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The Impact of the Extension on Anti-dumping Measures on Imports: A Study on Steel Products

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Abstract: *This study conducts research related to the impact of implementing trade policies in the form of anti-dumping measures, which influence changes in import patterns from targeted countries. Analysis results using the difference-in-difference (DID) method, which compares the volume of imports from targeted and non-targeted countries in the period before and after the implementation of anti-dumping measures, show that the extension of anti-dumping measures has a significant effect on reducing imports from countries targeted by such measures. This research will provide new insight into the impact analysis of the implementation of anti-dumping measures for steel products in Indonesia, with observations that have experienced an extension of the measures.*

Keywords: Anti-Dumping Measures; Difference-Indifference Method; Extension

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INTRODUCTION

Rapid developments in international trade drive the level of business competition higher. This competition occurs not only among domestic producers but also with foreign producers who supply imported goods. Companies under challenging conditions seek survival and competitive advantage, sometimes leading to unfair trade actions. This situation encourages unfair trade actions to dominate others' market share. Several countries have overcome this nuisance by utilizing the defense mechanisms against unfair trade actions (dumping and subsidies) or a sudden sharp increase in imports with trade remedy instruments, namely, anti-dumping, countervailing, and safeguard measures.

One of the trade remedies instruments that is popularly used concerning unfair trade measures is anti-dumping measures. A country can apply this action to imported goods originating from certain countries that are proven to have committed dumping and injured domestic industries by imposing additional import duties on these imported goods. Thorough and attentive efforts must be taken in analyzing the evidence of material injury experienced by the domestic industry. According to Article 3 of the Agreement on Implementation of Article VI of the General Agreement on Tariffs and Trade 1994, the authorities must prove that the alleged act of dumping against an exporter from a trading partner country is proven to have generated material losses to the domestic industry or hindered the growth of new industries, which is also reinforced by the presence of a causal relationship between the alleged act of dumping and the losses encountered by the domestic industry.

The expected anticipation from the application of these anti-dumping measures is to protect the domestic producers by establishing the same level playing field (in terms of the selling price). The imposition of anti-dumping measures on imported products causes additional import duties, which will increase the selling price of

these products. To maintain the sustainability of the supply of raw materials, consumer users will switch to looking for new sources of supply from other countries that are not subject to anti-dumping measures at competitive prices. The change in import patterns causes a decrease in demand for imported products from the target country. The purpose of anti-dumping measures is not to restrict the entry of imported products, but rather to prevent unfair practices by exporters from certain countries who have engaged in dumping. In other words, these measures are implemented to reduce the import volume of products that are dumped.

It is crucial to consider certain factors, especially after Prusa's (2005) study that revealed how countries misinterpreting anti-dumping provisions indicate that the anti-dumping instrument is not only a defense mechanism against unfair trade actions, but also an act of protectionism aimed at reducing competition with imported goods from specific countries or a retaliatory act. Therefore, anti-dumping measures aim to minimize losses resulting from unfair trade practices and have additional consequences on trade for both enforcing countries and their trading partners.

Indonesia frequently employs trade remedy mechanisms, particularly anti-dumping measures. In the past nearly three decades, there have been 89 anti-dumping action investigations, of which 50 cases ended with a decision to implement the anti-dumping measures (Komite Anti Dumping Indonesia, 2023). This investigation was conducted on various manufactured and agricultural products in several developed and developing countries. These measures primarily aim to protect vital industries for economic development.

The metal industry, including the iron and steel industry, is one of the ten priority industries in Indonesia's national industrial development plan. Based on that government program, the iron and steel industry is grouped into priority upstream industries, which will become important industries supporting other industries' development (Kementerian Perindustrian, 2014). Hence, the role of this industry is very important. Regarding those matters, the government needs to consider the decision to implement anti-dumping measures on imported steel products.

Therefore, seeing the importance of the steel industry in Indonesia and the development of the intense implementation of anti-dumping measures currently being used in Indonesia against this industry, this research was conducted to look at the impact of anti-dumping measures on imports from targeted countries using the difference-in-difference (DID) method. This method is often used to analyze by comparing conditions before and after the implementation of policies by the Authority or Government. Analysis was carried out on imported Hot Rolled Plate (HRP) products imported from China, Singapore, and Ukraine, which have been subject to anti-dumping measures since October 2012 (Kementerian Keuangan, 2012) until August 2024 (Kementerian Keuangan, 2019) (experiencing an extension of the imposition of anti-dumping measures).

The empirical analysis was carried out by collecting monthly import volume data based on the Harmonization System (HS) code at the 8-digit level as stated in the regulations. The import data was obtained from two sources, namely the Indonesian Central Agency of Statistics, which includes data on imports of HRP products from 2012 until 2022, and the International Trade Center, which includes data on imports of HRP products from 2006 until 2011. Both data sets include information on import volume data in metric tons. The two data sets are combined based on the country of origin of imports and harmonization code at the 8-digit level. There is a total of 57 countries that export to Indonesia during the period from 2006 to 2022.

The identification process is carried out by comparing the volume of imports from countries that are targeted for the imposition of anti-dumping measures (treatment group) with the volume of imports from countries that are not targeted for imposition (control group) in the period before and after the implementation of anti-dumping measures. We utilized the regression method with difference-in-difference (DID), generally used on panel data, to see the impact of an action or event experienced by the treatment group and connected to a control group that did not receive the action.

The estimation outcomes revealed that the implementation of anti-dumping measures significantly influenced the reduction in imports from the targeted countries. Nevertheless, the amount of anti-dumping measures has a distinct effect, where the amount of anti-dumping measures determined during the implementation period does not contribute to a decrease in the volume of imports of HRP products. We increased the number of observations to determine the robustness of our model, where the results show that the probability of the t-value is statistically significant. The standard error and confidence interval values also improve as the number of observations increases. Moreover, the variation in the data set is getting lower, which indicates that the coefficients are reliable in describing the true values in the population.

