The Regional Comprehensive Economic Partnership and its Implications for Global Trade

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Abstract

The Regional Comprehensive Economic Partnership (RCEP) free trade agreement was signed in 2020 by 15 Asia-Pacific countries and entered into force in 2022, encompassing many of the world's largest economies, including China, Japan, South Korea, and Vietnam. The massive size of the agreement promises to significantly reshape the patterns of trade both regionally and globally, and quantifying the anticipated impacts of this nascent trade agreement is critical to establishing an understanding of how global trade dynamics are likely to evolve in the coming decades. We explore this important trade policy issue by quantifying the potential trade effects of RCEP, predicting counterfactual bilateral trade flows across 13 sectors for 160 trading countries using a structural gravity framework. Our findings show that the RCEP agreement yields substantial trade benefits, generating $501.5 billion in expanded trade among RCEP members, with impacts varying considerably across sectors and countries.

Keywords: Regional Comprehensive Economic Partnership; Gravity
JEL Codes: F13; F14; F17; O24

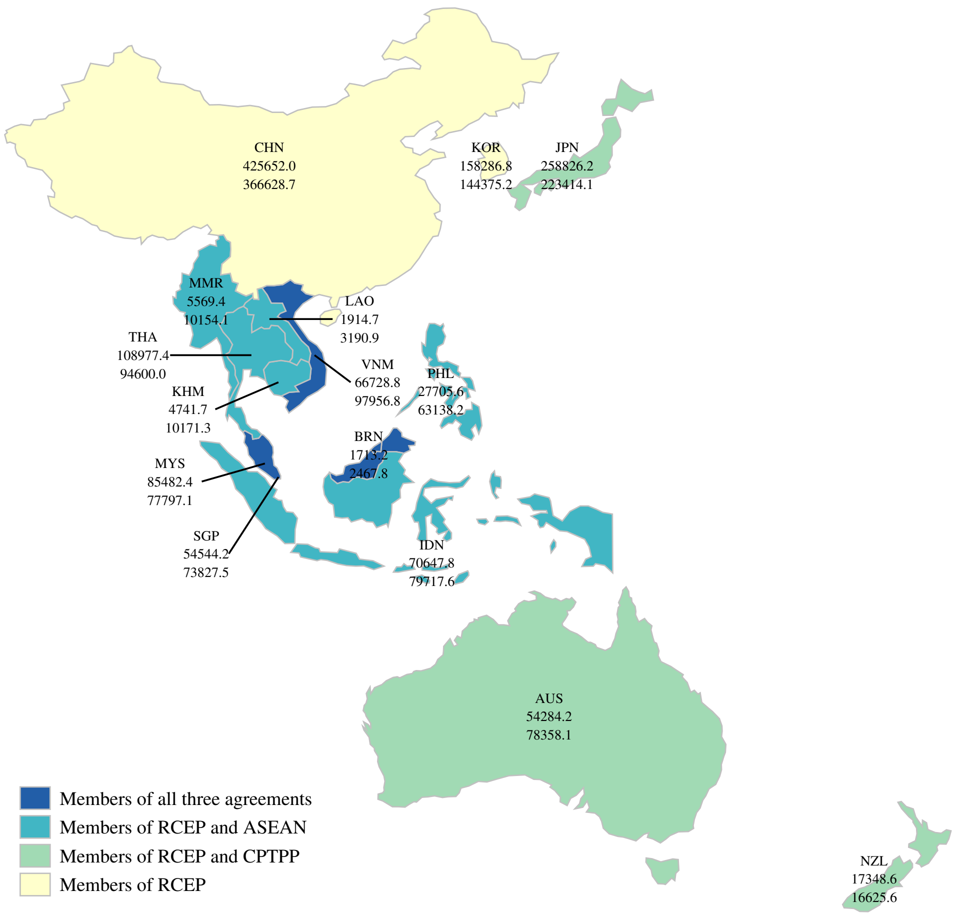
1. Introduction

Amidst the recent turmoil of international trade disputes, the COVID-19 pandemic, and other global trade disruptions which have illustrated the fragility of global supply chains, the Regional Comprehensive Economic Partnership (RCEP) agreement was signed in 2020 between 15 Asia-Pacific countries and entered into force in January 2022. The RCEP is the largest free-trade area in history in terms of both economic scale, with a combined GDP of $26 trillion, and population, encompassing 2.3 billion people.[1] Figure 1 delineates the composition of RCEP relative to two other major Asia-Pacific free trade agreements: ASEAN and CPTPP, and illustrates the export and import volume in million dollars among RCEP members. Notably, China and South Korea are exclusive to RCEP, not participating in the other two FTAs, and RCEP represents the first trade agreement to unify China, Japan, and South Korea. The agreement aims to eliminate over 90% of tariffs among member countries over the next 20 years and endeavors to deepen supply chains and production networks in Asia. The substantial size and scope of RCEP are poised to influence regional trade and investment patterns for years to come, marking a significant milestone in the evolution of the global trading system, particularly in the post-pandemic era. This paper seeks to evaluate the potential trade effects of RCEP by employing a structural gravity model framework to predict counterfactual bilateral trade flows across multiple sectors. Analyzing the potential trade effects of RCEP sheds light on how reductions in trade costs reshape bilateral trade patterns, including both trade creation among member countries and trade reallocation involving non-member economies, from both sectoral and country-specific perspectives.

A growing but still limited body of work examines the impacts of RCEP on member and non-member countries, with most studies relying on simulation-based approaches, particularly computable general equilibrium (CGE) models (Itakura, 2022). For instance, Petri and Plummer (2020) use a CGE approach to investigate the agreement's potential impacts on the United States and the European Union. Park et al. (2021) adopt a CGE model to determine that the RCEP agreement will generate income gains for member countries, with the nondurable and durable manufacturing sectors growing the most in terms of exports and imports. Zhu and Huang (2023) employ a dynamic CGE model to estimate the effects of tariff concessions under the RCEP agreement. While CGE frameworks can provide useful insights on the broad counterfactual impacts of trade policy changes such as RCEP, such approaches

[1] The agreement brings together 15 Asia-Pacific countries including China, Japan, Australia, South Korea, New Zealand, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam, Brunei, and Cambodia. Several of these countries maintained FTAs prior to the formation of the RCEP; notably, the Association of Southeast Asian Nations (ASEAN) and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP).

Figure 1: Comparative Memberships Composition among RCEP, ASEAN, and CPTPP



Notes: Figure illustrates the membership overlap and trade dynamics between RCEP and ASEAN, and between RCEP and CPTPP. Each label displays a country's three-digit ISO code, followed by its export and import volume with other RCEP members (in million dollars). Notably, countries exclusive to ASEAN (e.g., India) or CPTPP (e.g., Canada, Chile, Mexico, and Peru) are not included in this map.

(i) are typically constrained by their use of years-old data, thus giving an inaccurate picture of the current global market situation, and (ii) frequently rely on externally obtained values of key model parameters that can contribute to biased estimates of counterfactual trade impacts. Both of these shortcomings diminish the capacity of existing work on RCEP to accurately assess the agreement's anticipated impacts.

Our study explores this important development in the global trade environment by quantifying the potential trade effects of RCEP. To achieve this, we derive an empirical gravity equation from a structural gravity model and quantify the potential gains of RCEP under a conditional equilibrium framework. Our empirical approach consists of two main components. First, we estimate the gravity equation across 13 broad manufacturing and agricultural sectors for 160 trading partners using Poisson pseudo-maximum likelihood (PPML) method and obtain the tariff elasticity of trade and both direct and indirect trade costs. Second, using the estimates in the first step, we undertake a counterfactual simulation based on the approach developed by Anderson et al. (2018) to quantify the trade effect under a counterfactual scenario where RCEP is enacted.

The first-stage estimates reveal substantial variation in sectoral sensitivity to tariff changes, reflecting differences in the ability of sectors to adjust to trade costs. We obtain estimates of the tariff coefficient ranging from –3.027 in the chemicals sector to –0.880 in animal feed sector, which correspond to tariff elasticities of trade as 4.027 and 1.965, respectively. In the second step, we compute bilateral trade flows under the counterfactual scenario of RCEP's enactment, by incorporating both direct and indirect trade costs calculated in the first step. Through this approach, we analyze both trade creation and trade reallocation at the country and sector levels. Trade creation captures increases in trade among RCEP members following the implementation of the agreement, while trade reallocation reflects changes in bilateral trade flows between member and non-RCEP countries.[2]

Our findings indicate that the RCEP agreement yields substantial trade benefits, generating $501.5 billion in expanded annual trade among RCEP partners. At the sectoral level, trade creation effects dominate, exceeding trade reallocation effects by a substantial margin, with the former approximately 1.6 times larger on average. The chemicals sector emerges as the primary beneficiary, with an increase of $210.8 billion in trade creation among RCEP

[2] While we acknowledge the concept of trade diversion in the trade literature, which is traditionally associated with the reallocation of imports from more efficient non-member countries to less efficient member countries, we frame our analysis in terms of trade reallocation. This distinction reflects our finding that the effects on trade with non-member countries can be both positive and negative, extending beyond the conventional scope of trade diversion.

trading partners, representing a 45.2% increase relative to existing trade volumes, while bilateral trade with non-RCEP countries increases by $126.5 billion, equating to 132.5% of the initial level. The growth of the chemicals sector can be attributed to its sensitivity to tariff reductions and its substantial trade volume. Other key sectors benefiting from RCEP include metals, wood and paper, food, and textiles. Among agricultural sectors, the fruit and nuts sector exhibits the most significant increase in trade.

At the country level, China, Japan, and South Korea are the top three beneficiaries from RCEP. China stands to gain the most, given its substantial trade volume. Exports from Japan to RCEP members are projected to increase by $96.9 billion (a 42.7% increase relative to its existing exports to RCEP countries), while imports are expected to rise by $78.6 billion (a 34.8% increase). This is particularly significant for Japan, as its initial applied tariff rates with other RCEP members were relatively high. South Korea, which maintains some of the highest average tariff rates of RCEP member countries, is projected to see its exports and imports increase by approximately 43%, amounting to $81.6 billion and $72.1 billion, respectively. The middle-tier countries, including Thailand, Indonesia, Malaysia, Australia, Vietnam, Singapore, the Philippines, and New Zealand, are estimated to experience increases in both exports and imports ranging from $10 to $50 billion, with the increases in percentage terms around 40%. The Philippines is projected to increase its exports by 55.5%. In contrast, a small group of countries, including Laos, Cambodia, Myanmar, and Brunei, are not expected to experience significant increases in trade. These countries generally have smaller trade volumes or near-zero initial tariff rates, which limit the potential for substantial gains under RCEP. In addition, many of these countries already participate in existing free trade arrangements, such as ASEAN, with other RCEP members, further constraining the scope for additional trade creation.

