How did Tariff Elimination/Reduction through Economic Trade Agreements Affect Japan's Export Promotion?

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Abstract

This study examines the impact of tariff reductions and eliminations under Japan's Economic Partnership Agreements (EPAs) on export promotion. Using panel data for all products under the 7 EPAs (Agreements with Cambodia, Myanmar, India, Mongolia, the EU, Canada, and the US) from 2008 to 2021, I estimated the effect of tariff eliminations or reductions on Japanese exports using a Triple Differences approach and a Staggered Difference in Difference (DiD) analysis. As a result, a 1 percent decrease in tariffs increased the export value by approximately 1%, and it was also shown that the higher the tariff reduction rate, the greater the increase in export value. This study provides empirical findings on the relationship between Japan's existing EPA policy and export promotion and will also contribute to tariff design in future EPA policies.

I. Introduction

Currently, the debate over tariffs is heating up worldwide. On April 2nd of this year, President Trump claimed that the US's persistent trade deficit threatens national security and announced the introduction of a "Reciprocal Tariff" to counter unbalanced trade practices (The White House 2025). As a result, an additional 10% tariff has been imposed on imports from all countries since April 5th, and further additional tariffs will be applied to specific trading partners, including Japan, on April 9th (The White House 2025). In response, for example, China has announced that it will impose retaliatory tariffs, and the trade conflict is expected to intensify in the future (Olcott et al. 2025).

To quantify the impact of trade policies such as trade volume and welfare improvements, trade elasticity is a key parameter (Boehm, Levchenko, and Pandalai-Nayar 2023). Trade elasticity is a measure of the responsiveness of trade flows to changes in trade barriers, such as tariffs (Boehm, Levchenko, and Pandalai-Nayar 2023). For example, in the case of the reciprocal tariffs recently implemented by the US, the tariff rates required to eliminate bilateral trade deficits with each country are calculated using the elasticity of import prices concerning tariffs and the price elasticity of import demand (Office of the United States Trade Representative (USTR) n.d.). In this calculation, based on empirical studies, the former is set at 0.25 and the latter at 4 (USTR n.d.).

However, there are various elasticity estimates, and no consensus has been reached (Boehm, Levchenko, and Pandalai-Nayar 2023). To accurately estimate elasticity, it is necessary to exploit changes in actual trade policy. In this regard, tariff reductions through Economic Partnership Agreements (EPAs) and Free Trade Agreements (FTAs) are effective policy variations. These agreements promote the liberalization and facilitation of trade through measures such as reducing tariffs with partner countries, and Japan is actively pursuing the conclusion of EPAs (Ministry of Foreign Affairs of Japan (MOFA), 2025). EPAs are also important for export companies in that they can strengthen export competitiveness through the reduction and elimination of tariffs (Ministry of Economy, Trade and Industry (METI), 2024), and the Japanese government has also indicated its intention to continue to expand its EPA policy (Cabinet Office, Government of Japan, 2024). For Japan to effectively advance its EPA policy going forward, it is essential to accurately assess how tariff reductions through EPAs affect exports and overall trade performance.

This paper aims to contribute to Japan's tariff strategy in its future EPA policy. By creating panel data for all products from 2008 to 2011 using Japanese trade statistics, WTO data, UN data, and the US Tariff Schedule, and conducting regression analysis on tariff rates and trade volumes for seven of Japan's EPAs (agreements with Cambodia, Myanmar, India, Mongolia, EU, Canada and US) were analyzed using regression analysis. In general, it was found that a 1 percent decrease in tariffs led to an approximately 1 percent increase in export values, suggesting that the trade elasticity is around 1. This estimate is consistent with the welfare-relevant (i.e., tariff-inclusive) long-run trade elasticity estimated by Boehm, Levchenko, and Pandalai-Nayar (2023), based on changes in the Most-Favored-Nation (MFN) tariffs of WTO member countries. Furthermore, it was shown that the greater the tariff reduction, the greater the increase in export values. These results suggest a strong link between tariff reductions under EPAs and promoting Japanese exports.

The structure of this paper is as follows: Section II provides background information on EPAs. Section III reviews the literature on the effects of trade agreements. Section IV explains the data used in the analysis. Section V presents the study's empirical strategy and main findings, and the final section concludes.

II. Background

EPA is an agreement that promotes the liberalization and facilitation of trade and investment and aims to strengthen economic relations between the signatory countries (MOFA 2025). These agreements mainly include eliminating and reducing tariffs and the liberalization of trade in services (MOFA 2025). In general, WTO member countries, including Japan, must follow the MFN principle, which states that the most favorable treatment given to any one country must be extended to all other member countries (METI 2024). Through this principle, WTO member countries have set MFN tariffs, which are applied uniformly among WTO member countries

(METI 2024). On the other hand, EPAs/FTAs are positioned as exceptions to the WTO system's most-favored-nation treatment obligation under international economic rules (METI 2024). In most cases, EPA/FTA tariff rates are lower than MFN tariffs (Urata and Ando 2010), giving exporting companies an advantage when exporting to the countries that have concluded these agreements.

