Market Intelligence Team from the International Trade Center and to DIAN, and I also estimate tariffs for 2016 and 2017 through an alternative methodology, by calculating the rate of yearly discounts as the difference between customs duties of 2015 and 2018 divided by three (as this comprise three-year reductions). The procedure is specified by Equation 13.

Equation 13. Estimation of the Yearly Rate of Reduction of Colombian Tariffs

$$R = \frac{\tau_{i,2015} - \tau_{i,2018}}{3}$$

Because 2016 tariffs were computed under the baseline estimation as the average difference between 2015 and 2017, for this check, I estimated them by subtracting the yearly discount rate to the tariffs of 2015, which corresponds to the MFN. I estimated the tariffs for 2017 by subtracting two times the yearly discount rate to the initial MFN tariff, as Equation 14 displays.

Equation 14. Alternative Estimation of Tariffs Applied by Colombia in 2016 and 2017

$$\hat{\tau}_{i,2016} = \tau_{i,2015} - R$$

$$\hat{\tau}_{i,2017} = \tau_{i,2015} - 2R$$

This method accurately fills information for missing years because, as explained under Section 3.2*.,* the FTA removes tariff barriers for Korean goods entering Colombia through symmetrically distributed yearly stages, which entails a constant rate of change for each heading. I perform (1), (2), and (3) using this dataset. The results confirm those of the benchmark estimations in Table 6, which remain mainly unaltered.

Up to this point, the presented methodology compares all HS4 good categories subjected to the agreement, emphasizing tariff reductions. For this reason, non-tariff measures, such as trade facilitation (Section A, Chapter 4 of the FTA) and mutual administrative assistance in customs matters (Section B, Chapter 4) might not be captured by the assessment.

Given the lack of significant results for Colombian exports, I developed a different approach that compares goods within the FTA's scope to those outside of it, capturing possible non-tariff effects by employing a Difference-in-Differences (DD) setting. I present this strategy through the following lines.

The main difficulty with this method was finding a suitable control group. Ryan et al. (2015) stated that the DD works under the assumption that the control group provides an adequate proxy for the counterfactual outcome if the treated group had not been exposed to any change (the treatment being the enforcement of the FTA). Japan meets the closest approximation to this requirement in the Asia Pacific Region. The distance from Colombia is nearly the same; the aggregated trend of exports follows a similar pattern before the treatment is assigned, and the compositional nature of trade flows is relatively similar. I retrieved information on exports from Colombia to Japan from Trade Map

The parallel trends assumption is graphically assessed in Figure 15. Colombian exports to both South Korea and Japan followed a similar trend since 2013. At the extensive margin, it can be observed that Japan, on average, purchases higher values of Colombian goods. Both countries share an initial upward movement until 2014, after which trade flows drop, one year for Korea and two years for Japan. After 2016 there is another shared escalation and a final decline for the period's closure.

From the intensive margin perspective, agricultural goods hold a much larger share of exports to Japan when compared to Korea. Conversely, minerals and metals are more relevant in the latter's composition, while chemicals and foodstuffs are important for both nations. Although relevant differences are present, the structural trade patterns from Colombia to these two countries remain the best option for setting the analysis.

