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From Tariffs to Strategy: A TINA Simulation of a Potential Free Trade Agreement

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Abstract

Free trade agreement negotiations require product-level evidence because aggregate trade values often hide the tariff lines where market-access gains, sector sensitivities and third-country effects are concentrated. This paper demonstrates how the Trade Intelligence and Negotiation Adviser (TINA), developed by the United Nations Economic and Social Commission for Asia and the Pacific, can be used as a negotiation-intelligence platform for ex-ante FTA simulation. The applied case is a hypothetical Türkiye-Japan FTA using 2024 baseline trade flows and two directional tariff-elimination scenarios: Japan reducing tariffs on selected Turkish products to zero and Türkiye reducing tariffs on selected Japanese products to zero. The partial-equilibrium simulation estimates trade creation, trade diversion and total trade effects at the HS six-digit level. Results show a strong directional asymmetry. Türkiye's simulated gain in Japan is about US$295.59 million across 380 affected products, concentrated in pasta, fisheries, apparel, processed foods and fruits. Japan's simulated gain in Türkiye is about US$988.06 million across 2,019 affected products, led by passenger vehicles, auto parts, electrical equipment, machinery, motorcycles, steel and precision instruments. Trade creation accounts for most gains in both directions, but trade diversion remains large enough to require sector-level scrutiny. The paper concludes that TINA outputs should not be read as a complete forecast of a final agreement. Their main value is to identify where negotiators should investigate first, which sectors merit offensive requests, and where defensive sensitivities and non-tariff barriers require complementary analysis.

Keywords
Simulation Model, Economic Analysis, Intelligent Simulation, PLS-SEM

1. Introduction
Free trade agreements are negotiated at the product level, but public discussion often focuses on aggregate bilateral trade values. This creates an analytical gap. Aggregate trade statistics can show whether two economies trade more or less with each other, but they do not identify which tariff lines create market-access opportunities, where domestic sensitivities may arise, or which third-country suppliers may be affected by preferential liberalization. Product-level simulation is therefore valuable before negotiation because it converts trade and tariff data into a structured map of offensive interests and defensive concerns.

The Türkiye-Japan case is a useful application because the two economies have different export structures and different sectoral interests. Japan has formally conducted multiple rounds of negotiations for a Japan-Türkiye Economic Partnership Agreement, while the policy relevance of the bilateral negotiation agenda has remained visible in official and business discussions (Ministry of Foreign Affairs of Japan 2025). A simulation exercise can therefore clarify what a full tariff-elimination scenario would imply even before a final legal agreement is evaluated.

This paper uses the Trade Intelligence and Negotiation Adviser (TINA) to simulate a hypothetical Türkiye-Japan free trade agreement. TINA is designed to help policymakers, researchers and consultants perform analytical tasks commonly required in preparation for trade negotiations, including reviewing bilateral trade, building negotiation lists and conducting tariff-reduction simulations (UN ESCAP 2025). The purpose of the paper is not to forecast the exact result of a signed agreement. Rather, it shows how tariff-line results can be translated into negotiation intelligence: which products gain, which sectors matter and where further policy investigation is needed.

The contribution is practical and methodological. First, the paper demonstrates a reproducible workflow from product-level trade data to policy interpretation. Second, it provides a Türkiye-Japan simulation case that illustrates how the same tariff-elimination rule can generate very different directional outcomes. Third, it emphasizes that trade creation and trade diversion should be interpreted jointly, because an FTA can expand bilateral imports while also reallocating trade away from third-country suppliers.

1.1 Objectives

The objectives are to: (1) describe how TINA can be used as a product-level FTA simulation platform; (2) construct a two-directional Türkiye-Japan tariff-elimination scenario using 2024 baseline trade flows; (3) quantify aggregate and product-level trade effects; (4) compare Türkiye's offensive interests in Japan with Japan's offensive interests in Türkiye; and (5) derive policy caveats for interpreting TINA outputs as negotiation intelligence rather than complete welfare forecasts.

2. Literature Review

The literature on preferential trade agreements begins with the distinction between trade creation and trade diversion. Modern empirical studies continue to use this distinction when evaluating trade agreements. Vicard (2009) shows that the form and depth of regional trade agreements influence trade creation, while Mattoo et al. (2022) find that deeper agreements tend to generate more trade creation and less trade diversion than shallow agreements. Lee et al. (2023) further show that regional agreements may also create third-country spillover effects when provisions reduce regulatory entry costs.

