SECTORAL EFFECTS OF THE US-CHINA TRADE WAR ON COLOMBIAN EXPORTS TO THE US AND CHINA, 2018-2024

Impacto Sectorial de la Guerra Comercial en las Exportaciones Colombianas a Estados Unidos y China, 2018-2024

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Abstract

This thesis examines how the US-China trade war (2018–2024) affected Colombian exports to both countries at the product level. Using monthly data at the HS10 level (for the US) and HS08 level (for China) and applying a Difference-in-Differences model with continuous treatment, it estimates the effect of tariffs on Colombian trade. Results show no statistically significant impact of the tariffs China imposed on the US on Colombian exports to China. Conversely, a small but significant decline was observed in Colombian exports to the US due to tariffs the USA imposed on China, contrary to standard trade diversion expectations. A qualitative analysis of the five most affected products reveals that input demand contraction dominated the effects on Colombian exports to China, while trade diversion occurred in a few US-bound Colombian products such as aluminum, plastics, and footwear. Overall, Colombia experienced limited trade diversion effects, with modest gains in some sectors but losses in others. The limited effects are likely due to weak GVC participation and declining industrial demand. The findings underscore the importance of product-level analysis when assessing third-country effects of trade conflicts in commodity-exporting economies.

Contents

1. Introduction

The US-China trade war, launched in 2018, disrupted global trade dynamics far beyond the two countries directly involved. As the world's two largest economies imposed escalating tariffs on each other, trade flows, supply chains, and commodity markets were significantly affected. While most existing research emphasizes the experiences of manufacturing-based economies with deep integration into global value chains (GVCs), the consequences for commodity-exporting countries remain underexplored. This thesis addresses that gap by analyzing Colombia—a country whose exports are concentrated in raw materials and low-tech manufactures, and whose trade ties with both the United States and China are significant but structurally distinct from more industrialized economies.

To address this gap, this thesis quantifies the impact of US-China trade war tariff exposure on Colombian exports at the product level, using high-frequency (monthly) trade data for the period 2018-2024. The analysis applies a Difference-in-Differences strategy with continuous treatment, leveraging variation in tariff rates across HS10- and HS08-level products over time. The study evaluates four transmission channels drawn from trade theory: trade diversion, input demand spillovers, aggregate demand contraction, and commodity price effects.

The results show a small but statistically significant aggregate decline in Colombian exports to the US—contrary to standard trade diversion expectations. No significant aggregate effect is observed for Colombian exports to China. To explore the heterogeneity behind these findings, the study ranks products by their estimated response to tariffs and applies qualitative case study analysis to the most affected ones.

The case studies indicate that input demand spillovers were the dominant mechanism in the Chinese market, while moderate trade diversion occurred in select US-bound products such as aluminum, plastics, and footwear. Overall, very few product lines show plausible trade diversion effects once data noise and classification issues are addressed, suggesting that Colombia experienced limited and highly uneven third-country spillovers.

The thesis contributes to understanding how trade conflicts affect developing, commodity-based economies. For Colombian policymakers, the findings highlight the importance of targeted export diversification and greater awareness of exposure to external shocks. By pinpointing the sectors most affected—both positively and negatively—the analysis supports more informed and resilient trade policy design.

2. The US-China Trade War: Context and Timeline

The trade tensions between the United States and China that escalated into a full-scale tariff war in 2018 reshaped the global trade landscape. What began as US complaints over trade imbalances, intellectual property violations, and industrial subsidies evolved into one of the most far-reaching trade conflicts in decades. While Colombia was not directly involved, the scale and duration of the tariffs likely altered the environment in which Colombian exporters operated—both through direct market shifts and broader disruptions in global demand, production, and prices. This section outlines the timeline of tariff actions to contextualize potential spillover effects.

2.1. Origins and Escalation (2017–2019)

Tensions intensified in 2017 when the US launched investigations under Section 201 (safeguards), Section 232 (national security), and Section 301 (unfair trade practices), laying the legal foundation for broad tariff actions.

The trade war formally began in 2018 with safeguard tariffs on solar panels and washing machines, followed by steel and aluminum duties. The most substantial actions came under Section 301, targeting a wide range of Chinese goods in escalating stages:

Table 1. Timeline of US-China Trade War Escalation and Key Tariff Actions (2017-2024)

Date	Action	Details
2017	Investigations	US launches Section 201, 232, and 301 investigations
7-Feb-18	Section 201	US: 30% on solar panels, 20% on washing machines
23-Mar-18	Section 232	US: 25% on steel, 10% on aluminum; China retaliates on Apr 2 with 15-25% on $2.4B
6-Jul-18	List 1 (Section 301)	US: 25% on $34B; China retaliates with 25% on $50B
23-Aug-18	List 2 (Section 301)	Both sides: 25% on additional $16B
24-Sep-18	List 3 (Section 301)	US: 10% on $200B (raised to 25% Jun 2019); China retaliates with 5-10% on $60B
1-Sep-19	List 4A (Section 301)	US: 15% on $101B; China retaliates with 5-10% on $75B
15-Jan-20	Phase One Agreement	Signing of agreement
14-Feb-20	Phase One Agreement	Partial de-escalation, both sides halved Sep 2019 tariffs
2020-2024	Continuation	Most tariffs remain with additional measures (e.g., import bans, export controls, etc.)

By the end of 2019, average US tariffs on Chinese goods rose from 3.1% to 19.3%, covering 66.4% of US imports from China. In response, China raised its average tariff on US goods from 8.0% to 20.7%, covering 58.3% of affected imports (Bown, 2021).

2.2. Phase One Agreement (2020)

The Phase One Agreement, signed on January 15, 2020, paused further escalation. China committed to purchasing $200 billion in additional US goods over 2020–2021 and both countries halved tariffs from List 4A. However, most tariffs remained in place, and China ultimately missed its purchase targets by over 40%. Core structural issues remained unresolved, and tensions persisted.

2.3. Lingering Tensions and Continuation (2020–2024)

Although no new tariffs were imposed after 2020, restrictions such as export controls and investment screening continued. The trade conflict overlapped with the COVID-19 pandemic and rising decoupling pressures, further disrupting global supply chains and trade patterns.
This thesis examines the full 2018–2024 period to capture both immediate shocks and delayed adjustments. For Colombia, this extended window enables detection of gradual effects such as trade diversion, input demand shifts, and commodity price changes as firms adapted to persistent uncertainty and new trade dynamics.

3. Theoretical Framework

This thesis explores how the US-China trade war may have influenced Colombian exports to both countries, despite Colombia's non-participation in the conflict. Drawing on international trade theory, this section outlines how tariffs imposed by large economies can indirectly affect third countries. Four key transmission channels are discussed: trade diversion, input demand spillovers, aggregate demand contraction, and commodity price effects. These mechanisms provide a framework for interpreting possible sectoral impacts and form the theoretical basis for the empirical strategy. The analysis builds on the 2018–2020 escalation in tariffs under US Sections 201, 232, and 301 and China's retaliatory measures, which potentially reshaped demand and prices in Colombia's export markets.

3.1. Tariffs and Trade

Tariffs are taxes imposed on imported goods that alter relative prices between domestic and foreign products. In standard trade models, tariffs reduce imports by increasing the domestic price of foreign goods, creating a wedge between world prices and local consumer prices (Carbaugh, 2019). For a **small open economy**, this price change affects only domestic consumption patterns; world prices remain unaffected because the country's demand is too small to influence global markets.

However, as Carbaugh (2019) explains, the case is fundamentally different when **large economies** such as the United States or China impose tariffs. Due to their market power, these countries can influence world prices through their trade policy decisions. In such cases, the burden of the tariff is shared between domestic consumers and foreign producers. This concept of **burden-sharing**—also discussed by Carbaugh (2019)—means that the full cost of the tariff is not passed on to domestic buyers. Instead, exporters in the tariffed country often lower their prices to maintain market share, effectively absorbing part of the tariff cost.

This price adjustment in turn affects **global trade flows**. When a large importer like the US reduces demand for a particular good from one supplier (e.g., China), global demand for that product shifts. Third countries producing substitutable goods may experience increased demand, while those supplying complementary goods or industrial inputs to the tariffed countries may see reduced demand. This is the theoretical foundation for the **spillover effects** examined in this thesis.

3.2. Transmission Mechanisms

The following four mechanisms explain how trade conflicts between major powers can affect third-country exporters through distinct but interrelated economic channels.

3.2.1. Trade Diversion

Trade diversion refers to a shift in import demand away from a tariffed country toward alternative, untariffed suppliers. First formalized by Viner (1950), this mechanism arises when trade policies change the relative prices of goods from different origins. In the case of the US-China trade war, tariffs imposed by the US on Chinese products—particularly under Sections 201, 232, and 301—made those products more expensive in the US market. If Colombian products were similar enough to substitute for those Chinese goods, they may have experienced increased demand.

The likelihood of trade diversion depends heavily on **product substitutability**, as modeled in Armington’s (1969) theory of differentiated products. According to this framework, goods are not perfectly interchangeable across source countries. The **elasticity of substitution** — the degree to which buyers are willing to switch from one country’s product to another — plays a central role in determining whether trade will be diverted.

According to Nicita (2019), several factors influence the potential for diversion:

- **Commodities**, such as coal, oil, or basic agricultural products, are typically more substitutable and thus more likely to benefit.
- **Supply constraints** can limit a country's ability to respond to increased demand.
- **Market frictions**, including certification requirements, long-term contracts, and buyer-supplier relationships, can delay or reduce diversion (Rauch, 1999).
- **Policy uncertainty** can also discourage firms from switching suppliers due to fears that trade conditions may change again (Rauch & Watson, 2003).

In Colombia's case, sectors that export relatively homogeneous goods (e.g., coffee, oil, minerals) are more likely to have benefited from trade diversion, especially over time as buyers adjusted their sourcing strategies.

3.2.2. Changes in Sectoral Demand for Inputs

A second mechanism relates to **production network linkages**. Tariffs that reduce output in one sector can lower demand for the intermediate inputs used in its production. Leontief (1936) formalized this with his input-output model, which shows how inter-industry dependencies allow demand shocks to propagate through the economy. Hirschman (1958) emphasized the importance of **backward linkages**, wherein a reduction in final goods production leads to a proportional reduction in input demand from upstream sectors.