Besides adding to the nascent body of literature examining the trade impacts of the RCEP, our study contributes to two other distinct strands of the literature. First, our study is in line with the large body of existing work analyzing impacts from the establishment of FTAs and other forms of regional economic agreements. Our work most closely relates to recent studies in this vein that use the gravity model to analyze these impacts, for instance, Baier et al. (2014), Bergstrand et al. (2015), Anderson and Yotov (2016), Mattoo et al. (2022), and many others. A growing body of work on RCEP documents positive but uneven welfare gains across member countries. (Estrades et al., 2023; Lin et al. (2024)). Second, our study contributes to the growing literature emphasizing heterogeneity in the impacts of trade agreements. A key insight from recent work is that the gains from trade liberalization are unevenly distributed across countries, sectors, and factors of production. Jin et al. (2025) document substantial heterogeneity across countries and sectors, with larger benefits accruing to major economies such as China, Korea, and ASEAN member states, as well as to non-manufacturing sectors and more developed regions within countries. Peng et al. (2024) show that the effects of RCEP differ along global value chains by distinguishing between intermediate and final goods. Shan and Yan (2025) highlight the role of trade facilitation, showing that improvements in digital infrastructure and e-commerce can generate disproportionately large trade responses. Heterogeneity also extends to labor market outcomes and the distribution of gains between member and non-member economies, reflecting differences in skill composition, industry structure, and exposure to trade diversion (Liu et al., 2025). Third, our work adds to the growing literature that employs recent advances in the estimation of structural gravity model to analyze trade policy counterfactuals. Prominent recent examples include Brakman et al. (2018), who employ a structural gravity method to analyze the counterfactual impacts of Brexit, and Herman and Oliver (2023), who use structural gravity to analyze the trade impacts of both internet connectivity and digital trade provisions in trade agreements. Pertaining to trade in agricultural products, Ridley et al. (2022) and Ridley and Devadoss (2023) implement a structural gravity framework to analyze trade policy dynamics in the global markets for wine and cotton, respectively. Our work extends both of these strands of the literature by leveraging the latest quantitative approaches in the literature to analyze the impacts from the establishment of the world's largest preferential trading bloc.

The remainder of the paper is organized as follows. Section 2 outlines our empirical approach, starting with the derivation of the empirical gravity equation from the structural gravity model. This section is divided into two parts: (i) the econometric approach with which we obtain sector-specific estimates of the tariff elasticity of trade and other key parameters, and (ii) the structural gravity simulation method based on a conditional general equilibrium framework. Section 3 details our data sources and provides summary statistics for our sample. In section 4, we present the findings of the empirical analysis, illustrating the effects of RCEP on trade at both sector and country levels. Finally, section 5 concludes by summarizing our findings and reflecting on the broader trade and policy implications of our results.

2. Empirical Approach

2.1 Econometric Model

We base our analysis on the canonical CES-Armington gravity framework developed by Anderson and van Wincoop (2003).[3] The structural gravity equation is given by

$$x_{ijkt} = \frac{y_{ikt} e_{jkt}}{y_{kt}^{W}} \left(\frac{t_{ijkt}}{\Pi_{ikt} P_{jkt}} \right)^{1-\sigma_k}. \tag{1}$$

x_{ijkt} is the monetary value of exports from country i to country j of product k in year t, which is a function of factors relating to the economic size of the two trading partners and trade cost terms. Note that x_{ijkt} includes both international trade flows (bilateral trade for $i \neq j$) and intra-national domestic sales (within-country trade for $i = j$). Equation (1) implies that trade between country i and j is influenced by two driving forces. The first force, market size, is a contributing factor including the country i's own production capability y_{ikt} and country j's purchasing power e_{jkt} relative to the global output y_{kt}^{W}. The aggregated output and expenditure terms are $y_{ikt} = \sum_j x_{ijkt}$, the value of production in exporting country i, and $e_{jkt} = \sum_i x_{ijkt}$, the value of consumption in importing country j, which are scaled relative to world production/consumption $y_{kt}^{W} = \sum_i y_{ikt} = \sum_j e_{jkt}$. The second force comprises trade barriers that impede trade growth, which we define in detail as direct trade costs and indirect costs. The direct trade cost t_{ijkt}, what we usually refer to as iceberg trade costs, capturing bilateral trade costs between country i and j (t_{ijkt}). The indirect trade costs contains two factors: (i) the outward multilateral resistance term (MRT) Π_{ikt}, indicating the consumption-weighted incidence of trade barriers faced by country i across all possible export destinations j; and (ii) the inward MRT P_{jkt}, representing the production-share-weighted incidence of trade barriers faced by country j across all possible import sources i. The expressions for the outward MRT and inward MRT are given by

$$\Pi_{ikt}^{1-\sigma_k} = \sum_j \left(\frac{t_{ijkt}}{P_{jkt}} \right)^{1-\sigma_k} \frac{e_{jkt}}{y_{kt}} \quad \text{and} \quad P_{jkt}^{1-\sigma_k} = \sum_i \left(\frac{t_{ijkt}}{\Pi_{ikt}} \right)^{1-\sigma_k} \frac{y_{ikt}}{y_{kt}}. \tag{2}$$

Both outward and inward MRTs are weighted by expenditure/production proportion, implying that the MRTs vary with country's consumption/production capability. The concept of multilateral resistance posits that the bilateral trade between countries i and j is influenced not solely by the "remoteness" or distance between them but also by their respective

[3] We provide additional description of the theoretical structure underlying the CES-Armington gravity framework in the Appendix.

“remoteness” from other trading partners. Outward multilateral resistance refers to the aggregate trade costs faced by the exporting country i from all its trading partners, excluding country j. Similarly, inward multilateral resistance encompasses the trade costs incurred by the importing country j from all its exporting partners, with the exception of country i. The MRTs emphasize that bilateral trade dynamics extend beyond direct interactions between two countries to include their interactions within the broader international trading network. Finally, σ_k denotes the elasticity of substitution between varieties of product k obtained from different sources. We assume consumers have a preference for variety, thus here $\sigma_k > 1$.

For empirical estimation, we follow the standard approach in the literature (as in, for example, Anderson and Yotov, 2016) and parameterize the direct trade cost t_{ijkt} as a function of observable, time-varying policy variables and fixed effects:

$$t_{ijkt} = \exp\left\{\log\left(1+\tau_{ijkt}\right) + \alpha_{1k}\mathrm{FTA}_{ijt} + \lambda_{ijk}\right\}, \tag{3}$$

where τ_{ijkt} is the ad valorem tariff rate, and FTA_{ijt} is a binary variable capturing the joint membership of country i and j in a free trade agreement (FTA), equal to one if two trading partners are active members of the same FTA, and zero otherwise. Other factors such as geographic variables that remain constant throughout time are captured by the sector-specific bilateral fixed effect λ_{ijk}. Inserting the empirical form of direct trade cost in Equation (3) into Equation (1) and introducing a random error term ϵ_{ijkt}, our estimating equation is given by

$$x_{ijkt} = \exp\left\{\beta_{0kt} + \beta_{1k}\log\left(1+\tau_{ijkt}\right) + \beta_{2k}\mathrm{FTA}_{ijt} + \gamma_{ikt} + \delta_{jkt} + \eta_{ijk}\right\} + \epsilon_{ijkt} \tag{4}$$

where $\beta_{0kt} = -\log(y_{kt}^W)$, $\beta_{1k} = (1-\sigma_k)$, and $\beta_{2k} = (1-\sigma_k)\alpha_{1k}$. The coefficients before two trade policy variables correspond respectively to the elasticity of bilateral trade with respect to applied tariff rates and the average effect of FTA membership on bilateral trade flows. The coefficient of main interest here is β_{1k} which will give us insights into each sector's sensitivity to changes in applied tariff rates and enable us to retrieve the elasticity of substitution between varieties. As previously noted, the multilateral resistance terms cannot be directly observed, presenting a well-known challenge in estimating the empirical gravity equation. In Equation (4), we therefore incorporate exporter/importer-time fixed effects to account for the MRTs as well as the exporter and importer size terms, that is, $\gamma_{ikt} = \log y_{ikt} - (1-\sigma_k)\log\Pi_{ikt}$ and $\delta_{jkt} = \log e_{jkt} - (1-\sigma_k)\log P_{jkt}$. In addition to accounting for these factors, γ_{ikt} and δ_{jkt} also control for other time-varying domestic policy, technology, income, exchange rate, and unilateral and non-discriminatory trade policies at the country level. Critically, the country-pair-sector fixed effect, $\eta_{ijk} = (1-\sigma_k)\,\lambda_{ijk}$, controls for all time-invariant elements of bilateral trade costs (e.g., distance, colonial histories, contiguous border, etc.), and in doing so, help control for time-invariant omitted variables that might correlate with both trade volumes and trade policy (e.g., historical trading relationships; Baier and Bergstrand, 2007).

As previously mentioned, we estimate Equation (4) using both intra-national and international trade data, further detail for which we provide below. Incorporating intra-national data has been increasingly highlighted as a critical feature of accurate identification of trade policy parameters in gravity estimation, and additionally, ensures that estimation is consistent with the underlying theory (Yotov, 2022). Following Santos Silva and Tenreyro (2006; 2011), we estimate the empirical gravity model using the Poisson pseudo-maximum likelihood (PPML) estimator, which addresses the well-known issues associated with zero-trade flows and heteroskedasticity in the error term. Second, we cluster at the country-pair level to account for within-pair correlation in the error term.

2.2 Simulation

In this section, we describe the conditional general equilibrium analysis based on Anderson et al. (2018) to quantify bilateral trade flows under the counterfactual scenario where RCEP is enacted using estimates we obtained in the preceding section. The core of this simulation exercise is to estimate trade costs within a counterfactual scenario, subsequently integrating these estimates into the original model to compute counterfactual values of bilateral trade under alternative trade policy regimes (i.e., trade flows with and without tariff concessions enacted under RCEP). This simulation is a conditional equilibrium approach, wherein total supply (y_{ikt}) and demand (e_{jkt}) are held fixed to analyze how adjustments in trade costs reshape bilateral trade patterns in responses to changes in bilateral trade policies, all else equal. This approach entails a comprehensive consideration of changes in trade originating from both direct bilateral trade costs (t_{ijkt}) and indirect trade costs—namely, those mediated by adjustments in the inward and outward MRTs (P_{ijkt} and Π_{ijkt}). We base this counterfactual analysis on the year 2018 (the most recent year in our data); consequently, we omit time subscripts from the description that follows.

In our simulation, the counterfactual scenario considers the elimination of tariffs among the 15 sectors that have ratified the RCEP agreement (i.e., setting τ_{ijk} to zero for trade between RCEP member countries), contrasting with the baseline scenario that reflects the pre-RCEP real-world tariff system. The simulation is executed in sequential steps as follows. First, based on estimates of trade policy parameters (β_{1k} and β_{2k}) and the bilateral fixed effects

(η_{ijk}), we estimate the following baseline gravity equation

$$x_{ijk} = \exp\left\{\hat{\beta}_{1k}\log(1+\tau^B_{ijk}) + \hat{\beta}_{2k}\mathrm{FTA}_{ij} + \gamma_{ik} + \delta_{jk} + \hat{\eta}_{ijk}\right\} + \epsilon_{ijk} \tag{5}$$

for each sector k holding the bilateral elements of trade costs ($\hat{\beta}_{1k}\log(1+\tau^B_{ijk})$, $\hat{\beta}_{2k}\mathrm{FTA}_{ij}$, and $\hat{\eta}_{ijk}$) constant, where superscript B represents values under the baseline scenario (i.e., under real-world applied bilateral tariff rates).[4] Estimating Equation (5) allows us to obtain values of $\hat{\gamma}^B_{ik}$ and $\hat{\delta}^B_{jk}$ which, as shown by Fally (2015), are exactly proportional to the (unobserved) outward and inward MRTs by definition, and thereby capture all indirect (multilateral) elements of trade costs. Having estimated Equation (5), we predict baseline bilateral trade flows as

$$x^B_{ijk} = \exp\left\{\hat{\beta}_{1k}\log(1+\tau^B_{ijk}) + \hat{\beta}_{2k}\mathrm{FTA}_{ij} + \hat{\gamma}^B_{ik} + \hat{\delta}^B_{jk} + \hat{\eta}_{ijk}\right\}. \tag{6}$$