A second literature evaluates trade agreements using gravity models and structural trade frameworks. Baier and Bergstrand (2007) demonstrate that accounting for endogeneity substantially changes estimated FTA effects. Baier et al. (2014) show that economic integration agreements affect both intensive and extensive margins of trade. Gravity-based work by Anderson and van Wincoop (2003), Silva and Tenreyro (2006), and Head and Mayer (2014) provides the broader empirical foundation for quantifying bilateral trade responses. General equilibrium applications such as Caliendo and Parro (2015) show that tariff reductions can produce heterogeneous welfare and trade effects, especially when input-output linkages are considered.

A third stream focuses on partial-equilibrium simulation. Partial-equilibrium tools are attractive for negotiation preparation because they use tariff-line trade data and produce disaggregated results that are easier to interpret than economy-wide models. Laird and Yeats (1986) provided the analytical basis for the UNCTAD trade policy simulation model, while UNCTAD and WTO (2012) explain how partial-equilibrium models can be used for tariff reform analysis. TINA builds on this applied tradition by combining bilateral trade data, tariff information, product filters and elasticity-based tariff simulations (UN ESCAP and UN ECA 2025). The offensive-list methodology used in TINA proposes filtering products by partner demand, exporter capacity, tariff presence and revealed comparative advantage. Elasticities are central to the interpretation of simulation results. Broda and Weinstein (2006), and Soderbery (2015) show why import demand and supply elasticity estimation matters for trade analysis. TINA relies on updated global elasticity estimates prepared by Utoktham et al. (2020), which improves product coverage and supports HS six-digit simulation. Overall, the literature suggests that FTA analysis should combine aggregate interpretation with product-level evidence. This paper follows that approach by using TINA not as a final policy answer, but as a structured diagnostic tool for identifying sector priorities and caveats.

3. Methods

The methodology follows a partial-equilibrium simulation logic. The analysis focuses on the direct response of product-level imports to tariff reductions while holding macroeconomic variables, income, exchange rates and cross-sector feedbacks constant. This design is suitable for a first-stage negotiation exercise because it preserves tariff-line

detail and generates interpretable product rankings. It is not intended to replace general equilibrium analysis, welfare estimation or sector consultation.

Figure 1 summarizes the workflow used in the paper. The simulation begins by selecting the two economies and reviewing current bilateral trade at the HS six-digit level. The next step is to build a negotiation list based on market demand, exporter capacity, tariff presence and comparative advantage. A tariff scenario is then imposed, the partial-equilibrium simulation is run and the outputs are interpreted as sector priorities. The workflow is deliberately sequential: descriptive trade evidence comes first, simulation second and policy interpretation third.

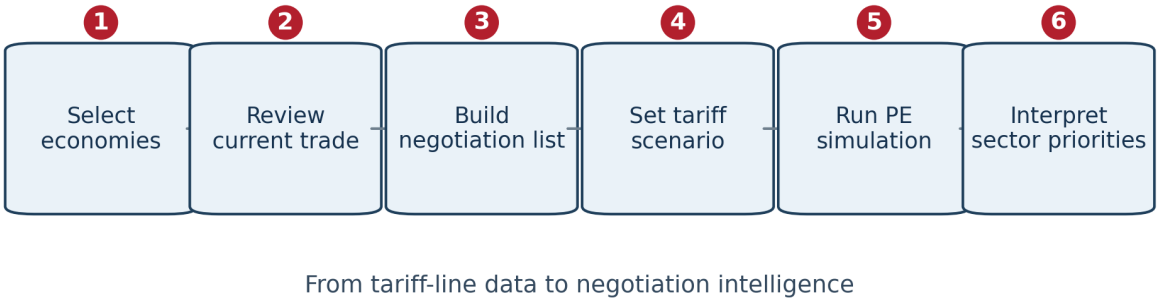

Figure 1. TINA workflow from trade data to negotiation intelligence

The simulation is based on two directional tariff-elimination scenarios. Direction A evaluates Turkish exports to Japan under a scenario in which Japan reduces tariffs on selected Turkish products to zero. Direction B evaluates Japanese exports to Türkiye under a scenario in which Türkiye reduces tariffs on selected Japanese products to zero. Table 1 summarizes the simulation design.

In simplified form, the tariff shock can be represented as a change in the tariff-inclusive import price. If M_{ijk} denotes imports of product i by importing economy j from exporter k, and t_{ijk} denotes the initial ad valorem tariff, a tariff reduction changes the import price and generates a demand response governed by import demand elasticity. TINA decomposes the resulting change into trade creation and trade diversion. Trade creation reflects expanded imports following lower prices, while trade diversion reflects substitution away from third-country suppliers caused by preferential relative-price changes.