Japan currently has 21 EPAs with 24 countries and regions, and the value of trade with the partner countries of these agreements accounts for 78.8% of Japan's total trade (MOFA 2025). As such, they play an important role in Japan's economic diplomacy strategy.

III. Literature Review

Many studies have analyzed the impact of trade agreements on exports. However, most of these studies focus on whether or not an agreement is concluded, and relatively few studies directly examine the impact of eliminating or reducing individual tariffs on exports. For example, Studnicka, Thierie, and Hove (2019) use an extended gravity model to examine the impact of EU Regional Trade Agreements (RTAs) on EU total exports and exports of existing and new products. In this model, the effects of trade agreements are classified in more detail by taking into account the differences between each trade agreement, not only by whether or not an RTA has been concluded but also by introducing a composite index that reflects the characteristics of the trade agreements of the exporting and importing countries. However, the characteristics of the trade agreements in this study mainly focus on factors other than tariffs, such as anti-dumping measures, intellectual property rights, and environmental regulations, and do not directly analyze the effects of tariff elimination and reduction.

Mahmood and Jongwanich (2018) also used a gravity model to analyze the impact of the FTAs that Pakistan has concluded on the country's exports. This study is significant in that it examines the impact of FTAs in detail by considering the difference between the MFN tariff rate and the preferential tariff rate (tariff gap) and the presence or absence of an FTA. However, in developing countries such as Pakistan, obtaining a certificate of origin significantly constrains export promotion. In addition, the implementation period for FTAs in developing countries is long, with many exceptions. Hence, the tariff reduction schedule is complex, and the situation differs significantly from Japan's trade agreements.

Furthermore, only a limited number of studies have analyzed the impact of the trade agreements that Japan has concluded on exports. Urata and Ando (2012) used a gravity model to examine the effect of the Japan-Mexico Economic Partnership Agreement on import and export values, considering differences between products, such as the degree of tariff reduction. However, this study did not directly measure the effect of eliminating and reducing tariffs themselves, and there are limitations to grasping the impact of tariffs comprehensively and in detail.

As such, a limited amount of literature comprehensively evaluates the direct impact of tariff elimination and reduction through the multiple trade agreements that Japan has concluded. In this study, I will examine the effect of tariff elimination and reduction in the multiple trade agreements that Japan has concluded on the export volume of all items over multiple years. While previous studies have tended to focus on specific agreements or items, this study comprehensively evaluates the impact of tariff reductions on exports by utilizing data on all items and multiple years for multiple EPAs concluded by Japan. This clarifies the comprehensive effects of tariff reductions in Japan's EPAs, complements previous studies on the impact of EPAs, and provides quantitative evidence that contributes to future trade policy decision-making.

IV. Data

In this study, I analyzed data on the value of exports from Japan to seven countries, Cambodia, Myanmar, India, Mongolia, the EU, Canada, and the US, from 2008 to 2021. These seven countries had not concluded multiple EPAs with Japan by 2021. For example, Singapore has concluded multiple EPAs, including the Japan-Singapore EPA, the Japan-ASEAN EPA, and the CPTPP until 2021. When it is affected by multiple EPAs at the same time, it becomes difficult to identify the effects of a specific EPA. On the other hand, the countries covered in this study have concluded only a single EPA with Japan, making it easier to identify the effects of the EPA.

- Export Value Data

The data was obtained from the Japanese Trade Statistics. The statistics list the trade value with each country in 1,000-Yen units at the 9-digit Harmonized System (HS) code level for each year. The HS code is a code that standardizes the classification of traded goods using numbers (International Trade Administration (ITA) n.d.). There is a unique 6-digit code as a global standard, but each country can use codes for more detailed classification in addition to the 6-digit code (ITA n.d.). As Japan uses a 9-digit code, I totaled the export value to the six-digit HS unit. For exports to the EU, to consider the changes in member countries during the period under study, I totaled the export value of the other member countries, excluding the UK, which left the EU during the period under study, and Croatia, which joined the EU during the period under study. In addition, since the statistics only list the HS codes for which exports have been recorded, I referred to the HS code list from the United Nations Statistics Division (UNSD) to supplement the missing HS codes to obtain a complete list of HS codes. In this way, I have created data on the value of exports for each country and year.

- Tariff Rate Data

I obtained data on the MFN and EPA tariff rates data for each country and year.

A. MFN Tariff Rate

I used WTO data on MFN tariff rates, specifically the simple average with ad valorem equivalents, reported at the 6-digit HS level for each country and year. I extracted the tariff rate data before the EPA came into effect. Where tariff rate data was missing for some HS codes, I checked the previous and following years' tariff rates and used the nearest year's tariff rate as substitute data.