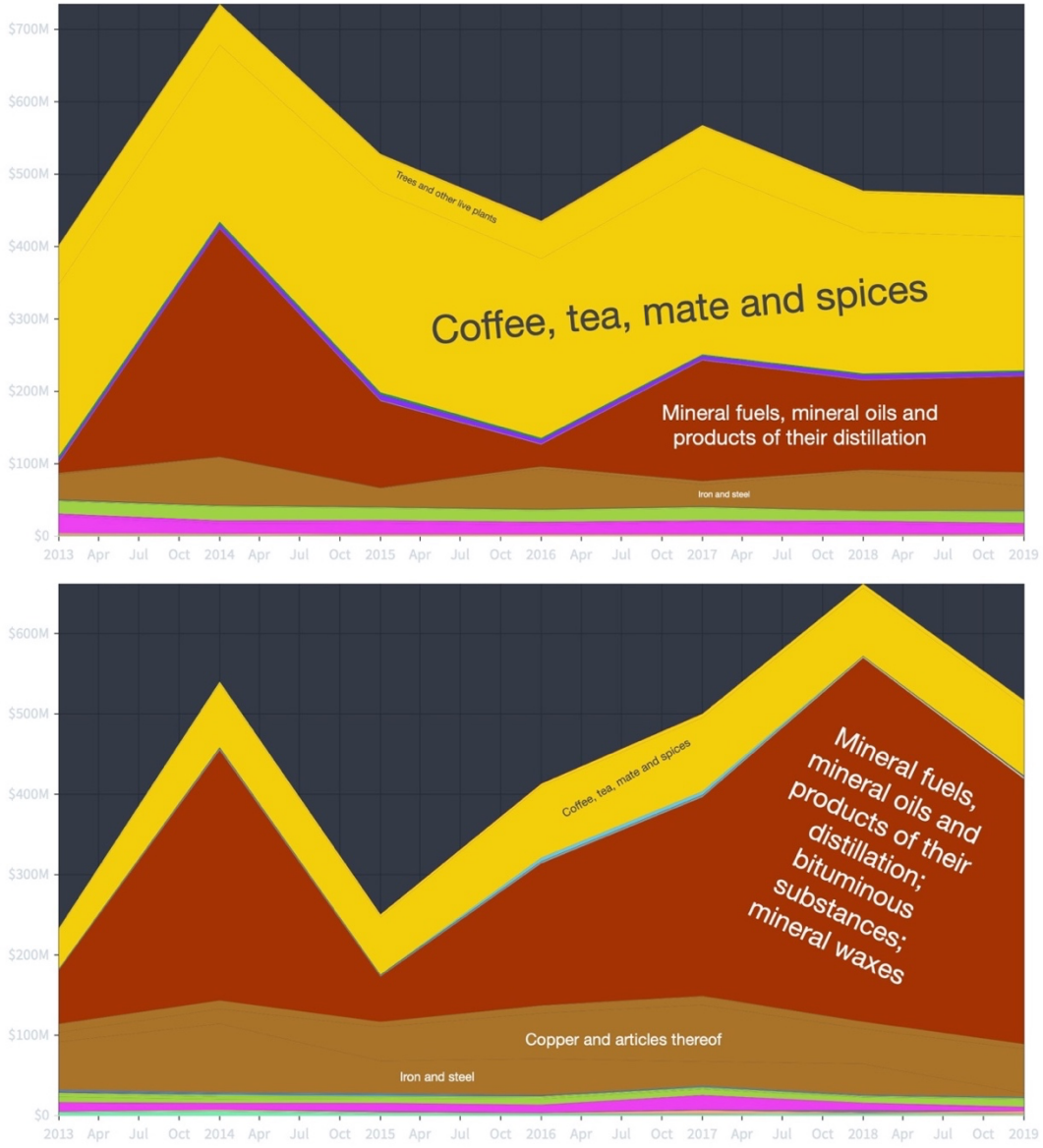
For the model specification, I employ an extension of the basic two-group two-time periods setting of the Difference-in-Differences method to allow for multiple periods through year fixed effects. In Equation 15, I specify the estimation of the DD coefficient as the average difference over time in the treated group (all headings exported to Korea) minus the average difference of the control group (all headings exported to Japan). This method removes biases linked to time trends common to both groups that are not related to the treatment or shared changes over time, as well as permanent or fixed between-groups differences (Imbens & Wooldridge, 2009, pp. 64–66; Oakes & Kaufman, 2017 p. 351).

