Lancaster University
Management School

Economics Working Paper Series

2025/012

The Effect of Third-Country Tariffs on Bilateral Trade

Dakshina G. De Silva, Inkoo Lee, Soon-Cheul Lee and Maurizio Zanardi¶

The Department of Economics
Lancaster University Management School
Lancaster LA1 4YX
UK

© Authors
All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission, provided that full acknowledgement is given.

LUMS home page: http://www.lancaster.ac.uk/lums/

The Effect of Third-Country Tariffs on Bilateral Trade*

Dakshina G. De Silva†
Inkoo Lee‡
Soon-Cheul Lee§
Maurizio Zanardi¶

September 2025

Abstract

We develop a three-country theoretical framework and provide new evidence on the role of third-country tariffs in shaping bilateral trade flows. Our model predicts that tariff preferences can generate trade diversion and that the magnitude of this effect depends on the full tariff schedule faced by competing suppliers. Leveraging highly disaggregated transaction-level data on South Korea's imports, we show that bilateral applied tariffs significantly depress imports, while higher third-country tariffs divert trade toward the partner country. These effects are only identifiable when exploiting the richness of our data at the product level and vary substantially across preferential and non-preferential regimes and by the number of potential suppliers. Our findings highlight the importance of accounting for third-country tariffs when assessing the trade effects of tariff changes, a point that is particularly salient in the current context of U.S. policy proposals of tariff increases.

Keywords: trade flows, applied tariffs, gravity equation
JEL Classification: F14, F15

*We thank conference participants at the European Trade Study Group conference in Athens and participants at a CITP seminar for very useful comments. All remaining errors are our own.

†Department of Economics, Lancaster University, Lancaster, LA1 4YX, United Kingdom. E-mail: d.desilva@lancaster.ac.uk

‡Department of Global Commerce, Soongsil University, 369 Sangdo-Ro, Dongjak-Gu, Seoul 06978, Korea. E-mail: iklee1120@ssu.ac.kr

§School of Asian Studies, Busan University of Foreign Studies, Busan, Korea. E-mail: sclee@bufs.ac.kr

¶Department of Economics, University of Sussex, Brighton, BN1 9RN, United Kingdom. E-mail: m.zanardi@sussex.ac.uk

1 Introduction

Tariff changes, whether driven by deeper market integration or by rising protectionist pressures, can substantially alter trade costs. Since Viner's (1950) seminal analysis of customs unions, it is well established that discriminatory tariffs may distort trade patterns and resource allocation by inducing trade diversion. This happens if preferential tariffs redirect imports away from efficient suppliers toward higher-cost countries that enjoy lower tariffs. This mechanism has regained particular salience in the context of recent U.S. trade policy announcements, where the Trump administration's reliance on discriminatory tariffs illustrates the continuing (and growing) importance of understanding how tariff differentials shape trade patterns.

Over the last two decades, a large literature has examined the trade and welfare effects of preferential trade agreements (PTAs) with important (methodological) contributions. Comprehensive surveys (e.g., Baldwin and Freund, 2011; Head and Mayer, 2014; Limão, 2016) review this body of work, which falls broadly into three strands. First, gravity-based studies (e.g., Baier and Bergstrand, 2007; Anderson and Yotov 2016; Mattoo et al., 2019) estimate the impact of PTAs on trade flows, often using categorical measures of agreement type. Second, demand-based approaches (e.g., Romalis, 2007) quantify the trade and welfare implications of different forms of PTAs. Third, research on the political economy of PTAs (e.g., Egger and Larch, 2008; Baldwin and Jaimovich, 2012; Dai et al., 2014) highlights the defensive or contagious dynamics of agreement formation. Taken together, these studies show that PTAs often impose costs on non-members through reduced trade and welfare losses, although recent evidence also points to potential offsetting "extended gravity" (Morales et al., 2019) effects whereby outsiders may gain access to PTA markets indirectly (e.g., Lee et al., 2023).

Yet, despite the long literature on the topic, little is known about the extent to which changes in tariffs on third-country parties affect the members of PTAs.[1] Part of the reason may be due to the fact that most of the existing studies draw empirical guidance from trade models that are typically framed in two-country environments. This paper advances the literature by explicitly incorporating a third country into a standard two-country endowment economy model. Using this framework, we specifically address the trade-diverting elements of preferential tariff reductions. The inclusion of a third country in a simple trade model allows us to distinguish the trade effects of tariff preferences with a trading partner on the rest of

[1] Cigna et al. (2022) is an exception whereby they study the effects of the 2018 Trump's tariffs against China on imports from other countries.

the world. Our theoretical model obviously predicts that trade diversion occurs as a result of preferential tariff reductions but the extent of the effect varies with the tariff levels imposed on the third country, as well as other dimensions (explored in our heterogeneity analysis). This is the crucial empirical prediction that we take to the data in our econometric analysis. The model deliberately focuses on the role of tariff preferences (and abstracts from much else) to provide a framework for explicit analysis of trade diversion driven by third countries.

In order to implement the empirical analysis, we exploit a novel three-dimensional panel data set of South Korea's imports and tariffs. The dataset includes tariff information and trade flows between South Korea and all its trade partners (i.e., more than 200 countries) for the years 2012-2015. Crucially, trade flows are recorded at the 10-digit level of the Harmonized Tariff Schedule of Korea (HSK code), which is the level at which tariffs are set in South Korea.[2] Each trade flow-destination is associated with the specific (preferential) tariff applied to it. Hence, our data is at the product–partner–firm size level over four years. These data are compiled by the Korea Trade Statistics Promotion Institute (KTSDPI) and are the most comprehensive in terms of coverage of goods, applied and MFN (most-favoured-nation) tariffs, and firm type (i.e., by size), providing a uniquely rich dataset.

Leveraging the granular data at our disposal and the insights of our theoretical model, we estimate gravity-type regressions using the Poisson Pseudo Maximum Likelihood (PPML) estimator. To bring the theory to the data, third-country tariffs are aggregated into a distance-weighted applied tariff (with results robust to alternative weighting schemes). Our first finding is that highly-disaggregated data are essential: identifying the role of third-country tariffs requires highly disaggregated product-level (10-digit HSK) fixed effects. This, in itself, underscores that credible trade policy assessments must rely on very detailed data. Second, we show that third-country tariffs exert a positive and significant effect on bilateral trade, confirming the presence of trade diversion when such tariffs change. Our heterogeneity analysis highlights the role of preferential margins and the importance of the number of potential source countries. Finally, a quantification exercise demonstrates the magnitude of trade redirection associated with tariff changes.

The rest of the paper is organized as follows. In Section 2, we present the theoretical three-country model to motivate the setup for the empirical analysis. Sections 3 and 4 cover the empirical strategy and data description, respectively. Section 5 presents the benchmark econometric results and the findings from an extensive set of robustness checks. Section 6 concludes.

[2]At the 6-digit level, HSK codes are identical to the Harmonized System (HS) codes.