B. EPA Tariff Rates

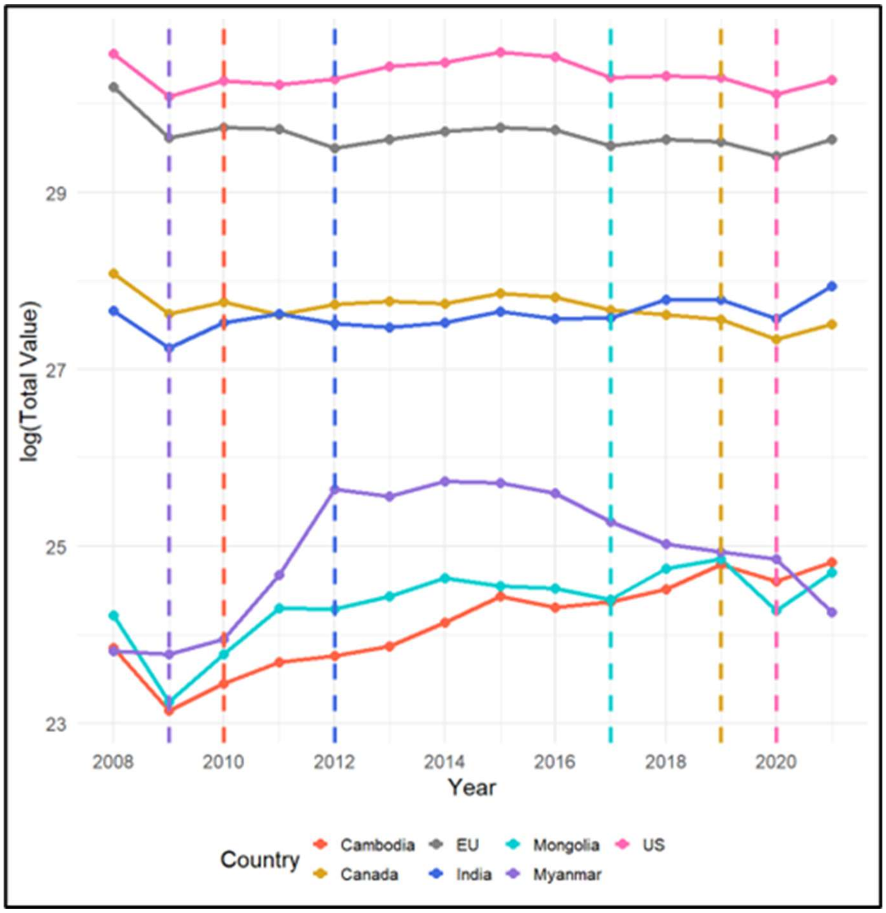
For the countries covered except the US, WTO data was used. As this data includes tariff rates for each country at the 9-digit or 10-digit level of the HS, the data was converted to 6-digit level tariff rates by taking a simple average. However, for some non-ad valorem taxes, the import volume data necessary to convert tariff rates to ad valorem taxes was missing, and there was no appropriate alternative data, so these values were treated as missing values.

For the EPA tariff rates of the US, I used the "Harmonized Tariff Schedule" (2020 and 2021 editions) of the US International Trade Commission (USITC). This data includes all tariff rates, including MFN and EPA rates. I extracted the HS codes covered by the US-Japan Trade Agreement and converted them to 6-digit level tariff rates by taking a simple average. I then supplemented the HS codes by referring to the UNSD's list of HS codes.

Data consistency is necessary as the HS codes are revised every five years. Therefore, I used UNSD's HS correspondence table (which shows the correspondence between HS2017 and each HS code) to integrate all the data into HS2017. The detailed conversion method is described in the Appendix. Finally, I integrated these trade value and tariff data to create a dataset with a unit of analysis of "Year-Country-Product (HS 6-digit)".

Figure 1 shows a graph of the time-series changes in the total value of exports to the target countries created based on this dataset. This graph shows that the impact of the conclusion of EPAs differs from country to country. While the export value of Myanmar and Cambodia increased significantly after the conclusion of EPAs, and they were likely affected by the EPAs, the changes in the other countries, Mongolia, Canada, India, the EU, and the US, were small after the conclusion of EPAs. The impact of the EPAs is not clear, so it is necessary to conduct a detailed analysis of the effects of tariff rates on EPAs.

Figure 1 Change in Total Amount of Export Value (log scale)



Note: This shows the amount of export values to the seven countries in the legend from 2008 to 2021. The total value of exports (in Yen) for each year was transformed using the logarithm. The line graph shows the trend in total export value, while the vertical dashed lines indicate the start year of each EPA, with colors corresponding to each country. The EU's vertical broken line is not shown because the EPA started in 2019, the same year as Canada.

V. Research

Part 1: Comprehensive impact of tariff elimination or reduction on export value

Research Question and Hypothesis

In this study, I will examine the impact of tariff elimination or reduction under Japan's EPAs on export value. I hypothesize that tariff reduction under these agreements will increase export value because it will benefit exporters by reducing trade costs and stimulating export activity.

Research Design

In this study, I employ the Triple Difference method to examine the impact of EPA tariff reductions on export values. This method allows for handling three-dimensional changes: changes in time (comparison before and after the conclusion of an EPA or trade agreement), changes across countries (comparison between EPA conclusion and non-conclusion at a specific point in time), and changes across products (comparison between products subject to tariff reductions and those not subject to tariff reductions). To measure this effect, I use data on export values and tariff rates for all product categories in Myanmar, Cambodia, India, Mongolia, Canada, the EU, and the US from 2008 to 2021.

To assess how Japan's export values have changed since these agreements were implemented, it is necessary to evaluate how export volumes to each country varied before and after the introduction of each EPA. Additionally, not all products are subject to tariff reductions under EPAs. Furthermore, since each EPA was introduced in a different year, some countries had an EPA in effect each year, while others did not (see Table 1).