Equation 15. DD Estimand

$$\varphi_{DD} = (\mathrm{E}[Y_i|C_i = 1, T_t = 1] - \mathrm{E}[Y_i|C_i = 1, T_t = 0]) - (\mathrm{E}[Y_i|C_i = 0, T_t = 1] - \mathrm{E}[Y_i|C_i = 0, T_t = 0])$$

For my DD estimation —Equation 16— the dependent variable is set as the natural logarithm of exports from Colombia to either Korea or Japan ($\ln X_{it}^{EI}$). The variable C_I, which stands for the importer country, is equal to one if the heading is exported to Korea and equal to zero if exported to Japan, regardless of when it is exported. Conversely, T_t is equal to one if the heading is being exported after the FTA's entry (after 2016), regardless of the value of C_I, and equal to zero otherwise. Additionally, controls RER_t^{EI}, $ln\, GDP_t^I$, $ln\, MRW_i^I$, ERW_i^C are also included, along with year fixed effects.

Figure 15. Colombian Exports to Japan and Korea (2013–2019)



Note. Figure built with the visualization tool from the Observatory of Economic Complexity (OEC).

Equation 16. Impacts of the FTA Under the DD Setting

$$\ln X_{it}^{CKJ} = \beta_0 + \beta_1 C_I + \beta_2 T_t + \varphi_{DD} C_I \times T_t + \beta_3 RER_t^{EI} + \beta_4 \ln GDP_t^I + \beta_5 \ln MRW_i^I + \beta_6 \ln ERW_i^C + \sum_{t=2015}^{T} \delta_t Year_t \, \varepsilon_{it} \quad (4)$$

The interaction term will be equal to one only if an observation is exported to Korea after the FTA. The coefficient φ_{DD} reveals any change in the outcome *(*ln *Colombian exports to Korea or Japan,* $\ln X_{it}^{CKJ}$*)* from the pre-treaty period to the post-treaty period, that occurs in the treated group and not in the untreated group.

In Table 8, I present the results for the DD estimation. According to these, the positive coefficient on the period dummy (T_t) indicates an increase (after applying the procedure of Equation 12) of 2.9% on imports originated in Colombia for both Korea and Japan after 2016, when compared to the previous years. The country dummy (C_I) separates the control group from the treated one, disregarding if the treatment has been implemented or not, the negative coefficient indicates that the value of exports destined to Japan was (after applying the procedure of Equation 12) 18.2% larger, on average, than those to Korea throughout the reference period. The interaction term displays the average effect of the treatment on the treated group. Headings saw an average increase of 3% when exported to Korea compared to those destined to Japan after the treaty's implementation. However, none of these estimates were significant. Meaning there is no evidence under this setting that the difference in the mean outcome values between the two groups can be attributed to the treatment.

Table 8. Effects of the FTA on Colombian Exports to Korea when Compared to Japan

ln Colombian exports	(4)
Period dummy (T_t)	0.0286
	(0.2753)
Country dummy (C_I).	-0.2019
	(2.6393)
Interaction term (φ_{DD})	0.0302
	(0.1190)
RER_t^{EI}	-0.0007
	(0.0176)
ln GDP_t^I	-0.1350
	(1.8456)
ln MRW_i^I	0.0238**
	(0.0043)
ln ERW_{it}^C	0.1109**
	(0.0054)
Heading FE	No
Year FE	Yes
Observations	12,141
R^2	0.1070

Notes. The table reports the coefficients of the DD model, with robust standard errors in parenthesis. ***, ** and * indicate statistical significance at the 1%, 5% and 10%, respectively.

The variable MRW_i^I has a positive and significant coefficient (at the 5% level), which entails that a 1% increase in total imports of Korea or Japan, excluding Colombia as the source country, is associated with an increase of 0.0238% of Colombian sales to these nations. On the other hand, a 1% marginal increase of exports from Colombia to the ROW, was associated with a significant (at the 5% level) increase of 0.11% in exports to Korea and Japan.

6.3. NARRATIVE ILLUSTRATION OF THE RESULTS

Regarding Korean imports, these results are in line with the findings of Ariza (2020) — mentioned in the literature review— who analyzed the imports of Korea from 126 partners from 1993 to 2013. In this study, the impact of FTAs was introduced as a dummy variable into a regression comprising overall trade and another one that separated industrial from primary goods. The effects of these estimations through a fixed-effects model correcting for autocorrelation were non-significant, suggesting Korea's imports do not tend to increase as a consequence of trade agreements.