In the counterfactual scenario, we set $\tau_{ijk} = 0$ for RCEP members, prioritizing the elimination of sector-specific tariff barriers over adjustments to the FTA policy variable. This focus is justified because the FTA variable essentially captures the residual impacts of FTA formation once tariff rates and country-pair fixed effects are controlled for. Changes in bilateral trade costs are directly linked to the changes in tariff rates and subsequently influence both bilateral (direct) trade costs via $\hat{\beta}_{1k}\log(1+\tau_{ijk})$ as well as multilateral (indirect) trade costs through the (MRTs) channeled changes in the exporter and importer fixed effects ($\hat{\gamma}_{ik}$ and $\hat{\delta}_{jk}$). The estimation process for obtaining counterfactual trade flows is analogous to the one previously described. First, we re-estimate an auxiliary version of Equation (4) given by

$$x_{ijk} = \exp\left\{\hat{\beta}_{1k}\log(1+\tau^C_{ijk}) + \hat{\beta}_{2k}\mathrm{FTA}_{ij} + \gamma_{ik} + \delta_{jk} + \hat{\eta}_{ijk}\right\} + \epsilon_{ijk}, \tag{7}$$

where τ^C_{ijk} reflect the counterfactual tariff rates and superscript C corresponds to values under the counterfactual scenario. Estimation of Equation (7) yields estimates of the counterfactual exporter and importer fixed effects ($\hat{\gamma}^C_{ik}$ and $\hat{\delta}^C_{jk}$), which are exactly proportional to the values of the MRTs under the counterfactual scenario. Counterfactual bilateral trade, denoted by x^C_{ijk}, is thus calculated as

$$x^C_{ijk} = \exp\left\{\hat{\beta}_{1k}\log(1+\tau^C_{ijk}) + \hat{\beta}_{2k}\mathrm{FTA}_{ij} + \hat{\gamma}^C_{ik} + \hat{\delta}^C_{jk} + \hat{\eta}_{ijk}\right\}. \tag{8}$$

The key metric of interest is the difference between the counterfactual and baseline bilateral trade, represented as $\left(x^C_{ijk} - x^B_{ijk}\right)$. To establish a range for the estimates of RCEP's trade

[4] Note that the general intercept β_{0k} from Equation (4) is subsumed by the exporter and importer fixed effects.

Table 1: Sample Summary Statistics

Variable	Mean	Std. dev.	Max
International trade flows (X_{ijt} for $i \neq j$)	21.111	499.013	213,742.9
Intra-national trade flows (X_{ijt} for $i = j$)	10,023.37	82,597.49	3,198,207
Tariff rates (τ_{ijt})	11.143	27.817	853.839
Free trade agreements (FTA_{ijt})	0.119	0.324	1

Notes: Calculations are based on the sample data from 2000 to 2018. Trade flows are measured in current million USD, tariffs are reported as percentages, and FTA_{ijt} is represented by dichotomous variables indicating mutual membership between countries in FTAs. The minimum value recorded for all variables is zero.

impacts that account for parameter uncertainty, we replicate the aforementioned procedures using the upper and lower 95% confidence interval values of the tariff elasticity β_{1k}.

3. Data

We use a balanced sample comprising 160 exporting and importing countries across 13 sectors for the years 2000 to 2018. Our sample includes international trade data from two sources: information on manufacturing sectors from CEPII's Trade and Production (TradeProd; Mayer et al., 2023) database and data for agricultural sectors from CEPII's BACI database (Gaulier and Zignago, 2010). Our sample spans a variety of sectors from both the manufacturing and agricultural categories. The manufacturing data, sourced from the TradeProd database, is classified according to the 2-digit International Standard Industrial Classification (ISIC) and includes nine sectors: food, textiles, wood and paper, chemicals, minerals, metals, machinery, vehicles, and other miscellaneous manufacturing sectors not elsewhere classified (the "other" sector). The agricultural component of our sample comprises four sectors from the BACI database, categorized under broad 2-digit Harmonized System (HS) product categories. These sectors are animal feed, cereals, fruits and nuts, and vegetables and animal oils. In Table 1, we present the summary statistics for four key variables across the 13 sectors in our sample. As might be expected, intra-national trade constitutes a significant portion of total trade volume. The average tariff rates across the 13 sectors stand at 11.143, accompanied by a substantial standard deviation of 27.817, indicating considerable variability in applied tariffs. Additionally, 11.9% of bilateral trade observations in our sample occur between country pairs that share at least one free trade agreement.

The TradeProd data incorporates embedded intra-national trade information for manufacturing sectors. For agricultural sectors, we calculate intra-national trade data using country-sector-specific farm-gate prices. This calculation involves multiplying these prices

Table 2: Summary Statistics on Trade Flows and Applied Tariffs

Sector	Trade Value (billion USD)			Applied Tariffs		
	Total	RCEP countries	RCEP country share of total (%)	Total mean (%)	RCEP countries (%)	RCEP/total ratio (%)
Manufacturing	**41.972**	**18.353**	**43.727**	**7.375**	**1.217**	**16.502**
Chemicals	9.272	3.665	39.524	4.220	0.538	12.740
Food	5.713	2.295	40.165	13.976	3.597	25.739
Machines	8.905	4.456	50.039	4.639	0.724	15.605
Metals	5.836	2.949	50.522	5.765	0.551	9.565
Minerals	1.583	0.903	57.053	7.566	0.927	12.250
Other	1.177	0.348	29.591	9.275	0.831	8.964
Textiles	1.842	0.85	46.159	8.804	1.209	13.729
Vehicles	5.723	2.209	38.596	6.083	1.680	27.623
Wood and Paper	1.921	0.679	35.326	6.048	0.895	14.806
Agriculture	**2.243**	**0.719**	**32.055**	**11.236**	**7.011**	**62.401**
Animal Feed	0.203	0.021	10.545	10.176	2.798	27.492
Cereals	0.849	0.391	46.07	13.324	20.076	150.677
Fruits and Nuts	0.485	0.149	30.809	14.644	4.629	31.609
Vegetable and Animal Oils	0.221	0.008	3.414	6.799	0.542	7.977

Notes: This statistic summary is based on the sample data for the year 2018. The applied tariff rates are equivalent to preferential tariff rates if they exist. If no preferential tariff rates are available, the applied tariffs default to the Most Favored Nation (MFN) tariff rates.

by the difference between a country's total agricultural output and its exports, according to data sourced from CEPII and the Food and Agriculture Organization (FAO). The dataset also includes observations of zero trade flows. Our tariff data, encompassing both non-discriminatory Most Favored Nation (MFN) tariff rates and applicable preferential tariff rates, are obtained from the World Integrated Trade Solution (WITS) Database and UNCTAD TRAINS database (UNCTAD, 2022). Information on bilateral membership in FTA agreements is obtained from the US International Trade Commission (USITC) gravity data set (Gurevich and Herman, 2018).

Table 2 presents key variables used in our analysis, including sector-level trade volumes and preference margins. Preference margins are defined as the average difference between nondiscriminatory Most Favored Nation (MFN) tariff rates and preferential tariff rates, reported for both the overall sample and RCEP members in 2018. In the context of the RCEP countries, Trade flows within member countries account for 43.727% of global manufacturing trade, amounting to \$18.353 billion, and 32.055% of global agricultural trade, totaling \$0.719 billion, with a pronounced focus on manufacturing sectors such as minerals (57.053%), metals (50.522%), machines (50.093%), textiles (46.159%), and food (40.165%). Sectors with the highest average bilateral trade volumes within RCEP are machines (\$4.456 billion), chemicals (\$3.665 billion), metals (\$2.949 billion), and food (\$2.295 billion). The preference margins are generally higher for agricultural sectors than for manufacturing sectors, both globally and within RCEP members. The agricultural sector typically faces higher trade barriers than other sectors (in keeping with well-documented patterns on higher levels of protectionism in agricultural trade; see, e.g., Anderson, 2022), with an average applied tariff of 7.011% for RCEP countries compared with an average of 1.217% applied tariff for manufacturing sector, also noted in Table 2. The agriculture sector is thus expected to benefit from significant reductions in trade barriers under the RCEP agreement.[5] Overall, RCEP members face larger preference margins than the global average, suggesting greater potential gains from reductions in regional trade costs. The vegetable and animal oils sector is an exception, facing a lower preference margin than the global average. Other sectors experience preference margins ranging from 1.051 times the global average in the food sector to 1.828 times in the fruits and nuts sector. Notably, sectors with the largest trade volumes, including chemicals (\$9.272 billion), machinery (\$8.905 billion), metals (\$5.836 billion), and

[5]We exclude the services sector from our analysis because the RCEP agreement adopts a hybrid approach for it. Specifically, some countries such as Cambodia, China, Laos, Myanmar, New Zealand, Philippines, Thailand, and Vietnam have adopted a positive list approach, while others including Australia, Brunei, Indonesia, Japan, Korea, Malaysia, and Singapore follow a negative list approach. Besides, the barriers in the services sector are primarily non-tariff barriers (NTB) rather than tariff barriers. The hybrid nature of the agreement makes it challenging to measure the effects accurately under this agenda.

vehicles ($5.732 billion), tend to face relatively low preference margins.

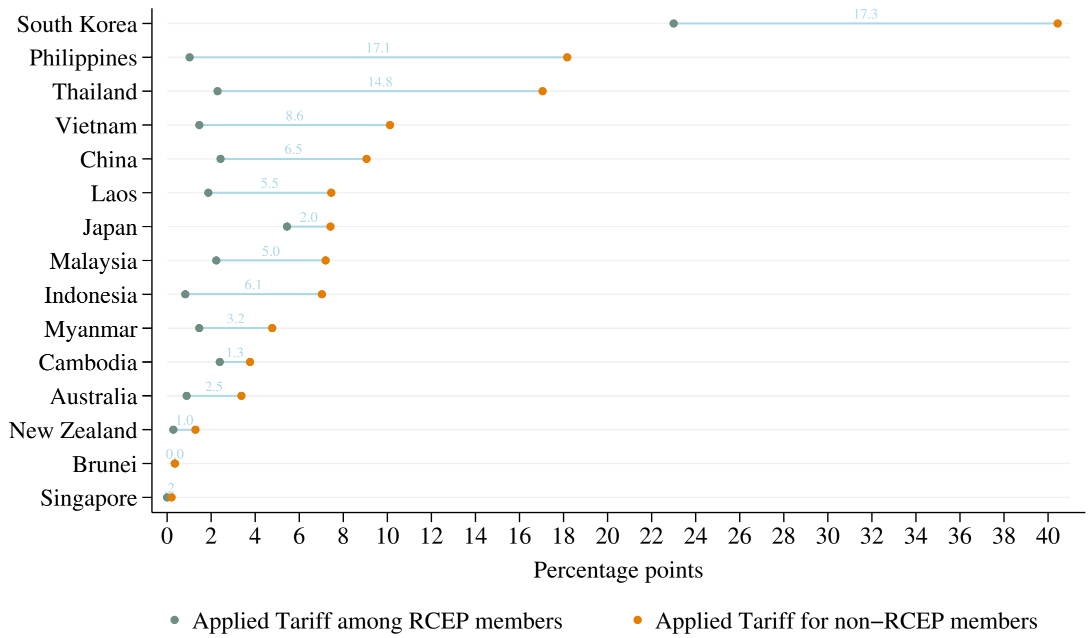
Figure 2 visually depicts average applied tariff rates across sectors set by the 15 RCEP countries for their trading partners, both within and outside the RCEP agreement. The applied tariff rate is equal to the preferential tariff rate when such a rate exists; otherwise, it defaults to the MFN tariff rate. The green dots represent the applied tariff rates set for RCEP members, which are generally lower than those for non-RCEP trading partners, represented by the orange dots. The sectors are ranked by the average applied tariff for non-RCEP countries. The difference between the two groups' tariff rates is noted by the labels at the midpoint of each line. The most notable case in Figure 2 is South Korea, which imposes an average tariff of 23% on its RCEP members and an average tariff of 40.4% on its non-RCEP trading partners. South Korea has the highest tariff levels and significant differences between within and outside RCEP members. Therefore, the implementation of RCEP is likely to greatly benefit South Korea. Some countries, such as Singapore, New Zealand, Brunei, and Indonesia, already have relatively low tariff rates for RCEP members, with average applied rates under 1%. Consequently, the RCEP is not expected to have pronounced effects on these countries. Countries like the Philippines and Thailand have tariff differences between RCEP and non-RCEP members exceeding 14% on average. This suggests that these countries have relied more on trade relationships with RCEP members than from the outset; consequently, the implementation of RCEP is unlikely to significantly alter these countries' trade situations. In contrast, countries such as Japan, which maintains an average tariff rate of 5.4% for RCEP members and 7.4% for non-RCEP members, stand to benefit relatively more from the implementation of the RCEP agreement.