Table 1 Japan's EPA Partner Countries and Implementation Years

Country	Year of EPA Implementation
Myanmar	2009
Cambodia	2010
India	2012
Mongolia	2017
Canada	2019
EU	2019
US	2020

Note: A year is defined as the "Year of EPA Implementation" if the EPA was in effect as of April 1.

Estimating Equation

The estimating equation for this study is as follows.

$$log\ (Export\ Value)_{cpt} = \beta\ (Tariff)_{cpt} + \gamma_{cp} + \delta_{\ ct} + \theta_{\ pt} + \varepsilon_{cpt}$$

$log\ (Export\ Value)_{cpt}$ indicates the logarithm of the amount and value of each item exported from Japan to each country, and $(Tariff)_{cpt}$ indicates the tariff rate for each product exported from Japan to each country. ε_{cpt} is the error term. T The subscript *c* indicates countries with an EPA with Japan, *p* indicates the product (based on the 6-digit HS code), and *t* indicates the year (2008-2021). This regression equation can consider three-dimensional changes: changes in time, changes across countries, and changes across products by treating changes in tariff rates for each product in each country at different points in time as independent variables.

Furthermore, the following fixed effects are applied to the regression equation. First, γ_{cp} indicates the country-by-product fixed effect, which controls the impact a specific product receives over time in a particular country. An example that could affect the outcome of the amount or value of exports from Japan is the long-term propensity to consume specific products in a particular country. In addition, δ_{ct} indicates the country-by-year fixed effect, which controls the impact of a particular country in a specific year. Examples include changes in economic conditions and policies each year. θ_{pt} indicates a product-by-year fixed effect that controls the impact of a particular product on a global scale in a specific year. For example, this includes decreased demand for steel products in 2020 under the COVID-19 pandemic (The Nikkei 2020).

Assumptions and Limitations

To interpret this relationship, I have assumed that other Japanese policies (such as large subsidies for export industries) do not affect exports. Regarding the large-scale export promotion policies during the period in question, the Ministry of Agriculture, Forestry and Fisheries (MAFF) has been implementing policies to support the export of agricultural, forestry, and fishery products, including legal revisions since 2016 (MAFF n.d.). However, these policies are limited to exporting agricultural, forestry, and fishery products and do not affect other major export industries. Furthermore, although agricultural, forestry, and fishery exports have been gradually increasing each year, a significant surge has only been observed since 2021 (MAFF 2024). Therefore, the impact on exports for the entire period covered by this study is limited. Therefore, it can be said that Japan's export promotion policy has not had a significant impact on overall export value.

One limitation of this analysis is that there is still concern about endogeneity. The EPA tariff rate is determined by multiple factors, including the diplomatic, political, and economic factors of each country, and these factors may also affect export value from Japan. In other words, excluding these factors may result in Omitted Various Bias. On the other hand, it is difficult to identify these factors and incorporate them as appropriate control variables. Therefore, this study mitigates the impact of endogeneity by including fixed effects in the regression equation, but it is possible that endogeneity has not been completely eliminated.

As another limitation, this study assumes that every item that can be applied to the EPA tariff uses this tariff, but it is possible that it is not necessarily that all such products use the EPA tariff for export. In some cases, products do not meet the criteria for the rule of origin, or exporters choose not to use the EPA tariff. However, obtaining the EPA utilization rate for each country and item is difficult. Therefore, in this study, the impact of differences in the actual EPA utilization rate will not be considered, but this may limit the validity of the results.

Result

Table 2 shows the results of the regression of the estimation equation. The model of Column (1) is a model without including fixed effects, and the model of Column (2) is a model that includes country-by-product fixed effects, country-by-year fixed effects, and product-by-year fixed effects. Column (2) results show that when the tariff rate falls by 1%, the export value increases by approximately 1%. This result is significant at the 0.1% level. Compared with the results in Column (1), the impact of tariffs is greatly reduced when fixed effects are introduced. This indicates that factors such as country, product, and year affect the determinants of export volume. If these factors are not considered, the impact of tariffs might be overestimated. In addition, an increase of around 1% in export value may seem like a very small value. However, for example, considering that the total value of exports to the target countries in 2021 is around 23.5 trillion Yen, the impact is quite large. These results confirm that tariff reductions are related to increased export values in trade with the target country during the target period.

Table 2 Regression Analysis

	Without FE **(1)** **log (export value)**	**With FE** **(2)** **log (export value)**
(Intercept)	17.464***	
	(0.008)	
Tariff Rate	-0.066***	-0.010***
	(0.001)	(0.002)
Number of Observation	191,603	191,603
Number of countries	7	7
R-squared	0.027	0.936
R-squared Adjusted	0.027	0.891
Standard Errors		by: Country×HS
Mean Export Value (log)	17.1679	17.1679
SD Export Value (log)	2.9643	2.9643
Product-Year Fixed Effect		Y
Country-Prouct Fixed Effect		Y
Country-Year Fixed Effect		Y

Note: Regression analysis by country-year-product level for 7 countries (Cambodia, Myanmar, India, Mongolia, EU, Canada, and US) from 2008 to 2021. The unit for the tariff rate is %. The export value is measured in the Yen and is taken to the logarithm. The figures in parentheses indicate the standard deviation. *** is significant at the 0.1% level.