These estimates also mirror the sectoral analysis performed in Section 5. For Korea, the behavior of the two most extensively exported headings is very illustrative of the results: telephone sets (8517) which accounted for 18% of total exports after the treaty's entry, saw a reduction of 100% off their initial customs duties, while motor cars and vehicles for passengers (8703), which represented 13% of total sales after the FTA, saw a much smaller decrease in tariffs of 30%. I estimated the difference between annual average growth rates (AAGR) before and after the FTA. The AAGR of telephones increased by more than four times after the FTA, while for motor vehicles, it was only 3.1% higher, although it remained negative through both periods. Most goods within the motor vehicles (8703) heading were placed under category 10, one of the slowest ones on the liberalization schedule. The fall on the vehicles section accounts for a drop of 431M from 2014 (579M) to 2019 (148M), a reduction of more than 75% of its initial value. Conversely, placed under Category 0, cellphones and telephones steered the machines section to become the most important one after the FTA.

Even within the transportation section, the assigned category on the schedule led to different growth paths: motor parts and accessories (8708), with an average reduction on tariffs of 47%, mostly assigned to category 5, showed an average growth rate 14% higher after the FTA when compared to before, while motor cars and vehicles only experienced the aforementioned 3.1% difference.

Another important chapter is that of plastics (39), which made up 12.3% of overall exports from Korea to Colombia through the reference period. It also declined

drastically after the FTA, from 186M in 2014 down to 94.7M in 2019, and experienced one of the slowest tariff reductions of barely 25%. Although Korea has been an important supplier of this good for Colombia —which acquires from it a more significant share (12.3%) than its average importer from the world (4.57%)— and Colombia's demand for this good has remained mainly unaltered throughout the reference period (between 2.1B and 2.6B).

The highest individual growth per heading is not easy to spot when focusing on largely traded goods because it might be concentrated in categories that do not represent the highest aggregated values. Among Korean headings traded uninterruptedly throughout both periods, 36 displayed a difference in AAGR over 100%, most of which met drastic decreases in tariffs, like gimped yarn (5606) with an AAGR 34.17 times larger after the agreement and a reduction in tariffs of 100%, or video recording or reproducing apparatus (8521) with an AAGR 5.87 times larger than the one before the FTA and a reduction of 100% off customs duties. Another 137 headings experienced an AAGR between 1% and 99% higher for the post FTA period.

From the perspective of Colombian exports, the rationale behind these findings lines up with the observed behavior of product categories throughout the reference period: the most important goods traded after the agreement's entry, i.e., coal briquettes, ovoids, and similar solid fuels manufactured from coal (2701), which accounted for 55% of exports after the FTA's enforcement; and copper, its waste and scrap (7404), that represented an additional 11% of exports, were subjected to free trade before the enforcement.

The highest individual growth per heading also points towards this conclusion, only three headings had an AAGR larger than 100% after the FTA when compared to before —live plants (602), crotched or knitted T-shirts (6109), and beauty preparations and make-up (3304); only the last one experienced a reduction of 100% from the base rate. Other important goods like Coffee (0901) even saw decreases in their yearly growth rates after the FTA when compared to the previous period, with a fall of 10% on the AAGR, and a 100% fall on the base tariff, which represented an even more drastic fall of 101 percentage points. Only 14 Colombian headings uninterruptedly traded experienced higher growth rates after the FTA when compared to before.

The second most important section: metals, underwent two different headings experiencing different paths: cooper and its articles (7404) grew from 18.2M to 55.2M in 2019 and accounted for more than 2/3 of minerals in that year, while exports of ferro-alloys (7202) of 75.6M in 2014, ceased in 2019 (data from OEC). Tariffs for the first one were non-existent before the FTA, while the second heading experienced a drop of 94% off the base rate.