4. Results

4.1 Econometric Estimates

We first present the results of empirical gravity equation of of Equation 4 in Table 3 with a particular focus on the coefficients of the two trade policy variables, tariffs (in logs) and free trade agreements. In Figure 3, further illustrates the estimated tariff coefficients across 13 sectors, along with their 95% confidence intervals, providing a clearer view of how tariff elasticities vary across sectors. In general, applied tariff rates have a significant negative effect on bilateral trade flows. Across all sectors, the average tariff elasticity is approximately –2.1 (excluding positive and statistically insignificant estimates), implying that a 1% reduction in tariffs is associated with an increase of about 2% in bilateral trade. This effect is stronger in manufacturing (around –2.5) than in agriculture (around –1.7). Mapping these

Figure 2: Applied Tariff Rates within RCEP Members and from Outsiders (2018)



Notes: Figure illustrates the applied tariffs imposed by the 15 RCEP countries on their export partners, both within the agreement and outside, across 13 sectors for the year 2018. Numeric labels on the figure highlight the differences between tariffs on intra-RCEP trade and tariffs on trade with external partners.

estimates into the structural gravity framework, the implied trade elasticity ($\sigma_k = 1 - \beta_{1k}$) captures the degree of substitutability across exporters. Our estimates imply σ values of approximately 3.1 on average, with higher elasticity in manufacturing (around 3.5) and lower elasticity in agriculture (around 2.7). These results suggest that manufactured goods are more substitutable across countries, leading to stronger trade responses to tariff changes, while agricultural trade exhibits lower substitutability, consistent with greater product differentiation, supply constraints, and the importance of non-tariff barriers.

To further explore heterogeneity across sectors, the first nine rows in Table 3 show the estimates for the nine manufacturing sectors from the TradeProd data and the remaining four rows show results for agricultural sectors from the BACI data. This implies the elasticity of substitution spanning from 1.725 to 4.027, based on the relation $\sigma_k = 1 - \beta_{1k}$. The tariff coefficients are notably larger in magnitude for manufacturing sectors such as chemicals, metals, textiles, wood and paper, and other sectors, with respective tariff coeffcients at –3.027, –2.800, –2.617, –2.384, and –2.561. This indicates that reductions in trade costs serve as a significant incentive for enhancing bilateral trade flows, particularly in these manufacturing sectors. Trade in food products demonstrates a lower sensitivity to tariffs on average, with a coefficient of –1.471 and an elasticity of substitution of 2.471. Further analysis of the agricultural sector reveals differences among specific categories. The fruits and nuts sector, with a coefficient of -3.016 and an elasticity of substitution of 4.016, and the vegetable and animal oils sector, with a coefficient of –1.791 and an elasticity of substitution of 2.791, exhibit higher sensitivities to tariffs compared to the animal feed and cereals sectors, which have coefficients of –0.880 and –0.965, and elasticities of substitution of 1.880 and 1.965, respectively.

These estimates of σ are broadly consistent with those reported in the existing literature on trade elasticities, with studies such as Fontagné et al. (2022) and Mayer et al. (2023), using highly disaggregated CEPII trade and tariff data, reporting values around 5. A key distinction between previous studies and our analysis lies in the fixed-effects structure. While existing studies rely on exporter-product-year and importer-product-year fixed effects, our specification additionally includes pair-product fixed effects, thereby absorbing all time-invariant bilateral heterogeneity at the product level. Consequently, identification relies more heavily on within-pair–product tariff variation over time, which results in estimates of σ toward the lower end of the range reported in the literature. To preserve the validity of our counterfactual analysis, we refine our sample for the subsequent estimation by excluding four sectors, machines, vehicles, minerals, and animal feed, that yield theoretically inconsistent or statistically insignificant estimates, and focus instead on the nine sectors that exhibit theory-consistent and statistically significant responses to tariff rates.

The coefficients associated with FTAs are predominantly found to be statistically insignificant, indicating that, when accounting for tariffs and country-pair fixed effects, coefficients of FTAs only reflect residual impacts on bilateral trade flows. The magnitudes of the FTA coefficients are noticeably modest, and counter to expectations, the signs of the coefficients for certain sectors, including machinery, minerals, textiles, and wood and paper, are estimated to be negative. This suggests that, beyond the immediate effects of tariff reductions, the presence of an FTA does not significantly affect trade volumes between countries, and in some instances, the expected positive impact of FTAs on trade flows in specific sectors may not materialize as anticipated.[6]

[6]While these results are perhaps surprising, our findings on the effects of FTA membership are consistent with the broader survey of the literature provided in the meta-analysis of Cipollina and Salvatici (2010) based on 1,827 point estimates of FTA impacts from 85 papers in the literature. Their findings reveal that 693 of these estimates are statistically insignificant, while 778 exhibit non-positive effects.

Table 3: Estimates of Gravity Equation, by Sector

	Policy Variables					
	$\log(1+\tau)$		FTA			Pseudo
Sector	Estimate	Std. err.	Estimate	Std. err.	Obs.	R^2
Manufacturing						
Chemicals	-3.027^a	(0.508)	0.095^b	(0.036)	198,753	0.998
Food	-1.471^a	(0.275)	0.092^b	(0.030)	215,623	0.998
Machines	2.145^c	(0.931)	–0.071	(0.056)	168,542	0.996
Metals	-2.800^a	(0.600)	0.108^c	(0.059)	197,056	0.997
Minerals	–0.725	(0.546)	0.001	(0.072)	149,777	0.998
Other	-2.561^a	(0.623)	–0.023	(0.075)	160,098	0.993
Textiles	-2.617^a	(0.597)	0.010	(0.058)	177,728	0.992
Vehicles	0.524	(0.854)	0.026	(0.051)	131,608	0.996
Wood and Paper	-2.384^a	(0.568)	–0.003	(0.039)	171,199	0.997
Agriculture						
Animal Feed	-0.880^c	(0.524)	0.015	(0.116)	126,077	0.987
Cereals	-0.965^a	(0.230)	0.031	(0.078)	172,373	0.994
Fruits and Nuts	-3.016^a	(0.632)	0.015	(0.056)	191,712	0.994
Vegetable and Animal Oils	-1.791^a	(0.406)	0.084	(0.089)	100,137	0.987

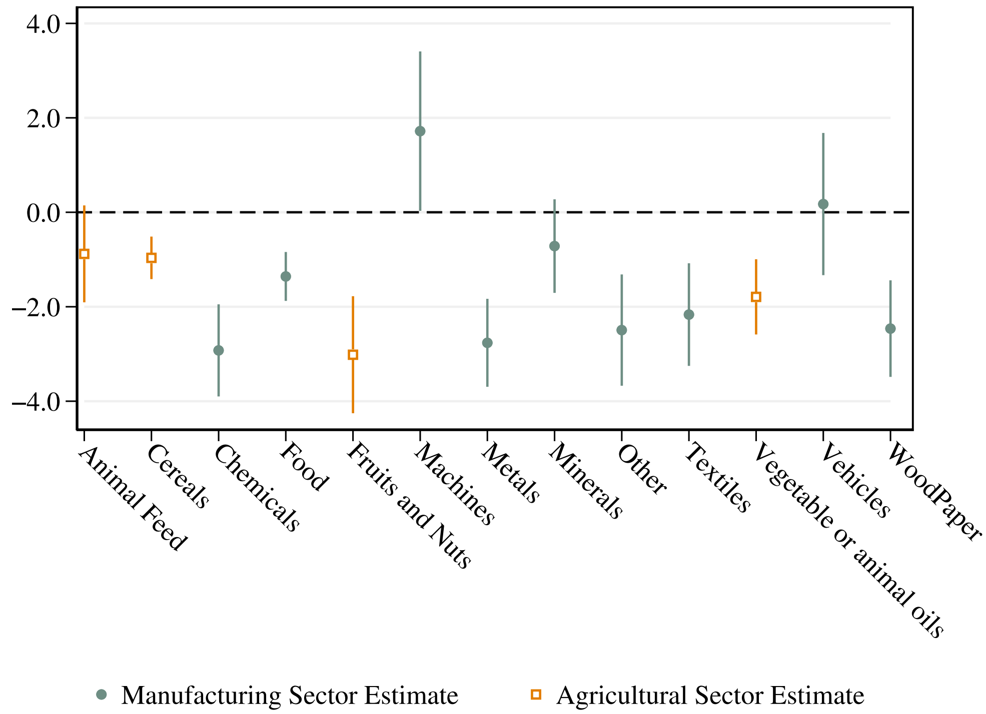
Notes: Table shows results from the gravity equation estimation for each of the 13 sectors from 2000 to 2018. Dependent variable is the country-pair-year bilateral trade. Robust standard errors clustered at country-pair level are reported in parentheses. a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.1$.

4.2 Simulation Results

In this section, we report simulation results based on the methodology described above, comparing trade flows before and after the implementation of RCEP. The counterfactual scenario captures the post-RCEP equilibrium, while the baseline represents the pre-RCEP equilibrium. The horizontal lines in 4-6 depict the point estimates of changes in trade volumes based on the tariff elasticities reported in the last section. The upper and lower bounds correspond to estimates constructed using the upper and lower values of the 95% confidence intervals of the tariff elasticities, respectively. This approach offers a comprehensive view of the potential range of outcomes, allowing for a clearer understanding of the variability and uncertainty surrounding our estimates. We structure our analysis along two dimensions, distinguishing between exports and imports. First, we examine trade creation effects, focusing on the gains accruing to RCEP member countries following the agreement's implementation. Second, we analyze trade reallocation effects, capturing changes in trade flows between RCEP members and non-member countries induced by the agreement. Throughout, we pay particular attention to heterogeneity across sectors and countries.

Panel (a) of Figure 4 presents the total trade gains from intra-RCEP trade across sectors,

Figure 3: Estimates of Tariff Elasticity, by Sector



Notes: Figure displays tariff coefficients estimated from the empirical gravity equation for each of the 13 sectors. Green squares represent manufacturing sectors, while orange dots represent agricultural sectors. Vertical bars indicate 95% confidence intervals. Standard errors are clustered at the country-pair level.

which range from \$210.8 billion in the chemicals sector to \$0.9 billion in the animal feed sector. Percent changes, reported along the x-axis next to each sector, indicate the relative magnitude of trade expansion following the implementation of RCEP. The chemicals sector exhibits the largest increase, with intra-RCEP trade nearly doubling relative to its baseline level. This substantial gain likely reflects both the high sensitivity of the sector to tariff reductions and its large initial trade volume, both globally and within the RCEP region. Among manufacturing sectors, textiles show the smallest increase, though still economically meaningful, with trade rising by \$35.7 billion (26.7%). For agricultural sectors, although the absolute increases are smaller, the percentage growth remains notable. In particular, the fruits and nuts sector experiences a \$3.4 billion (26.7%) increase in trade, while the cereals sector shows a more modest but still sizable expansion of \$1.3 billion (13.8%).