Table 1. Simulation design

Element	Specification
Simulation platform	Trade Intelligence and Negotiation Adviser (TINA)
Case	Hypothetical Türkiye-Japan FTA/EPA scenario
Baseline year	2024 trade flows
Product level	HS six-digit tariff lines
Scenario rule	Selected tariffs reduced to 0 percent
Direction A	Türkiye exports to Japan: Japan tariff elimination
Direction B	Japan exports to Türkiye: Türkiye tariff elimination
Main outputs	Trade creation, trade diversion and total trade effect

4. Data Collection

The data used in this paper are simulation outputs generated in TINA for the Türkiye-Japan case. The simulations use 2024 baseline trade flows and tariff data embedded in the TINA platform. TINA relies on harmonized merchandise trade data and tariff information drawn from standard international databases and transformed for product-level comparison. UN Comtrade provides detailed merchandise trade data for approximately 200 countries and more than 99 percent of world merchandise trade (United Nations Statistics Division 2026). The World Integrated Trade Solution provides access to merchandise trade, tariff and non-tariff measure data, including UN Comtrade, UNCTAD TRAINS and WTO tariff sources (World Bank 2026).

Products are classified at the HS six-digit level. The Harmonized System is used by more than 200 countries and economies as the basis for customs tariffs and international trade statistics (World Customs Organization 2024). The HS six-digit level is appropriate for this paper because it provides sufficient product detail while remaining internationally comparable. The case should be read as an ex-ante scenario using available tariff and trade inputs, not as a legal assessment of a finalized agreement.

5. Results and Discussion

The results are presented in four steps. First, the aggregate directional effects are compared. Second, product-level gains for Türkiye in Japan are discussed. Third, product-level gains for Japan in Türkiye are examined. Fourth, the trade creation and diversion decomposition is interpreted as a negotiation-relevant diagnostic.

5.1 Numerical Results

Table 2 reports the aggregate simulation results. The main finding is strong asymmetry. Türkiye's total simulated gain in Japan is US$295.59 million across 380 affected products. Japan's total simulated gain in Türkiye is US$988.06 million across 2,019 affected products. This does not mean that Japan necessarily receives higher welfare gains; it means that the tariff-elimination scenario creates a larger simulated market-access effect for Japanese exports under the partial-equilibrium assumptions.

Table 2. Aggregate Türkiye-Japan simulation results

Indicator	Türkiye → Japan	Japan → Türkiye
Total simulated gain	US$295.59M	US$988.06M
Affected products	380	2,019
Selected import increase	59.07%	28.61%
Third-country partners affected	134	197
Main interpretation	Smaller and concentrated	Larger and broader

The number of affected products is particularly important. Türkiye's gains are concentrated in fewer products, while Japan's gains are distributed across a much broader industrial product base. This supports the interpretation that the two sides would enter a negotiation with different offensive and defensive priorities. Türkiye would likely emphasize specific food, fisheries and apparel products, whereas Japan would likely emphasize industrial goods, vehicles, machinery and electrical equipment.

Table 3 reports the top 10 Turkish product gains in Japan. The dominant product is uncooked pasta under HS 190219, with a simulated gain of US$128.55 million and a 179.35 percent increase under tariff elimination. This single tariff line accounts for a large share of Türkiye's total simulated gain. The rest of the list includes frozen trout, cotton jerseys, fruit and vegetable juice, women's cotton trousers, frozen vegetables, tomato preparations, frozen tuna fillets and grapefruit. The pattern points to a niche-oriented offensive profile rather than broad industrial transformation.

Table 3. Top 10 Türkiye to Japan product gains

HS code	Product short label	Tariff	Gain US$M	Change %
190219	Pasta, uncooked	19.79%	128.55	179.35%
030314	Frozen trout	3.50%	24.49	140.30%
611020	Cotton jerseys/pullovers	10.30%	16.60	83.65%
200989	Fruit/vegetable juice	13.51%	8.07	58.71%
620462	Women’s cotton trousers	9.55%	7.18	67.31%
071080	Frozen vegetables	8.00%	5.80	119.52%
620192	Men’s cotton anoraks	10.95%	5.34	362.82%
200290	Tomato preparations	13.25%	5.25	26.19%
030487	Frozen tuna fillets	3.50%	4.89	7.94%
080540	Grapefruit/pomelos	10.00%	4.01	72.91%