2 A Three-country Model

In this section, we develop a simple three-country model to investigate the role and effects of a third-country on bilateral trade when two other countries form a PTA. We build on the model proposed by Sercu and Uppal (2003), which we extend by incorporating a third country in an endowment economy with complete financial markets. We do not model trade frictions other than import tariffs and deliberately focus on the trade effect of tariff preferences to keep the analysis as simple as possible. Our approach is intended to offer a tractable framework to carry out explicit analyses of changes in trade policy, emphasizing the interplay of tariffs on the PTA partner and the third-party country.

The world economy consists of three countries (n) indexed by i, j, j^-. The three countries are assumed to be populated by a large and equal number of consumers with identical preferences. Consumers in each country maximize the expected value of lifetime utility given by

$$U(C_{n,t}) = \sum_{t=0}^{\infty} \beta^t \frac{C_{n,t}^{1-\sigma}}{1-\sigma} \qquad \text{for } n \in \left\{i, j, j^-\right\} \tag{1}$$

where β is the discount factor and σ is the inverse of the intertemporal elasticity of substitution. In every period t, each economy is exogenously endowed with a single good, Y_t, that is non-storable. We assume that the three countries have perfectly integrated financial markets but frictional goods markets such that individuals face tariffs when importing goods from foreign countries. We introduce the tariff of the iceberg type by assuming that a proportion of any physical shipment is lost in transit. We use τ_t to denote the tariff faced by individuals. In this setting, when one unit is shipped, only $1/(1+\tau_t)$ units actually arrive at destination.

Given the presence of the tariffs, the resource constraints for each country are given by:

$$C_{i,t} = Y_{i,t} - X_{ij,t} - X_{ij^-,t} + \frac{X_{ji,t}}{(1+\tau_{ji,t})} + \frac{X_{j^-i,t}}{(1+\tau_{j^-i,t})} \tag{2}$$

$$C_{j,t} = Y_{j,t} - X_{ji,t} - X_{jj^-,t} + \frac{X_{ij,t}}{(1+\tau_{ij,t})} + \frac{X_{j^-j,t}}{(1+\tau_{j^-j,t})} \tag{3}$$

$$C_{j^-,t} = Y_{j^-,t} - X_{j^-i,t} - X_{j^-j,t} + \frac{X_{ij^-,t}}{(1+\tau_{ij^-,t})} + \frac{X_{jj^-,t}}{(1+\tau_{jj^-,t})} \tag{4}$$

$$Y_{i,t} \geq X_{ij,t} + X_{ij^-,t}, X_{ij,t} \geq 0, X_{ij^-,t} \geq 0 \tag{5}$$

$$Y_{j,t} \geq X_{ji,t} + X_{jj^-,t}, X_{ji,t} \geq 0, X_{jj^-,t} \geq 0 \tag{6}$$

$$Y_{j^-,t} \geq X_{j^-i,t} + X_{j^-j,t}, X_{j^-i,t} \geq 0, X_{j^-j,t} \geq 0 \tag{7}$$

where $X_{ij,t}$ is the amount of exports from country i to country j, $\tau_{ji,t}$ is the tariff rate imposed by country i on the good imported from country j, and $X_{ji,t}/(1+\tau_{ji,t})$ is the amount of imports of country i from country j measured after the tariff.

Given our assumption of complete financial markets, the model is solved as a central planner problem whose objective is to maximize the aggregate utility by choosing the amount of trade:

$$\max_{X_{ij,t},X_{ij^-,t},X_{ji,t},X_{jj^-,t},X_{j^-i,t},X_{j^-j,t}} U(C_{i,t}) + U(C_{j,t}) + U(C_{j^-,t})$$

subject to the constraints (2)-(7). Solving for the central planner's problem, we obtain the equilibrium amount of imports of country i from country j, defined as $M_{ij,t} = X_{ji,t}/(1+\tau_{ji,t})$, which is given by

$$\begin{aligned} M_{ij,t} \;=\; & \frac{(1+\tau_{ji,t})^{-1}\left((1+\tau_{j^-i,t})^{\frac{1}{\sigma}-1}+1\right)}{(1+\tau_{ji,t})^{\frac{1}{\sigma}-1}+(1+\tau_{j^-i,t})^{\frac{1}{\sigma}-1}+1} Y_{j,t} - \\ & \frac{(1+\tau_{ji,t})^{\frac{1}{\sigma}-1}}{(1+\tau_{ji,t})^{\frac{1}{\sigma}-1}+(1+\tau_{j^-i,t})^{\frac{1}{\sigma}-1}+1} Y_{i,t} - \\ & \frac{(1+\tau_{ji,t})^{\frac{1}{\sigma}-1}(1+\tau_{j^-i,t})^{-1}}{(1+\tau_{ji,t})^{\frac{1}{\sigma}-1}+(1+\tau_{j^-i,t})^{\frac{1}{\sigma}-1}+1} Y_{j^-,t}. \end{aligned} \tag{8}$$

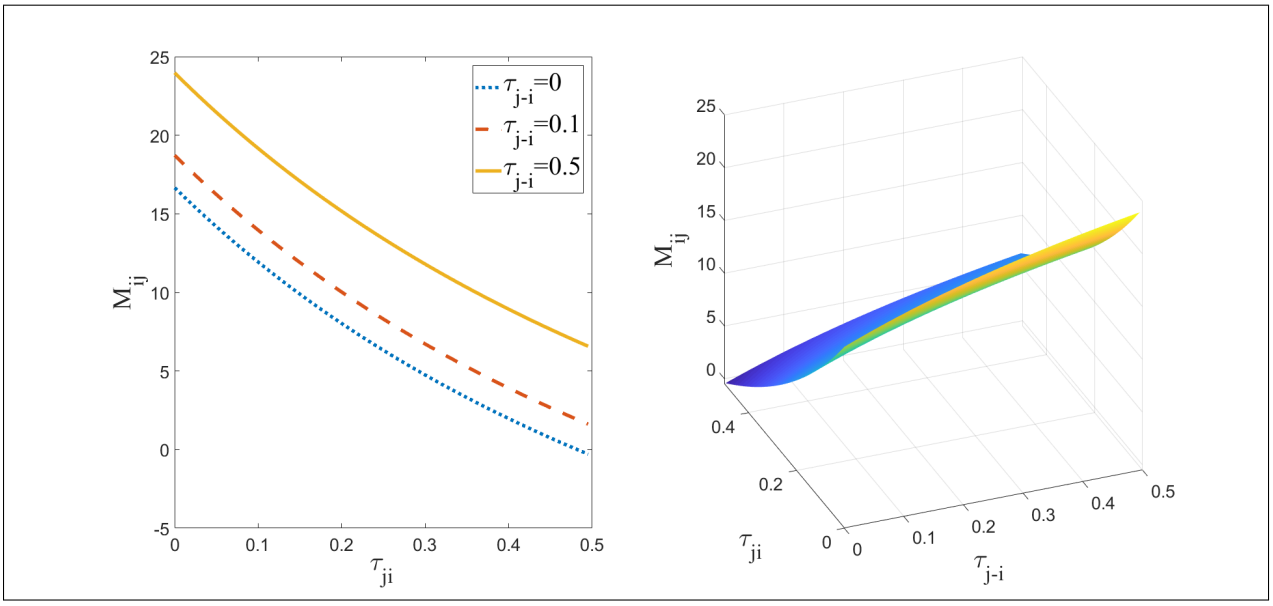
The expression in equation (8) shows that the imports of country i from j are not only affected by the tariff rate of i against goods from j but also the tariff that i imposes on the third country (i.e., $\tau_{j^-i,t}$). Because the expression is highly nonlinear, we conduct a numerical exercise to examine whether it is consistent with the idea that trade becomes more costly with countries outside a preferential agreement compared to trading with partners within it.