Although the main effect of tariff reductions was non-significant for Colombian exports, there are very specific gainers by the FTA; these included crustaceans (306), which were not exported before the FTA, only since 2018 with 293K. They ended 2019 with 2,7M and experienced a tariff reduction of almost 80%.

A more modest increase was that of cut flowers (603), which grew 15% faster after the FTA when compared to before, with a reduction of 64% on its initial tariff; and bananas

(803), which started exports in 2017 with only 15K, and closed 2019 with 839K, it experienced a fall of 60% from its initial base rate.

Conversely, some headings were striking losers, like cane or beet sugar and chemically pure sucrose (1701), which experienced continuously decreasing exports form 2.26M in 2014 down to 718K in 2019 (data from Trade Map) despite tariff reductions; and cocoa powder (1805) with growth rates 57% lower after the FTA when compared to before and a fall of 100% off the base rate.

6.4. CONSIDERATIONS ABOUT THE EMPIRICAL ASSESSMENT

Korean exports to Colombia have been positively impacted by the progressive reduction and elimination of tariffs sourced on the FTA. However, this work did not find significant evidence that Colombian exports have substantially increased due to tariff decreases, even though Korea's liberalization schedule has been much more far-reaching than Colombia's and 81.27% of Colombian goods were under free trade by 2018, as Table 1 displays. There is also no significant evidence that Colombian sales to Korea were enhanced through non-tariff measures compared to Japan as a control group. The fact that this is the case even for products in which Colombia has a large endowment of factors such as agricultural goods is concerning. To appropriately seize underexploited opportunities, it is essential to assess the country's competitiveness and the response from local policymakers, encharged of steering incentives, and implementing programs to foster industries with the potential of entering or increasing their share on the counterparty's market.

7. CASE STUDY: THE EVOLUTION AND EFFECTS OF THE COLOMBIA–KOREA FREE TRADE AGREEMENT ON COLOMBIAN EXPORTS OF EDIBLE FRUITS AND NUTS

Chapter 08 of the HS comprises edible fruits and nuts; peel of citrus fruit or melons. This particular group has seen an average reduction of 26.6% from the base rate (12.4 percentage points) of 46.6% before the FTA, down to 34.2% in 2019 (estimated with data from Market Access Map). These goods experienced the highest growth in exports from 2015 to 2019 according to the five-year growth rate indicator of Trade Map, calculated by the logarithmic least-squares trend method on series valued in current USD.

Throughout this section, this work computes and analyses the evolution of the HHI for Colombia's fruit and nuts export market to Korea with the information provided by the ranking tool of Legiscomex; the index's computation is performed on Microsoft Excel.

Bondarenko (2019) set forth that larger index values reflect higher market concentration, decreased competitiveness, and monopoly power. The highest value attainable (10,000)

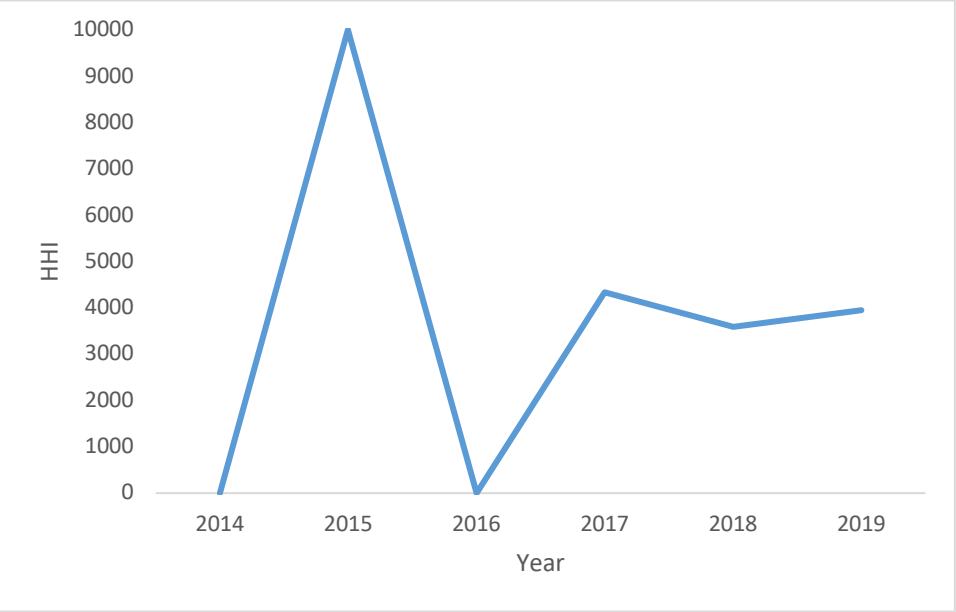
displays the presence of only one firm with a market share of 100%. As competitors enter the market and each firm's share is reduced, the index decreases. The computation consists of squaring the individual share of each exporting firm in the following way.

