Using Machine Learning to Predict the Impact of the 2025 US Tariffs

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Abstract- On April 2, 2025, the president of The United States of America, Donald J. Trump placed a baseline 10% tariff on US imports from all countries, labeling it as "Liberation Day". This tariff was higher for countries that imposed higher tariffs on American goods [1], with certain exceptions [2]. Similarly, lower tariffs on the US resulted in lower tariffs from the US. These tariffs were placed to lower the US trade deficit and increase national good production [3]. To understand the impact of large economic events such as the implementation of these tariffs, economists use a classical approach based on past events and intuition to. Although the classical method provides success to a high degree, AI and machine learning propose a potentially more accurate and efficient method. This paper uses machine learning to evaluate the 2025 US tariffs and predict the impacts on US trade.

Index Terms- Economy, Machine Learning, Tariff, US

I. INTRODUCTION

The 2025 tariffs have significant impact on the global economy due to the United States' dominant position in international trade. Despite consequential effects such as creating economic uncertainty, crashing global markets, and increasing prices, there is no definitive answer regarding the outcome of these tariffs. Numerous economists are attempting to address this problem by providing reliable projections as to the potential impact on consumers, businesses, and countries using classical analysis. Classical analysis involves using mathematical reasoning, past experiences, and intuition to establish strong and affirmative predictions. However, the use of standard models contains two conspicuous flaws. The first problem with this approach is that different intuition results in controversial ideas from potentially the same data. Another flaw is that this method requires similar events to have occurred in the past; however, 1934 was the last time that such tariffs were seen from the US [5]. The tremendous growth of global trade since 1934 renders those tariffs impractical for the modern era. Therefore, it is necessary to involve new techniques to fully comprehend the impact of these tariffs.

One such example of a modern methodology is the use of machine learning to catch tariff frauds in the paper by Bandarupalli [4]. His research introduces a new perspective for further studies regarding economic policies such as tariffs. He emphasizes that using machine learning over current models provided a significant improvement in accuracy and fraud detection. Although the purpose of his study was fraud detection, it highlighted the need and advantage of machine learning (ML)

in economic analysis. Another reason to integrate machine learning is that it enhances the use of computers as mathematical tools which allows economists to explore more complex relationships. Machine learning can be utilized to identify simple patterns between numerical variables, which would allow economists to focus more on the qualitative effects such as trade deals, negotiations, and shifting trade routes. Furthermore, ML tooling provides enhanced mathematical algorithms that are far more capable of understanding complicated patterns within numerical values.

This paper aims to bridge the gap between machine learning and economic models by creating a new ML based model that focuses on trade. The rest of the paper is structured in the following manner. First, a literature review is presented of the background research required to understand the topic and create analytical insights. Secondly, other similar works that use classical models to attempt to predict the economic impacts of the 2025 US tariffs are presented. Thirdly, the methodology for cleaning data and training models is described. Afterwards, the results from the AI models are presented as well as the insights acquired from the AI predictions. Finally, concluding thoughts and ideas about the paper and its results are shared.

II. LITERATURE REVIEW

To fully grasp the impact of President Trump's 2025 tariffs, it is first essential to understand trade operations in the absence of tariffs. In a free trade environment, supply and demand dictate prices of goods. However, since the importing country does not have import taxes, only the exporting country benefits with increased economic growth. Thus, importing governments place tariffs as protectionist policies to limit exporter growth, decrease trade deficit, and gain revenue for the importing country. When the importing government implements a tariff, the ratio of supply to demand increases because the consumer must pay more for the same quantity of goods. Since the price that the consumer must pay increases, the demand for the imported goods decreases, but the exporter has an excess of goods to supply the original demand. Then, the exporter decreases the cost of their goods to increase demand for the imports so the consumer will have to pay less and buy more, a concept established in comparative advantage [6][7]. However, the consumer still ends up paying more than usual and the exporter ends up profiting less than usual. The excess money that the consumer pays and the exporter loses goes to the importing government. To avoid the tariff and the subsequent increased prices, the consumer looks towards

domestic businesses that produce goods which can increase national production and further decrease demand for imports. It is important to note that as tariffs increase, the quantity of imports also decreases and so do consumer costs. This may be useful for promoting national business but can also lead to a depressed economy due to increased consumer prices. Additionally, increasing tariffs beyond a point may decrease the amount of revenue that the importing government gains as excessively high tariffs can significantly reduce imported goods purchased by consumers, lowering import volumes and leaving the government with less to tax.