The two panels in Figure 1 provide alternative graphical representation of $M_{ij,t}$ in two or three dimensions to investigate the effect of varying values of $\tau_{ji,t}$ and $\tau_{j^-i,t}$. Following Backus, Kehoe and Kydland (1994), we conduct the comparative statics assuming that $\sigma = 2$.[3] Now imagine that countries i and j enter into a PTA, which leads $\tau_{ji,t}$ to move from a positive number to zero. The left panel of Figure 1 illustrates the increase of country i imports from j for three different values of the tariff that country i imposes on the third country j^- (i.e., for $\tau_{j^-i,t} = 0$, 0.1, 0.5 as represented by the short blue dashed line, the long

[3]Data on consumption choices suggests a value for σ between 1 and 5. Backus, Kehoe, and Kydland (1992, 1994) use $\sigma = 2$ in their study of international business cycles. Chetty (2006) shows that the choices by consumers facing the risk of unemployment combined with plausible values for the income and wage elasticities of labor supply imply that σ is at most 2.

red dashed line, and the solid yellow line, respectively). There are three features to note from this graph. First, as one might expect, greater values of $\tau_{ji,t}$ are associated with smaller values of $M_{ij,t}$, consistent with the conventional wisdom that the imposition of higher tariffs decreases the amount of imports from the trade partner. Second, for a given $\tau_{ji,t}$, higher values of $\tau_{j^-i,t}$ are positively associated with $M_{ij,t}$ (i.e., indifference curves further away from the origin), indicating the trade diversion effect arising from the tariff preference accorded to the PTA partner. This is shown by evaluating $M_{ij,t}$ at any given $\tau_{ji,t}$ for different values of $\tau_{j^-i,t}$. For instance, holding $\tau_{ji,t}$ fixed at 0.1, imports of country i from country j decrease by 14.5% if i reduces the import tariff imposed on j^- from 0.1 to 0 (i.e., a fall in $\tau_{j^-i,t}$ from 0.1 to 0). Third, the effect of the third country does not depend linearly on $\tau_{j^-i,t}$. For $\tau_{ji,t} = 0.1, M_{ij,t}$ increases by 8.9% when $\tau_{j^-i,t}$ rises from 0 to 0.05, while $M_{ij,t}$ increases by 7.4% when $\tau_{j^-i,t}$ rises from 0.05 to 0.1.

Figure 1: Comparative statics for imports of i from j ($M_{ij,t}$)



The right panel of Figure 1 shows the surface plot of $M_{ij,t}$ for various values of $\tau_{ji,t}$ and $\tau_{j^-i,t}$. The concavity of the surface plot illustrates that the effect of $\tau_{ji,t}$ on country's i imports from j is nonlinear, with a larger impact for lower values of the import tariff. Furthermore, the three-dimensional plot also show that the imports of country i from j are not maximized when country i drops to zero the import tariffs against both other countries: higher level of imports are achieved when there are restrictions against imports from j^-i, a

result due to trade diversion.

The discussion above indicates that the extent of trade diversion depends on the level of tariff rates that are imposed bilaterally and beyond.[4] In reality, such rates vary (dramatically) across products and countries leading to substantial heterogeneity. Therefore, a more systematic empirical approach is required to validate these theoretical predictions, which is the objective of the paper next.

3 Empirical Model

In this section, we leverage the insights of the numerical exercise based on equation (8) to posit a specification to be taken to the data, exploiting the richness of the South Korea dataset at our disposal. We specify our empirical model, which is nothing other than a gravity equation, as follows:

$$\begin{aligned} M_{ij,s,f,t} &= \alpha + \beta(1+\tau^{a}_{ji,s,f,t}) + \delta(1+\tau^{a}_{j^{-}i,s,f,t}) + \lambda \ln y_{i,t} + \phi \ln y_{j,t} + \\ &\quad \varpi \ln y_{j^{-},t} + \theta_k + \theta_j + \theta_f + \theta_t + \sigma + \varepsilon_{ij,s,f,t}. \end{aligned} \tag{9}$$

Following from equation (8), $M_{ij,s,t}$ represents the imports to home country i from partner j at time t for product s (defined at the 10-digit level of the HSK classification) by firm type f. In order to be clear on the type of tariff we refer to, notice that $\tau^{a}_{ji,s,t}$ denotes the tariff applied by the home country i on partner j at time t for product s, while $\tau^{a}_{j^{-}i,s,t}$ is the applied tariff imposed by home country i on third-country j^{-} at time t for product s. The GDPs of the home, partner, and third countries are represented by y_i, y_j, and $y_{j^{-}}$, respectively. θ_k denotes product fixed effects (where k represents different HSK levels, depending on the specification), θ_j represents trade partner fixed effects, θ_f captures firm-size fixed effects, and θ_t indicates year fixed effects. σ is the inverse of the intertemporal elasticity of substitution, which is constant for all countries and cannot be identified separately from the fixed effects in the above specification.[5]

Given the richness of our dataset (at the country-product-firm size-year level), our identification strategy can rely on different sets of time-varying fixed effects to control for possible

[4] The qualitative implications from Figure 1 are unaffected if we were to use different values for σ. When using $\sigma = 3$ or 4, the figures would look exactly the same with only the scale changing.

[5] The choice of having σ included additively is consistent with the numerical exercises where different values for the parameter only shift the level of imports without changing the shape of their response to tariffs.

omitted variables and confounding effects. In this case, we would not be able to shed light on the role of some controls (e.g., GDP) but with the advantage of more thoroughly addressing possible omitted variable bias. Thus, we will use different combinations of time-varying trade partner (θ_{jt}) and firm-size (θ_{ft}) fixed effects (and also time-varying product fixed effects, θ_{kt}, as a robustness check). And given that our analysis is at the firm type level, we assume that each of these firm types is not able to influence the South Korean policymakers in its trade policy decisions.

In our application, South Korea is the home country (i) for which we observe trade relationships with more than 200 countries over 4 years. For each bilateral relationship, we aggregate all third countries into one. To do so, we consider the physical distance between countries and construct a distance-weighted tariff rate for all countries considered (together) as third countries (with respect to the partner j). Denoting with d_{ij} the physical distance between countries i and j, third-country tariffs are given by $\sum_{z \in j^-} \frac{1}{d_{iz}} \left(1 + \tau^a_{zi,s,f,t}\right)$, where j^- denotes countries other than j. Notice that the third-country tariffs are calculated for the same product, year and type of firm. With these considerations in mind, we can rewrite the specification in (9) as:

$$M_{ij,s,f,t} = \vartheta + \gamma(1 + \tau^a_{ji,s,f,t}) + \psi \sum_{z \in j^-} \frac{1}{d_{iz}} \left(1 + \tau^a_{zi,s,f,t}\right) + \delta_{kt} + \delta_{jt} + \delta_{ft} + \mu_{ij,s,f,t}. \quad (10)$$

As demonstrated by the numerical exercise, $M_{ij,t}$ is negatively associated with $\tau_{ji,t}$ while it is positively related to $\tau_{j-i,t}$. Thus, we expect γ to be negative and ψ be positive. We estimate our empirical model using the PPML estimator, now a standard estimation method in trade analysis.[6] In our benchmark specification we cluster error by partner countries but we experiment with different types of clustering.