If tariffs reduce industrial output in China or the US—especially in sectors like electronics, machinery, or steel—then countries supplying raw materials or intermediate goods may experience a drop in export demand. For Colombia, which mainly exports fuels, metals, and agricultural inputs, this implies potential vulnerability to negative spillovers through global supply chains.

Unlike trade diversion, which requires time to develop new relationships, input demand effects are **more immediate**, as firms adjust procurement volumes in response to production needs in real time. If a Chinese firm cuts production of smartphones due to reduced exports to the US, its demand for imported Colombian coal or aluminum may fall almost instantly.

3.2.3. Lower Aggregate Demand

Trade wars can also affect third countries through **macroeconomic demand channels**. By increasing uncertainty, reducing investment, and disrupting supply chains, tariffs can slow overall economic activity in the countries imposing or receiving them (Caldara et al., 2020; Barattieri & Cacciatore, 2021). This leads to a general contraction in import demand, which affects all trading partners regardless of whether they are directly involved in the tariff action (IMF, 2019; Crowley et al., 2022).

Theoretical foundations for this mechanism come from Keynesian open-economy models and the **Mundell-Fleming framework**, which illustrates how domestic expenditure decisions and exchange rate movements influence trade flows (Mundell, 1963; Fleming, 1962). A decline in national income leads to reduced imports, particularly in sectors with high income elasticity.

Goldstein and Khan (1985) provide empirical benchmarks, estimating that the **income elasticity of import demand** typically ranges from 1 to 2, meaning a 1% decline in GDP could reduce imports by up to 2%. Thus, if the US or Chinese economy contracts due to the trade war, Colombian exports may fall even in unaffected sectors.

This channel is **non-discriminatory**—it affects all export sectors to varying degrees based on their exposure and the nature of the goods. Necessities like oil or coffee may be more resilient than discretionary goods like cut flowers or processed foods, which are more sensitive to changes in consumer and firm spending.

3.2.4. Commodity Price Changes

The final channel operates through **global commodity prices**. Tariff-induced slowdowns in industrial activity reduce demand for inputs such as coal, oil, and metals, which in turn affects the prices of those commodities on global markets. This creates a **terms-of-trade shock** for commodity exporters like Colombia (Marshall, 1890; Deaton & Laroque, 1992; Baffes & Nagle, 2020; Kilian & Zhou, 2020).

The concept of **derived demand**, introduced by Marshall (1890), explains that the demand for intermediate goods depends on the demand for the final goods they help produce. As industrial demand contracts, so does the price of raw materials. The commodity markets' sensitivity to expectations and inventory dynamics amplifies these shocks. Deaton and Laroque (1992) show that **storage constraints and market volatility** cause even modest demand changes to produce outsized price swings.

Colombia, a small price-taking exporter in global markets, is particularly vulnerable to these effects. Its major exports—crude oil, coal, nickel—are priced globally and subject to high volatility. Kilian

(2009) also shows that demand-driven oil shocks, such as those caused by global slowdowns, have immediate and significant effects on commodity-exporting economies.

Even if export volumes are unchanged, **price declines can substantially reduce export revenues**, especially in periods of heightened uncertainty or strong US dollar appreciation, which raises local prices for international buyers (Rees, 2023).

These four mechanisms provide the theoretical foundation for assessing whether Colombian exports were indirectly influenced by the trade war. In the next section, we examine the empirical literature that supports these predictions and assess what existing research suggests about the likelihood and direction of third-country spillovers.

4. Empirical Literature Review

4.1. Trade Diversion

Empirical studies of trade diversion during the US-China trade war have primarily examined whether third countries increased exports to the US in products targeted by tariffs on Chinese goods. This mechanism, rooted in Viner (1950) and Armington (1969), is most likely in sectors with high substitutability and where exporters can rapidly meet new demand.

Several influential studies use product-level data to quantify these effects. Fajgelbaum et al. (2020), using HS6-level bilateral data, estimate that US imports from China declined 37% in affected sectors, while imports from other countries rose 11%, with diversion concentrated in Vietnam, Mexico, and Taiwan. However, they do not assess sectoral heterogeneity or include small exporters like Colombia.

Cerdeiro and Ruane (2022) apply a difference-in-differences model to monthly HS6-level data, treating products under Section 301 tariffs as exposed. They find trade diversion strongest for nearby countries with large pre-existing market shares and scalable export capacity. Colombia is in their dataset but not analyzed directly.

Amiti et al. (2019) focus on substitution within HS10-level codes, finding that US firms gradually shifted suppliers away from China, supporting the feasibility of product-level analysis in this thesis.

Flaaen and Pierce (2019) use firm-level US data to detect substitution toward Mexican suppliers. Similarly, Nicita (2019), using UN COMTRADE data, finds diversion concentrated in emerging markets like Vietnam and Bangladesh. Both emphasize the limiting role of supply constraints—especially in commodities and capital-intensive sectors—on diversion potential.

Structural factors also play a role. Freund et al. (2020) argue that Vietnam's export surge was driven by its prior integration into global value chains (GVCs), which limits generalization to countries like Colombia. Bown et al. (2021) explicitly note that Latin American countries benefited less, citing infrastructure and institutional barriers.

Ziaei (2022) finds diversion varied by product type: raw materials and low-tech manufactures saw weaker gains than mid-tech sectors like electronics and machinery. This implies that Colombia's commodity-dominated exports were less likely to benefit.

In sum, the literature confirms that trade diversion occurred, but its distribution was uneven across sectors and countries. Key conditions included product substitutability, GVC linkages, and supply-side responsiveness.

4.2. Changes in Sectoral Demand for Inputs

The literature on global value chains and production networks highlights how tariffs affecting large economies can reverberate through third countries via changes in input demand. This channel is particularly relevant when a country exports raw materials or intermediate inputs that feed into global production hubs.

Borin et al. (2021) show that countries upstream in GVCs—particularly those supplying intermediate goods to China—suffered declines in export demand when Chinese output fell. Using input-output linkages and sectoral trade data, they demonstrate that sectors more dependent on Chinese final demand experienced sharper declines, even when those suppliers were not direct targets of US tariffs.

Ferrantino et al. (2019) analyze trade disruptions using firm-level data and find that downstream firms facing tariffs reduce orders from upstream suppliers. This creates a ripple effect through the value chain. Their findings imply that countries like Colombia, which supply primary and intermediate goods (e.g., metals, fuels), are indirectly affected by a slowdown in tariff-targeted sectors abroad.

Espitia et al. (2021) combine HS6-level trade data with World Input-Output Database linkages to show how third-country exports contracted in response to tariffs, especially in sectors with strong backward linkages to the US and China. They find significant heterogeneity, with input-providing sectors like chemicals, basic metals, and rubber products more affected than final goods exporters.

Constantinescu et al. (2020) also examine the reconfiguration of production networks during the trade war. They show that the reshuffling of supplier relationships in the face of tariffs disproportionately hurt countries with less diversified export bases and lower production flexibility—both characteristics that apply to Colombia.

Taken together, these studies demonstrate that input demand effects are a key channel through which tariff shocks spread globally. The evidence suggests that exporters of intermediate and raw goods—especially those tied to sectors like electronics, autos, and machinery—saw declines even if their products were not directly tariffed. For Colombia, this implies potential negative effects on sectors like coal, oil, plastics, and minerals that feed into downstream industrial production in the US and China.

4.3. Lower Aggregate Demand

A third channel identified in the literature is the contraction of overall demand in major economies affected by trade tensions. Unlike trade diversion or input demand effects, this channel operates at a macroeconomic level and can influence all trade partners, regardless of their position in global value chains.

The uncertainty generated by the US-China trade war has been associated with falling investment, slowing output growth, and disrupted supply chains in both countries. Caldara et al. (2020) develop a Trade Policy Uncertainty Index and show that spikes in uncertainty coincide with reductions in global economic activity and trade flows. They find that firms respond to tariff threats and actual tariffs by delaying investment and reducing production, leading to generalized import contractions.

Crowley et al. (2022) provide evidence that the US manufacturing sector experienced a significant slowdown during the trade war period, with declines in production and employment particularly acute in tariff-exposed sectors. Since manufacturing accounts for a large share of US imports, this contraction may have contributed to reduced demand for imports from third countries.

Barattieri and Cacciatore (2021) use a dynamic general equilibrium model calibrated to US-China trade to quantify welfare and output effects of the tariff escalations. They find that increased uncertainty and retaliatory tariffs led to a persistent decline in output and imports, especially of durable goods. This suggests that third-country exporters to either the US or China faced headwinds even in non-tariffed sectors.

Moreover, the IMF (2019) estimates that the trade war lowered global GDP by about 0.8% in the medium term, with ripple effects on trade volumes through demand-side channels. Their simulations suggest that both direct and indirect effects from the trade conflict contributed to the contraction in global trade observed during 2018–2019.

These findings imply that Colombian exporters—particularly those in income-sensitive sectors like cut flowers, processed foods, and consumer goods—may have been indirectly affected by the general decline in aggregate demand in their main trading partners. While these effects are difficult to isolate econometrically, they represent an important backdrop to interpreting sectoral export trends.

4.4. Commodity Price Changes

Finally, a key mechanism through which the US-China trade war may have affected commodity-exporting countries like Colombia is through changes in global commodity prices. Several studies have documented how industrial slowdowns in large economies, triggered by trade tensions and tariff shocks, contributed to falling demand and prices for energy and mineral products.

Baffes and Nagle (2020) provide a broad overview of commodity price behavior during trade disputes, showing that global prices for coal, crude oil, and base metals declined in 2018–2019, in part due to weakening industrial activity in China and the US. Their findings suggest that commodity exporters experienced indirect losses through deteriorating terms of trade.

Kilian and Zhou (2020) distinguish between demand-driven and supply-driven oil price shocks, emphasizing that demand-side contractions—such as those induced by trade wars—have immediate negative effects on oil exporters' revenues. They estimate that a decline in Chinese industrial production equivalent to 1% GDP reduces global oil prices by 3–5%.

Rees (2023) further investigates the interaction between trade tensions and commodity markets, focusing on the role of uncertainty and currency movements. He finds that trade war-related uncertainty shocks, especially when combined with US dollar appreciation, led to sharp price drops in dollar-denominated commodities, compounding losses for exporters like Colombia.