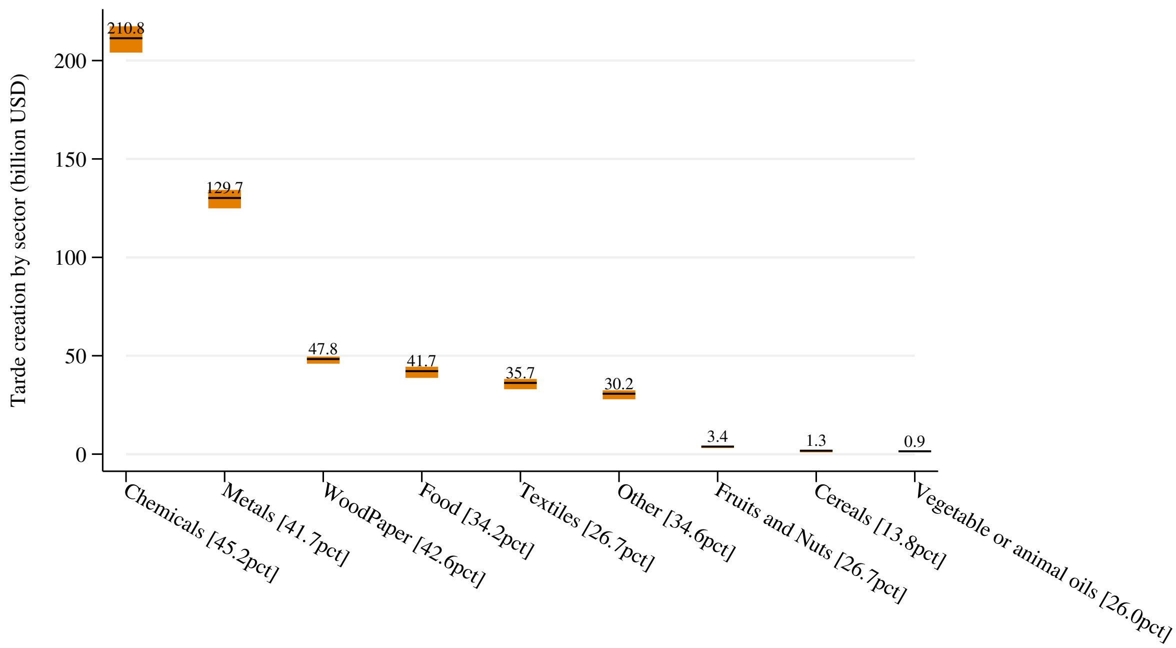
Panel (b) of Figure 4 presents changes in trade flows between RCEP member countries and non-member countries following the implementation of RCEP. The positive trade reallocation effects indicate that increased intra-RCEP trade does not come at the expense of trade with external partners. Instead, all sectors experience an expansion in trade with non-member countries, although these increases are smaller in magnitude than the corresponding trade creation effects. The chemicals sector exhibits the largest increase, with trade rising by \$126.5 billion (32.5%) relative to its baseline level. This is followed by the metals sector, with an increase of \$63.4 billion (28.9%), the wood and paper sector (\$26.5 billion, 34.4%), and the food sector (\$24.1 billion, 31.6%). A similar pattern is observed in agricultural sectors, where trade creation within RCEP is not accompanied by a reduction in trade with non-member countries. However, the magnitude of trade reallocation remains smaller than that of trade creation across these sectors.

To further unpack our findings on trade creation and reallocation, we detail the top 40 most-impacted bilateral trade linkages at the country pair-sector level for the full sample, along with corresponding percentage changes and 95% confidence intervals in Table 4, organized by the magnitude of trade volume changes. Notably, Chemicals and metals account for the largest share of the top 40 trade linkages, consistent with their large baseline trade volumes and high sensitivity to tariff reductions. The largest bilateral changes are concentrated in the chemicals sector, where the top five linkages all occur, led by trade between the United States and Canada. Within RCEP, China emerges as a key importer of chemical products, with South Korea and Japan as its main partners. This pattern is consistent with pre-existing tariff structures. While tariffs on chemical products between the United States and Canada are already close to zero, China's average tariffs on chemical imports are higher, ranging from approximately 3-6% for imports from South Korea and around 7.5% for imports from Japan. As a result, the marginal impact of tariff reductions under RCEP is more pronounced for China-Japan trade than for China-South Korea trade, where an existing free trade agreement already reduces tariffs. Trade linkages involving China, South Korea, and Japan also appear frequently among the top 40, consistent with evidence that these economies are among the primary beneficiaries of RCEP (Jin et al., 2025).

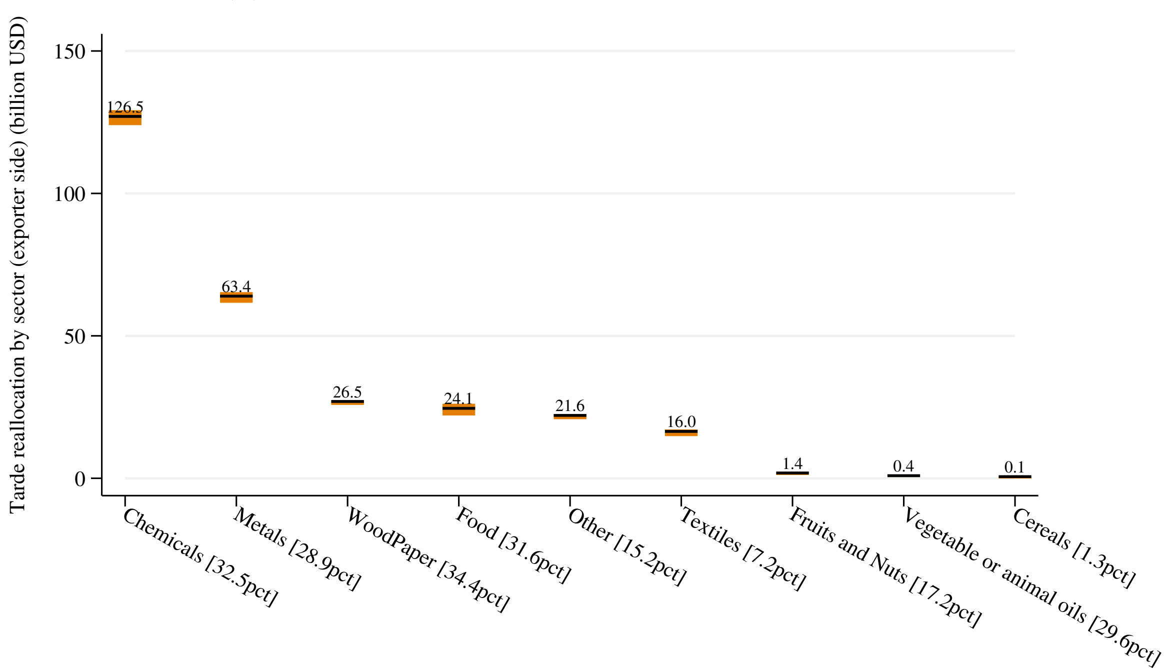
Table 4 also sheds light on the positive trade reallocation effects. The results indicate that RCEP strengthens trade linkages within the Asia-Pacific region without displacing existing trade relationships with non-member countries. This reflects the continued importance of other trade agreements and established trade networks. For instance, trade in metals between the United States and Mexico remains substantial, as does trade between Germany and other European Union countries. These patterns suggest that increased intra-RCEP trade coexists with strong trade integration outside the region.

Figure 4: Counterfactual Impacts on Trade Flows among RCEP Partners, by Sector

(a) Trade Creation within RCEP Members



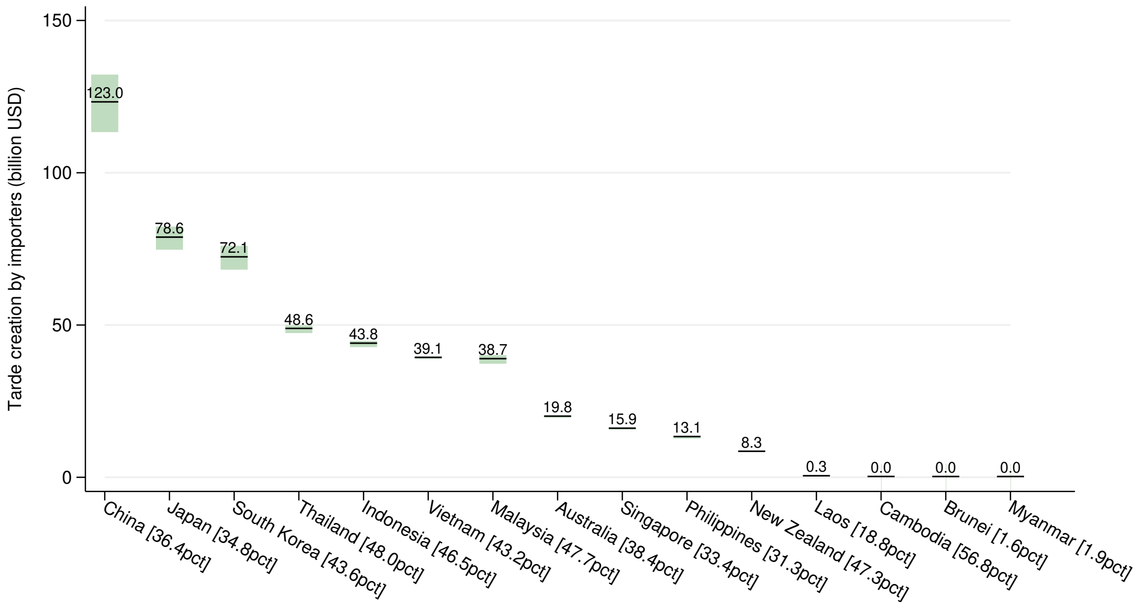
(b) Trade Flows between RCEP Members and Non-Members



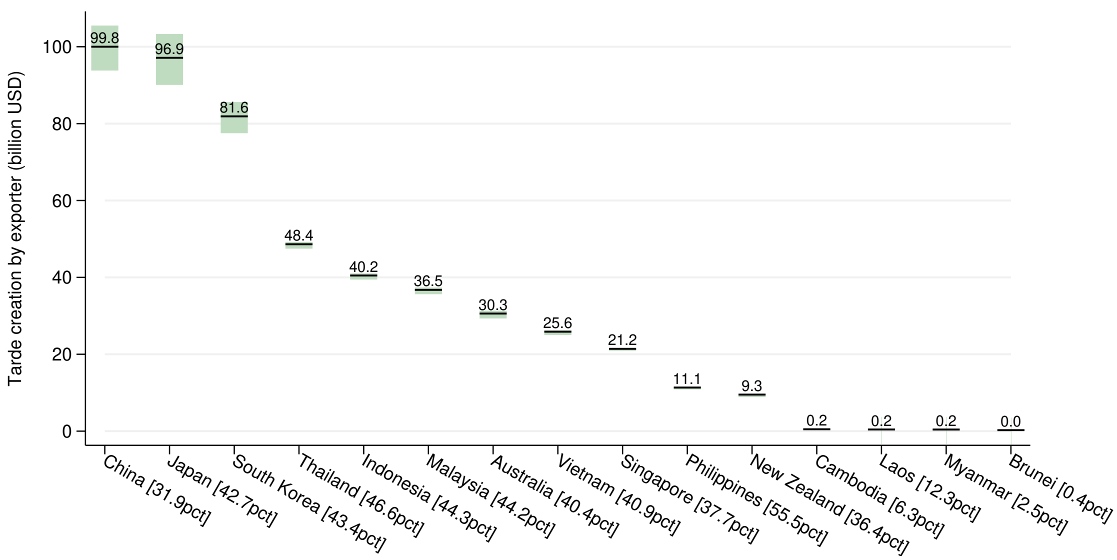
Notes: Sector-level trade creation effects are calculated as $\Delta x_k = \sum_{i \neq j}(x^C_{ijk} - x^B_{ijk})$. Point estimates are marked in billion USD. The orange shaded areas represent the 95% confidence intervals. Corresponding percentage growth rates are indicated in brackets along the x-axes.