4 Data

In order to bring the model from (10) to the data, it is necessary to have access to information about import flows and the tariffs that are imposed on products coming from different trade partners with different (or no) preferential status. The cornerstone of our empirical analysis is the transaction-level import dataset for South Korea, which records information on trade flows but also the MFN and applied tariff rates at the 10-digit level of the HSK classification.

[6]For a more detailed discussion of PPML, see Santos Silva and Tenreyro (2006).

For each imported (10-digit HSK) product, the dataset includes information about the value and weight of imports, the relevant MFN tariff and the applied tariff with an explanation of why such tariff is different from MFN.[7] Furthermore, separate entries are considered depending on the size (in terms of assets) of the importing firms, distinguishing between large, medium, or small firms, plus a residual 'other' group (non-profit enterprises, individual businesses, public enterprises, and other firms that do not belong to any other category).[8] In total, the dataset includes information for more than 11,000 products imported from more than 200 trade partners.

In Table 1, we report some basic statistics on South Korean trade flows. As shown in panel A, the data provided by KCTDI essentially represent the universe of all import transactions (i.e., above 99.7% of the flows recorded by the Korean International Trade Association, KITA). The value of total imports has been more or less constant in the earlier years but it did drop significantly in 2015 as a result of the overall slow down of the global economy. Imports are recorded for around 11,000 unique products originating from around 215 trade partners. Panel B shows how total imports are split across 10 major industrial sectors (based on import values). The statistics indicate that most of the South Korean imports (i.e., just above one third) fall under the category of minerals. This is somewhat expected as Korea has no fossil fuel deposits and imports all petroleum products that fall under the category of mineral products. Electronics and machinery is the next largest sector. On the other extreme, food and textile account for the smallest shares of imports. The bottom panel of Table 1 reports import shares by product type (using the classification from UNCTAD) distinguishing between capital goods, consumer goods, intermediate goods, raw materials, and others. Imports of capital goods and raw material are of very similar magnitude and together account for around 55% of imports with consumer and intermediate goods coming next and with similar shares.

[7] A tariff different from MFN may be applied because of PTA agreements, preferential duties, antidumping measures, or other adjustments (e.g., concessions, special exemptions).

[8] Large firms are designated by the Fair Trade Commission (KFTC) and identified as business groups subject to the ceiling on the total amount of shareholdings in other domestic companies with 5 trillion Korean Won (approximately 3.8 billion US Dollars) of assets or more. Medium-size firms are defined as companies with assets worth at least 500 billion Korean Won (approximately 380 million US Dollars) and not defined as large. Small firms are defined as firms that are the remaining firms but they also do not belong to non-profit enterprises, individual businesses, and public enterprises.

Table 1: Structure of South Korean imports

Panel A: overall imports					
Year	Imports in US$	KITA imports in US$	% of imports	Number of products	Number of partners
2012	518,508.7	519,584.5	99.79	11,052	214
2013	514,506.9	515,858.5	99.74	10,924	213
2014	524,597.4	525,514.5	99.83	11,014	216
2015	435,410.2	436,499.0	99.75	10,977	214
Panel B: sectoral imports					
Year	Agriculture	Food	Minerals	Chemicals	Textile
2012	3.05%	1.79%	40.86%	9.15%	2.27%
2013	3.14%	1.83%	39.57%	9.11%	2.57%
2014	3.31%	1.91%	37.94%	8.97%	2.70%
2015	3.86%	2.14%	28.02%	9.83%	3.19%
Year	Steel & Iron	Non-steel	Auto & Transp.	Electronics & Mach.	Other
2012	6.10%	3.26%	2.94%	25.50%	5.08%
2013	5.61%	3.23%	3.02%	26.69%	5.22%
2014	5.88%	3.27%	3.54%	27.10%	5.38%
2015	5.38%	3.57%	4.94%	32.71%	6.35%
Panel C: product imports					
Year	Capital goods	Consumer goods	Intermediate goods	Raw materials	Other products
2012	25.09%	17.92%	19.07%	32.06%	5.85%
2013	26.11%	19.76%	18.76%	29.33%	6.05%
2014	26.59%	20.72%	18.79%	27.83%	6.07%
2015	32.47%	20.93%	19.70%	22.10%	4.81%

Notes: KITA stands for Korea International Trade Association.

Before discussing some summary statistics about Korean tariffs, it is worth describing the trade agreements that South Korea had in place during our sample period. Eight free trade agreements were already in effect before the start of the sample: APTA (1975), Chile (2004), Singapore (2006), EFTA (2006), ASEAN (2009), India (2010), EU (2011), and Peru (2011).[9] Seven more agreements entered into force during the sample period: USA (March 2012), Turkey (May 2013), Australia (December 2014), Canada (January 2015), China and New Zealand and Viet Nam (all three in December 2015). As the list makes clear, South Korea has a range of trade agreements with major trading partners among developed and developing countries, with 63% of imports in 2015 coming from one of such countries.[10]

[9]The Bangkok Agreement (1975) was renamed Asia-Pacific Trade Agreement (APTA) in 2005. It includes Bangladesh, China, India, South Korea, Lao, Sri Lanka, and Mongolia (since 2020). The agreement with the EU has been provisionally applied since July 2011 but was formally ratified only in December 2015.

[10]Not all imports from such countries were subject to preferential import tariffs (because of phase-in