Equation 17. Estimation of the HHI

$$HHI = Share\ of\ exports\ of\ firm\ 1^2 + Share\ of\ exports\ of\ firm\ 2^2 \ldots Share\ of\ exports\ from\ firm\ N^2$$

Throughout the reference period, 13 firms exported chapter 08 goods to Korea. In two years, 2014 and 2016, no one participated in this market. Only one firm entered and exited the market between these two periods, with an HH of 10,000 and a minimal sale value of 23,000 USD, as Figure 16 displays. From 2017 onward, the HHI has stabilized between 3,586 and 4,332 and firms participating each year have ranged from 4 to 6, the exported value increased almost tenfold and, albeit a decline in 2018, it peaked in 2019 at 862K.

Figure 16. HHI of the Fruits and Nuts Export Market. Evolution (2014–2019)



Note. Figure built with data from Legiscomex.

Table 9 shows that firms exporting in 2017 had a minor market share in 2019 or already had stopped exporting and that new entrants lead the market, with the two leaders holding over 88% of it.

It is also noticeable that firms tend to remain in the market for short periods: only three firms remained in the market for three years, the remaining ten have been present through only one. However, from 2017 onward, this market has become more appealing to new entrants, as they have substantially increased.

Table 9. Volume and Market Shares of Firms Exporting Edible Fruits and Nuts

Firm	2014	2015	2016	2017	2018	2019
Exp. Value	0	23K	0	227K	154K	862K
Firm 1						46.05
Firm 2						42.05
Firm 3						6.61
Firm 4				39.72	50.99	2.73
Firm 5						1.36
Firm 6						1.19
Firm 7				52.04	28.62	
Firm 8				6.6		
Firm 9				1.63		
Firm 10					3.47	
Firm 11					6	
Firm 12		100		0.01		
Firm 13					10.92	
HHI	0	10,000	0	4,332.057	3,586.3718	3,943.2157

Note. Table built with data from Legiscomex.

It is important to recall that this section entered the treaty into categories 5, 7, 10, 12, and 16. The goods listed in the first category became tax-free, effective January 1, 2020 (Article 1, lit. c, annex 2-A), and the tariffs of the remaining goods will continue to decline. This has been perceived as a business opportunity for Colombian producers, which manifests not only through the highest number of exporters but on the rising volume of exported values, with an average yearly growth rate of 105% through the reference period (for this computation, an increase from 0 exports to any positive value is considered a 100% increase).

Finally, it is important to add that these companies were not the largest ones; only firm 11 and firm five were among the 50 largest Colombian exporters of goods listed under chapter 08 with a share of 0.45% (position 21) and 0.3% (position 31), respectively.

To recap, one year after the entry into force of the FTA, the number of exporting firms started increasing substantially and remained high for the following years. The HHI has decreased from 2017 to 2018 and increased slightly in 2019 but remained much lower than pre-agreement levels. The firms in these categories of goods usually enter the Korean importing market for short periods of time, mainly one year, they are not the largest Colombian exporters of these goods, and new entrants usually hold higher shares.