Robustness Check

As shown in the results above, the relationship between tariff reduction and an increase in export value is statistically significant. However, taking the logarithm of trade values means that products with zero trade performance are excluded, and there is concern that many observations are lost. Therefore, as shown in Table 3, a robustness check was conducted.

Table 3 Column (1) Inverse Hyperbolic Sine (IHS) Transformation Model

In Table 3, Column (1), I used the IHS Transformation as an alternative to the logarithmic transformation. This method is similar to the logarithmic transformation and is often used as a nonlinear transformation because it can preserve zero-valued observations (Bellemare and Wichman 2019). The IHS is defined as follows.

$$IHS\ (y) = In(y + \sqrt{y^2 + 1})$$

This Column (1) model shows that a 1% decrease in the tariff rate increases the export value by approximately 0.5%. This result is statistically significant at the 1% level. When compared to the result when the export value is transformed into a logarithmic value (Table 2 column (2)), the significance decreases. However, a significant effect of tariff reduction on export value is still confirmed.

Table 3 Column (2) Poisson Pseudo Maximum Likelihood (PPML)

In Table 3 Column (2), the estimation was conducted using PPML. This method was proposed to deal with the non-uniform variance often seen in trade data (Kosaka 2020). The PPML regression equation used in this paper is as follows.

$$Export\ Value_{cpt} = exp(\ \beta\ (Tariff)_{cpt} + \gamma_{cp} + \delta_{\ ct} + \theta_{\ pt})$$

The results of this model show that a 1% decrease in tariff rates leads to an increase in export values of around 2.5%. This result is significant at the 0.1% level, showing a significance level similar to that of the logarithmic transformation model. It also indicates that tariff reductions have a greater effect than when export values are logarithmically transformed. PPML is a more practical estimation method that considers the heterogeneity of the variance of trade data, and it is thought to estimate the effects of tariff reductions more accurately.

The robustness check confirmed the relationship between tariff reduction and export growth in the IHS conversion and PPML models, suggesting that this study's main results are robust.

Table 3 Regression Analysis (Robustness Check)

	IHS (1) IHS (export value)	PPML (2) export value
(Intercept)		
Tariff Rate	-0.005**	-0.025***
	(0.002)	(0.006)
Number of Observation	527,601	286,077
Number of countries	7	7
R-squared	0.846	
R-squared Adjusted	0.804	
Standard Errors	by: Country×HS	by: Country×HS
Mean Export Value	6.4864 *IHS(Export Value)	1,226,325,170
SD Export Value	8.7733 *IHS(Export Value)	22,056,448,596
Product-Year Fixed Effect	Y	Y
Country-Prouct Fixed Effect	Y	Y
Country-Year Fixed Effect	Y	Y

Note: Regression analysis by country-year-product level for 7 countries (Cambodia, Myanmar, India, Mongolia, EU, Canada, and US) from 2008 to 2021. The unit for the tariff rate is %. The export value is measured in Yen. IHS is used for regression formula (3), and PPML is used for the regression formula (4). The figures in parentheses indicate the standard deviation. *** is significant at the 0.1% level, and ** is significant at the 1% level.

Heterogeneity

While I estimated the impact of tariffs using all Japanese export products, the effect of tariffs may vary across industries. Therefore, this study also conducts an analysis limited to HS Section XVII: Vehicles, Aircraft, Vessels, and Associated Transport Equipment (Chapters 86–89, that is, products classified under HS 2-digit codes 86 through 89), which includes major Japanese export products such as automobiles and auto parts. Among the products in Section XVII, automobiles, in particular, have been Japan’s largest export item globally since 1995 (Ministry of Finance Japan n.d.), making them a suitable focus for sector-specific analysis.

Table 4 presents the regression results based on the specification restricted to products in Section XVII. In column (1), the results show that a 1% decrease in the tariff rate is associated with an approximately 2.5% increase in export value, which is statistically significant at the 1% level. In column (2), using the IHS-transformed model, the result is not statistically significant. However, in column (3), the PPML model indicates that a 1% reduction in tariffs leads to approximately a 3.6% increase in exports, with statistical significance at the 0.1% level. The coefficients in all cases are larger in absolute value than those estimated using all the products, suggesting that the transport equipment sector is more sensitive to tariff changes.