In a related study, Zhang and Broadstock (2021) analyze commodity futures markets and show that speculation and expectation-based reactions to the trade war caused large swings in commodity prices even in the absence of fundamental supply disruptions. This highlights the importance of investor sentiment in amplifying price volatility during trade conflicts.

Collectively, these empirical studies validate the four theoretical channels outlined earlier and provide strong motivation for the identification strategy used in this thesis. The next section presents the methodology used to estimate the impact of tariff exposure on Colombian exports, leveraging high-frequency product-level trade data.

5. Methodology

This thesis investigates how the US-China trade war affected Colombian exports to the United States and China at the HS10 and HS08 product levels, respectively, over the period 2018–2024. The empirical strategy adopts a two-stage approach. First, a Difference-in-Differences (DiD) framework with continuous treatment estimates the net effect of tariffs. Second, a qualitative product-level analysis explores the likely mechanisms behind the observed export responses.

5.1. Scope and Time Frame

Monthly bilateral trade data from January 2018 to December 2024 is used to capture both the escalation and post-escalation phases of the trade conflict. This extended window allows the analysis to account for:

- Delayed adjustments in trade flows and supplier switching (Cigna et al., 2022),
- Strategic supply chain realignments and decoupling trends,
- Policy uncertainty that may have postponed firm-level responses.

5.2. Econometric Estimation

The model estimates the impact of tariff exposure by comparing monthly export growth between tariffed (“treated”) and untariffed (“control”) products, using product and time fixed effects. Tariff intensity enters as a continuous treatment variable, allowing the estimation of semi-elasticities. This design controls for unobserved heterogeneity across products and over time, improving causal identification relative to simple before-after or cross-sectional comparisons.

5.2.1. Why Continuous Treatment?

Rather than binary treatment indicators, the study uses statutory tariff rates as a continuous variable—capturing variation in intensity (e.g., 10% vs. 25%), accommodating staggered increases, and allowing coefficients to be interpreted as semi-elasticities (i.e., percentage change in exports per one-point tariff increase). This approach follows recent empirical work using high-frequency customs data (e.g., Fajgelbaum et al., 2020).

5.2.2. Baseline Regression Specification

Separate regressions are estimated for Colombian exports to each destination:

- **To the United States (HS10 level):**

$$\ln\left(1 + ExportValue_{US,i,t}\right) = \alpha_i + \delta_t + \beta_1 \cdot Tariff_{US,i,t} + \varepsilon_{US,i,t}$$

- **To China (HS08 level):**

$$\ln\left(1 + ExportValue_{China,i,t}\right) = \alpha_i + \delta_t + \beta_2 \cdot Tariff_{China,i,t} + \varepsilon_{China,i,t}$$

Where:

- $\ln\left(1 + ExportValue_{p,i,t}\right)$: Log of 1 plus Colombian export value of product i to partner p in month t, which accommodates zeroes and allows semi-elasticity interpretation.
- α_i: Product fixed effects (HS10 or HS08), controlling for time-invariant product heterogeneity.
- δ_t: Month fixed effects, capturing time-specific shocks (including COVID-19, global demand shifts, etc.).
- $Tariff_{p,i,t}$: Tariff rate imposed by country p on the rival's equivalent product i.
- $\varepsilon_{p,i,t}$: Error term.

Standard errors are clustered at the product level to account for serial correlation over time.

5.2.3. COVID-19 Controls

COVID-related variation is absorbed via month fixed effects (δ_t), which capture aggregate shocks across all products. While a separate COVID dummy was initially considered, it was subsequently excluded because it exhibited multicollinearity with existing variables and was automatically dropped by the statistical software (R).

5.3. Product-Specific Interaction Regressions

To explore product-level heterogeneity, an additional regression interacted the tariff variable with each product code:

$$\ln\left(1 + ExportValue_{i,t}\right) = \alpha_i + \delta_t + \sum_i \beta_i \cdot \left(Tariff_t \times HSCode_i\right) + \varepsilon_{i,t}$$

- Each HS code received a distinct coefficient β_i, reflecting its individual sensitivity to tariff changes.
- The regression was implemented in blocks of ~200 products due to computational constraints.
- Products with collinearity issues were automatically excluded per block.

The resulting product-level estimates provide a ranking of tariff sensitivity across Colombia's export basket, forming the basis for the second-stage qualitative analysis. These case studies explore underlying mechanisms—such as trade diversion or input demand shifts—based on export patterns, product characteristics, and contextual sectoral information.

5.4. Qualitative Product-Level Analysis

Due to the 30-page limit, the qualitative analysis focuses on the five most statistically responsive HS codes per destination. These were selected based on the magnitude and significance of their estimated effects, as well as the plausibility of trade patterns. While several additional products showed statistically significant coefficients, they were excluded from case study selection due to issues such as classification inconsistencies, irregular trade patterns, or weak correspondence with external trade data.

Each case study includes:

- A review of trade trends for Colombian exports of the product, US/China equivalents, and the parent HS04 category for Colombian exports to the relevant market and for the market's imports from the trade war rival and from the world.
- The average tariff applied to the equivalent product.
- Identification of the dominant mechanism (Trade Diversion, Input Demand Spillovers, Aggregate Demand Contraction, or Commodity Price Effects), inferred from timing, substitutability, income sensitivity, and contextual factors.

Other plausible channels are noted where relevant. All interpretations are presented with appropriate caution, given the limits of inference from observational data.

5.5. Data

For tariff alignment purposes, this study uses **US- and China-reported import data from Colombia**—rather than Colombia's own export data—as the main source for bilateral trade values. This approach ensures precise matching between the tariff treatment (based on US and Chinese HS codes) and observed trade flows.

Throughout the thesis, I refer to these flows as "Colombian exports to the United States/China" and use this terminology interchangeably with "US/China imports from Colombia," as they are equivalent in this context.

- **Trade Data:**
  Monthly export data from ITC Trade Map (2018–2024), using US-reported HS10 imports and China-reported HS08 imports from Colombia, ensuring tariff-product alignment with national codes.

- **Tariff Data:**
  Statutory tariff rates from Chad Bown's PIIE dataset, including US Section 301, 232, and 201 tariffs, and China's retaliatory measures.
  Pre-treatment tariff values (before Jan 2018) were set to zero to isolate the causal effect of trade war tariffs, as per DiD conventions (Wooldridge, 2010; Angrist & Pischke, 2008). However, this approach assumes that pre-trade-war tariffs were either uniform or economically insignificant—which may not hold for all products. For example, some US imports (e.g., footwear, textiles, processed foods) faced non-zero MFN tariffs before the conflict began.

  This simplification could bias estimates if baseline tariff variation influenced pre-treatment trade behavior. While detailed MFN schedules were unavailable for all HS10 codes in the US dataset, this limitation is partially mitigated by product and time fixed effects, which absorb persistent differences and month-specific shocks. Nonetheless, this remains a limitation of the identification strategy and should be considered when interpreting the estimated tariff effects. Future work could improve robustness by incorporating pre-2018 MFN rates where available or dropping high-risk sectors in sensitivity analyses.

Statutory rates were used as proxies for effective tariff burdens. While this may introduce attenuation bias due to exclusions or enforcement gaps, this approach remains standard in the literature (Bown, 2021).

5.5.1. Data Exclusion Criteria

To ensure data quality, products were excluded if their total export value to the destination accounted for less than 0.05% of total Colombian exports to that country (2018–2024). An initial criterion excluding products with fewer than 24 non-zero months was considered but ultimately dropped, as few products met that threshold and some were economically important.

5.5.2. Descriptive Statistics and Data Overview

This section summarizes the datasets used to analyze Colombian exports to the US and China from January 2017 to December 2024 (96 months).

The US panel includes 366,624 observations across 3,819 HS10 codes. From the original 22,357 codes in ITC Trade Map, most were excluded for contributing less than 0.05% of total US-bound exports—ensuring economic relevance and consistency.

The China panel includes 25,728 observations across 268 HS08 codes, reduced from 9,074 using the same threshold.

As many product-months report zero trade, the dependent variable is transformed using log(1 + export value). This transformation allows **zeros to be retained** in the regression while approximating **percentage changes** in trade values for non-zero observations. It is commonly used in trade models with sparse data to maintain statistical efficiency without biasing results through arbitrary truncation.

5.6. Parallel Trends Assumption

The DiD design relies on the parallel trends assumption: in the absence of tariffs, products with different exposure levels would have followed similar export trends. This was assessed using two methods:

- **Visual Inspection:** Products were grouped into terciles by maximum tariff exposure, and average log exports were plotted for 2017. The trends appeared broadly similar, supporting the assumption.
- **Placebo Regression:** A 2017-only placebo could not be estimated due to perfect multicollinearity—tariff rates were zero for all products, and MFN baseline tariffs were unavailable. Thus, visual inspection serves as the primary check for the parallel trends assumption.

5.7. Limitations

This study focuses on tariff-induced trade effects. While non-tariff measures (e.g., export controls, screening policies) may have influenced trade flows, these are unlikely to have substantially affected Colombian exports given their concentration in less exposed sectors.

Additionally, the analysis may only partially capture the effect of global commodity price movements triggered by the trade war. These shocks, while potentially impactful for Colombia's oil, coal, and metal exports, are not fully identified econometrically unless directly correlated with tariff exposure. Nonetheless, these channels are considered in the qualitative stage for relevant products.

The assumption of zero tariffs prior to 2018—used to define the treatment effect—is a simplifying choice necessitated by limited access to detailed MFN tariff schedules for the pre-trade-war period. While this allows for clean identification of tariff shocks associated with the trade war, it may not hold for all product categories. In particular, sectors such as footwear, textiles, and processed foods often faced non-zero baseline tariffs. This introduces potential attenuation bias, especially if pre-existing tariffs affected trade flows prior to the conflict. The limitation is partially addressed by product and time fixed effects, but it is acknowledged when interpreting both aggregate and sector-level results.

6. Results

This section presents the empirical findings from the econometric analysis. It begins with an assessment of the parallel trends assumption, then outlines key descriptive trade trends. It proceeds to evaluate the aggregate impact of tariffs on Colombian exports to China and the United States and concludes with a detailed examination of product-level effects.

6.1. Parallel Trends Validation

To assess the parallel trends assumption in the DiD strategy, products were grouped into terciles by maximum tariff exposure (low, medium, high) over 2018–2024. I compared average log export values across these groups during the 2017 pre-treatment period. This approach offers a transparent way to assess pre-treatment equivalence without arbitrary thresholds or post-treatment bias.