8. CROSS-SECTION CONCLUSIONS AND RECOMMENDATIONS

This section presents some conclusions and recommendations deriving from a joint analysis of each segment's main takeaways. The first point results from comparing the

benefited sectors forecast by the feasibility studies in 2009 with the actual winners and losers after the first years of agreement implementation. The second point describes the development of international trade patterns for both countries throughout the reference period, focusing on shared features and specificities. The third point explains correlations between tariff reductions and trade growth and centers on the changes in the internal composition of the Korean export basket. The fourth identifies some issues that have kept Colombia from making the most of its trade potential and suggests actionable strategies for dealing with them.

The first analysis directly links the findings from Objective 1, regarding the conditions and motives that gave rise to the agreement, and Objectives 3 and 4, which analyzed the evolution of trade between the parties after its entry into force and the impact of tariff removals. The results of the empirical methodology are only aligned with feasibility forecasts for some sectors, while the evidence shows differences in others.

In the study performed by Seoul National University, the potentiality matrix assessment pointed to crude petroleum and bituminous oils, bituminous coal, shrimp, and roses as the headings with the highest potential for inclusion in Colombian exports to Korea. The forecast was mostly accurate, although coal and derivatives, and crude oil, entered the trade flow before the agreement's implementation, and cannot thus be directly attributed to that circumstance. Even with the FTA in effect, they have experienced drastic variations, with exports of crude petroleum dropping to zero in 2016, for example.

In the same study, the CGE assessment for Colombia pointed to agricultural products, fishing, apparel, and ferrous and non-ferrous metals as the main sectors that would benefit from the agreement. These predictions were less aligned with the empirical evidence, as the textile sector has not reached pre-agreement levels of trade, with only three of its headings increasing their AAGRs after the FTA, and metals decreased overall, with ferro alloys dropping to zero in 2019. In agricultural products, coffee has seen a slight reduction in its AAGR, while the rest have increased. Fishing gains have been concentrated around growth in crustacean exports.

From the Korean side, the study forecast that machinery, transport equipment, textiles, chemicals, and rubbers and plastic chapters would benefit the most from the FTA. The actual trends show that the transportation equipment, car parts, and chemical sectors have increased after the agreement, while machinery has exhibited higher surplus growth. Rubber, plastic, and textiles were on the decline before 2016, recovered slightly after the FTA, and fell again over subsequent years.

Besides the previously mentioned goods, the study conducted by Fedesarrollo estimated gains for Colombia in sugar products. As mentioned in Section 6.3, sugar cane and sucrose experienced drastic exports reductions after the FTA. For Korea, it envisioned growth in telephone electronics, which was indeed one of the sectors to benefit the most under the agreement, and chemicals, which also grew after the FTA but at a slower rate.

On the second point, the findings of Objective 2 suggest that the two nations display, albeit at a different scale, similar trade patterns throughout the reference period. Trade metrics (imports and exports) in current USD for both countries contracted between

2014 and 2016, then recovered until 2018 and fell in 2019, except for Colombia's imports, which continued growing. Exports in constant USD have grown almost without interruption over the entire period, with the only exception to this trend a minor contraction in Colombia's exports in 2016. The most significant difference is that, for Korea, imports in constant USD increased over the entire period except for the last year, while Colombia's dropped during the first half but increased throughout the second.

The third point is related to Objective 4, more specifically to evaluating the effect of tariff removals on trade flows. The data reveals that the number of subheadings exported by Korea to Colombia decreased mostly steadily throughout the reference period[2], even after the FTA. Thus, trade gains in tariff-released goods have been offset by losses in heavily taxed ones and overall trade has decreased. The growth of liberalized headings has been, to a large extent, at the expense of those whose liberalization schedule has been delayed. This has driven the growth of sectors that have experienced steeper reductions of tariffs on highly exported goods[3], but also the growth of liberalized headings within chapters[4]; concealing the fact that trade gains were made due to the FTA when only aggregated trade flows are observed.

Conversely, trade from Colombia to Korea has experienced growth in aggregated terms, but a detailed analysis shows that this trend has been driven predominantly by goods that were not taxed before the agreement, hence the lack of a significant association between tariff removals and trade.