The cut down on import volume continued until the first extension of anti-dumping measures. However, after the second extension of the measures, the effect of lowering import volumes was diminished. Another side that needs to be considered is the amount of anti-dumping measures. The analysis results reveal that the amount of anti-dumping measures has a significant positive impact on import volume. That could indicate that the amount of anti-dumping measures is no longer adequate to prevent unfair trade actions. Accordingly, as the competent authority in implementing this trade policy, the government must consider these two issues in determining the extension of anti-dumping measures.

Limitations in this research relate to data availability at the company level, which is mostly publicly unavailable due to the sensitive information about the company. Analyzing the impact of implementing anti-dumping measures using data sets at the company level (exporters' sales and financial data) will provide more reliable results because the analysis is directly carried out on targeted companies that are subject to individual anti-

dumping measures.

The outline of this paper will be in five parts. The second part of this literature review will explain the preceding and relevant literature that discusses and analyses the impact of anti-dumping measures, along with an overview of anti-dumping measures in Indonesia. The third part will explain data dan analytical methods. The fourth part will provide a summary of the analysis results carried out in the previous sections. In the final section, we will present recommendations for related policies or further studies.

The Impact of Anti-Dumping Measures

In recent decades, anti-dumping instruments have been widely used by developing countries. In contrast, these instruments were only used by the United States and developed countries in the European region (Prusa, 2005). According to the latest data held by the WTO, some new users are developing countries with a relatively high number of anti-dumping action investigations, similar to or even exceeding developed countries (one of which is the EU), namely India, Brazil, and Turkey (World Trade Organization, 2023). This shifting is the impact of developments in international trade, whereby developing countries actively carrying out export-import activities will protect domestic producers from threats of unfair trade actions.

Another explanation that might cause this trend is the trade deflection effect of implementing anti-dumping measures. One example is when the United States implemented anti-dumping measures against imported steel products from China; there was an increase in China's exports to third countries, which were developing countries (Xiaoling & Siqi, 2021). Consequently, when the an increase in imports from China, the ideal mechanism for protecting the domestic industry is to use anti-dumping measures. This imposition is reinforced by the imposition of anti-dumping measures on these products by the United States.

Many scholars have analyzed the impact of the imposition of anti-dumping measures with various methods and parameters that fit their subject of analysis. Previous research has suggested that the imposition of anti-dumping measures affects the volume of world trade. Two impacts emerge from implementing anti-dumping instruments (Prusa, 2001). First, there will be a significant decline in export values (above 30%). Then, the widespread use of anti-dumping instruments would make it difficult to restrain and could lead to the misuse of the objective of implementing the trade remedy.

The impact of anti-dumping measures was analyzed in more depth by focusing on observations on trade transactions between the two countries, where Mahajan et al. (2021) researched trade transactions between India and China. Research was conducted on 121 anti-dumping measures carried out by India on imported products from China. Furthermore, the research results show that implementing these measures has reduced the importation of commodities from China. On the contrary, still related to bilateral trade between India and partner countries, there is research that analyzes eight imported products from Bangladesh that were subject to anti-dumping measures by India, which concluded that the implementation of anti-dumping measures significantly reduced imports. However, trade diversion conditions could indicate that anti-dumping measures were ineffective because of the insignificant reduction of imports due to the increasing imports from other countries (Bhuyan & Oh, 2023).

The adjustment in trade patterns is analyzed by comparing the value or quantity of imports before and after implementing anti-dumping measures. This parameter is used to analyze the occurrence of changes in trading patterns after implementation. The additional import duties in the form of anti-dumping measures generate an increase in the selling prices of imported products from the targeted countries, which decreases demand, so that the volume of imports decreases. Nevertheless, the country's domestic needs must be fulfilled, so it is necessary to have other suppliers from countries that are not targets of anti-dumping measures, which can offer lower prices. The occurrence of trade diversion linked to the imposition of anti-dumping measures has been mentioned in several articles (Brenton, 2001; Kinnucan et al., 2017).

Another outcome still related to changes in trade patterns is that implementing anti-dumping measures can also generate shifts in trade patterns from the side of exporters, who are the targets of anti-dumping measures. The company will move its export destinations to third countries that do not impose trade barriers or with lower tariffs (trade deflection). This action indicates that trade remedy measure also influences the exporters' behavior from countries targeted by the anti-dumping measures. A decrease in demand due to increased product selling prices will gradually diminish their market share. This condition will influence the exporter's decision to stay or leave that market and move to another country that does not impose barriers to trade (Besedeš & Prusa, 2017; Felbermayr & Sandkamp, 2018). The study was conducted to quantify the impact of the imposition of anti-dumping measures by the Brazilian government on the tendency of exporters to exit the country's domestic market. It was found that the percentage of probability that was relatively high, 33% higher, was that exporters targeted would be affected by anti-dumping measures compared to exporters from other countries (Mazzucco & Bittencourt, 2022). Apart from that, based on the results found, there is a greater tendency for this to occur during the final stages of the investigation, namely, 47% in threat rate.

Further study found three effects regarding the impact of the United States' anti-dumping measures on steel products from China (Xiaoling & Siqi, 2021). First, the effect of trade restrictions caused a decline in China's exports to the United States. Second, the effect of trade transfer on China's market share continued to decline due to the increasing imports from other countries (India and Indonesia). The final impact is trade deflection, where Chinese exporters shift their export targets to other countries to reduce losses caused by anti-dumping

measures.