Figure 5: Trade Creation within RCEP Members, by Country

(a) Trade Creation within RCEP Members, by Importer



(b) Trade Creation within RCEP Members, by Exporter



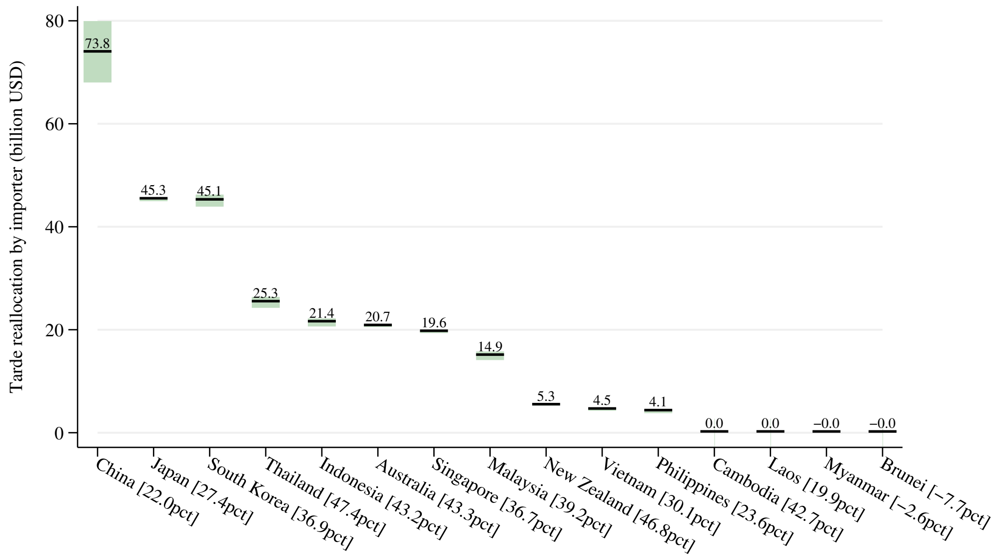
Note: Country-level trade creation effects are calculated as $\Delta x_i = \sum_k \sum_{j \neq i}(x^C_{ijk} - x^B_{ijk})$ for exporters and $\Delta x_j = \sum_k \sum_{i \neq j}(x^C_{ijk} - x^B_{ijk})$ for importers. Point estimates are marked in current billion USD. The green shaded areas represent the 95% confidence intervals. Corresponding percentage growth rates are indicated in brackets along the x-axes.

Figure 5 presents trade creation among the 15 RCEP members following the implementation of the agreement, with panel (a) showing results by importing country and panel (b) by exporting country. The top six beneficiaries among 15 RCEP member countries are China, Japan, South Korea, Thailand, Indonesia, and Malaysia. China records the largest increase, with imports rising by $123.0 billion and exports by $99.8 billion. This substantial expansion is partly driven by the relatively high preferential tariff rates faced by China prior to the implementation of RCEP. Japan and South Korea also experience significant increases, with Japan's imports and exports rising by $78.6 billion and $96.9 billion, respectively, and South Korea's by $72.1 billion and $81.6 billion. A middle group of seven countries exhibits moderate trade growth following RCEP, with increases generally ranging from $10 billion to $50 billion. The remaining countries, including Laos, Cambodia, Brunei, and Myanmar, show relatively small absolute increases in trade, although their percentage growth rates are not necessarily low. This pattern reflects the fact that these countries are already members of ASEAN and face relatively low initial tariff barriers, which limits the marginal impact of further tariff reductions under RCEP. This pattern is likely related to their initially low preferential tariff rates, as shown in Figure 2, as well as their pre-existing preferential trade relationships with other RCEP members.

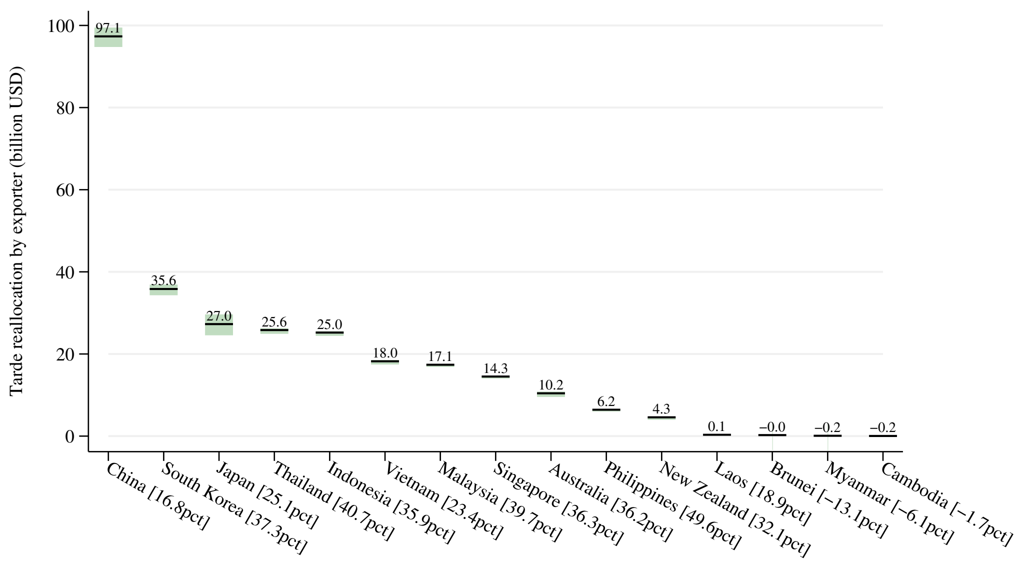
Figure 6 illustrates the country-specific impacts of trade reallocation. Panel (a) reports changes in imports of RCEP members from non-member countries, while panel (b) presents the corresponding changes in their exports to non-member countries relative to the pre-RCEP baseline. Trade reallocation follows a pattern similar to trade creation, though with smaller magnitudes. This increase in trade with non-member countries arises as a direct consequence of the expansion of intra-RCEP trade. Lower tariff barriers within RCEP markets stimulate exports among member countries, particularly for large economies such as China. Given that country-level expenditures within sectors are held fixed in the counterfactual analysis, the increase in exports reduces domestic availability of goods, which in turn induces higher imports from both RCEP members and non-member countries. As a result, external trade flows expand alongside intra-RCEP trade, leading to positive trade reallocation effects in multiple cases. China stands out as the largest contributor to trade reallocation, exhibiting substantial increases in trade with non-RCEP countries. As an importer, China's trade rises by $73.8 billion, exceeding that of Japan, which records the second-largest increase of $45.3 billion. On the export side, China's trade increases by $97.1 billion, more than twice the corresponding increase for South Korea at $35.6 billion. South Korea, Japan, and Thailand also display sizable increases in trade with non-RCEP countries, highlighting their important roles in the overall pattern of trade reallocation.

Figure 6: Trade Flow between RCEP Members and Non-Members, by Country

(a) Trade Flow between RCEP Members and Non-Members, by Importer



(b) Trade Flow between RCEP Members and Non-Members, by Exporter



Note: Country-level trade reallocation effects are calculated as $\Delta x_i = \sum_j \sum_{i \neq j} (x_{ijk}^C - x_{ijk}^B)$ for exporters and $\Delta x_j = \sum_i \sum_{i \neq j} (x_{ijk}^C - x_{ijk}^B)$ for importers. Point estimates are marked in current billion USD. The green shaded areas represent the 95% confidence intervals. Corresponding percentage growth rates are indicated in brackets along the x-axes.

Table 4: Bilateral Trade Linkages with the 40 Largest Estimated Trade Impacts

Exporter	Importer	Sector	Δx_{ijk}	$\%\Delta x_{ijk}$	$\Delta x_{ijk}^{95\%CI}$
Canada	United States	Chemicals	28.54	77.39	(28.35,28.71)
United States	Canada	Chemicals	21.58	62.45	(21.48,21.67)
South Korea	China	Chemicals	20.07	55.04	(18.42,21.66)
Japan	China	Chemicals	17.44	67.99	(15.44,19.36)
Mexico	United States	Chemicals	17.02	130.91	(17.01,17.04)
Mexico	United States	Metals	15.41	119.62	(15.28,15.53)
Canada	United States	Metals	15.08	56.99	(14.98,15.18)
United States	Canada	Metals	14.25	78.76	(14.16,14.34)
United States	Mexico	Chemicals	13.96	50.01	(13.82,14.09)
United States	Mexico	Metals	13.17	69.13	(13.00,13.34)
Japan	South Korea	Chemicals	9.94	96.94	(9.37,10.50)
South Korea	China	Metals	9.15	60.86	(8.45,9.83)
Japan	China	Metals	9.13	52.05	(7.99,10.22)
China	South Korea	Metals	8.69	57.45	(8.31,9.06)
China	Japan	Chemicals	8.67	50.45	(8.27,9.06)
Germany	Belgium	Chemicals	8.52	58.64	(8.42,8.61)
United States	Canada	Wood and Paper	8.44	69.96	(8.40,8.47)
Canada	United States	Food	8.36	56.22	(8.51,8.22)
Netherlands	Germany	Chemicals	8.14	56.84	(8.05,8.23)
Italy	Germany	Chemicals	7.81	80.89	(7.74,7.88)
Germany	France	Chemicals	7.65	55.86	(7.56,7.73)
Germany	Italy	Chemicals	7.60	70.60	(7.53,7.66)
United Kingdom	Germany	Chemicals	7.49	92.07	(7.41,7.57)
Germany	United Kingdom	Chemicals	7.48	56.63	(7.39,7.56)
Japan	South Korea	Metals	7.47	93.71	(7.20,7.74)
Belgium	Germany	Chemicals	7.36	63.45	(7.29,7.41)
United States	Germany	Chemicals	7.35	62.36	(7.60,7.11)
United States	Canada	Food	7.27	67.06	(7.41,7.13)
Canada	United States	Wood and Paper	7.24	42.47	(7.19,7.30)
France	Germany	Chemicals	6.76	64.80	(6.69,6.84)
China	Japan	Textiles	6.73	27.11	(5.76,7.65)
Germany	Netherlands	Food	6.62	84.89	(6.50,6.72)
Germany	Netherlands	Chemicals	6.43	47.00	(6.33,6.54)
Poland	Germany	Chemicals	6.41	119.94	(6.38,6.43)
China	South Korea	Chemicals	6.23	55.01	(5.86,6.60)
Netherlands	Germany	Food	6.00	68.13	(5.89,6.11)
Poland	Germany	Metals	6.00	101.51	(5.96,6.04)
Belgium	Netherlands	Food	5.97	105.65	(5.86,6.07)
Netherlands	Belgium	Food	5.89	109.28	(5.82,5.97)
Netherlands	Belgium	Chemicals	5.87	53.39	(5.81,5.93)

Notes: Calculations in the table are give by $\Delta x_{ijk} = x_{ijk}^{C} - x_{ijk}^{B}$ (in current billion USD) denoting the bilateral trade difference between counterfatcual and baseline scenarios, $\%\Delta x_{ijk} = (\Delta x_{ijk}^{C}/x_{ijk}^{B}) \times 100\%$ indicating the growth of bilateral trade relative to the baseline trade volume. $\Delta x_{ijk}^{\%95CI}$ provides the lower and upper bounds of the estimated trade growth effects based on the 95% confidence interval values of β_{1k}, measured in current billion USD.