Table 2: Tariff structure of South Korean imports

Variable	Observations	Mean	St. Dev.	Minimum	Maximum
Panel A: Korea-ASEAN FTA					
MFN tariff	35,204	9.83	5.48	0	50.00
Applied tariff	35,204	0.43	3.16	0	176.00
MFN tariff - applied tariff	35,204	9.39	5.15	-136	50.00
Panel B: Korea-Chile FTA					
MFN tariff	1,169	19.12	13.93	0	50.00
Applied tariff	1,169	0.98	3.28	0	40.00
MFN tariff - applied tariff	1,169	18.14	13.20	0	50.00
Panel C: Korea-China FTA					
MFN tariff	2,602	8.60	2.88	0	50.00
Applied tariff	2,602	4.96	4.79	0	62.60
MFN tariff - applied tariff	2,602	3.65	3.46	-13	13.00
Panel D: Korea-EFTA FTA					
MFN tariff	14,779	8.20	2.51	0	50.00
Applied tariff	14,779	0.17	1.53	0	40.00
MFN tariff - applied tariff	14,779	8.03	2.01	-19	32.80
Panel E: Korea-New Zealand FTA					
MFN tariff	71	20.85	13.11	3	45.00
Applied tariff	71	8.29	15.44	0	80.10
MFN tariff - applied tariff	71	12.56	15.61	-40	36.00
Panel F: Korea-Peru FTA					
MFN tariff	741	12.67	9.02	0	50.00
Applied tariff	741	6.46	42.37	0	600.20
MFN tariff - applied tariff	741	6.21	43.29	-597	45.00
Panel G: Korea-Singapore FTA					
MFN tariff	575	8.34	4.06	3	50.00
Applied tariff	575	0.62	1.61	0	17.40
MFN tariff - applied tariff	575	7.72	2.92	3	38.40
Panel H: Korea-Turkey FTA					
MFN tariff	3,631	9.75	5.55	0	50.00
Applied tariff	3,631	1.44	7.25	0	288.20
MFN tariff - applied tariff	3,631	8.31	5.80	-283	21.00
Panel I: Korea-USA FTA					
MFN tariff	56,048	9.08	5.96	0	50.00
Applied tariff	56,048	1.67	9.84	0	783.00
MFN tariff - applied tariff	56,048	7.40	9.20	-778	50.00
Panel J: Korea-Viet Nam FTA					
MFN tariff	195	10.09	4.58	0	45.00
Applied tariff	195	0.65	4.46	0	40.50
MFN tariff - applied tariff	195	9.44	3.33	-1	30.00

Table 2 provides summary statistics for import tariffs, also distinguishing by trade agreement. Panel A reports statistics at the 10-digit HSK for our entire sample: the average MFN rate applicable to imports during 2012-2015 was 8.93% but the applied tariff was 2.25 percentage points lower at 6.68%. The statistics also show that there is much more variation in the applied than MFN tariffs, also because of the many more transactions with zero import tariff and some significant outliers.[11] The statistics in Panel B only refer to the transactions that were subject to a preferential tariff resulting from a trade agreement. The difference between MFN and applied rate in this case is three-times as large as for all products with an average applied tariff of only 1.59%. The number of observations reveals that around 27% of all import flows received a preferential rate, implying that many qualifying flows did not. The averages in Panel B mask quite some variation across different trade agreements. Applied preferential tariffs vis-à-vis the EU (Panel F) and India (Panel G), whose FTAs were in force since 2010 and 2011, respectively, display similar averages of around 1.4%. Instead, the APTA preferential rates (Panel C) are much higher (at 5.51%) although such agreement has been in place for much longer. Still, the relatively recent FTAs with Australia (December 2024; Panel D) and Canada (January 2025; Panel E) exhibit quite different average rates, possibly due to the composition of the underlying trade flows and Korea's different strategies across PTAs.[12]

Table 3: Summary statistics

Variable	Mean	St. Dev.	Minimum	Maximum
Imports (US$)	1,438,287	4.50e+07	1	1.45e+10
Applied tariff rate $(1+\tau^a_{ji,s,f,t})$	1.067	0.225	1	9.874
Third-country tariff rate $\sum_{z\in j^-}\frac{1}{d_{iz}}\left(1+\tau^a_{zi,s,f,t}\right)$	1.074	0.194	0	9.874
Distance (km)	7,048.162	3,714.851	955.651	19,629.5
Large firm	0.154	0.361	0	1
Medium firm	0.183	0.387	0	1
Small firm	0.339	0.473	0	1
Other firm	0.325	0.468	0	1

Notes: all summary statistics based on 1,385,399 observations.

Beyond tariffs, we provide the summary statistics for all relevant variables in Table 3. On

periods and utilization rate of preferential tariffs).

[11] Almost 94% of applied tariffs above 50% are for agricultural products and food; the maximum rate of 887.40% is for manioc.

[12] See Table A.1 in the Appendix for the summary statistics of the other trade agreements.

average, each import transaction (by 10-digit HSK code, by partner, by firm type, and by year) is worth $1.44 million but with a significant standard deviation. In fact, the universe of transactions also includes those with very low values, which we will exclude in one of the many robustness checks. The average third-country tariff rate is 1.074, based on the inverse of distance while the (bilateral) applied tariff rate is 1.067 (i.e., an applied tariff of 6.7%, as shown in Table 2). The distance between South Korea and trade partners is just above 7,000 km with significant variation, due to the geographical location of the country. When it comes to the type of firms engaged in imports, small and other type of firms account for around one third each of the total number of transactions, with the remaining third almost equally split between large and medium firms. However, large (medium) firms account for around 50% (18%) of the total value of imports.

5 Empirical Results

Table 4 reports the initial set of empirical results using five specifications, which differ mainly by the inclusion of various fixed effects. Before going into the details, even a cursory look at the table shows that the point estimate for the bilateral tariff is quite robust (i.e., the estimates are not different from each other across columns) independently of the sets of fixed effects that are included. This is because partner-year fixed effects are always included and they control for the multilateral resistance term, whereby bilateral trade relationships are part of general equilibrium forces (including third-country tariffs). The advantage of explicitly introducing the tariff rates imposed on third countries (from column 2) is to understand their role.

Considering the various columns, partner times year fixed effects and firm size times year fixed effects are common across all specifications. The difference between the second and the other columns refer to the granularity of the product fixed effects. Exploiting our rich data, the first two columns in the table include 10-digit HSK product effects and show that, as expected, the tariff applied on third countries exerts a positive and statistically significant effect on bilateral imports. In the next three columns, we experiment with progressively more aggregate-level fixed effects at the 8, 6, and 4-digit level. Interestingly, the role of third-country tariffs becomes insignificant when using 6-digit effects and even turns negative (but far from any conventional significance level) in the last column when sector-wide 4-digit fixed effects are used. This is an important result, which bears significant implications for this type of analysis: rich datasets are needed, and most definitely more disaggregated than

Table 4: Benchmark

Variable	Imports				
	(1)	(2)	(3)	(4)	(5)
Applied tariff	-6.548***	-6.547***	-6.725***	-7.665***	-9.153***
	(1.591)	(1.588)	(1.444)	(1.397)	(1.379)
Third-country tariff rate		0.206***	0.184***	0.055	-0.035
		(0.050)	(0.058)	(0.046)	(0.090)
Partner X year FE	Yes	Yes	Yes	Yes	Yes
Firm type X year FE	Yes	Yes	Yes	Yes	Yes
HSK10 FE	Yes	Yes	No	No	No
HSK8 FE	No	No	Yes	No	No
HSK6 FE	No	No	No	Yes	No
HSK4 FE	No	No	No	No	Yes
Observations	1,385,399	1,385,399	1,385,399	1,385,399	1,385,399
Pseudo R2	0.705	0.705	0.686	0.652	0.574

Notes: standard errors clustered by trade partner in parenthesis; ***, ** denote significance at the 1% and 5%, respectively.

the 6-digit classification that is common across countries.

Based on the results in Table 4, we consider the specification with 10-digit HSK fixed effects in column (2) as our benchmark. It clearly shows the role of trade diversion, as a function of the variation in third-country tariff rates. Next we verify the robustness of our results to methodological and conceptual variations, to be followed by a focus on several dimensions of heterogeneity. Finally, we engage in a quantification exercise, to go beyond statistical significance.