This shift in trade patterns shows that the imposition of anti-dumping measures caused by unfair trade does not aim to limit imports. However, there is much debate regarding this matter, where some parties argue that this anti-dumping action is a form of protectionism for the domestic industry despite being aimed at hindering imported products. On the other hand, some think that anti-dumping measures that cause trade diversion are a form of weakness of this trade remedy mechanism. In contrast to previous opinions, anti-dumping measures can be considered a way to diminish protectionist judgment. The aim of implementing this action is expected to be temporary protectionism that leads to increased openness with the changes in trade patterns (Ketterer, 2018).

Another study that analyzed exporters' data also showed no change in the volume of exports of products subject to anti-dumping measures to countries that were not subject to the imposition, or no evidence of trade deflection occurred (Lu et al., 2013). Moreover, the exporter's behavior concerning the imposition of anti-dumping measures using the DID method was examined. There was a significant reduction in export volume due to the increasing number of exporters leaving the market. Based on an analysis of product-level data, evidence was found that survival exporters in the process of imposing anti-dumping measures were companies with high productivity (product and market diversification). Consequently, when the imposition has ended, it could reverse the protection for the domestic industry because the level of competition will be higher and threaten their welfare.

Referring to several studies that have been carried out as mentioned above, we can see that the implementation of trade policies, especially anti-dumping measures, has direct and indirect impacts, both of which influence trade patterns in both domestic industries and exporters from other countries (whether it is the target of imposition or not). Still, we must also consider the indirect impact on the company's behavior in determining its business decisions to maintain competitiveness in international markets.

Overview of Anti-Dumping Measures in Indonesia

Observing the data obtained by the WTO, Indonesia has carried out 50 investigations into anti-dumping actions during the 2006-2020 period, where most allegations were against imported steel products (World Trade Organization, 2023). This action happens considering that the country's development program includes the steel industry in the ten priority industries (Kementerian Perindustrian, 2023). Moreover, several HS codes from steel products have been imposed with anti-dumping measures for over ten years, with several developed and developing countries subject to anti-dumping measures on steel products, including China, Japan, Korea, Taiwan, Russia, Malaysia, Vietnam, Thailand, and Kazakhstan.

On the basis of data from the Indonesian Iron and Steel Industry Association (IISIA), the utilization rate of domestic producers from 2019 to 2021 is above 60%. It continues to increase to above 80% in 2021 (Indonesian Iron & Steel Industry Association, 2023). The increase in capacity utilization is related to the production process, which, in this case, indicates an increase in production by domestic producers. Economic development driven by investment in infrastructure causes national consumption to increase, one of which is iron and steel products, closely related to the infrastructure development process. Projections for steel consumption in Indonesia for 2015 to 2023 show a significant increase, where consumption in 2015 was around 11.4 million tons and continues to increase until it reaches 17.2 million tons in the projection for 2023 (Indonesian Iron & Steel Industry Association, 2023).

Referring to the trade balance for iron and steel products in the 2023 period (January-November), it is known that a large number of iron and steel products are experiencing a trade deficit, one of which is HRP products. Even though imported HRP products are targets for implementing anti-dumping measures, in 2023, the value of imports of these products is known to be 613 million USD, where there is a trade deficit of 90 million USD on total HRP exports in the same year (Indonesian Iron & Steel Industry Association, 2023). Indonesia's dependence on several imported products, especially iron and steel, including Hot Rolled Steel, Cold Rolled Steel, Coated Steel, and Pipe, reaches 62.3% of total imports of iron and steel products (Indonesian Iron & Steel Industry Association, 2023).

These circumstances illustrate the level of Indonesia's dependence on imported products. Implementing anti-dumping measures that can affect trade patterns will impact the stability of the supply of imported iron and steel products. In line with the increase in national consumption of iron and steel products as a result of the country's economic development program, the protection of the iron and steel industry and the stability of iron and steel supplies have become things that must be considered in the process of determining trade policy, in this case, the implementation of anti-dumping measures.

The preceding study that focused on the impact of anti-dumping measures on Tin Plate products concluded that before and after anti-dumping measures, the value of imports was no different (Nurcahyo & Purwana, 2020). In addition, the result analysis for the non-targeted countries discovered a significant change in only one country. Using import values as the research subject without considering the effect of exchange rates in the examination can cause biased results. The use of import value as the subject of study might be more complex when compared to the volume of imports because other variables ought to be considered, namely, the effect of the exchange rate on import demand.

Other steel products, namely Cold Rolled Coil/Sheet (CRC/S), which are subject to anti-dumping measures originating from several countries (China, Japan, South Korea, Taiwan, and Viet Nam), are analyzed to determine

the impact of the imposition of these measures on the volume of imports seen through 3 impacts, namely the impact on investigation, the impact of trade restriction, and the impact of trade diversion (Tjahjasari, 2015). From the results of the analysis, it was found that the implementation of anti-dumping measures had a negative impact on imports from the target country and had the opposite impact on imports from other countries that were not affected. However, the decline in imports from the target country can be said to be relatively small. Even though it is relatively small, the decline in import volume occurred continuously during the period of investigation and implementation of anti-dumping measures, so the impact of the trade ban occurred. Finally, the results of this study state that it is proven that there is a trade diversion impact where there is an increase in imports of target products from other countries that are not subject to anti-dumping measures.

A similar thing was found in research on the impact of implementing anti-dumping policies on manufacture products besides steel, i.e., BOPET (Biaxially Oriented Polyethylene Terephthalate) products, where the results obtained showed that there was a significant positive partial impact in the long-run on imports from the targeted countries, nonetheless when in the short term, the imported products had no significant partial impact (Prasetya & Nurcahyo, 2022).