Table 4 Regression Analysis (Transportation equipment only)

	With FE (1) log (export value)	IHS (2) IHS (export value)	PPML (3) export value
Tariff Rate	-0.025**	-0.032	-0.037***
	(0.009)	(0.022)	(0.009)
Number of Observation	7,012	14,014	9,596
Number of countries	7	7	7
R-squared	0.936	0.854	
R-squared Adjusted	0.901	0.813	
Standard Errors	by: Country×HS	by: Country×HS	by: Country×HS
Mean Export Value	18.7222 *log (Export Value)	9.7146 *IHS (Export Value)	14,537,876,020
SD Export Value	3.5633 *log (Export Value)	10.0299 *IHS (Export Value)	114,984,764,410
Product-Year Fixed Effect	Y	Y	Y
Country-Prouct Fixed Effect	Y	Y	Y
Country-Year Fixed Effect	Y	Y	Y

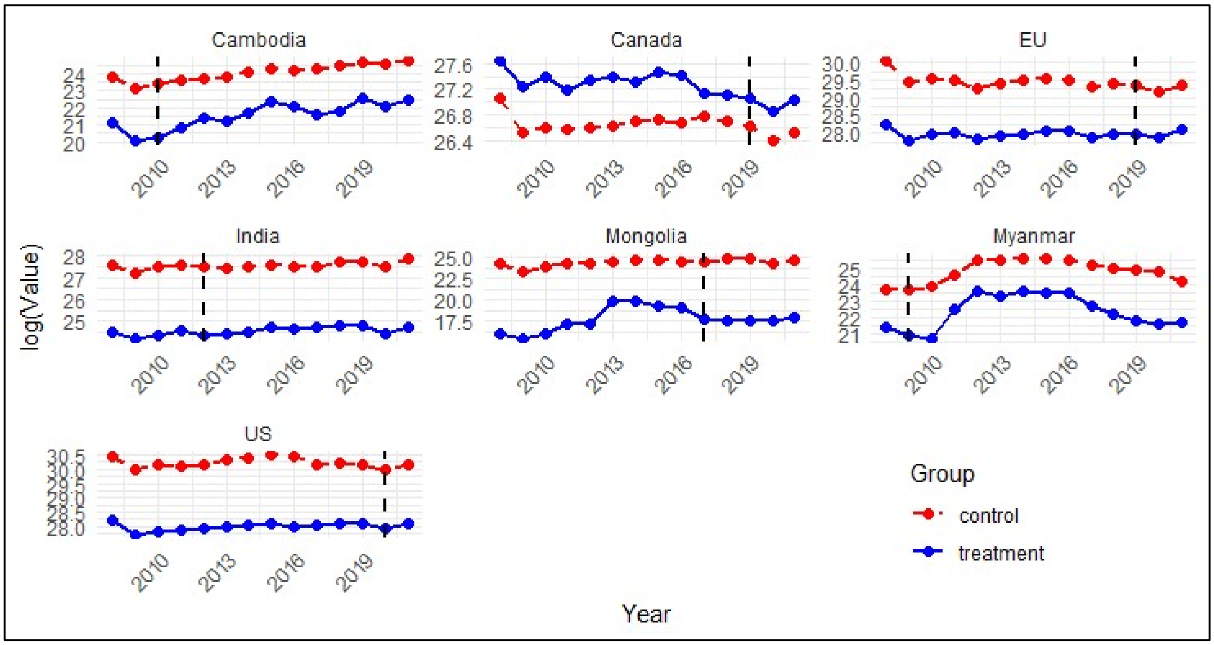
Note: Regression analysis by country-year-product level for 7 countries (Cambodia, Myanmar, India, Mongolia, EU, Canada, and US) from 2008 to 2021. The product is limited to Chapter 86-89 of the HS code, which covers transport equipment-related goods. The unit for the tariff rate is %. The export value is measured in Yen. IHS is used for the regression formula (2), and PPML is used for the regression formula (3). The figures in parentheses indicate the standard deviation. *** is significant at the 0.1% level, and ** is significant at the 1% level.

Part 2: The impact of differences in tariff reduction rates on export values

Research Question and Hypothesis

In Part 1, a statistically significant relationship was confirmed between tariff reductions and export values. However, this analysis treated all products in the same way and did not consider the differences in impact depending on the size of the tariff reduction. Therefore, I will conduct additional research based on the hypothesis that the products for which EPA tariff reductions are large will increase export values more than products for which tariff reductions are small or for which there are no tariff reductions.

Figure 2 Trends in Total Export Value (Log Scale) for Treatment and Control Groups



Note: This shows the export values of the seven countries in the legend from 2008 to 2021. Each year's total export value (Yen) has been converted to a logarithm. The treatment group refers to products for which the tariff reduction rate under the EPA is greater than the median, and the control group refers to products for which the tariff reduction rate is less than or equal to the median. The line graph shows the trend in total export value, while the vertical dashed lines indicate the start year of each EPA.

Figure 2 shows the time-series changes in total export values for each country, with products for which EPA tariff reduction rates are greater than the median as the treatment group and products for less than or equal to the median as the control group. From Figure 2, I can see that similar trends in trade value can be seen, but in many countries, the change in export value for the control group tends to be smaller than for the treatment group. In particular, after the EPA came into effect, Cambodia and Myanmar saw a large increase in the trade value of the treatment group compared to the control group. On the other hand, it is difficult to determine the impact of the size of tariff reductions on changes in export value from this figure alone.

Research Design

I will use an event study-type Staggered DiD method to test my hypothesis in this study. Specifically, as in Figure 2, I will compare the products for which each country's tariff rate was reduced by more than the median when the EPA came into effect (the treatment group) with those for which the tariff reduction was less than or equal to the median or for which there was no tariff reduction (the control group), and analyze the change in trade volume (see Appendix for the median for each country). The method considers the fact that the EPA enactment year varies by country and sets the enactment year as the treatment timing for each country-product pair, allowing for an appropriate comparison of trade value changes before and after the EPA enactment. The tariff reduction rate was calculated by subtracting the relevant year's tariff rate from the previous year's. The Callaway and Sant'Anna (2021) DID package was used.