These possibilities were clearly illustrated during the implementation of the 2018 U.S. tariffs under President Trump, which offered key insights into the real-world impact of such measures for large trade partners. In response, countries such as China, the European Union, Mexico, Russia, and Turkey raised their tariffs on the US, averaging about 16% on roughly $121 billion of US exports, commencing a global trade war [8]. The impacts were immediate with a major decrease in employment rates. China's retaliation tariffs alone resulted in 87,000 jobs lost within the US [10]. Examining the impact of these tariffs on trade, Mary Amiti, Stephen J. Redding, and David E. Weinstein found that by November 2018, tariffs had rerouted roughly $13.8 billion in monthly trade, $2.4 billion in exports and $11.4 billion in imports, equaling to about $165 billion annually [12]. Furthermore, estimates suggest that input and output tariffs together increased U.S. manufacturing prices by 1%, about half the average inflation rate of just over 2% between 1990 and 2019 [8]. Additionally, in 2019, U.S. exports and imports declined compared to 2018, but both stayed above their five-year averages. In 2019, U.S. exports fell to $1.6 trillion, down 1.4% or $22.5 billion from the previous year, while imports declined 1.6% (about $40.2 billion) to $2.5 trillion [14]. Research shows that U.S. tariffs significantly impacted trade and firm performance. A 1% increase in a firm's import price corresponded with an average 4.16% decline in U.S. imports. This price hike also disrupted global trade, reducing both international exports and overall trade volumes. At the firm level, each 1% rise in the tariff-inclusive import price was linked to an average 0.83% decrease in total U.S. imports and a 0.63% drop in overall sales. Additionally, profit margins reduced by 0.35% for every 1% increase in import costs. Companies sampled in the study by Yang Jiao, Zhikuo Liu, Zhiwei Tian, and Xiaxin Wang faced an average profit margin of –6%. Among the companies, 72.7% of managers were unable to reduce prices due to already thin margins, and 21.1% were constrained by contractual commitments [11]. Moreover, studies show that even with the sharp rise in U.S. tariffs, the base prices of imported goods stayed nearly constant. This pattern exemplifies that the tariff-induced price increases were borne entirely by American consumers. The increased cost of imports gave native producers more pricing power which led to them increasing prices. The tariffs cost American consumers and companies a total of $4.6 billion per month [8]. Additionally, the U.S. economy experienced reduction in the availability of imported goods, and the tariffs directly increased prices for consumers and companies did not absorb much of the cost. The cumulative deadweight loss from the 2018 U.S. tariffs, measured as the reduction in real income, was about $8.2 billion. An additional $14 billion was paid by domestic consumers and importers in tariff revenues that went to the government [8].

III. RELATED WORKS

One study by Giesecke, J. A., & Waschik, R. [15] on the topic regards the tariffs during March and April. According to the study, the retaliation from other countries will lead the US economy to decline in all aspects except for employment rates. It predicts that employment rates in the US will initially decline by about 2.5% but by 2040, they are expected to recover. Conversely, capital stock is expected to decrease by 2.54% by 2040 for the US. Another study [16] found that the increased trade tension from US and China trade war will result in decreased GDP growth globally. These tariffs are also predicted to result in the US losing 1.2 trillion dollars of trade by 2030 [17]. Another prediction is that if both the US and China add a 10% tariff relative to December 2019 rates, China will suffer a 0.5% GDP contraction and 1.5% in welfare losses because of the reduced export demand and increased import prices in the US. The US is expected to face smaller losses with a 0.2% GDP contraction and 0.3% welfare loss but vital sectors like agriculture face significant challenges. Even though other sectors of the US economy will benefit due to reduced competition, higher consumer prices and disruption in trade flows will result in net loss. The changing trade flows will benefit countries like Mexico and Vietnam as trade is expected to shift into those countries due to decreased US tariffs compared to China [18].