For the US, trends are broadly parallel, with no sharp divergences (Figure 1).

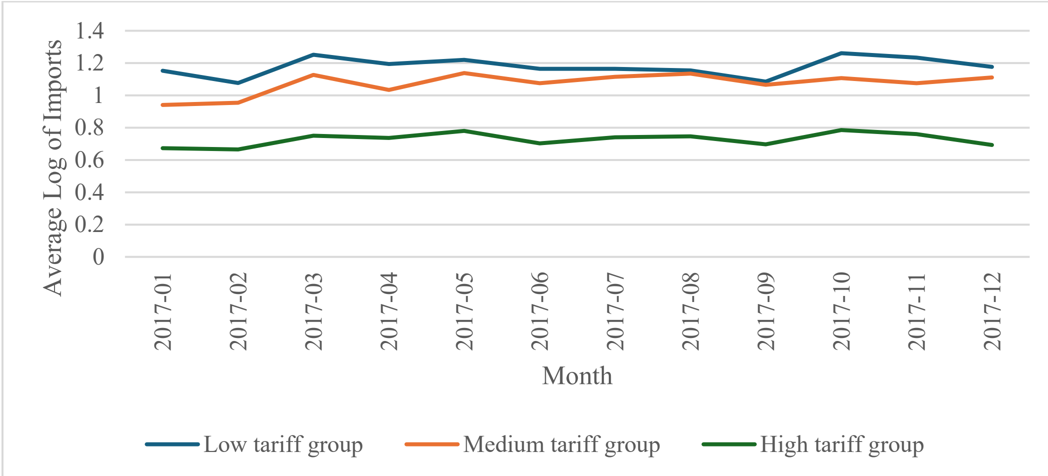

Figure 1. *Average Monthly Log Value of US Imports from Colombia by Tariff Exposure Group (2017)*

For China, pre-treatment trajectories are **not perfectly parallel**—the medium exposure group shows a somewhat different slope in early 2017—but overall movements remain roughly aligned over time (Figure 2). While this visual evidence suggests a reasonable basis for the identification strategy, it does imply **weaker pre-treatment comparability** in the China sample. As such, results for China should be interpreted **with appropriate caution**, recognizing potential deviations from the parallel trends assumption.

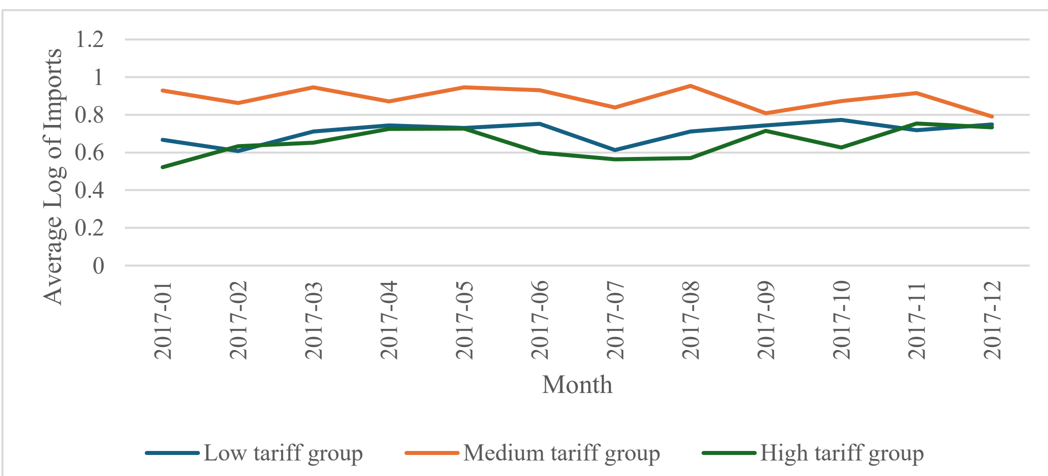

Figure 2. *Average Monthly Log Value of Chinese Imports from Colombia by Tariff Exposure Group (2017)*

6.2. Descriptive Trends

Figure 3 compares China's imports from Colombia with China's total global imports using an index with 2017 as the base year (2017–2024). Colombian exports to China showed significant volatility, rising to 165% of 2017 levels by 2019, falling to 113% in 2020, then surging to 180% by 2022 before stabilizing around 160–165%. In contrast, China's global imports followed a more moderate trajectory, reaching 150% of 2017 levels by 2022.

Colombia's sharper rebound and apparent outperformance during 2021–2022 **may suggest some trade diversion**, particularly if Chinese importers sought alternative suppliers to replace restricted or tariffed US goods. However, these patterns could also reflect **commodity-specific shocks**—such as price fluctuations in coal or oil—and **idiosyncratic supply factors** tied to Colombia. As such, this trend should be interpreted as **suggestive but not conclusive evidence** of diversion.

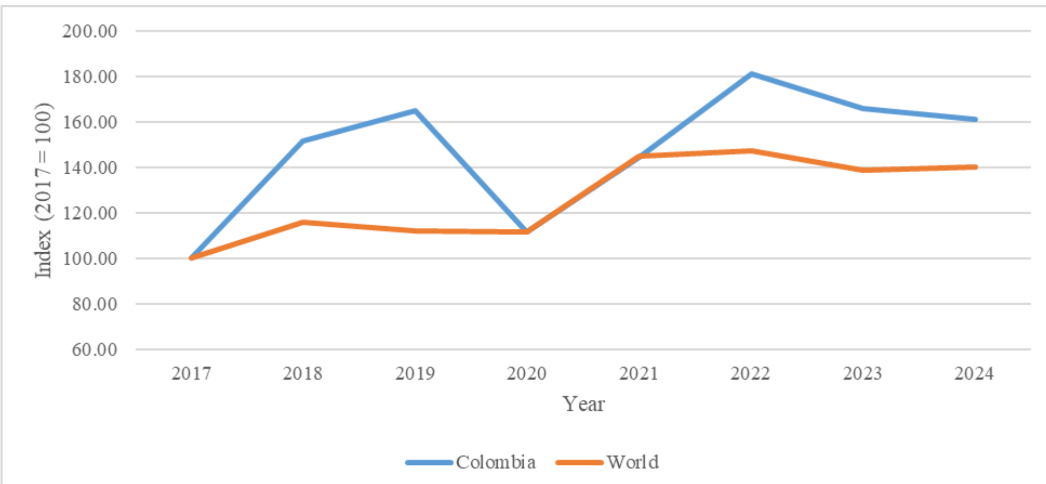

Figure 3. *China's Imports from Colombia and the World: Index with 2017 Base Year (2017-2024)*

Figure 4 compares US imports from Colombia with US total global imports using an index with 2017 as the base year (2017–2024). Both series followed similar trajectories through 2019 but diverged significantly during the 2020-2022 period. Colombian exports to the US experienced a sharper decline in 2020 (falling to around 80% of 2017 levels compared to about 100% for global imports) but then rebounded more dramatically, reaching about 139% by 2022 while global imports peaked at 140%. This pattern suggests that Colombian exports were more sensitive to economic disruptions but also benefited more strongly from the post-pandemic recovery. The convergence of both series around 130-140% by 2024 indicates that Colombia successfully maintained its enhanced position in the US market following the trade war period.

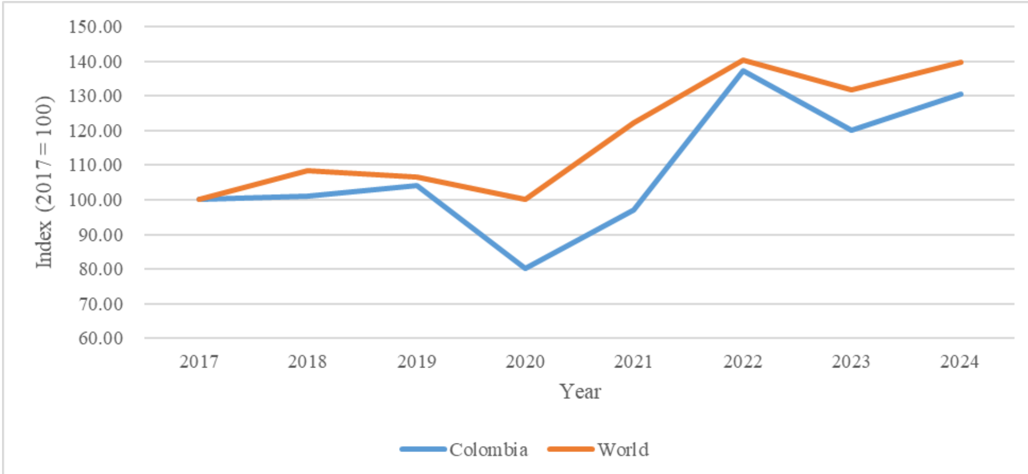

Figure 4. *US Imports from Colombia and the World: Index with 2017 Base Year (2017-2024)*

6.3. Aggregate Effect of Tariffs

6.3.1. On Colombian Exports to China

To estimate the overall impact of Chinese tariffs on Colombian exports, I regressed the natural logarithm of monthly export values on a continuous tariff variable, controlling for product and month fixed effects. Table 2 presents the results.

Table 2. Regression Results – China Aggregate Model (2018–2024)

Variable	**China Model**
Tariff	0.00401
	(0.00591)
HS Code Fixed Effects	Yes
Month Fixed Effects	Yes
Observations	25,728
Adjusted R^2	0.609
Within R^2	0.00017
RMSE	1.31

Notes: Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The estimated coefficient is positive (0.00401) but statistically insignificant ($p = 0.4978$), indicating no discernible aggregate effect of Chinese tariffs on Colombian exports. These results suggest that, on average, Colombia did not experience significant trade gains or losses in the Chinese market as a result of tariffs on US goods.

This finding does not support broad diversion but leaves room for sector-specific effects, explored in the case studies. Any potential gains were likely limited and sector-specific, constrained by Colombia's limited product overlap with US exports and high entry barriers in the Chinese market. The absence of an aggregate effect may also reflect offsetting sectoral trends: modest gains in a few products could have been neutralized by declines elsewhere. Furthermore, the result implies that other factors—such as commodity price fluctuations or macroeconomic shocks—likely played a more prominent role in shaping Colombia's export performance during this period.