5.1 Robustness Checks

First, we have verified that the statistical significance of the results of our benchmark specification does not depend on the level of clustering of the standard errors (results not reported but available upon request). It is the case that the significance of our key regressors is unchanged if we adopt a double clustering by trade partner and 10-digit HSK codes. Likewise, the coefficients maintain the same level of significance if we cluster by trade partner X 6-digit HSK codes, where the higher level of aggregation is motivated by having on average more observations per cluster given their reliance on asymptotical foundations (but significance would not be affected by partner X 10-digit HSK clustering).

Next, the results in Table 5 show the robustness of our results to several variations. In the first column, we push the identification strategy one step further by including the interaction of the 10-digit HSK fixed effects with years, to allow for changes in the products

over time. The point estimate for the role of the third-country tariff diminishes slightly, although not statistically different from the original estimate, while maintaining the same level of significance. From the two specifications that follow, we see that the weighting scheme used to calculate third-country tariffs is not driving results, which are robust to using a simple mean or a GDP-weighted version. Notice that using imports to construct the weighted tariff would lead to an insignificant estimate. However, such weighting is inappropriate because it underplays the role of high(er) tariffs, which are associated with lower import volumes.

Table 5: Robustness checks

Variable	Imports					
	(1)	(2)	(3)	(4)	(5)	(6)
	HSK10-Year fixed effects	Simple mean	GDP mean	>1,000US$	Positive std(tariff)	Tariff <1.4%
Applied tariff	-6.665***	-6.548***	-6.550***	-4.572***	-7.051***	-7.307***
	(1.650)	(1.589)	(1.590)	(1.635)	(1.742)	(1.776)
Third-country tariff	0.155***			0.188***	0.225***	0.203***
	(0.046)			(0.045)	(0.059)	(0.049)
Third-country tariff (mean)		0.192***				
		(0.047)				
Third-country tariff (GDP)			0.116**			
			(0.054)			
Partner X year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm type X year FE	Yes	Yes	Yes	Yes	Yes	Yes
HSK10 FE	No	Yes	Yes	Yes	Yes	Yes
HSK10 X year FE	Yes	No	No	No	No	No
Observations	1,383,458	1,385,399	1,385,399	1,021,578	1,282,853	1,371,103
Pseudo R2	0.712	0.705	0.705	0.712	0.706	0.706

Notes: standard errors clustered by trade partner in parenthesis; ***, ** denote significance at the 1% and 5%, respectively.

The summary statistics in Table 3 indicate that our dataset includes transactions with very small values, which is natural since we are working with the universe of transactions. Still, these observations may affect the results. To exclude this possibility, column (4) of Table 5 reports the estimates when excluding transaction below 1,000US$. While the point estimate for the effect of the third-country tariff barely changes, the estimate for the bilateral applied tariff becomes smaller (in absolute terms), indicating a lower level of responsiveness. Next, in column (5) we exclude products for which there is no variation of tariffs across trade partners (within each year) while we drop observations with tariffs above the 99^{th} percentile (i.e., tariffs above 40%) in column (6). The point estimates of our key regressors change slightly (but not significantly) across these specifications but the qualitative results are unaffected. These observations reinforces the consideration that our granular product

fixed effects already take into account such variations across products.

In conclusion, the various robustness checks confirm the qualitative results on the relevance of bilateral and third-country applied tariffs, in line with the theoretical model presented in Section 2.

5.2 Heterogeneity Analysis

Having established our main result, it is worth investigating several dimensions of heterogeneity. The first one that we explore, in Table 6, is the role of preferential tariffs resulting from the several PTAs that South Korea has concluded. Thus, the specification in column (1) includes the level and an interaction term (with our two key regressors) with a 'preferential' indicator equal to 1 if imports are applied preferential tariff rates, else it is zero. Notice that the new regressor captures the actual use of preferential tariffs, and not whether the trade partner has a trade agreement with South Korea. This is particularly important given the concern about preference utilization and the different degrees of depth of trade agreements (e.g., APTA is relatively shallow compared to other agreements, as demonstrated by the statistics in Table 2). In the end, around 27% of import flows in the dataset are subject to preferential tariff rates.

The results in the table show that the added regressors are not statistically significant, but they point to an interesting finding: the tests at the bottom of the table illustrate that there is no reaction to third-country tariffs and the responsiveness to bilateral tariff decreases when it comes to preferential tariffs. This result is intuitive, as the application of these preferential rates implies a regulatory cost for importers (e.g., rules of origin, which need to be "learned" as shown by Krishna et al., 2025) that will make them less responsive to changes in bilateral tariffs and less inclined to re-orient their imports when changes in third-country tariffs occur.

Next, we consider a more flexible specification with an interaction between the two tariff rates to allow for a nonlinear relationship between the two key determinants. The positive and significant estimate for the interaction term in column (2) indicates that firms react more to changes in third-country rates the higher the bilateral tariff is (and less to changes in bilateral rates the higher the third-country tariffs are). As an illustration of the implied effects, the tests at the bottom of the table show that the total effect of the third-country rate goes, for example, from 0.188 when the bilateral tariff is zero (i.e., applied tariff is 1) to 0.259 when the bilateral tariff is 10%, with the the point estimate of 0.206 from column (2) of Table 4 representing the average effect.

Table 6: Heterogeneity analysis

Variable	Imports		
	(1)	(2)	(3)
	Preferential tariff	Interaction tariffs	Interaction markets
Applied tariff	-5.383**	-7.500***	-6.420**
	(2.606)	(1.812)	(2.558)
Third-country tariff	0.230***	-0.531***	-0.097
	(0.052)	(0.200)	(0.135)
Preferential rate	-1.175		
	(2.170)		
Applied tariff × Preferential rate	1.805		
	(2.192)		
Third-country tariff × Preferential rate	-0.410		
	(0.372)		
Applied tariff × Third-country tariff		0.718***	
		(0.185)	
Number third countries			-0.002
			(0.060)
Applied tariff × Number third countries			-0.007
			(0.061)
Third-country tariff × Number third countries			0.037***
			(0.009)
Partner X year FE	Yes	Yes	Yes
Firm type X year FE	Yes	Yes	Yes
HSK10 FE	Yes	Yes	Yes
Observations	1,385,399	1,385,399	1,385,399
Pseudo R2	0.706	0.705	0.709
Applied tariff + applied tariff × preferential	-3.578**		
Third-country tariff + third-country tariff × preferential	-0.180		
Third-country tariff (applied tariff=1)		0.188***	
Third-country tariff (applied tariff=1.1)		0.259***	
Third-country tariff (8 source countries)			0.200**
Third-country tariff (15 source countries)			0.460***

Notes: standard errors clustered by trade partner in parenthesis; ***, ** denote significance at the 1% and 5%, respectively.