Estimating Equation

The estimating equation for this study is as follows.

$$IHS(Export\ Value)_{it} = \sum_{\tau=-1}^{-11} \beta_t D_{it}^{l} + \sum_{\tau=1}^{9} \beta_t D_{it}^{l} + \gamma_t + \delta_i + \theta_{pt} + \varepsilon_{cpt}$$

For the independent variable (export value), the IHS transformation was used as an alternative to the log transformation. In the data set used in this paper, the trade value of 0 accounts for about 64% of all observations, and if the log transformation is applied, these observations will be excluded. Therefore, the IHS transformation was adopted to minimize data loss and to perform a more appropriate analysis. ε_{cpt} is the error term. The subscript i indicates a specific product-country combination, t denotes the year (2008-2021), and p is the product.

D_{it}^{l}:=1{ t−Ei =l} is an indicator that takes the value one for each standardized change. Here, l represents the distance of each year from the EPA start year for Each country-product (i) 's treatment, t is an arbitrary year, and Ei is the first year of treatment.

βt is an estimated coefficient that shows the extent to which the trade value of the treatment group changed after the EPA enactment relative to the products of the control group. This includes the 11 years before the treatment and the 9 years after the treatment, excluding the year of the start of the treatment ($l = 0$). The standard errors are clustered at the product-country level.

In addition, the following fixed effects are applied to the regression equation. First, γ_t indicates the year-fixed effect, which controls the impact of each year. Also, δ_i indicates the product-by-country fixed effect, which controls the impact of a specific country in a particular year. Furthermore, θ_{pt} indicates the product-by-year fixed effect, which controls the global impact of a specific commodity in a particular year.

Assumptions and Limitations

To interpret this relationship, it is necessary to satisfy the parallel trend assumption. This assumption means that, in the absence of an EPA, the export values of both goods subject to tariff reduction and those not subject to tariff reduction would have followed a similar trend over time.

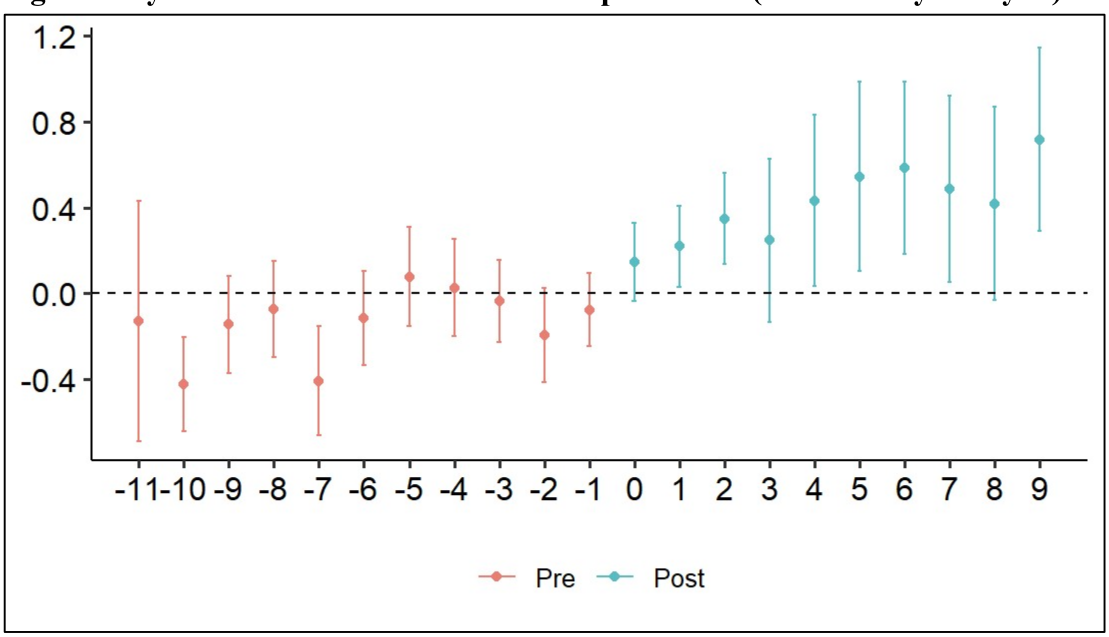
In addition, as in Part 1, it is also assumed that other policies in Japan do not affect exports. Furthermore, as in Part 1, endogeneity concerns may remain, and the impact of differences in actual EPA utilization rates is not considered in this estimation equation, so the validity of the results may be limited.

Result

Figure 3 shows the estimated coefficients for each year before and after the EPA began. First, in the figure, the pre-treatment (before the EPA started) trend is close to 0, and there is no clear trend, so the parallel trend process is likely satisfied. After the EPA began, the estimated values tend to increase from immediately after the EPA started until the final treatment year, although there are some increases and decreases. In other words, this shows that the large tariff reductions due to the EPA positively impact on export volume.