6.3.2. On Colombian Exports to the US

To estimate the aggregate impact of US tariffs on Colombian exports, I regressed the natural logarithm of monthly export values on a continuous tariff variable, controlling for product and month fixed effects. Table 3 reports the results.

Table 3. Regression Results – US Aggregate Model (2018–2024)

Variable	**US Model**
Tariff	-0.00303**
	(0.00143)
HS Code Fixed Effects	Yes
Month Fixed Effects	Yes
Observations	366,624
Adjusted R^2	0.612
Within R^2	0.00012
RMSE	1.278

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The estimated coefficient of –0.00303 indicates that a one percentage point increase in tariffs on Chinese goods is associated with a 0.303% decline in Colombian exports to the US. The result is statistically significant at the 5% level (p = 0.034), suggesting a small but meaningful negative effect.

This finding runs counter to standard trade diversion expectations and suggests that Colombian exporters may not have benefited from displaced Chinese market share. Instead, the result points to possible negative spillovers, such as reduced aggregate US demand, heightened trade policy uncertainty, or increased competition from more competitive third-country suppliers.

Overall, the aggregate impact of US tariffs on Colombian exports appears negative, albeit modest—indicating that any diversionary gains were likely offset by broader trade disruptions.

This aggregate result, however, must be interpreted with the understanding that it reflects the **average effect across hundreds of thousands of observations** and over 3,800 HS10 product codes. In this context, even if some products experienced substantial trade gains, these may be masked by a much larger number of products that remained unaffected or declined. The case studies that follow deliberately focus on the most **responsive products**—those showing the strongest estimated effects. As such, they represent **exceptions**, not the norm. The coexistence of a negative aggregate effect with positive product-level responses is therefore not a contradiction, but a reflection of **heterogeneous impacts**: narrow trade diversion gains were outweighed by broader stagnation or losses in less responsive sectors.

6.3.3. Comparative Visualization of Tariff Effects

To complement the regression tables, Figure 5 compares the estimated effects of tariff exposure on Colombian exports to China and the United States. The plot presents the point estimates and 95% confidence intervals from the main regression models.

The estimated coefficient for China is nearly zero and tightly bounded, confirming the absence of any statistically significant effect of Chinese tariffs on Colombian exports. In contrast, the coefficient for the United States is negative and statistically significant, with a wider confidence interval that excludes zero. This visualization reinforces the asymmetric impact of the trade war: while China's retaliatory tariffs on US goods had no measurable effect on Colombian exports, US tariffs on Chinese goods were associated with a modest decline in Colombian exports to the US.

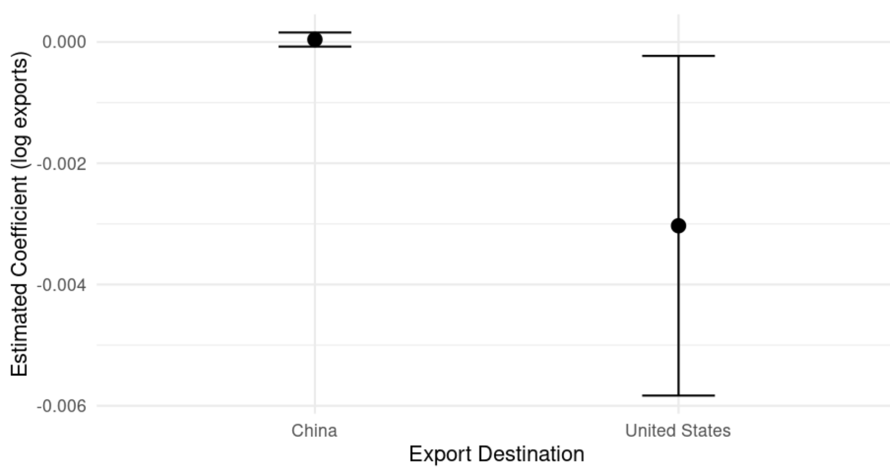

Figure 5. Estimated Tariff Effects on Colombian Exports to China and the United States
Dot plot showing the estimated coefficients from the Difference-in-Differences regressions, with 95% confidence intervals. The estimated effect is statistically insignificant for China (coefficient ≈ 0), while the US coefficient is negative and significant at the 5% level.

6.4. Export Concentration and Tariff Exposure

Figure 6 presents the relationship between US tariff exposure and Colombian export performance at the product level during the post-trade war period. Each point represents an HS10 product exported from Colombia to the United States, plotting the average US tariff rate applied to equivalent Chinese products against Colombia's average log export value from July 2018 to December 2024.

Three key features stand out. First, a substantial portion of products fall into the 0% tariff category, suggesting that many Colombian exports to the US were not directly affected by retaliatory measures. Second, there are pronounced vertical clusters at 5%, 20%, and 25%, corresponding to the structure of Section 301 tariff lists implemented during the trade war. Third, the plot reveals no clear positive or negative relationship between tariff magnitude and export performance—export values are distributed widely across all tariff levels, including untariffed products.

These patterns reinforce the regression results, which found no systematic correlation between tariff exposure and Colombian export growth. Instead, they highlight that trade diversion, where present, was concentrated in a limited number of products and not broad-based. This suggests that structural factors—such as product specificity, supply capacity, or timing—played a more decisive role than tariff exposure alone.

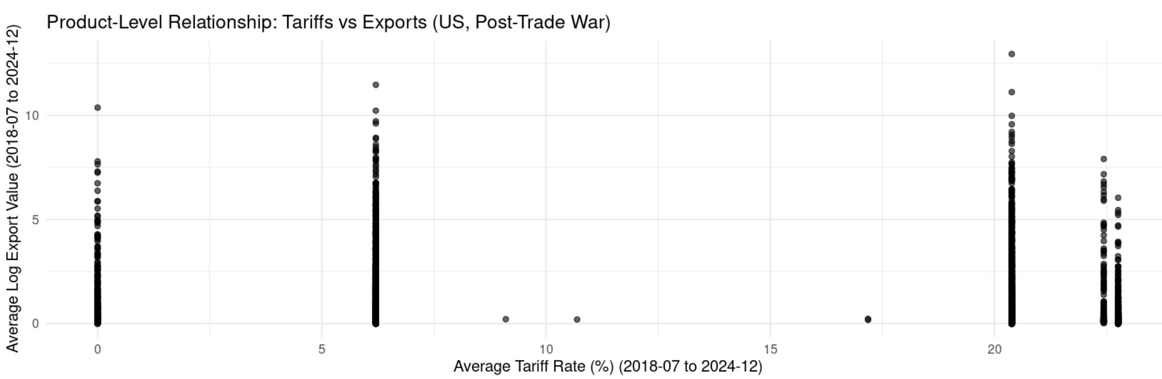

Figure 6. Product-Level Relationship Between Average Tariff Rates and Colombian Exports to the United States (2018–2024)

Scatter plot of HS10 product-level average log export values from Colombia to the US (y-axis) versus the average US tariff rates applied to equivalent Chinese products (x-axis), from July 2018 to December 2024. Most products cluster around 0%, 5%, 20%, and 25%, consistent with Section 301 tariff schedules. No systematic relationship is visible between tariff intensity and export value.

Figure 7 illustrates the relationship between Chinese retaliatory tariffs on US goods and Colombian exports to China at the product level during the post-trade war period. Each point represents an HS08 product exported by Colombia, plotting the average tariff rate applied to equivalent US products against Colombia's average export value.

The data exhibits three notable features. The updated figure reveals several notable patterns. First, approximately 12% of products faced an average tariff rate of 0%, indicating that a small share of Colombian exports to China remained outside the scope of Chinese retaliatory tariffs on US goods. Second, the distribution of tariff exposure is highly concentrated, with the majority of products falling within the 20% to 25% range. This clustering reflects the structure of China's ad valorem retaliatory tariffs, which were often applied uniformly across product categories. Third, there is no discernible trend in the relationship between average tariff rates and export performance. Products facing higher tariffs do not systematically exhibit stronger or weaker export values compared to those with lower or zero tariffs.

These visual patterns are consistent with the regression results, which find no statistically significant relationship between Chinese tariffs on US goods and Colombian export values. Together, the evidence suggests that Colombia's capacity to benefit from diverted demand was constrained by structural factors—such as limited product substitutability, modest export scale, and weak integration into Chinese value chains.

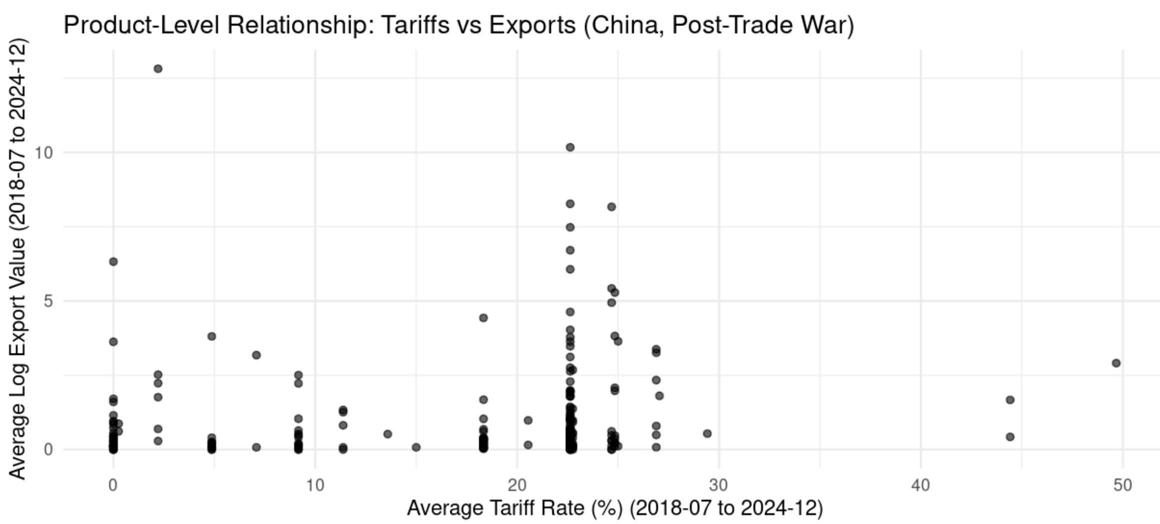

Figure 7. Product-Level Relationship Between Average Tariff Rates and Colombian Exports to China (2018–2024)
Scatter plot of HS08 product-level average log export values from Colombia to China (y-axis) versus the average Chinese tariff rates on equivalent US products (x-axis) from July 2018 to December 2024. Approximately 12% of products faced 0% tariffs, while most clustered in the 20%–25% range. No systematic relationship is observed between tariff exposure and export performance.