The specification in column (3) of Table 6 is similar in spirit to the previous one, albeit the interaction is now with the number of countries from which South Korea imports a given product (in a given year and for a specific firm type). The motivation for this exercise is to consider the extent to which importing firms can change their sources, depending on how many countries supply a specific product. The results show that, indeed, the sensitivity to third-country tariff rates increases with the number of partners exporting the good and it is statistically significant (at 5% level) when there are at least 8 exporting countries. For context, it is worth noting that the sample mean of source origins (by HSK10, year, and

firm size) is 19 with a median value of 15 (and the maximum is 121). Again, this shows the underlying heterogeneity that is masked by the average effect reported in Table 4.

In conclusion, the heterogeneity analysis has demonstrated significant variation in the quantitative effect found earlier while maintaining the overall qualitative conclusions.

5.3 Quantification

Having established the robustness of our statistical results and shown the nuances when considering various heterogeneity angles, we now consider a quantification exercise to illustrate the economic size of the effects. Table 7 shows the percentage reductions in imports in 2015 (i.e., last year of our sample) if South Korea were to increase all its tariff rates by 5 percentage points, with different specifications illustrating the role of heterogeneity. Notice that these calculated changes take into account both the direct effect of bilateral tariffs and the role of third-country tariffs.

Table 7: Quantification when all tariffs increased by 5 percentage points

Variable	Imports				
	(1)	(2)	(3)	(4)	(5)
	No third-country tariff	Benchmark	Preferential tariff	Interaction tariffs	Interaction markets
Δ% total imports	-27.919%***	-27.169%***			
	(5.733)	(5.812)			
Δ% preferential imports			-17.131%**		
			(8.226)		
Δ% non-preferential imports			-22.713%**		
			(10.077)		
Δ% imports, applied tariff=1 & third-country tariff=1				-27.956%	
				(5.868)	
Δ% imports, applied tariff=1 third-country tariff=1.2				-27.437%	
				(5.776)	
Δ% imports, applied tariff=1 third-country tariff=1.4				-26.914%	
				(5.683)	
Δ% imports, 8 trade partners					-26.933%***
					(7.830)
Δ% imports, 15 trade partners					-26.158%***
					(6.769)
Δ% imports, 40 trade partners					-23.321%***
					(5.187)

Notes: quantification for the year 2015 based on the estimates from columns 1 and 2 of Table 4 and Table 6, respectively; standard errors clustered by trade partner in parenthesis; ***, ** denote significance at the 1% and 5%, respectively.

A 5-percentage point increase in all tariffs is a substantial change when the average tariff

is 6.7% (see Table 3) – still quite small considering recent trade policy announcements from the Trump administration! The percentage changes reported in the first two columns of Table 7 compare the effects when third-country tariffs are ignored (column 1) or taken into account (column 2). Although the point estimates for the role of bilateral tariffs are identical in these two specifications (see Table 4), we do see a small difference in the quantification exercise because of the explicit role of third-country tariffs. Overall, total imports decrease by around 27%, less than when third-country tariffs are ignored (as an increase in these tariffs raise bilateral imports). In other words, trade diversion does play a (small) role.

The last three columns of Table 7 show that the overall effect masks quite some variation. Column (3) demonstrates that distinguishing between imports subject to preferential versus non-preferential tariffs has a substantial impact. Imports benefiting from preferential treatment respond significantly less to the tariff increase, with a decline of 17%, compared to a 23% drop for non-preferential imports. Notably, the overall reduction in total imports (i.e., a weighted average between the last two figures) at the mean is also smaller than in column (2), which does not differentiate by tariff type. This suggests that the composition of tariff regimes shapes both the aggregate and disaggregated trade responses. When it come to allowing an interaction between the two types of tariffs, column (4) evaluates their interrelation by considering the effects when keeping the bilateral tariff at zero (i.e., applied rate of 1) and progressively increasing the third-country rate. As shown, the overall reduction in imports decreases but only marginally (and not in a statistically significant way). Finally, in the last column we see that the more trade partners are exporting a given product and the lower the reduction in imports for the given tariff increase. Also in this case, as for column (3), the total percentage change is lower when allowing this heterogeneity to be explicitly accounted for.

The quantification exercise in Table 7 suggests a range of import elasticities with respect to applied tariffs ranging between –4.3 and –5.6, depending on the specification, with the smallest response occurring when preferential and non-preferential tariffs are distinguished. In this case, the implied elasticity is substantially lower for goods imported under preferential rates. These values are broadly in line with or slightly above the range of import elasticities reported in the literature, though higher elasticities are found in product-level analyses.[13] The relatively high responsiveness observed in our setting reflects the granular nature of the data, the many small-value import flows that are included, and the fact that the simulations

[13]The meta analysis by Head and Mayer (2014) suggests an average elasticity of -5 while recent studies based on difference-in-difference frameworks report much smaller (absolute) values; see, for example, Boehm et al. (2023).

capture full adjustment to tariff changes (as calculated over a sample of 4 years).[14]

Overall, the results point to a substantial sensitivity of South Korean imports to bilateral tariff changes, especially when preferential tariff treatments are not applied.

6 Conclusion

This paper advances the literature on trade policy and trade diversion by developing a three-country theoretical framework and applying it to highly disaggregated data on South Korea's imports. Our analysis integrates the role of bilateral applied tariffs and third-country tariffs into a unified setting, thereby bridging a significant gap in prior work, which has often focused on average MFN tariffs or categorical indicators of PTAs without accounting for the evolving tariff landscape across third-country partners.

On the theoretical side, we extend a standard endowment economy framework with iceberg-type trade costs to explicitly model the interplay between bilateral and third-country tariffs. Empirically, we leverage highly disaggregated transaction-level data at the product-partner-firm size-year level and adopt a Poisson pseudo-maximum-likelihood estimation strategy with rich sets of fixed effects to estimate gravity equations. Our benchmark results reveal three key findings. First, the granularity of our transaction-level data is crucial to uncovering the positive and significant effect of third-country tariffs on bilateral imports, which is only identified when exploiting product-level variation at the highly disaggregated HSK10 level. Second, consistent with the theoretical model we find the expected negative effect of bilateral tariffs while third-country tariffs exert a positive role. Third, the richness of our data allows us to uncover substantial heterogeneity in tariff effects (across preferential and non-preferential regimes and by the number of potential source countries), underscoring the importance of accounting for such variation to fully understand the mechanisms at work. This analysis yields several novel insights. Imports under preferential tariffs do not respond to third-country tariffs, highlighting the strong advantages of PTAs despite rules-of-origin costs. We also find that the effect of third-country tariffs is amplified when bilateral tariffs are higher, reflecting the high sensitivity of trade flows to tariff interactions. Moreover, responsiveness rises with the number of potential suppliers, underscoring the role of trade diversification. Finally, non-preferential imports prove substantially more sensitive than preferential imports in the quantification exercise, a result with clear policy significance.

[14] If we were to calculate the drop in imports when excluding imports below 1,000$ (as in column (4) of Table 5), we would uncover an elasticity of -3.9.

Robustness checks confirm the stability of these results to alternative tariff-weighting schemes, exclusion of outliers, different levels of clustering, and additional sets of fixed effects. A simple quantification exercise suggests that a uniform five percentage point increase in tariffs would reduce South Korea's total imports by approximately 27%, with larger effects for non-preferentially treated goods. The implied import elasticities (in the range of –4.3 to –5.6) highlight the high responsiveness of trade flows to applied tariffs in settings where tariff schedules and trade partners are diverse.