The sector narrative behind Table 3 is clear. Türkiye's offensive interests are concentrated in agri-food and processed food, fisheries, textiles and apparel, and fruit products. However, these opportunities should be interpreted carefully. For food and fisheries, market access depends not only on tariff elimination but also on sanitary and phytosanitary requirements, packaging rules, retail-entry conditions, cold-chain logistics and consumer preferences. Therefore, the simulation identifies where to investigate first; it does not guarantee that the full simulated expansion will materialize. Table 4 reports the top 10 Japanese product gains in Türkiye. Passenger vehicles under HS 870390 dominate the results with a simulated gain of US$393.91 million and a 127.93 percent increase. Other high-gain products include automatic regulating instruments, gear boxes and parts, electrical switching apparatus, motorcycles, monitors, electrical steel, control panels, hot-rolled steel coils and measuring instruments. The Japanese opportunity profile is much more industrial and technology-intensive than the Turkish profile.

Table 4. Top 10 Japan to Türkiye product gains

HS code	Product short label	Tariff	Gain US$M	Change %
870390	Passenger vehicles n.e.c.	19.50%	393.91	127.93%
903289	Automatic regulating instruments	8.90%	31.79	56.16%
870840	Gear boxes and parts	4.25%	31.43	12.31%
853690	Electrical switching apparatus	6.90%	29.05	100.80%
871140	Motorcycles 500-800cc	6.00%	24.31	65.93%
852859	Monitors	35.60%	22.42	94.54%
722511	Electrical steel	6.00%	21.82	17.14%
853710	Electrical control panels	13.60%	16.45	90.86%
720839	Hot-rolled steel coils	9.00%	16.08	38.19%
903180	Measuring/checking instruments	12.03%	14.00	65.03%

Table 4 has a different policy interpretation from Table 3. Japan's offensive interests are not confined to a small number of food or apparel items. They are concentrated in vehicles, auto parts, electrical machinery, control equipment, steel and precision instruments. These sectors create stronger defensive sensitivities for Türkiye because they overlap with industrial supply chains and domestic manufacturing capabilities. The simulation therefore highlights where market-access requests may meet political economy constraints.

5.2 Graphical Results

Figure 2 visualizes the decomposition between trade creation and trade diversion. Trade creation is the dominant component in both directions, accounting for about 80 percent of Türkiye's simulated gain in Japan and about 75 percent of Japan's simulated gain in Türkiye. Nevertheless, diversion is not negligible.

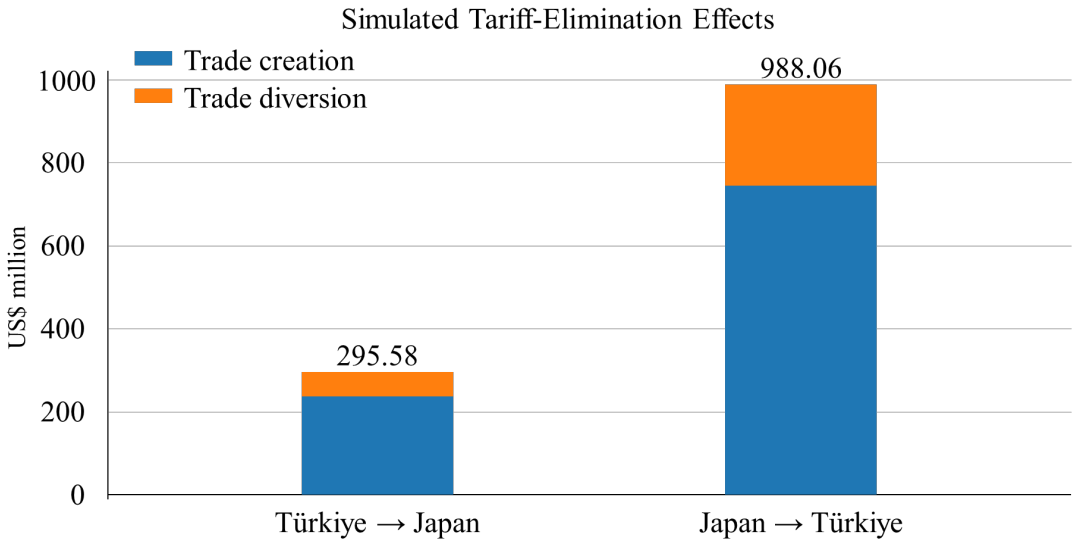

Figure 2. Trade creation and trade diversion by simulation direction

Türkiye's scenario generates US$58.54 million in trade diversion, while Japan's scenario generates US$243.39 million. This means that negotiators should examine not only bilateral gains but also displacement effects across third-country suppliers. These numbers also assume that non-tariff trade barriers will be removed after FTA. However, the non-tariff barriers are really high for food products. It requires dozens of certifications and approvals to export or import food. So, the hypothetical increase in Turkish food products may not be realized at all due to legislative barriers. Table 5 summarizes the overall trade creation and diversion affects as a share of the total trade impact.