Exporters may ship the product to other countries before re-exporting to the country that imposed the anti-dumping measures to avoid the anti-dumping measures. This condition is suspected because there is still an increase in imports of steel products when anti-dumping measures are implemented. Consequently, the circumvent action causes anti-dumping measures on several steel products to be ineffective (P.Alhayat, 2017). However, the authorities must distinguish whether the product's origin is from the named countries when analyzing the increased imports from non-named countries to determine the circumvention. More than simply skimming the shifts in trading patterns, it requires an in-depth investigation to demonstrate that circumvention has occurred.

METHODOLOGY

The data used in this analysis is monthly import volume for Hot Rolled Coil (HRC) products with an 8-digit Harmonized System (HS) code. The data set was obtained from two data sources: statistical data from the Central Bureau of Statistics of the Republic of Indonesia (data from 2012-2022) and the International Trade Center (data from 2006-2011). Established on the provisions related to the implementation of anti-dumping measures, there are two HS codes designated as objects of imposition, so we combine import data from the two HS codes based on the country of origin of the imported products. The data set we use is panel data, which includes import volume data from partner countries during the period January 2006 to December 2022. As additional information, the Indonesian government makes periodic amendments to the HS code following changes defined by the World Customs Organization (WCO). However, for the HS code of HRP products from 2009-2022, the HS code is still the same, so adjusting the HS code is unnecessary.

The imposition was established on Minister of Finance Regulation No. 150/PMK.011/2012, which is known to impose measures against HRP products imported from China, Singapore, and Ukraine. This anti-dumping action has undergone an extension of the imposition period based on the Regulation of the Ministry of Finance Number 50/PMK.010/2016 and Number 111/PMK.010/2019, with the amount of anti-dumping measures remaining unchanged, following the provisions defined in the previous regulation which is as follows, 10.47% for China, 12.50% for Singapore, and 12.33% for Ukraine. In this regard, data on the number of anti-dumping measures specified for each country was obtained from the publication of the Ministry Regulations, published by the Ministry of Finance of the Republic of Indonesia.

The extension of the implementation of anti-dumping measures will be in force until 2024. The analysis will be carried out using the DID method, which will carry out comparisons before and after the measures' implementation, so that the data period used is important data from January 2006 to December 2022.

DID model is commonly used to evaluate the impact of a specific intervention or treatment (such as the implementation of government policy) constructed comparison of the changes in outcomes between the group that contact with the treatment (treatment group) and others that are not exposed to the treatment over the time (Jesse Lecy & Federica Fusi, 2020). The research is going to adopt a DID model used by (Lu, Tao, & Zhang, 2013). The model suggested in this research is as follows:

$$y1_{ct} = \beta_1\ treat\_cntry\ \text{x}\ post1_t + \beta_2\ add_c\ \text{x}\ post1_t + \varepsilon_t$$
$$y2_{ct} = \beta_1\ treat\_cntry\ \text{x}\ post2_t + \beta_2\ add_c \text{x}\ post2_t + \varepsilon_t$$
$$y3_{ct} = \beta_1\ treat_{cntry}\ \text{x}\ post3_t + \beta_2\ add_c \text{x}\ post3_t + \varepsilon_t$$

The dependent variable ($y1_{ct}, y2_{ct}, y3_{ct}$) is the import volume of the country in the t period during the first imposition, second imposition, and third imposition, respectively. The $treat\_cntry$ is a dummy variable for country equal to 1 if a country is included as a targeted country (refers to the treatment group, namely China, Singapore, and Ukraine) or 0 if otherwise (refers to the control group, non-targeted countries). On the other side, $post1_t,\ post2_t,\ post3_t$, is the time variable indicating the post of the first, second, and third imposition, respectively. Because the second and third impositions are an extension of the imposition period of the previous anti-dumping implementation, constructing the $post2_t$ and $post3_t$ variables also include the duration of the imposition of the previous action. The $post1_t$ variable will have a value of 1 if the import time ranges from October 2012 to April

2016. The $post2_t$ variable will have a value of 1 if the import time ranges from October 2012 to April 2009 or 0 for times other than that. Furthermore, $post3_t$ will have a value of 1 if the import time is from October 2012 to December 2022 or 0 for times other than that. There is a time lag in the second extension process, namely in the period May 2019 to July 2019, so we set these months as 0 when constructing the $post3_t$ variable.

Meanwhile, the amount of anti-dumping measures is constructed into the add_c variable. The three targeted countries (China, Singapore, and Ukraine) obtain anti-dumping measures following the amounts determined in the Minister of Finance Regulation regarding the implementation of this measure. On the other hand, countries that are not targeted for imposition will get a value of zero. Throughout the imposition of anti-dumping measures, including the extension of the implementation of these measures, the amount of anti-dumping measures for each country that is the target of imposition does not change.

The import pattern is estimated using a DID study design, which compared the import volume of named countries before anti-dumping measures (January 2006 until September 2012) to post anti-dumping measures (October 2012 until December 2022). We conduct analyses of three different periods separately to determine the effect of extending the imposition of anti-dumping measures on the import volume of the countries targeted by the measures. The import volume from targeted and non-targeted countries is weighted from the monthly data in the period before and after the anti-dumping measures. Therefore, we will present the estimation results for almost 17 years average effect due to the extension of anti-dumping measures. Furthermore, to determine that our model is robust, we conduct a robustness check using the bootstrap sampling method to get more accurate standard error and confidence interval values connected to the right-skewed distribution in our dataset. A sampling distribution will be obtained by resampling the samples in the data set randomly and repeatedly (Guan, 2003). Thus, we can observe the standard deviation of the sample distribution. In addition, we also carried out a robustness check by adding the number of observations in the DID model to determine the consistency of the estimation results from the standard error value and coefficient significance.