6.5. Sectoral Analysis

6.5.1. Case Study Methodology

Following the regression-based ranking of HS10- and HS08-level products, I identified those with the largest statistically significant effects—positive or negative—in response to Chinese tariffs on US goods and US tariffs on Chinese goods. For each top-ranked product, I analyzed monthly trade flows between Colombia and the destination market, examined corresponding imports from the original trade partners (China or the US), and reviewed broader trends in the parent HS04 category. I also considered the average tariff magnitude and the timing of implementation to assess the plausibility of observed trade responses.

Each case study interprets the trade pattern through the lens of key mechanisms: trade diversion, input demand contraction, aggregate demand slowdown, commodity price changes, and structural constraints. In instances where trade flows diverged from regression results, alternative explanations—such as volatility, product reclassification, or limited Colombian supply capacity—were considered.

The goal of these case studies is not to establish causality, but rather to explore whether the patterns plausibly reflect third-country spillovers from the US-China trade war and to highlight structural features of Colombia's export profile that may have amplified or constrained these effects.

6.5.2. Product Selection for Case Studies

To identify the most affected products for qualitative analysis, I applied the ranking procedure described in the methodology section. This ranking was based on the absolute magnitude of the product-specific tariff coefficients from the interaction regressions. The top-ranked HS08 and HS10 products—those showing the strongest estimated responses to Chinese and US tariffs, respectively—were selected for detailed case studies. This approach ensures that the products examined below reflect the most pronounced statistical associations, whether positive or negative, and allows for a focused exploration of potential trade diversion, input demand spillovers, or other mechanisms.

6.5.3. Case Studies: Sectoral Responses to Chinese Tariffs

The following table presents the top-ranked HS08 products exported by Colombia to China that exhibited statistically significant responses to Chinese tariffs on US goods between 2018 and 2024. Products are ranked by the absolute value of the estimated coefficient from the Difference-in-Differences regression. The table includes the HS08 code, product description, estimated coefficient, standard error, p-value, absolute effect size, and the most likely transmission mechanism inferred from product characteristics and trade patterns.

Table 4. Top HS08 Products Affected by Chinese Tariffs: Regression Estimates and Mechanism Classification

HS08 Code	Product Description	Estimate	Std. Error	P-Value	Absolute Effect	Rank	Probable Primary Mechanism
87083010	Mounted brake linings for vehicles of 87.01 to 87.05	1.029	0.025	7.07E-49	1.02983555	1	Input Demand Contraction
41041111	Wet-Blue Bovine Leather, No Hair	-0.771	0.029	5.51E-37	0.77169695	2	Input Demand Contraction
6021000	Unrooted cuttings and slips	0.482	0.04	3.08E-18	0.48285991	4	Trade Diversion
84805000	Moulds for glass	-0.339	0.029	1.34E-17	0.33954822	5	Input Demand Contraction
48115999	Plastic-Coated Paper/Paperboard, excl. Adhesives	-0.188	0.029	1.67E-08	0.18852077	7	Input Demand Contraction

The following case studies examine the five HS08 products listed in Table 4 in greater detail. Each case combines regression results, monthly trade flow patterns, tariff exposure, and broader sectoral trends to explore the most plausible mechanisms—such as trade diversion, input demand contraction, or structural constraints—driving Colombia's export response. The goal is not to claim causality, but to assess whether the observed patterns are consistent with third-country spillover effects from the US-China trade war.

1. **Case Study: HS08 – 87083010 (Mounted Brake Linings for Vehicles of 87.01 to 87.05)**
   Average Tariff: 0.36% | **Maximum Tariff:** 5% | **Estimate:** 1.03
   HS04 Parent Category: HS8708 – Parts and accessories for tractors and large-capacity passenger vehicles

The estimated coefficient indicates that each 1 percentage point increase in Chinese tariffs on US brake linings is associated with a 1.03% rise in Chinese imports from Colombia. However, the **low average tariff (0.36%)** and **modest peak tariff (5%)** suggest that any trade response likely stemmed from **short-term experimentation**, not durable substitution.

Colombian exports of this product to China emerged in mid-2018, peaked briefly at $230,000 per month, and disappeared after 2019. This coincided with a steep decline in Chinese imports from the US—from $26.7 million in 2016 to $1.5 million by 2024—but Colombia did not become a long-term substitute. Instead, this spike appears to reflect opportunistic or trial shipments rather than a structural trade diversion. This mirrors findings by **Ziaei (2022)**, who reports limited diversion effects in low-tech goods like basic auto parts, and by **Nicita (2019)**, who notes that supply constraints often limit third-country responses.

The broader context supports a different interpretation. China's total auto parts imports from Colombia (parent HS04: 8708) rose modestly in 2018 but declined afterward, paralleling a **global contraction in Chinese auto parts imports**, which fell from $29.3 billion in 2018 to $21.2 billion in 2024. This suggests that **input demand contraction**—rather than trade diversion—was the dominant force. As **Borin et al. (2021)** and **Espitia et al. (2021)** explain, tariffs that depress output in final goods sectors (like automobiles) quickly reduce demand for imported inputs. These effects are especially pronounced in global value chains and can appear rapidly, unlike the slower adjustment typical of trade diversion (Rauch & Watson, 2003).

Colombia's **limited industrial scale, weak integration in Asian GVCs**, and lack of established relationships with Chinese buyers likely constrained its ability to respond more meaningfully, as noted by **Freund et al. (2020)** and **Bown et al. (2021)**.

In sum, while the coefficient suggests a positive tariff effect, the **short-lived and isolated nature** of Colombia's export spike—followed by a complete disappearance—points more convincingly to **input demand contraction** as the dominant mechanism. The **positive regression estimate** likely captures **transitory noise** or **opportunistic trial shipments**, rather than structural diversion. Given the broader sectoral decline in Chinese auto parts imports and Colombia's limited industrial capacity, the more plausible explanation is that **Colombia failed to capitalize on diverted demand**, and instead faced **indirect losses** from weakened industrial output in China.

This case highlights an important caveat in interpreting product-level coefficients: a **statistically positive estimate** does not always reflect sustainable trade gains. In contexts with **high volatility and short export lifespans**, the **underlying mechanism** may still be contractionary, especially when supported by macro or sectoral trends.

2. **Case Study: HS08 – 41041111 (Wet-Blue Tanned Bovine Leather, No Hair)**
   Average Tariff: 4.64% | **Maximum Tariff:** 5% | **Estimate:** –0.77
   HS04 Parent Category: HS4104 – Hairless tanned or crust hides of cattle, buffalo, or horses

The regression reveals a significant negative association: each 1 percentage point increase in Chinese tariffs on US wet-blue leather correlates with a 0.77% decline in **Chinese imports from Colombia**. This effect is substantiated by trade data—imports fell from a stable $2–3 million per month in 2017 to near-zero by late 2019. A brief recovery in 2021 was not sustained, highlighting a likely structural contraction.

While US exports of this product to China dropped sharply—from $203 million in 2017 to $77 million in 2023—Colombia did not absorb any of the lost share. Instead, **Chinese imports from all suppliers** of this product declined, pointing to a broad **demand-side contraction** rather than intensified competition. This is consistent with the **input demand spillover mechanism** described by **Borin et al. (2021)** and **Ferrantino et al. (2019)**: when tariff shocks reduce industrial activity in downstream sectors (e.g., furniture and apparel), demand for intermediate goods like wet-blue leather falls across the board.

The product's nature as a **classic intermediate input** made it especially vulnerable to disruptions in manufacturing chains. According to **Espitia et al. (2021)**, such sectors—particularly those linked to downstream Chinese production—were among the most affected during the trade war.

Colombia's failure to regain market share, even as partial demand recovery occurred, reflects deeper structural constraints: **small scale, high production costs**, and **weak integration into Chinese value chains**, as discussed in **Constantinescu et al. (2020)**. These factors made it difficult for Colombia to compete once supply chains restructured.

Broader macroeconomic conditions likely amplified the contraction. As shown by **Caldara et al. (2020)**, trade policy uncertainty depresses global investment and consumption, while **Baffes and Nagle (2020)** document commodity price declines across intermediate goods during the 2018–2019 downturn—further hurting exporters like Colombia.

In sum, this case provides clear evidence of an **input demand spillover**: Chinese tariffs on US goods reduced downstream production, leading to a drop in Chinese imports of intermediate inputs from all suppliers, including Colombia. Trade diversion played no role here.

3. **Case Study: HS08 – 06021000 (Unrooted Cuttings and Slips)**
   Average Tariff: 2.01% | **Maximum Tariff:** 5% | **Estimate:** 0.48
   HS04 Parent Category: HS0602 – Live plants and mushroom spawn, excluding bulbs and tubers

The regression shows a statistically significant positive effect: each 1 percentage point increase in Chinese tariffs on US unrooted cuttings is associated with a 0.48% rise in **Chinese imports from Colombia**. While exports were negligible before 2020, Colombian shipments rose steadily and exceeded $100,000/month in several months between 2022 and 2024.

This growth occurred despite a sharp **66% contraction in China's total imports of live plants (HS0602)** from 2018 to 2024, indicating that Colombia gained market share in a shrinking segment.

Notably, **Chinese imports from the US also increased**, from just $3,000 in 2017 to $74,000 in 2024. Although this complicates a simple trade diversion story, the two trends are not mutually exclusive: both countries may have expanded within a fragmented or specialized market. In this context, Colombia's emergence appears to reflect **partial trade diversion** alongside **new supplier entry**.

The relatively low tariff level (avg. 2.01%) limited strong reallocation incentives, but even modest tariff shocks can shift sourcing in niche, high-differentiation goods—especially in horticulture. As explained by **Armington (1969)**, buyers may switch among similar-but-not-identical suppliers. Colombia's favorable climate, low initial base, and improvements in **phytosanitary compliance and logistics** likely helped it capture part of the market, consistent with the conditions outlined by **Nicita (2019)** and **Rauch & Watson (2003)** for overcoming trade frictions.