Our findings are particularly salient in the context of recent announcements by President Trump on broad-based tariff increases, which are modest compared to our quantification of a five percentage-point increase. If excessive tariffs of the type contemplated under the Trump administration were imposed, our results suggest trade flows would respond even more sensitively than expected. PTA members would continue to enjoy relative advantages over outsiders, contradicting claims that such policies render PTAs irrelevant. At the same time, the high sensitivity to the number of suppliers indicates that broader tariff escalation could accelerate trade diversification, prompting major trading nations to reduce dependence on the U.S. and form alternative alliances — dynamics that could ultimately impose costs on the U.S. itself.

References

[1] Anderson, J.E. and Y.V. Yotov, (2016). Terms of Trade and Global Efficiency Effects of Free Trade Agreements, *Journal of International Economics*, 99: 279-298.

[2] Backus, D., P. Kehoe, and F. Kydland, (1992). International Real Business Cycles, *Journal of Political Economy*, 100(4): 745–775.

[3] Backus, D., P. Kehoe, and F. Kydland, (1994). Dynamics of Trade Balance and the Terms of Trade: The J-curve? *American Economic Review*, 84(1): 84-103.

[4] Baier, S. and J. Bergstrand, (2007). Do Free Trade Agreements Actually Increase Members' International Trade?." *Journal of International Economics*, 71(1): 72-95.

[5] Baldwin R. and C. Freund, (2011). Preferential Trade Agreements and Multilateral Liberalization in Chauffour J.P. and J.C. Maur J.C. (eds.), Preferential Trade Agreement Policies for Development, The World Bank, Washington, DC.

[6] Baldwin, R. and D. Jaimovich, (2012). Are Free Trade Agreements Contagious? *Journal of International Economics*, 88: 1-16.

[7] Boehm, C.E., A. Levchenko and N. Pandalai-Nayar, (2023). The Long and Short (Run) of Trade Elasticities *American Economic Review*, 113: 861-905.

[8] Chetty, R., (2006). A General Formula for the Optimal Level of Social Insurance. *Journal of Public Economics*, 90: 1879-1901.

[9] Cigna, S., P. Meinen, P. Schulte and N. Steinhoff, (2022). The Impact of US Tariffs against China on US Imports: Evidence for Trade Diversion? *Economic Inquiry*, 60: 162-173.

[10] Dai, M.D., Y. V. Yotov and T. Zylkin, (2014). On the Trade-Diversion Effects of Free Trade Agreements. *Economics Letters*, 122: 321-325.

[11] Egger, P. and M. Larch, (2008). Interdependent Preferential Trade Agreement Memberships: An Empirical Analysis. *Journal of International Economics*. 76: 384-399.

[12] Head K. and T. Mayer, (2011). Gravity Equations: Workhorse,Toolkit, and Cookbook in Gopinath G., E. Helpman and K. Rogoff (eds.), Handbook of International Economics, Volume 4. Elsevier, North-Holland.

[13] Krishna, P., C. Salamanca, Y. Suzuki and C. Volpe Martincus, (2025). Learning to Use Trade Agreements. *Journal of International Economics*. 174: 103424.

[14] Lee, W., A. Mulabdic and M. Ruta, (2023). Third-Country Effects of Regional Trade Agreements: A Firm-Level Analysis. *Journal of International Economics*. 140: 103688.

[15] Limão, N., (2016). Preferential Trade Agreements in K. Bagwell and R. W. Staiger (eds.), Handbook of Commercial Policy, Vol. 1B. Elsevier, North-Holland.

[16] Mattoo, A., A. Mulabdic and M. Ruta, (2019). Trade Creation and Trade Diversion in Deep Agreements. World Bank Policy Research Working Paper No. 8206.

[17] Morales, E., G. Sheu and A. Zahler, (2019). Extended Gravity. *The Review of Economic Studies*, 86: 2668-2712.

[18] Romalis, J., (2007). NAFTA's and CUSFTA's Impact on International Trade. *Review of Economics and Statistics*, 89: 416-435.

[19] Santos Silva, J.M.C. and S. Tenreyro, (2006). The Log of Gravity. *The Review of Economics and Statistics*, 88(4): 641-658.

[20] Sercu, P. and R. Uppal, (2003). Exchange rate volatility and international trade: a general equilibrium analysis. *European Economic Review*, 47: 429-441.

[21] Viner, J., (1950). The Customs Union Issue. New York: Carnegie Endowment for International Peace.

Table A.1: Tariff structure of South Korean imports – other agreements

Variable	Observations	Mean	St. Dev.	Minimum	Maximum
Panel A: Korea-ASEAN FTA					
MFN tariff	35,204	9.83	5.48	0	50.00
Applied tariff	35,204	0.43	3.16	0	176.00
MFN tariff - applied tariff	35,204	9.39	5.15	-136	50.00
Panel B: Korea-Chile FTA					
MFN tariff	1,169	19.12	13.93	0	50.00
Applied tariff	1,169	0.98	3.28	0	40.00
MFN tariff - applied tariff	1,169	18.14	13.20	0	50.00
Panel C: Korea-China FTA					
MFN tariff	2,602	8.60	2.88	0	50.00
Applied tariff	2,602	4.96	4.79	0	62.60
MFN tariff - applied tariff	2,602	3.65	3.46	-13	13.00
Panel D: Korea-EFTA FTA					
MFN tariff	14,779	8.20	2.51	0	50.00
Applied tariff	14,779	0.17	1.53	0	40.00
MFN tariff - applied tariff	14,779	8.03	2.01	-19	32.80
Panel E: Korea-New Zealand FTA					
MFN tariff	71	20.85	13.11	3	45.00
Applied tariff	71	8.29	15.44	0	80.10
MFN tariff - applied tariff	71	12.56	15.61	-40	36.00
Panel F: Korea-Peru FTA					
MFN tariff	741	12.67	9.02	0	50.00
Applied tariff	741	6.46	42.37	0	600.20
MFN tariff - applied tariff	741	6.21	43.29	-597	45.00
Panel G: Korea-Singapore FTA					
MFN tariff	575	8.34	4.06	3	50.00
Applied tariff	575	0.62	1.61	0	17.40
MFN tariff - applied tariff	575	7.72	2.92	3	38.40
Panel H: Korea-Turkey FTA					
MFN tariff	3,631	9.75	5.55	0	50.00
Applied tariff	3,631	1.44	7.25	0	288.20
MFN tariff - applied tariff	3,631	8.31	5.80	-283	21.00
Panel I: Korea-USA FTA					
MFN tariff	56,048	9.08	5.96	0	50.00
Applied tariff	56,048	1.67	9.84	0	783.00
MFN tariff - applied tariff	56,048	7.40	9.20	-778	50.00
Panel J: Korea-Viet Nam FTA					
MFN tariff	195	10.09	4.58	0	45.00
Applied tariff	195	0.65	4.46	0	40.50
MFN tariff - applied tariff	195	9.44	3.33	-1	30.00