Due to the DID estimation method, we determined three countries that will be the control variables: Korea, Japan, and Taiwan (Republic of China). The selection of the three countries was carried out based on similar characteristics to the countries in the treatment group. These considerations can be seen from the large volume of imports carried out during the 2006-2022 period, the consistency of export transactions carried out, and being included in the top 10 countries of origin for imports of HRP products to Indonesia. Meanwhile, the treatment group explained in the previous section is the three countries targeted for imposing anti-dumping measures, namely China, Singapore, and Ukraine.

RESULTS

The total number of observations obtained from the data we have is 1,224. Based on the summary statistics presented in Table 1, we can see that the mean value for import volume from the two groups is 4,802 metric tons (MT) in the treatment group and 3,015 MT in the control group. Furthermore, in the quantile values, it can be seen that the greater the quantile percentage, the higher the average value of import quantity, both in the treatment and control groups. This condition is also supported by an abnormal data distribution where the distribution is skewed to the right and heavier at the curve's tail. From the difference in these values, we can conclude that the treatment group is a country with a greater quantity of exports when compared to the control group.

Table 1. Summary statistics of variable import volume (2006-2022)

	Treatment Group	Control Group
Mean	4,802.11	3,015.34
Standard Deviation	5,993.92	4,798.53
p25	617.22	251.67
p50	2,584.22	908.02
p75	6,717.57	3,862.52
IQR (Interquartile Range)	6,100.35	3,610.85
Skewness	2.53	3.13
Kurtosis	14.48	16.19

Source: Data processed (2024)

We tested to see import trends from the two groups by comparing each group's mean value of the import volume variable. By examining the magnitude of the difference between the two means, we can determine whether there were differences in import trends from the two groups before the imposition was implemented. Based on the results from the calculations (Table 2), it is known that during the 2006-2011 period, there were no significant differences between the two groups. Apart from that, if we look at the development of the mean value from year to year, the two groups experience parallel changes.

Table 2. HRP import volume before the implementation of anti-dumping measures

Year	Treatment Group [Standard deviation]	Control Group [Standard deviation]	Difference	*p*-value[b]
2006	1,100.67 [2,221.22]	759.00 [943.28]	-341.66	0.3985*
2007	1,799.80 [2,702.70]	949.08 [1,163.35]	-850.72	0.0872*
2008	6,285.78 [6,484.68]	2,407.18 [2,467.83]	-3,878.60	0.0013***
2009	3,192.69 [2,934.31]	1,468.92 [2,102.42]	-1,723.77	0.0055***
2010	3,210.56 [2,950.86]	3,649.76 [4,844.62]	439.20	0.6437*
2011	8,093.27 [6,351.03]	4,615.00 [5,124.33]	-3,478.29	0.0127**
Observations[a]	36	36		

Notes: (a) The number of observations for each group is the same in each estimated year. (b) The null hypothesis is that there is no difference between the means in the treatment and control groups. ***Statistically significant at the 0,1% level. **Statistically significant at the 1% level. *Statistically significant at the 5% level. Source: Data processed (2024)

These findings are also supported by the results of synthetic control estimation, where we compare the treatment group with the synthetic control group, a country with a weight comparable to the treatment group. We conducted two estimates to see the consistency of the synthetic control method results. The first estimate uses Japan as a synthetic control group, and the second uses Japan, Korea, the United Kingdom, and Germany as a synthetic group. Data on import value and Gross Domestic Product in USD exchange rate from each country are control variables in this estimation process. The estimation results show that the two groups had the same trend before treatment, as shown in Figure 1.

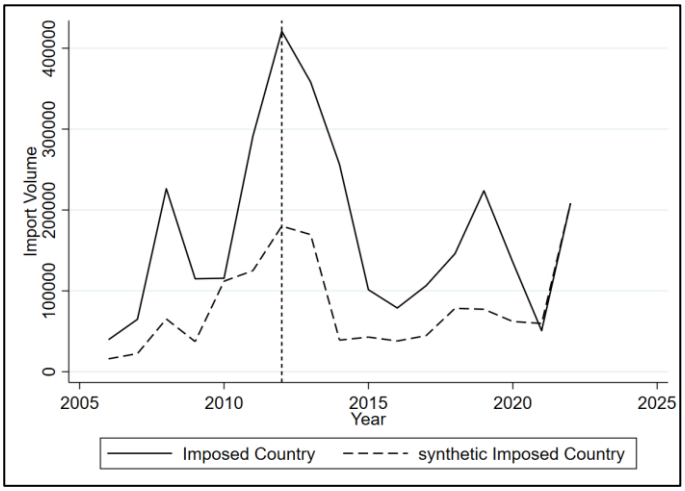


Figure 1. Synthetic Control Method
Source: Data processed (2024)

To support the use of the DID method in this literature, we compared the Fixed Effect (FE) and Random Effect (RE) methods of estimation. We utilized the Hausman test to see whether individual characteristics in the dataset correlate with the regressors. The Hausman test is carried out to determine whether the null hypothesis, where RE is more suitable than FE. We add sigmamore to overcome constraints related to exogeneity and overidentification in instrumental-variables regression (Stata, 2022). The result in Table 3 (table in the appendix) shows that the FE method is more efficient when compared to the RE method. Therefore, we use the DID specification with FE to conduct a causal inference analysis between import volume and the implementation of anti-dumping measures.

As shown in Table 3, we know that the β_1 and β_2 coefficients have more significant values for FE when compared to RE. The higher R-squared value with the FE method also supports these circumstances. Thus, this result aligns with the results obtained from the Hausman test. Accordingly, this result aligns with the results obtained from the Hausman test, where the three estimations indicate that we cannot reject the null hypothesis.