The fourth point, related to Objective 5, shows that the export growth of agricultural products has been driven by a few categories listed in Sections 5 and 6 of this study: live and cut flowers, bananas, and crustaceans. Together with the considerations of Section 4.1, this leads to a conclusion that, notwithstanding the presence of opportunities in the Korean market, technical standards and consumer requirements still pose an impossible burden for many local producers.

The treaty itself does not impose additional obligations other than those in the SPS Agreement and the instruments mentioned in Section 3.3, subjecting sanitary access conditions to international standards. Thus, it has been easier for firms that already export to foreign markets to enter the Korean one because a reaffirmation of existing regulations does not pose an obstacle for them. For example, most firms exporting goods listed under heading 08 —albeit not the largest exporters, as found under Section 7— were already exporting to some markets and subject to such requirements.

Considering these conditions, the creation of spaces for dialogue and sharing experiences on how to meet these standards can help pave the way for newcomers. The role of rural business associations in creating these spaces and disseminating relevant information on requirements to all producers is paramount. Local governments must reinforce private efforts to increase trade, mainly through the guidance provided by domestic SPS

[2] For yearly exported subheadings, see Table 5.
[3] See the case of machinery and appliances against transportation in Section 5.1.
[4] See the case of vehicles and vehicle parts in Section 6.3.

agencies, who are members of the SPS Committee and, as such, have firsthand information to help producers fulfill Korean requirements from early stages and prepare them for the risk assessment procedures that their products will have to undergo for clearance.

The Committee itself should also provide strategies to facilitate the exchange of information between the parties' local SPS agencies and foster its dissemination amongst firms. Open access conditions depend on public, transparent instruments that pass on the export and import requirements related to both countries' SPS measures. Standardizing such procedures and visualizing them provides certainty to local producers, minimizes the risks associated with their forays into foreign markets, and reduces information asymmetries. It also puts local authorities in a better position to assist firms with meeting the counterparties' requirements, as they are already involved in inspections of the production chain in their countries.

Furthermore, the Committee's mission to oversee implementation of the SPS Agreement to prevent local authorities from imposing disproportionate burdens is crucial. Entering foreign markets involves a very high fixed cost; for small enterprises to benefit from the agreement, associative and government interventions are needed to help them meet the requirements. It is also helpful to provide alternatives for reducing fixed costs and imputing them to marginal costs, including the use of trade facilitators or risk diversification mechanisms like strategic alliances and joint ventures.

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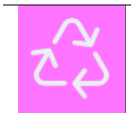
APPENDIX

Table 10A. Sections of the Harmonized System

Convention	Section name
	Section I Live animals; animal products.
	Section II Vegetable products.
	Section III Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes.
	Section IV Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes.
	Section V Mineral products.
	Section VI Products of the chemical or allied industries.
	Section VII Plastics and articles thereof; rubber and articles thereof.
	Section VIII Raw hides and skins, leather, furskins and articles thereof; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut).
	Section IX Wood and articles of wood; wood charcoal; cork and cork articles; manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork.
	Section X Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard; paper and paperboard and articles thereof.
	Section XI Textiles and textile articles
	Section XII Footwear, headgear, umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof; prepared feathers and articles made therewith; artificial flowers; articles of human hair.

	Section XIII Articles of stone, plaster, cement, asbestos, mica or similar materials; ceramic products; glass and glassware
	Section XIV Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin.
	Section XV Base metals and articles of base metal.
	Section XVI Machinery and mechanical appliances; electrical equipment; parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles
	Section XVII Vehicles, aircraft, vessels and associated transport equipment
	Section XVIII Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; clocks and watches; musical instruments; parts and accessories thereof.
	Section XIX Arms and ammunition; parts and accessories thereof.
	Section XX Miscellaneous manufactured articles.
	Section XXI Works of art, collectors' pieces and antiques.

Note. Illustrations from the Observatory of Economic Complexity.