This is also one of the few cases where Colombia gained share while both US and global demand conditions were unfavorable, suggesting some buyers may have deliberately diversified sourcing away from traditional suppliers, possibly in response to tariff-induced uncertainty or supply chain shifts.

In sum, the evidence points to a combination of **niche trade diversion** and **new supplier emergence**. Colombian exports likely benefited from shifting procurement patterns triggered by the trade war, even if US exports also grew. The result highlights how **modest tariff barriers can create openings for new entrants** in specialized product markets.

4. **Case Study: HS08 – 84805000 (Moulds for Glass)**
   Average Tariff: 4.64% | **Maximum Tariff:** 5% | **Estimate:** –0.34
   HS04 Parent Category: HS8480 – Metal casting moulds and related components (excluding injection/compression types)

The regression reveals a statistically significant negative effect: each 1 percentage point increase in Chinese tariffs on US glass moulds is associated with a 0.34% decline in **Chinese imports from Colombia**. However, the trade pattern indicates this is not a case of trade diversion but rather a consequence of **trade war-induced industrial slowdown**.

Colombian exports of glass moulds peaked in late 2017 at around $70,000 but disappeared entirely after 2018—**before** China imposed retaliatory tariffs. This timing suggests Colombia's exit from the market was not triggered directly by tariff changes. Meanwhile, Chinese imports from the US declined gradually from $3.2 million in 2018 to $2.0 million in 2024, and total imports from all sources fell by more than half. These trends point to a broader **contraction in industrial demand**, not a reallocation of sourcing.

This pattern aligns with the **input demand spillover** mechanism. Moulds are intermediate capital goods used in glass and metals manufacturing—sectors highly sensitive to investment cycles and trade disruptions. As shown by **Borin et al. (2021)** and **Ferrantino et al. (2019)**, tariffs can dampen output in downstream sectors, reducing demand for imported inputs from third countries. The combined impact of the trade war and the post-COVID industrial slowdown likely curtailed capital equipment purchases across the board.

Colombia's structural position made it especially vulnerable. As a **small, peripheral supplier with limited integration into Chinese value chains**, it was likely among the first to be cut when demand fell. **Constantinescu et al. (2020)** note that such exporters often struggle to regain access after supply chain disruptions.

Although the **tariff level was modest (avg. 4.64%)**, the regression captures a real effect—just not one of diversion. The decline in Chinese imports from Colombia reflects **weakened input demand tied to trade war dynamics**, not displacement by US or other suppliers.

In sum, this case illustrates how third-country exporters like Colombia can be indirectly harmed by trade wars—even without direct competition—via falling demand in tariff-affected industrial sectors.

5. **Case Study: HS08 – 48115999 (Other Plastic-Coated Paper/Paperboard, excl. Adhesives)**
   Average Tariff: 4.64% | **Maximum Tariff:** 5% | **Estimate:** –0.19
   HS04 Parent Category: HS4811 – Coated or treated paper, paperboard, and cellulose products (excluding printed items)

The regression shows a statistically significant negative effect: a 1 percentage point increase in Chinese tariffs on US-origin plastic-coated paper is associated with a 0.19% decline in **Chinese imports from Colombia**. Though modest, this negative relationship is meaningful and consistent with **trade war-related spillovers**—specifically through the **input demand contraction** channel.

Colombian exports of this product were always small and sporadic, peaking at $41,000 in 2019 and falling to near-zero after 2021. Chinese imports from the US declined from $90 million to $37 million after 2021, while global imports of the product category (HS4811) fell steadily—suggesting a systemic contraction in demand rather than origin substitution.

This pattern is best explained by **reduced industrial demand in China**, particularly in downstream sectors that use plastic-coated paper as an intermediate input—such as packaging, manufacturing, and distribution. If tariffs on Chinese final goods (e.g., electronics, machinery) reduced Chinese output—as shown by **Crowley et al. (2022)** and **Barattieri & Cacciatore (2021)**—then demand for packaging materials like coated paper would also fall. This is consistent with **input demand spillovers**, as described by **Borin et al. (2021)** and **Ferrantino et al. (2019)**.

Colombia, likely as a **marginal supplier with limited scale and weak GVC ties**, was unlikely to withstand this demand contraction. **Constantinescu et al. (2020)** note that such exporters are often pushed out when global production networks adjust to shocks.

While this case does not reflect **trade diversion**, it is still an example of how the **US-China trade war affected Colombian exports indirectly**—through the **decline in Chinese industrial production** and the resulting drop in intermediate input demand.

In sum, the negative effect likely stems from a **trade war-induced slowdown in downstream sectors**, not a shift in supplier preference—making this a clear case of **input demand contraction** tied to the broader economic consequences of the tariff escalation.

6.5.4. Case Studies: Sectoral Responses to US Tariffs

The majority of the selected HS10 products fall under **Section 301 List 4A**, implemented in September 2019. This list targeted a wide range of consumer goods, including several labor-intensive or price-sensitive items. Products under List 4A may have experienced relatively large trade effects due to four compounding factors: (1) their high baseline trade volumes, (2) the elastic nature of demand for consumer goods, (3) cumulative tariff burdens that intensified sourcing disruptions, and (4) the difficulty in immediately replacing China as a dominant supplier. These features made List 4A a particularly fertile ground for trade diversion and supply chain reconfiguration.

From the full set of HS10 codes, I selected the top 30 products with the strongest estimated tariff effects, based on absolute coefficient magnitude. Of these, only 8 cases showed trade patterns plausibly linked to the US-China trade war. The remaining products either displayed ambiguous timing, evidence of reclassification, or unrelated volatility. For example, HS10-0603110060 (Fresh Roses) and HS10-1701141000 (Raw Cane Sugar) showed sharp declines despite growth at the parent category level, suggesting classification issues. In other cases, like HS10-0603110050 (Other Cut Roses), export surges occurred well after tariffs, pointing to unrelated dynamics.

Table 5. Top HS10 Products Affected by US Tariffs: Regression Estimates and Mechanism Classification

Products are ranked by absolute effect size. The mechanism column reflects the most plausible primary explanation based on product characteristics and trade trends.

HS10 Code	Product Description	Estimate	Std. Error	P-Value	Absolute Effect	Rank	Probable Primary Mechanism
7604291010	Aluminum Alloy Profiles, Not Hollow, Heat-Treatable	0.475	0.010	3.33E-106	0.475	7	Trade Diversion
7604210010	Aluminum Alloy Hollow Profiles, Heat-Treatable	0.467	0.010	6.07E-105	0.467	11	Trade Diversion
7013282090	Stemware Drinking Glasses, Valued >30¢	0.45	0.016	6.47E-71	0.45	13	Trade Diversion
3926909985	Plastic Articles, NESOI	0.384	0.011	5.23E-85	0.384	17	Trade Diversion
7013371090	Drinking Glasses ≤ 30¢, Non-Ceramic	0.381	0.016	6.26E-60	0.381	19	Trade Diversion

The following case studies examine the eight HS10 products listed in Table 5 in greater detail. Each case combines regression evidence, trade flow patterns, and sector-specific context to assess whether the observed export responses are consistent with trade diversion or alternative mechanisms such as demand shifts, firm-specific entry, or structural sourcing changes. As in the China analysis, the goal is not to establish causality, but to evaluate whether these trade responses plausibly reflect third-country spillovers arising from US tariff actions against China.

1. **Case Study: HS10 – 7604291010 (Aluminum Alloy Profiles, Not Hollow, Heat-Treatable)**
   Average Tariff: 6.23% | **Maximum Tariff:** 15% | **Estimate:** 0.48
   HS04 Parent Category: HS7604 - Aluminum bars, rods, and profiles not elsewhere specified

The regression reveals a statistically significant positive relationship: each 1 percentage point increase in US tariffs on Chinese aluminum alloy profiles is associated with a 0.48% increase in **US imports from Colombia**. However, trade data shows that **US imports of this specific product from China were effectively zero prior to 2020**, and remained minimal through 2024—peaking only at $1.46 million in 2022.

This suggests that **Colombian exports did not displace Chinese supply**, but rather filled a **gap in a market where Chinese presence was already negligible**. Colombian shipments began in 2020, rose rapidly, and often exceeded $1.5 million/month—reaching $44.9 million at the broader HS7604 level by 2022.

Rather than classic trade diversion, this case likely reflects **trade policy uncertainty and anticipatory behavior**, where US firms **sought new or more reliable sources** in the face of broader tensions with China. The Section 232 tariffs on aluminum and the broader chilling effect of the trade war may have led US buyers to **avoid Chinese suppliers entirely**, even if they were not major players in this niche to begin with.

Colombia's entry into the market was thus more about **supplier substitution under rising protectionism** than direct replacement. This aligns with **Rauch & Watson (2003)**, who argue that firms tend to "start small" with new suppliers in uncertain environments. Colombia's export surge may also reflect improved capacity, certifications, or logistical relationships developed in response to perceived US sourcing needs.

In sum, this case is best understood as a **trade war-enabled market entry**, not diversion in the traditional sense. Tariff-induced uncertainty and supply chain realignment created an opening, which Colombian firms successfully filled—despite the absence of substantial pre-existing Chinese competition.

2. **Case Study: HS10 – 7604210010 (Aluminum Alloy Hollow Profiles, Heat-Treatable)**
   Average Tariff: 6.23% | **Maximum Tariff:** 15% | **Estimate:** 0.47

   HS04 Parent Category: HS7604 - Aluminum bars, rods, and profiles not elsewhere specified

The regression shows a statistically significant positive relationship: each 1 percentage point increase in US tariffs on Chinese hollow aluminum profiles is associated with a 0.47% increase in **US imports from Colombia**. This finding is supported by clear shifts in trade flows and market timing, suggesting a case of **partial trade diversion**.

Colombian exports of this product were **nonexistent through 2019**, but began in early 2020—just after the US implemented **Section 232 tariffs** and finalized the **Phase One deal** with China. From 2020 to 2022, Colombia's exports **grew rapidly**, peaking at over **$2.3 million/month**, and remained strong—though more volatile—through 2024.

At the same time, **US imports from China in this product remained low**, growing modestly but staying under $7 million in 2024. This suggests that **Colombian suppliers entered a space constrained by tariffs**, capitalizing on a broader shift in US sourcing strategies. At the HS7604 level, Colombia's aluminum exports to the US nearly doubled from $24 million in 2019 to $45 million in 2022, consistent with a wider expansion of aluminum profile exports.