Table 3. Comparison of Fixed Effect & Random Effect

	First Imposition (*post1*)		Second Imposition (*post2*)		Third Imposition (*post3*)	
	FE	RE	FE	RE	FE	RE
Country Imposed (β_1)	-18,678.98 [5,732.13]	-18,677.64 [5,718.60]	-23,829.79 [4,769.88]	-23,713.37 [4,747.26]	-15,217.41 [4,690.91]	-15,086.49 [4,652.37]

Anti-dumping measures (β_2)	161,396.50	161,601.20	206,279.90	205,557.50	119,552.10	119,006.2
	[48,457.22]	[48,342.75]	[40,314.38]	[40,123.03]	[39,635.02]	[39,309.23]
Observations	1,224	1,224	1,224	1,224	1,224	1,224
R-squared	0.227	0.042	0.237	0.044	0.229	0.016
	First Imposition (*post1*)		Second Imposition (*post2*)		Third Imposition (*post3*)	
Hausman-test	0.7392*		0.7540*		0.5556*	

Notes: Standard error reported in parenthesis. *Statistically significant at the 5% level. Source: Data processed (2024)

Estimates were carried out using the DID method to determine the impact of implementing anti-dumping measures on imported HRP products. Comparisons were made of import volumes in the period before and after the implementation of the anti-dumping policy. The analysis will be carried out over three time periods determined based on the period of imposition of these measures. Based on the results of the estimations that have been carried out (Table 4), it is known that implementing anti-dumping measures has substantially reduced import volumes.

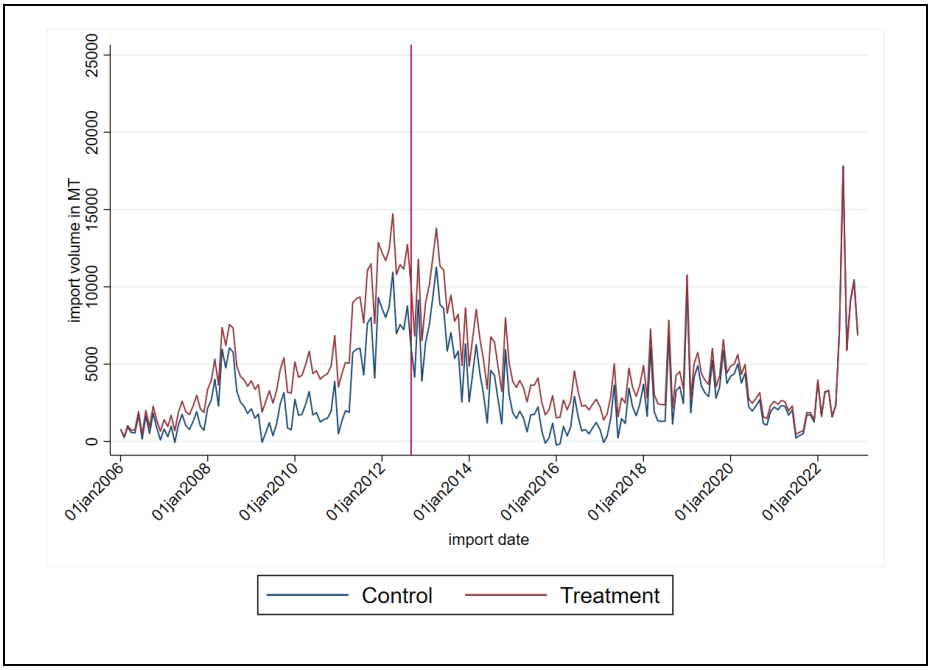
Table 4. The effect of anti-dumping measures on import volume

	First Imposition (*post1*)	Second Imposition (*post2*)	Third Imposition (*post3*)
Country Imposed (β_1)	-18,145.33*	-23,679.14**	-15,019.25**
	[7,122.61]	[7,255.33]	[576.20]
Anti-dumping measures (β_2)	161,396.50*	206,279.90**	119,552.10**
	[67,677.71]	[68,983.08]	[4,680.24]
Observations	1,224	1,224	1,224
Month Fixed Effect	Yes	Yes	Yes
Country Fixed Effect	Yes	Yes	Yes

Notes: Robust standard error is clustered by country and reported in parenthesis. *Statistically significant at the 10% level. **Statistically significant at the 5% level. Source: Data processed (2024).

However, when we observe the results obtained in Table 4, we identified that the decline in imports continued to increase until the post2 period, but this decline further diminished when the imposition of anti-dumping measures was extended for the second time (post3). On the other hand, a different effect can be seen in the anti-dumping measures coefficient, where the estimation results show that the amount of anti-dumping measures has a positive and significant effect on import volume. The same pattern was also experienced with this coefficient during the three periods, where the impact increased until the first extension period and decreased during the second extension period. This condition may be related to the amount of anti-dumping measures, the value of which does not change during the extended imposition period.

We also performed tests using the parallel trend and Granger causality test methods from the DID estimation results obtained to see the linear trend before treatment and the causal relationship between pre-treatment and post-treatment for the treatment or control group.