Table 5 shows the average treatment effect of products that received tariff reductions greater than the median by EPA. The ATT is a statistically significant positive value, estimated at 0.4147, which corresponds to an increase of approximately 51.39%. Therefore, it can be said that the change in the trade value of products that received large tariff reductions due to the EPA (treatment group) is statistically significantly different from the change in the trade value of products that received small or no tariff reductions (control group). In other words, the greater the tariff reduction, the more likely trade volume will increase.

Figure 3 Dynamic Effects of EPA on IHS Export Value (Event Study Analysis)



Note: The event study analysis by country-year-product level for 7 countries (Cambodia, Myanmar, India, Mongolia, EU, Canada, and US) from 2008 to 2021. The export value is measured in Yen, and IHS is used. This estimated value (ATT) is estimated by comparing the change in export value between the products (treatment group) for which the tariff was reduced by more than the median when the EPA came into effect and the products (control group) for which the tariff was reduced by less than the median. Standard errors are clustered at the product-country level. The DID package by Callaway & Sant'Anna (2021) was used for the analysis.

Table 5 Summary of ATT

	IHS (Export Value)
ATT	0.4147
Standard Errors	0.0884
95% confidence interval	(0.2414, 0.5881)*
Year Fixed Effect	Y
Country-Prouct Fixed Effect	Y
Country-Year Fixed Effect	Y

Note: Regression analysis by country-year-product level for 7 countries (Cambodia, Myanmar, India, Mongolia, EU, Canada, and US) from 2008 to 2021. The export value is measured in Yen, and IHS is used. This estimated value (ATT) is estimated by comparing the change in export value between the products (treatment group) for which the tariff was reduced by more than the median when the EPA came into effect and the products (control group) for which the tariff was reduced by less than the median. This regression includes the 11 years before the treatment and the 9 years after the treatment, excluding the year of the start of the treatment ($l = 0$). Standard errors are clustered at the product-country level. * indicates that the 95% confidence interval does not include zero, meaning it is statistically significant. The DID package by Callaway & Sant'Anna (2021) was used for the analysis.

VI. Conclusion

This study analyzed the impact of tariff reductions under the EPAs that Japan has concluded on promoting Japanese exports. A statistically significant relationship was confirmed between tariff rate reductions and increases in export value under the EPAs with the countries in question. Specifically, it was found that when tariffs are reduced by 1%, the value of exports increases by about 1%. This indicates that the elasticity of trade is about 1. Also, it was found that, in particular, the greater the extent of tariff reductions, the greater the increase in export value. As this study is limited to Japan and seven countries with which it has a single EPA, it is not certain that all EPAs will have the same impact, but these results suggest that tariff reductions will be an effective means of expanding exports as Japan promotes its EPA policy in the future.

Japan’s domestic market is shrinking due to the declining birthrate and aging population, and it is difficult to maintain economic growth with domestic demand alone (Mimura 2012). In this environment, it is essential to develop overseas markets to secure Japan’s economic interests, and policies supporting corporate exports are required. As part of this, tariff reductions through EPAs effectively reduce the cost burden on Japanese companies and increase their international competitiveness (METI 2024). The fact that this research has provided empirical findings on the relationship between tariff reductions and export values will offer suggestions to the design of future trade policies.

The government should continue to actively promote the expansion of EPAs. Also, In the face of protectionist moves such as tariff increases and the strengthening of trade barriers, tenacious negotiations are necessary to protect Japan’s national interests and expand free and fair economic blocs.

For this paper, I used ChatGPT 4.0 to assist with R code creation and modification, grammar and writing correction, and understanding theoretical concepts.

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Appendix

A. Supplementary information on data processing (Conversion to HS2017)

To convert all trade value data and tariff rate data to HS2017, I used the UNSD HS correspondence table. This table shows the correspondence between HS2017 and the HS codes for each year, and the following conversion patterns exist.

1:1 Corresponds one-to-one with HS2017
1:n Multiple HS codes correspond to one HS2017 code
n:1 One HS2017 code corresponds to multiple HS2017 codes
n:n Multiple HS2017 codes correspond to multiple HS2017 codes

- **Data conversion method:**

A. 1:1 and n:1

Each HS code was directly assigned to the corresponding HS2017 code.

B. n:n and 1:n

First, the 2018 export value data was converted back to the HS code before the HS2017 conversion using the HS conversion table for that year. This process obtained export values corresponding to each HS code before the HS2017 conversion. Next, the allocation ratio to each HS2017 code was calculated based on the obtained export value data, and the HS2017 code was converted by taking a weighted average based on that ratio. In addition, because there were duplicate values for n:n and 1:n, a simple average was calculated for tariff rates, and the total was taken for export volume to integrate the data.

By performing this type of processing, all data was converted to the unified HS2017 standard, ensuring its comparability.

B. Median tariff reduction rate for each country at the time of EPA entry into force

Country	Median Tariff Reduction Rate (%)	Year of EPA Implementation
Myanmar	0.000	2009
Cambodia	0.000	2010
India	1.818	2012
Mongolia	5.000	2017
Canada	0.000	2019
EU	3.200	2019
US	0.000	2020