Table 5. Trade creation and trade diversion decomposition

Direction	Trade creation	Trade diversion	Creation share
Türkiye → Japan	US$237.04M	US$58.54M	80.19%
Japan → Türkiye	US$744.67M	US$243.39M	75.37%

5.3 Proposed Improvements

The proposed improvement is not to replace TINA results, but to embed them in a broader negotiation workflow. For Türkiye, the next stage should focus on the regulatory feasibility of agri-food, fisheries and apparel exports to Japan. Pasta, fish products, tomato preparations, fruit products and apparel should be examined with respect to SPS standards, technical regulations, rules of origin, packaging, branding and distribution channels. High simulated percentage gains from a small base should be treated as opportunity signals rather than guaranteed export growth.

For Japan, the next stage should focus on the industrial sensitivity of Turkish market opening. Passenger vehicles, auto parts, motorcycles, electrical equipment, machinery and steel products are the sectors where Japanese market-access interests are strongest. These are also sectors where Türkiye may need adjustment safeguards, staging periods, rules-of-origin discipline or sector consultation. For both economies, the simulation should be combined with industry interviews, customs-line legal schedules, non-tariff measure analysis and logistics assessment.

5.4 Validation

The validation approach is based on numerical consistency checks and comparison with relevant literature. First, the decomposition is internally consistent: trade creation plus trade diversion equals the total simulated gain in each direction. For Türkiye to Japan, US$237.04 million plus US$58.54 million produces approximately US$295.59 million after rounding. For Japan to Türkiye, US$744.67 million plus US$243.39 million produces US$988.06 million. Second, the product-level concentration is consistent with the aggregate interpretation. The top 10 Turkish products account for about US$210.2 million, roughly 71 percent of Türkiye's total simulated gain, while the top 10 Japanese products account for about US$601.3 million, roughly 61 percent of Japan's total simulated gain.

The results are also consistent with established trade-agreement evidence. Baier et al. (2014) show that integration agreements affect trade margins unevenly, while Mattoo et al. (2022) show that trade creation and diversion depend on the structure and depth of agreements. The concentration of gains in products with large baseline trade values or high tariff margins is consistent with partial-equilibrium logic in Laird and Yeats (1986) and UNCTAD and WTO (2012). The role of third-country effects is consistent with Lee et al. (2023), who show that regional agreements can affect non-member exporters through regulatory and market-access channels. These comparisons support the interpretation of the TINA results as plausible negotiation intelligence, while also reinforcing the need for deeper analysis before policy decisions.

6. Conclusion

This paper used TINA to simulate a hypothetical Türkiye-Japan FTA and to demonstrate how product-level tariff simulations can be converted into negotiation intelligence. The objectives stated in Section 1.1 were met. The paper described the TINA workflow, constructed a two-directional tariff-elimination scenario, quantified aggregate and product-level results, compared the two directional narratives and identified policy caveats.

The central result is directional asymmetry. Türkiye's simulated gain in Japan is smaller and concentrated in a limited set of agri-food, fisheries, apparel and consumer-goods products. Japan's simulated gain in Türkiye is larger, broader and concentrated in vehicles, auto parts, electrical equipment, machinery, steel and precision instruments. Trade creation is the dominant component in both directions, but trade diversion is sufficiently large to require further third-country and sectoral analysis.

The unique contribution of the paper is to show that TINA should be used as a structured negotiation map rather than a complete policy-impact model. It helps identify where to look, what to ask for and which sectors require deeper scrutiny. A full policy assessment would still require legal schedule analysis, rules of origin, non-tariff measures, industry consultation, welfare modelling and political economy evaluation.

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Biography

Osman Gulseven is an Associate Professor of Economics and the WTO Chair at Sultan Qaboos University, Oman. He received his Ph.D. in Economics from North Carolina State University. His research focuses on international trade, finance, applied econometrics, food security and price transmission, with emphasis on emerging and resource-dependent economies. He has published peer-reviewed work on trade, regional integration, food price resilience and economic policy in the Middle East and the Gulf region. As WTO Chair at Sultan Qaboos University, he contributes to trade-policy research, capacity building and policy dialogue connected to the World Trade Organization framework. His recent academic work includes product-level simulations of trade agreements, empirical analysis of global food price dynamics and applied econometric modelling for policy-relevant research.