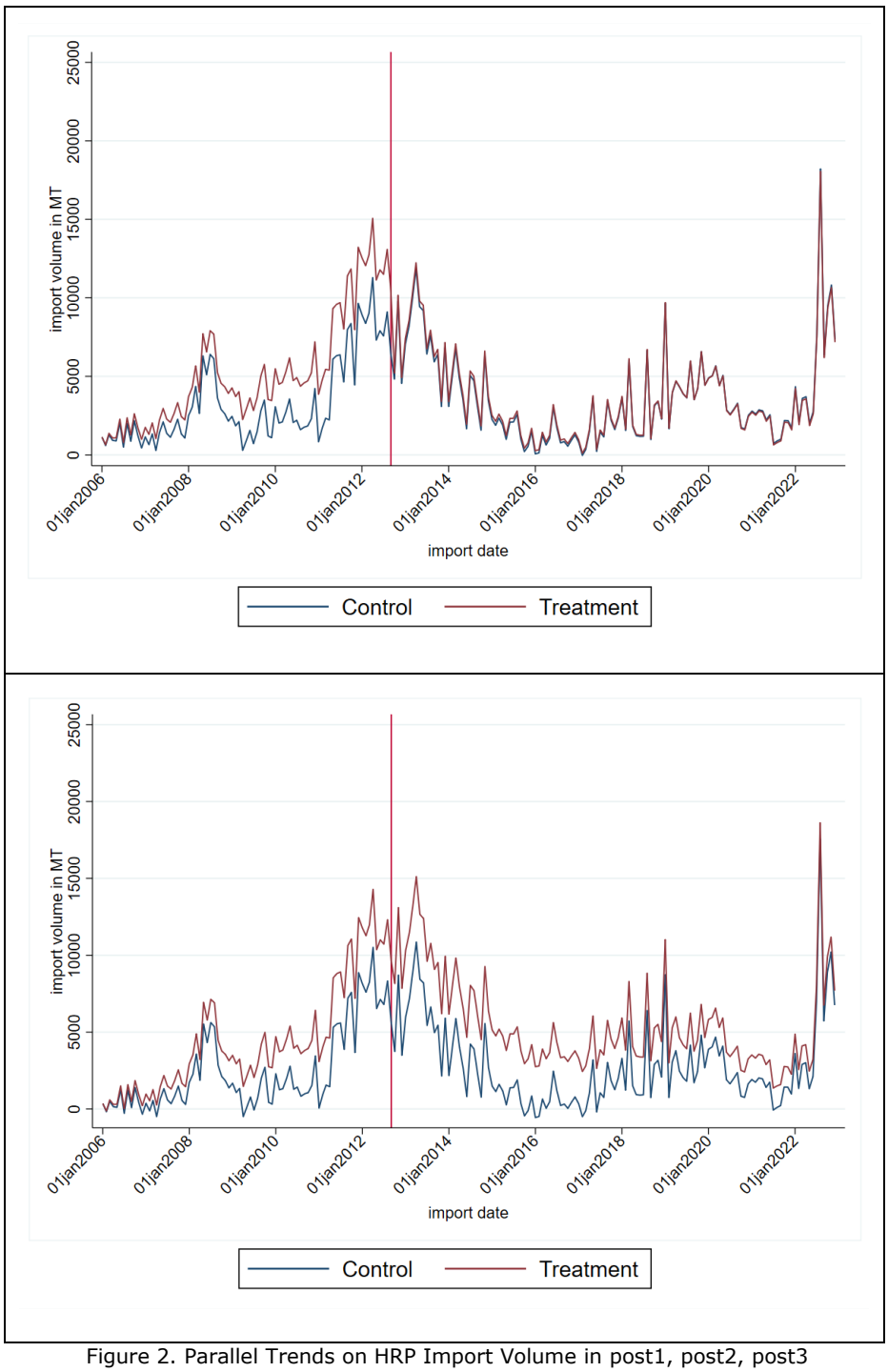


Figure 2. Parallel Trends on HRP Import Volume in post1, post2, post3
Source: Data processed (2024)

The outcomes of the parallel tests show a p-value of 0.794, 0.604, and 0.769, respectively, for each period, which means there is no strong evidence to reject the null hypothesis, so it can be concluded that the linear trends of the treatment and control groups are parallel. The result is supported by the graph in Figure 1, where there are no differences in trends between the two groups before treatment.

Subsequently, we conducted a Granger test for causality to see the causal relationship between the control group and the treatment group. In this estimation, a test was carried out to test the hypothesis that there was no anticipated effect from the control group on the changes experienced by the treatment group. Based on the estimation results in the three time periods, it was found that the p-value was greater than 0.05. Thus, there is no significant evidence to reject the null hypothesis. So, the two groups have no causal relationship, and the estimation results using the DID method are reliable.

To determine the robustness of the model used, we used the bootstrap sampling method to see the standard deviation in the population. Based on the estimation results (Table 5), it is known that in post1 and post2, the standard error is decreased, and the range in the confidence interval is decreased. This result is supported by the

statistical significance at 5% level of standard deviation. However, something slightly different occurs in the calculation with post3, where the standard error and confidence interval range increase. However, the probability of a z-score is statistically significant at a 5% level.

Table 5. Robustness checks 1: The effect of anti-dumping measures on import volume

	First Imposition (*post1*)	Second Imposition (*post2*)	Third Imposition (*post3*)
Country Imposed (β_1)	-18,145.33**	-23,679.14***	-15,019.25*
	[6,647.547]	[5,396.663]	[6,101.021]
Anti-dumping measures (β_2)	161,396.50**	206,279.90***	119,552.10*
	[56,330.65]	[45,617.49]	[50,627.28]
Observations	1,224	1,224	1,224

Notes: Bootstrap standard error reported in parenthesis. ***Statistically significant at the 0,1% level. **Statistically significant at the 1% level. *Statistically significant at the 5% level. Source: Data processed (2024).

We reassess the DID model's robustness by increasing the number of observations to 10,404. We get the results that the implementation of anti-dumping measures has a significant impact on reducing import volumes (Table 6). This finding is supported by the value of the probability on the t-score, which is statistically significant at the 1% and 0.1% levels, as presented in Table 6 (table in appendix). In addition, the coefficient for the amount of anti-dumping measures has the same impact as the previous DID estimation, where the coefficient has a positive and significant impact on import volume (statistically significant at the 1% and 0.1% levels). The robust standard error value also indicates a lower value when compared to the previous estimate. The increased number of observations generates a mean of these observations closer to the actual mean value. Hence, the standard deviation in this estimate is lower than the previous estimation result.