The evidence aligns with trade diversion theory (**Viner, 1950; Armington, 1969**), especially in contexts where products are **moderately substitutable** and tariffs shift relative prices. As **Amiti et al. (2019)** show, firms often respond to tariffs by switching suppliers at the HS10 level—particularly for industrial inputs like aluminum profiles.

While diversion pressures were **moderate (average tariff of 6.23%)**, Colombia's timing and sustained presence suggest it benefited from sourcing reconfigurations. The persistence of **some Chinese exports** implies that **other factors—such as pricing, certifications, or contract rigidities—also influenced substitution patterns**, consistent with **Nicita (2019)** and **Rauch & Watson (2003)** on market frictions.

In sum, this case represents a **credible instance of partial trade diversion**. The imposition of tariffs on Chinese aluminum created space for new entrants, and Colombian suppliers successfully expanded into that niche—though not fully displacing Chinese competitors.

3. **Case Study: HS10 – 7013282090 (Stemware Drinking Glasses, Valued >30¢)**
   Average Tariff: 6.23% | **Maximum Tariff:** 15% | **Estimate:** 0.45

   HS04 Parent Category: HS7013 – Household and decorative glassware (for table, kitchen, or indoor use)

The regression shows a statistically significant positive effect: a 1 percentage point increase in US tariffs on Chinese stemware is associated with a 0.45% rise in **US imports from Colombia**. Colombia began exporting under this HS10 code in mid-2020, shortly after the **Phase One Agreement** raised tariffs on this product category to 7.5%. Export volumes grew steadily through 2024, peaking between 2021 and 2023.

At first glance, this timeline supports a **trade diversion interpretation**: Colombian exports emerged immediately after tariffs were imposed, and the product is sufficiently standardized to allow for substitution. However, a deeper look complicates this view. **US imports of the same product from China rose sharply**, reaching **$38 million in 2024**, suggesting that **Chinese producers remained highly competitive despite the tariff**.

Additionally, at the parent level (HS7013 – Glassware for household and similar uses), **Colombian exports to the US declined over the same period**, even as total US imports rose. This indicates that the HS10-level surge likely reflects **firm-specific expansion or a niche entry**, rather than broader displacement of Chinese supply.

While the correlation between tariff timing and Colombia's market entry is notable, the broader patterns suggest that any diversion effect was **modest and possibly opportunistic**, limited by Colombia's scale, product range, and competitive position. This aligns with **Nicita (2019)** and **Ziaei (2022)**, who find that smaller, less diversified exporters often face structural constraints in capturing diverted trade.

As **Rauch & Watson (2003)** highlight, successful entry into established markets often depends on overcoming buyer frictions and relationship dynamics—factors that may explain why Colombia's gains were limited despite tariff headwinds for China.

In sum, this case suggests a **modest, niche-level trade diversion**, potentially facilitated by the tariff environment but **not driven by large-scale substitution**. Colombia likely benefited from **firm-level expansion** rather than systemic redirection of US demand away from China.

4. **Case Study: HS10 – 3926909985 (Plastic Articles, NESOI)**
   Average Tariff: 6.23% | **Maximum Tariff:** 15% | **Estimate:** 0.38

   HS04 Parent Category: HS3926 – Miscellaneous plastic products not elsewhere specified

The regression reveals a strong and statistically significant positive relationship: each 1 percentage point increase in US tariffs on Chinese plastic articles is associated with a 0.38% increase in **US imports from Colombia**. This association is well supported by the trade data and points to a clear case of **trade diversion**.

Colombia had no recorded exports under this code until mid-2020, shortly after the imposition of tariffs under Section 301. From late 2020 onward, **Colombian exports surged**, peaking above **$8 million in a single month in 2024**. At the broader HS3926 level, Colombian exports to the US nearly **tenfolded between 2022 and 2024**, indicating sustained growth across a range of plastic products.

Meanwhile, **US imports from China in this HS10 category dropped sharply**, falling by more than half between 2022 and 2024. This inverse relationship—combined with the high initial tariff of 15% (later reduced to 7.5%)—strongly suggests that Colombian suppliers **captured part of the market vacated by tariffed Chinese goods**. As emphasized by **Fajgelbaum et al. (2020)** and **Amiti et al. (2019)**, such origin-switching is a hallmark of trade diversion, particularly in differentiated but scalable manufactured goods.

Plastic articles under “NESOI” (Not Elsewhere Specified or Included) often cover a broad range of commercial and industrial uses, making them **substitutable but also price- and compliance-sensitive**. Colombia’s rise suggests it was able to **meet US buyer requirements quickly**, consistent with the conditions outlined by **Nicita (2019)** for successful diversion: supply capacity, basic product compatibility, and low frictions.

Although other factors—like capacity investments or changes in US sourcing strategies—may have played a role, the timing, direction, and magnitude of the shifts make **trade diversion the most plausible mechanism**.

In sum, this case aligns strongly with trade diversion theory: Colombian firms entered the market just as Chinese suppliers were penalized by tariffs and maintained a growing presence amid declining Chinese volumes. This reflects one of the clearest examples of Colombia capturing **displaced Chinese trade** during the US-China trade war.

5. **Case Study: HS10 – 6403994055 (Leather Footwear with Rubber or Plastic Soles, Not Welted)**
   Average Tariff: 6.23% | **Maximum Tariff:** 15% | **Estimate:** 0.36
   HS04 Parent Category: HS6403 – Footwear with Rubber/Plastic Soles and Leather Uppers

The regression shows a statistically significant positive effect: a 1 percentage point increase in US tariffs on Chinese leather footwear is associated with a 0.36% increase in **US imports from Colombia**. This relationship is supported by clear timing and export trends, suggesting a **trade diversion mechanism** at work.

Colombia had no recorded exports of this product before 2019. Its market entry began shortly after the US imposed **15% tariffs on Chinese footwear under Section 301 List 4A**. From 2020 onward, Colombian exports rose steadily, regularly exceeding $100,000/month and reaching **$208,000 by December 2024**. Though small in absolute terms, this growth is significant given the initial absence of Colombian supply.

Simultaneously, **US imports from China in this HS10 category fell sharply**, from over **$9 million in 2018 to $2.7 million in 2024**, consistent with import substitution. At the broader HS6403 level, Colombia’s exports to the US grew from **$1.8 million in 2018 to nearly $8 million in 2024**, mirroring global recovery and structural sourcing shifts.

These dynamics align with classic **trade diversion theory** (**Viner, 1950**), where tariffs alter relative prices and buyers shift toward untariffed suppliers. Footwear is a **moderately substitutable good**, and the elasticity of sourcing decisions is known to be high in labor-intensive sectors like apparel and footwear—making diversion more likely when tariffs are applied.

While the scale of diversion is modest, Colombia's sustained growth suggests it **captured a niche vacated by Chinese suppliers**, possibly in specific product lines or price points. This reflects the conditions emphasized by **Nicita (2019)** and **Rauch & Watson (2003)**: market entry requires not only opportunity but also the ability to meet buyer standards and scale over time.

In sum, this case offers compelling evidence of **small-scale but real trade diversion**. Colombia's rise in this HS10 category coincides directly with tariff escalation on China, and while firm-level strategies may also have played a role, the data point to a clear substitution effect facilitated by the trade war.

7. Conclusions

The analysis of Colombian exports to China reveals no statistically significant aggregate effect during the US–China trade war, suggesting that Colombian exporters did not broadly benefit from Chinese retaliatory tariffs on US goods. However, product-level analysis reveals meaningful variation.

A small number of goods—notably coal and grain-oriented electrical steel—exhibited signs of trade diversion. These cases shared key features: high substitutability, substantial Chinese tariffs on US competitors, and sufficient Colombian export capacity. Yet such instances were rare.

The dominant pattern among Colombian exports to China—especially intermediate inputs like brake linings, moulds, polymers, and leather—was one of decline or stagnation. These outcomes are consistent with input demand contraction, whereby Chinese industrial slowdowns reduced demand for upstream goods. As a marginal input supplier, Colombia faced indirect losses despite not being directly targeted by tariffs.

Some niche products (e.g., unrooted cuttings, gemstones) experienced short-term growth, but these shifts were inconsistent and difficult to interpret. Overall, structural constraints—including weak integration into Asian value chains and modest supply capacity—likely limited Colombia's ability to capitalize on diverted demand.

In the US market, the aggregate effect of tariffs on Colombian exports was negative and statistically significant—contrary to the expectation of widespread trade diversion. Instead of expanding, overall Colombian exports to the US declined slightly as tariffs on Chinese goods rose.

Yet case studies reveal more nuanced outcomes. Several HS10 products—notably aluminum profiles, plastic articles, footwear, textiles, and processed fats—showed statistically significant export gains. These tended to be moderately substitutable, price-sensitive, and scalable—conditions conducive to diversion.

In many of these cases, Colombian firms entered or expanded in the US market only after tariffs were imposed, suggesting that tariff-induced uncertainty and supply chain reconfiguration opened temporary windows of opportunity. This aligns with literature on buyer substitution and origin switching under trade disruptions.

However, most gains were limited in scale and scope, often driven by firm-specific factors. Many statistically responsive products were excluded from interpretation due to volatility, misclassification, or unrelated trends. In sum, Colombia experienced partial, product-specific diversion in the US market, while its broader export performance remained constrained by limited industrial capacity and competition from more established third-country suppliers.

These findings underscore the need for sector-specific export strategies. While Colombia did not broadly benefit from the US–China trade war, some sectors captured niche opportunities. Policymakers should prioritize scalable, moderately substitutable sectors and invest in infrastructure, compliance capacity, and trade-related logistics to enhance responsiveness to global shocks. Addressing institutional constraints—such as limited phytosanitary capacity, weak enforcement infrastructure, and gaps in preferential market access—would further improve Colombia's trade agility.

The evidence of negative spillovers from reduced input demand also highlights the importance of tracking global value chain dynamics and building resilience through export diversification.

These results raise important questions for further study. Did Colombia's short-term export gains translate into durable trade relationships or longer-term market presence? Future research could explore firm-level trajectories and the persistence of trade responses beyond the immediate shock period.

8. AI Use Disclaimer

This thesis involved the use of AI tools to support writing, structure improvement, and literature review. These tools also served as a sounding board to explore ideas and clarify arguments throughout the research process. All core analysis, interpretation, and final decisions were made by the author.

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