Table 4 also provides further insight into the structure of trade reallocation. A notable feature is that 30 of the top 40 most affected trade linkages occur between non-RCEP countries. This finding indicates that RCEP not only affects intra-regional trade but also generates spillover effects across existing global trade networks. At the same time, trade among non-RCEP countries exhibits clear regional clustering, with North American and European trade linkages appearing frequently among the largest changes. Prominent examples include trade between the United States and its North American partners, as well as intra-European trade among Germany and other European Union countries. These patterns suggest that established regional trade blocs remain highly integrated and continue to shape global trade flows. Taken together, these findings indicate that the effects of RCEP extend beyond its membership through highly interconnected global trade networks. Rather than redirecting trade away from non-member countries, the agreement appears to reinforce existing trade linkages while generating additional adjustments across both regional and global markets.

5. Concluding Discussion

With the proliferation of regionalism as the driving force behind the current global trade policy situation as a backdrop, the RCEP has recently been established as the world's largest free trade bloc. The RCEP is set to reshape not only Asia-Pacific economic integration but also the broader architecture of global trade dynamics, particularly in the context of ongoing US-China trade tensions and the economic recovery phase following the global pandemic and recent supply chain disruptions.

In this study, we investigate the implications of reduced trade barriers among RCEP countries on bilateral trade patterns, both within the member countries and with external trading partners. To do this, we implement a structural gravity approach that uses both econometric and simulation approaches to offer a comprehensive assessment of the agreement's anticipated impacts on trade. We first develop a structural gravity model that serves as the basis of our analysis. Based on estimates of key trade policy parameters, we then simulate baseline and counterfactual trade flows under a conditional general equilibrium framework. This simulation enables us to quantify changes in trade flows following the implementation of RCEP, detailing the effects on trade with fellow RCEP members as well as with non-member countries, across sectors and countries.

Our analysis reveals significant trade benefits resulting from RCEP, with total trade increases amounting to \$501.5 billion within RCEP partners. This results are driven in large part by sector-specific variability in the trade elasticity with respect to tariffs, estimates for which range from –3.03 to –0.73. The chemicals sector, which is highly sensitive to tariff changes, is estimated to experience the largest trade effects from the implementation of RCEP, with trade increasing by $210.8 billion within RCEP members and by $134.2 billion with non-member countries.

At the country level, the gains from RCEP are concentrated among a relatively small group of economies, particularly those that were not previously integrated into Asia-Pacific free trade agreements or that have large initial trade volumes. In contrast, countries that were already part of existing frameworks, such as ASEAN, tend to experience more limited trade increases, as their relatively low initial tariff barriers reduce the marginal impact of further liberalization under RCEP. The first tier of countries that benefit the most from RCEP includes China, Japan, and South Korea, which exhibit substantial trade creation, with import increases ranging from $72.1 billion to $123.0 billion and export growth from $81.6 billion to $99.8 billion. Notably, China maintains robust trade levels with non-RCEP countries, recording imports and exports at $73.8 billion and $97.1 billion, respectively, while Japan and South Korea see increases of around $45 billion in imports and approximately $30 billion in exports from external trading partners. The second tier, comprising Thailand, Indonesia, Malaysia, Australia, Singapore, New Zealand, and Vietnam, observes more modest trade creation, ranging from $8.3 billion to $48.6 billion, and trade reallocation from $4.1 billion to $25.6 billion. The last tier, consisting of Cambodia, Laos, Myanmar, and Brunei, started with low trade costs with RCEP partners and witnessed minimal gains from RCEP's implementation.

Our findings underscore the pivotal role of tariff reductions of RCEP in amplifying bilateral trade volumes in the Asia-Pacific. This decrease in trade costs is poised to significantly bolster regional trade, thereby facilitating deeper economic ties and fostering increased commerce across the Asia-Pacific region. Given the implications of these developments both regionally and globally, our estimates of these impacts provide valuable insights on this important development in the global trade arena.

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Appendix

A.1 Derivation of Equation (4)

The microfoundations of the CES-Armington version of the structural gravity model were first derived by Anderson (1979) based on a constant elasticity of substitution (CES) expenditure function. Anderson and van Wincoop (2003) famously expanded on this structure by establishing that the gravity relationship depends fundamentally on three factors: the economic size terms, bilateral trade frictions between trading partners, and the outward and inward multilateral resistance terms (MRTs) that describe the average barriers to trade with the rest of the world faced by exporters and importers, respectively. Here, we briefly describe the steps used to obtain the structural gravity equation used in our analysis.

Assuming CES preferences, the quantity demanded by consumers in country j of varieties of product k sourced from country i in year t are given by

$$x_{ijkt} = \left(\frac{\beta_{ikt} p_{ikt} t_{ijkt}}{P_{jkt}} \right)^{(1-\sigma_k)} e_{jkt}, \tag{9}$$

where P_{jkt} is the CES price index, $\beta_i > 0$ is a preference parameter, and $\sigma > 1$ is the elasticity of substitution between varieties of product k obtained from different sources. Define $p_{ijkt} = p_{ikt} t_{ijkt}$ where p_{ikt} is the factory-gate price in country i; p_{ijkt} is thus the received price of goods from exporter i to importer j inclusive of bilateral trade costs (i.e., the CIF price). The source of trade costs can be transportation cost, regulatory barriers, financial barriers, information costs, or any other factors that impede or encourage bilateral trade. Here, we assume exporters are responsible for trade costs and pass $t_{ij} - 1$ for each unit of the product that is shipped on to importers. The above demand function implies that the bilateral trade between country i and j depends on three parts: (i) a preference factor that is common for all the importers (β_{ikt}), (ii) price effects accounting for trade costs that negatively affect trade demand $\left(\frac{p_{ikt} t_{ijkt}}{P_{jkt}} \right)$, and (iii) market size/size of demand in the destination country j (x_{ijkt}). The CES price index is given by

$$P_{jkt} = \left[\sum_i \left(\beta_{ikt} p_{ikt} t_{ijkt} \right)^{(1-\sigma_k)} \right]^{1/(1-\sigma_k)},$$

a term that also reflects the inward multilateral resistance faced by an importing market j, i.e., the average trade barriers faced by j across all potential export sources i. The market clearing condition is the last building block of this multi-country trade model, implying that the income of exporter i is equal to all the expenditures from its trading partners including intra-national trade in the domestic market, given by $y_{ikt} = \sum_j x_{ijkt}$. By the same logic, the total expenditure at destination j is equal to all its imports from its trading partners and itself, $e_{jkt} = \sum_i x_{ijkt}$. Dividing the demand function by world market size y^W_{kt}, where $y^W_{kt} = \sum_i y_{ikt} = \sum_j e_{jkt}$, and rearranging terms yields the gravity equation

$$x_{ijkt} = \frac{y_{ikt} e_{jkt}}{y^W_{kt}} \left(\frac{t_{ijkt}}{\Pi_{ikt} P_{jkt}} \right)^{1-\sigma_k}.$$

Table A.1: Estimates of Gravity Equation by Sector (Three-Year Interval Data)

	Policy Variables					
	$\log(1+\tau)$		FTA			
Sector	Estimate	Std.err.	Estimate	Std.err.	Obs.	Rseudo. R^2
Animal Feed	-1.069^c	(0.601)	0.060	(0.119)	0.987	42346
Cereals	-1.274^a	(0.379)	0.155^c	(0.085)	0.994	52634
Chemicals	-3.311^a	(0.537)	0.114^a	(0.039)	0.998	72206
Food	-1.496^a	(0.307)	0.118^a	(0.034)	0.998	76958
Fruits and Nuts	-5.211^a	(0.571)	-0.029	(0.057)	0.994	61805
Machines	2.340^b	(1.022)	-0.091^c	(0.052)	0.996	61605
Metals	-2.998^a	(0.696)	0.116^c	(0.064)	0.997	70277
Minerals	-1.071^c	(0.566)	0.038	(0.072)	0.998	53298
Other	-2.357^a	(0.586)	0.020	(0.056)	0.993	58126
Textiles	-2.803^a	(0.687)	0.002	(0.066)	0.992	64690
Vegetable or Animal Oils	-1.562^a	(0.466)	0.249^b	(0.108)	0.987	33945
Vehicles	0.367	(0.810)	-0.002	(0.054)	0.996	47923
WoodPaper	-2.099^a	(0.580)	-0.014	(0.044)	0.997	61933

Notes: Table shows results from the gravity equation estimation for each of the 13 sectors over three-year intervals from 2000 to 2018. Dependent variable is the country-pair-year bilateral trade. Robust standard errors clustered at country-pair level are reported in parentheses. a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.1$.

A.2 Alternative Gravity Equation Estimates

Estimates of Equation (4) based on Interval Data

Our baseline estimation of the gravity model in Equation 4 uses sample of consecutive years from 2000 to 2018. In response to critiques such as (Trefler, 2004), which suggests that adjustments to Free Trade Agreements (FTAs) may extend beyond a single year, we provide further estimations allowing for 3-year intervals in the appendix. This method follows established conventions to capture the "phase-in" effects of FTAs, as evidenced by the usage of 3-year intervals by Trefler (2004), 5-year intervals by (Baier and Bergstrand, 2007), and both by (Olivero and Yotov, 2012). Our tests of the gravity equation across both 3-year and 5-year intervals yield robust results. Estimations over three-year intervals, presented in Table A.1, reveal that the coefficients closely align with, and even enhance, our baseline findings—11 out of 13 tariff rate coefficients are significantly positive.

Table A.2: Estimates of Gravity Equation by Sector (Pair-by-Three-Year-Interval Fixed Effects)

	Policy Variables					
	$\log(1+\tau)$		FTA			
Sector	Estimate	Std.err.	Estimate	Std.err.	Obs.	Rseudo. R^2
Animal Feed	-1.129^b	(0.488)	0.130^c	(0.068)	0.993	93602
Cereals	-0.233	(0.237)	-0.062	(0.069)	0.997	105755
Chemicals	-1.856^a	(0.322)	0.034^c	(0.018)	0.999	185699
Food	-0.646^a	(0.151)	0.057^a	(0.020)	0.999	190096
Fruits and Nuts	-0.411^a	(0.126)	0.031	(0.037)	0.997	131415
Machines	-0.546	(0.520)	0.027	(0.021)	0.999	161767
Metals	-1.660^a	(0.425)	0.082^a	(0.018)	0.999	177222
Minerals	-0.745^b	(0.318)	0.097^a	(0.028)	0.999	133410
Other	-2.503^a	(0.687)	0.121^a	(0.042)	0.997	151333
Textiles	-0.369	(0.401)	0.052	(0.034)	0.998	167510
Vegetable and Animal Oils	0.199	(0.227)	0.064	(0.122)	0.994	73785
Vehicles	-0.090	(0.355)	0.021	(0.029)	0.999	124125
WoodPaper	-0.682^b	(0.318)	0.036^b	(0.015)	0.998	160050

Notes: Table shows results from the gravity equation estimation for each of the 13 sectors with country pair by three-year interval fixed effects from 2000 to 2018. Dependent variable is the country-pair-year bilateral trade. Robust standard errors clustered at country-pair level are reported in parentheses. a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.1$.

Estimates of Equation (4) with Country-Pair-by-Interval Fixed Effects

In this section of the appendix, we refine our baseline gravity model by replacing the time-invariant country-pair fixed effects with country-pair-by-interval fixed effects. The traditional country-pair fixed effects capture the time-invariant unobserved heterogeneity between country pairs. Following Anderson and Yotov (2022), we introduce time-varying pair-by-interval fixed effects to better control for adjustments in bilateral trade costs which enhances our ability to address endogeneity issues regarding changes in bilateral trade policies over time.