Table 6. Robustness checks 2: The effect of anti-dumping measures on import volume

	First Imposition (*post1*)	Second Imposition (*post2*)	Third Imposition (*post3*)
Country Imposed (β_1)	-17,349.90*	-23,755.11**	-14,687.16**
	[6,355.02]	[6,155.68]	[418.26]
Anti-dumping measures (β_2)	162,907.90*	206,279.90**	119,552.10**
	[60,501.80]	[58,604.97]	[3,976.12]
Observations	10,404	10,404	10,404
Month Fixed Effect	Yes	Yes	Yes
Country Fixed Effect	Yes	Yes	Yes

Notes: Robust standard error is clustered by country and reported in parenthesis. **Statistically significant at the 0,1% level. *Statistically significant at the 1% level. Source: Data processed (2024).

DISCUSSION

The analysis method used is the DID estimation method, which compares two groups consisting of a group containing countries that are targets for implementing anti-dumping measures (treatment group) and a group containing countries that are not targets of these measures. A comparison of the outcome variables of the two groups was carried out before and after the implementation of anti-dumping measures. We use monthly import volume data for HRP products from 2006 to 2022. This period was chosen to identify comparisons of import conditions before and after the implementation of anti-dumping measures. The implementation of anti-dumping measures on imported HRP products from China, Singapore, and Ukraine was carried out from 2012 to 2024, which resulted from extending the period for implementing anti-dumping measures by the Indonesian government.

The DID estimation results are in line with the trend in HRP import volumes after the implementation of anti-dumping measures. We can identify that after the implementation of anti-dumping measures, there is a visible difference in the trends experienced by the treatment group and the control group due to the implementation of anti-dumping measures. The estimation results show that the implementation of anti-dumping measures for HRP products from China, Singapore, and Ukraine has significantly reduced imports of HRP products.

Estimates were carried out separately based on the initial and extended implementation periods, where the results show that during the initial and first extended periods, the impact of reducing imports continued to increase. However, after the second extension, the impact of the decline in import volume weakened. On the other hand, regarding the amount of anti-dumping measures applied, the estimation results show different conditions. The coefficient of anti-dumping measures positively and significantly impacts import volume. The amount of anti-dumping measures on imported HRP products from China, Singapore, and Ukraine, based on the Minister of Finance Regulation regarding the implementation of this action is states that the additional import duty is imposed at 10.47%, 12.50%, and 12.33%, respectively.

The downward tendency in the impact of implementing anti-dumping measures on import volumes, as shown in

the estimation results, shows that extending the implementation of anti-dumping measures can reduce the decreasing effect on the volume of imports of targeted products. This condition will have the potential to cause an increase in the volume of imports from the targeted countries when the implementation period for these measures has ended, where barriers in the form of anti-dumping measures are no longer applied to these products.

CONCLUSION

As the competent authority, the government implements anti-dumping measures to protect the domestic industry from unfair acts in trade carried out by exporters from trading partner countries. However, in line with the implementation of this trade policy, some factors influence the pattern of trade in imports of products that are the target of implementing anti-dumping measures. Several previous studies have carried out analyses related to this phenomenon, where the studies state that the implementation of anti-dumping measures affects the reduction of imports that originate from countries that are the target of the trade policy (Prusa, 2001; Mahajan et al., 2021; Xiaoling & Siqi, 2021).

In line with this, the estimation results also show that the amount of anti-dumping measures applied did not impact the reduction in import volume. Furthermore, this outcome indicates whether the additional import duty is still adequate in hindering imports that involve dumping prices on the targeted product. More in-depth research into this could be a topic for further research.

The results above can be used as a consideration for the government and related authorities in implementing anti-dumping measures, especially those that have experienced an extension of the imposition period for several periods. Is the decision to extend the imposition of the anti-dumping measures with the same amount still effective, or can a re-investigation be carried out to change the amount of anti-dumping measures to have a more positive effect on recovering losses and protecting domestic industries from unfair trade actions?

Observing these results, we suggest to the relevant authorities to consider the results of this research in determining the decision to extend the implementation of anti-dumping measures in the future. The extension of the implementation of anti-dumping measures is often interpreted as an act of state protectionism against the domestic industry. Therefore, analyzing the impact of implementation on import volumes can provide supporting information for decision-making.

Domestic industries' efforts to recover their losses can follow the effectiveness of anti-dumping measures. Therefore, government support is needed for policies that encourage these improvement efforts. The government can require regular monitoring of the import of products subject to anti-dumping measures, which can be a consideration to obtain initial information regarding changes in import patterns, especially as the imposition period ends. Surveillance is carried out not only on imported products from countries that are the target of imposition but also on countries that are not the target of this policy. Import diversion may occur due to the implementation of anti-dumping measures (Brenton, 2001; Kinnucan et al., 2017).

Increasing the competitiveness of the domestic industry must also be fostered so that it is no less competitive than the country's exporters, who are the targets of imposition when the policy implementation ends. In addition, companies can increase their production capacity to meet domestic market demand so that user industries can switch to domestic products with the same level of competition as imported products. Competitiveness will increase in line with the end of the anti-dumping measures because exporters who can survive during the imposition period are companies with high efficiency and performance (Lu, Tao, & Zhang, 2013).

Future research could benefit from analyzing the company-level data set more in-depth to get a more straightforward description of how the implementation of anti-dumping measures affects the volume of imports after the measures are extended. Moreover, a study on the impact of anti-dumping measures on several iron and steel products would be beneficial in seeing the effect of different magnitudes of the additional import duties on the volume of targeted import products. Comparison of different types of products can also provide new insights regarding the impact of impositions on import volumes, which are related to the elasticity of each product.

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