We evaluate the data spanning from 2000 to 2018 using 3-, 4-, and 5-year interval-pair fixed effects to ensure the robustness of our results. Table A.2 presents the estimation results of Equation (4), where the pair-sector fixed effect η_{ijk} is replaced with η_{ijkt}, with t denoting a three-year interval. The coefficients before applied tariff rates and FTA exhibit similar patterns to those reported in the baseline results (Table (3) and Figure (3)), albeit with a reduced magnitude. This suggests that incorporating interval-specific pair fixed effects effectively captures the dynamics of bilateral trade policies, thereby mitigating the observed impact of applied tariff rates.

Estimates of Equation (4) with Border Effects

In this section, we enhance our analysis of the gravity equation by incorporating a welfare analysis to assess the cost reduction effects of globalization on bilateral trade flows, beyond the influences of tariff rates and free trade agreements. The global efficiency discussed in Anderson and Yotov (2016) quantifies the changes in bilateral trade costs in international trade (i.e., how much the iceberg melts). Following this spirit, we define a year-specific border effect in Equation 4 through an interaction term "$broder \times i.year$", where "$broder$" is a dummy variable that equals to 1 when the importer and exporter are different countries (i.e., $isoi \neq isoj$), and 0 otherwise, while "$i.year$" represents annual dummy variables. The coefficients associated with this cross-border term reflect the iceberg melting effect of globalization and the larger the coefficients, with larger coefficients indicating greater welfare gains from trade liberalization.

In Table A.3 we present the border effect or global efficiency for bilateral trade across 13 sectors, controlling for applied tariffs and FTAs. We define the interaction term as 1 when the importer and exporter are different countries, consequently, the coefficients for variables from "%Δ2001" to "%Δ2018" measure the internal trade effect, which should be interpreted inversely in relation to global efficiency. Specifically, smaller coefficients signify reduced effects of internal trade, suggesting larger gains from international trade. As demonstrated in Table A.3, diminishing magnitude of these coefficients over the years indicates that reductions in international trade costs are increasingly influencing the expansion of bilateral trade across most sectors. The global efficiency effect is particularly pronounced in sectors such as animal feed, chemicals, fruits and nuts, textiles, and vegetable or animal oils.

Table A.3: Estimates of Gravity Equation with Border Effect by Year

	Animal Feed	Cereals	Chemicals	Food	Fruits and Nuts	Machines	Metals	Minerals	Other	Textiles	Vegetable or Animal Oils	Vehicles	Wood Paper
FTA	-0.054	-0.001	-0.014	0.022	-0.042	-0.016	0.111^b	-0.041	0.022	-0.100	-0.096	0.065	-0.059
	(0.113)	(0.078)	(0.042)	(0.033)	(0.055)	(0.043)	(0.047)	(0.064)	(0.066)	(0.070)	(0.096)	(0.050)	(0.037)
$\log(1+\tau)$	0.167	-0.727^a	-1.980^a	-0.429^c	-1.620^a	0.995	-1.897^a	0.847^c	-2.589^a	1.303^c	0.004	-0.229	0.146
	(0.523)	(0.223)	(0.616)	(0.246)	(0.410)	(0.795)	(0.641)	(0.492)	(0.612)	(0.790)	(0.407)	(0.755)	(0.713)
%Δ2001	0.151^c	-0.223^b	-0.076^a	-0.016^b	-0.105^a	0.006	0.005	-0.044^a	0.050^a	-0.103^a	0.108	-0.022	-0.016^b
	(0.089)	(0.087)	(0.013)	(0.007)	(0.032)	(0.016)	(0.007)	(0.010)	(0.019)	(0.037)	(0.119)	(0.014)	(0.008)
%Δ2002	-0.100	-0.317^a	-0.109^a	-0.030^a	-0.067^b	-0.029	0.020^b	-0.069^a	0.043	-0.166^a	0.293^b	0.056^a	0.037^a
	(0.082)	(0.080)	(0.019)	(0.010)	(0.031)	(0.030)	(0.010)	(0.015)	(0.027)	(0.045)	(0.135)	(0.021)	(0.014)
%Δ2003	-0.142	-0.304^a	-0.092^a	-0.026^b	-0.087^a	-0.037	0.038^a	-0.087^a	-0.032	-0.204^a	0.234	0.089^a	0.073^a
	(0.093)	(0.090)	(0.022)	(0.011)	(0.032)	(0.033)	(0.013)	(0.026)	(0.039)	(0.053)	(0.163)	(0.025)	(0.017)
%Δ2004	-0.306^a	-0.046	-0.125^a	-0.033^b	-0.14^a	-0.131^a	-0.048^a	-0.142^a	-0.170^a	-0.364^a	-0.053	-0.047^c	0.027
	(0.115)	(0.092)	(0.024)	(0.013)	(0.032)	(0.035)	(0.013)	(0.032)	(0.047)	(0.063)	(0.247)	(0.025)	(0.017)
%Δ2005	-0.263^b	-0.202^b	-0.106^a	-0.109^a	-0.238^a	-0.139^a	-0.110^a	-0.166^a	-0.225^a	-0.478^a	-0.146	-0.033	-0.004
	(0.110)	(0.087)	(0.027)	(0.013)	(0.035)	(0.039)	(0.015)	(0.036)	(0.056)	(0.082)	(0.237)	(0.025)	(0.020)
%Δ2006	-0.279^b	-0.312^a	-0.149^a	-0.159^a	-0.251^a	-0.149^a	-0.232^a	-0.167^a	-0.323^a	-0.706^a	0.104	-0.142^a	-0.033
	(0.109)	(0.096)	(0.038)	(0.014)	(0.038)	(0.038)	(0.019)	(0.036)	(0.063)	(0.120)	(0.216)	(0.031)	(0.026)
%Δ2007	-0.257^b	-0.248^a	-0.183^a	-0.199^a	-0.225^a	-0.059	-0.267^a	-0.156^a	-0.373^a	-0.804^a	-0.244	-0.033	-0.082^b
	(0.115)	(0.095)	(0.034)	(0.014)	(0.042)	(0.041)	(0.020)	(0.040)	(0.076)	(0.119)	(0.212)	(0.029)	(0.033)
%Δ2008	-0.333^a	-0.267^a	-0.233^a	-0.252^a	-0.284^a	-0.082^b	-0.282^a	-0.213^a	-0.365^a	-1.021^a	-0.147	-0.088^a	-0.169^a
	(0.116)	(0.090)	(0.044)	(0.016)	(0.043)	(0.037)	(0.022)	(0.035)	(0.059)	(0.157)	(0.241)	(0.034)	(0.039)

Notes: Table shows results from the gravity equation estimation for each of the 13 sectors with interaction term of year and border effect. Dependent variable is the country-pair-year bilateral trade. Robust standard errors clustered at country-pair level are reported in parentheses. a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.1$.

Table A.3: (continued)

	Animal Feed	Cereals	Chemicals	Food	Fruits and Nuts	Machines	Metals	Minerals	Other	Textiles	Vegetable or Animal Oils	Vehicles	Wood Paper
%Δ2009	-0.459^a	-0.373^a	-0.241^a	-0.202^a	-0.398^a	-0.043	-0.112^a	-0.151^a	0.140^b	-0.916^a	-0.319	0.047	-0.214^a
	(0.096)	(0.099)	(0.044)	(0.017)	(0.047)	(0.035)	(0.023)	(0.032)	(0.060)	(0.163)	(0.257)	(0.041)	(0.050)
%Δ2010	-0.498^a	-0.311^a	-0.221^a	-0.266^a	-0.412^a	-0.128^a	-0.205^a	-0.290^a	-0.113^b	-0.937^a	-0.570^b	-0.028	-0.312^a
	(0.096)	(0.103)	(0.040)	(0.019)	(0.051)	(0.039)	(0.025)	(0.032)	(0.057)	(0.165)	(0.280)	(0.042)	(0.052)
%Δ2011	-0.621^a	-0.215*^{b}	-0.231^a	-0.352^a	-0.434^a	-0.139^a	-0.284^a	-0.332^a	-0.247^a	-1.020^a	-0.483^c	-0.020	-0.393^a
	(0.114)	(0.104)	(0.043)	(0.020)	(0.050)	(0.042)	(0.030)	(0.034)	(0.054)	(0.169)	(0.286)	(0.043)	(0.054)
%Δ2012	-0.640^a	-0.212^c	-0.202^a	-0.347^a	-0.467^a	-0.127^a	-0.246^a	-0.340^a	-0.121^b	-1.100^a	-0.374	-0.033	-0.355^a
	(0.096)	(0.113)	(0.044)	(0.022)	(0.056)	(0.043)	(0.030)	(0.031)	(0.053)	(0.183)	(0.254)	(0.042)	(0.056)
%Δ2013	-0.627^a	-0.394^a	-0.215^a	-0.362^a	-0.490^a	-0.097^b	-0.241^a	-0.335^a	-0.094^c	-1.084^a	-0.612^b	-0.005	-0.372^a
	(0.100)	(0.123)	(0.047)	(0.022)	(0.057)	(0.045)	(0.031)	(0.029)	(0.056)	(0.181)	(0.264)	(0.045)	(0.058)
%Δ2014	-0.422^a	-0.477^a	-0.276^a	-0.379^a	-0.559^a	-0.100^b	-0.253^a	-0.352^a	-0.124^b	-1.154^a	-0.684^b	0.022	-0.393^a
	(0.120)	(0.108)	(0.049)	(0.023)	(0.061)	(0.047)	(0.032)	(0.029)	(0.060)	(0.193)	(0.266)	(0.047)	(0.058)
%Δ2015	-0.600^a	-0.515^a	-0.429^a	-0.432^a	-0.719^a	-0.096^c	-0.252^a	-0.362^a	-0.094	-1.170^a	-0.700^a	0.017	-0.386^a
	(0.104)	(0.111)	(0.049)	(0.025)	(0.067)	(0.057)	(0.033)	(0.035)	(0.059)	(0.205)	(0.268)	(0.046)	(0.061)
%Δ2016	-0.721^a	-0.576^a	-0.482^a	-0.406^a	-0.762^a	-0.058	-0.175^a	-0.327^a	-0.039	-1.132^a	-0.775^a	0.076^c	-0.341^a
	(0.112)	(0.118)	(0.053)	(0.025)	(0.075)	(0.062)	(0.031)	(0.035)	(0.065)	(0.210)	(0.271)	(0.042)	(0.061)
%Δ2017	-1.055^a	-0.507^a	-0.338^a	-0.164^a	-0.806^a	0.354^a	-0.007	-0.175^a	0.147^b	-1.132^a	-0.880^a	0.254^a	0.075
	(0.109)	(0.111)	(0.050)	(0.027)	(0.079)	(0.074)	(0.031)	(0.036)	(0.064)	(0.202)	(0.280)	(0.043)	(0.069)
%Δ2018	-1.252^a	-0.534^a	-0.358^a	-0.332^a	-0.766^a	0.345^a	-0.036	-0.267^a	0.071	-1.264^a	-1.606^a	0.263^a	-0.005
	(0.121)	(0.111)	(0.051)	(0.035)	(0.081)	(0.085)	(0.030)	(0.035)	(0.063)	(0.202)	(0.249)	(0.040)	(0.069)
Obs.	126,077	172,373	198,753	215,623	191,712	168,542	197,056	149,777	160,098	177,728	100,137	131,608	171,199

Notes: Table shows results from the gravity equation estimation for each of the 13 sectors over three-year interval from 2000 to 2018. Dependent variable is the country-pair-year bilateral trade. Robust standard errors clustered at country-pair level are reported in parentheses. a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.1$.