The tariffs on Canada and Mexico will hurt cause major decline in their GDP but will benefit the US and China. This effect is furthered should Canada and Mexico retaliate with their own increased tariffs on the US. The US benefits from these tariffs due to improved terms of trade being established to minimize the impact of the tariffs on Canada and Mexico. The 10% global tariff is predicted to lead to the largest losses for Canada and Mexico in welfare with an expected decrease of 9.4% and 6% respectively and the US and China experiencing welfare losses of about 0.5%. This global tariff will also lead to the most benefit for Vietnam due to changing trade routes [18].

IV. METHODOLOGY

To successfully use machine learning to evaluate impacts of the 2025 tariffs, it is crucial to gather reliable data. Hence, this paper uses world trade from the hs dataset on US Census. The dataset includes 7 columns that are indexed using the year and month of trade. Additionally, the dataset also includes the country code and country name for the countries that are exporting to the US. The values in the dataset are the dutiable value of the imports for

consumption (DUT_VAL_MO), the calculated duty for consumption (CAL_DUT_MO), and the cost to transport the goods from the exporting nation to the US (CON_CHA_MO). The country name column also provides aggregate values for groups and regions like the European Union, the World, the Pacific Rim, etc. To clean the data, the country code column is dropped as it provides no relevance for model predictions or indexing. The ad valorem tariff for each country/region per month as a percentage is calculated as the calculated duty on the consumption imports divided by the dutiable value multiplied by 100. The models used to train and predict based on the data are regression models and neural networks. These are trained with a random forest-based approach to predict either the cost of transporting the goods, the calculated duty, and the dutiable value of the goods. The models will be created for China, Canada, Mexico, Japan, Germany, the European Union, and the World. The reason for using those countries and regions is due to the significant number of US imports they provide. The World is specifically picked to display whether the general US tariffs of 10% on all countries will have a significant impact that can be calculated. However, since the US has trading partners that are very small in comparison to large partners like China, the dataset for the World is filtered to only include countries that have over 1 billion dollars' worth of trade with the US. This shrinking of the dataset allows the model to find more relevant patterns and not be influenced by the significant amount of data for countries that are not large trading partners.

V. RESULTS

The following graphs show the most accurate results from hundreds of trained models and their predictions. In all cases, linear regression remained prevalent in its average accuracy and despite its visible lack of fitting to the data, it provides vital insights into trade relationships. The following graph shows the profit that US makes from different tariffs on China.
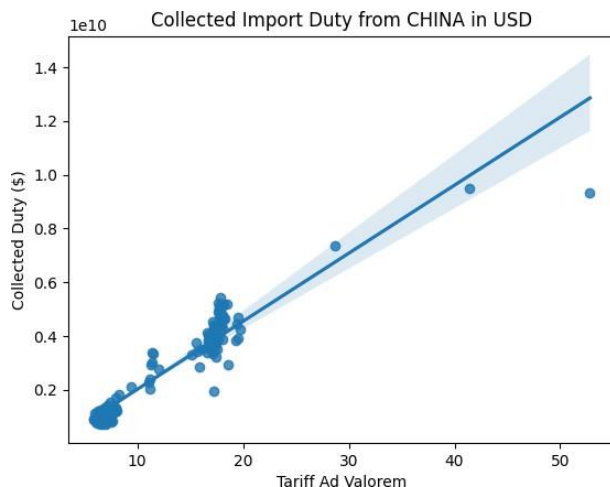

FIGURE 1 ILLUSTRATES THE MODEL PREDICTIONS FOR THE AMOUNT OF REVENUE THE US MAKES FROM ITS TARIFFS ON CHINA.

Although the line of best fit goes through most of the points between a tariff of 0-22%, it does not maintain high accuracy for

the new, higher US tariffs. Specifically, the 2 US tariffs of 41% and 52% result in much lower collected duty than the line predicts. However, the 41% tariff falls within the lighter blue area around the line indicating 95% confidence. This pattern creates the start of a Laffer Curve [19] indicating that somewhere around 41% is where maximum tariff revenue would be collected from China which would be about 10 billion dollars. It is also important to understand that even though the revenue collected by the US is at its maximum around 41%, the US import value might significantly decrease by then which would hurt consumers.
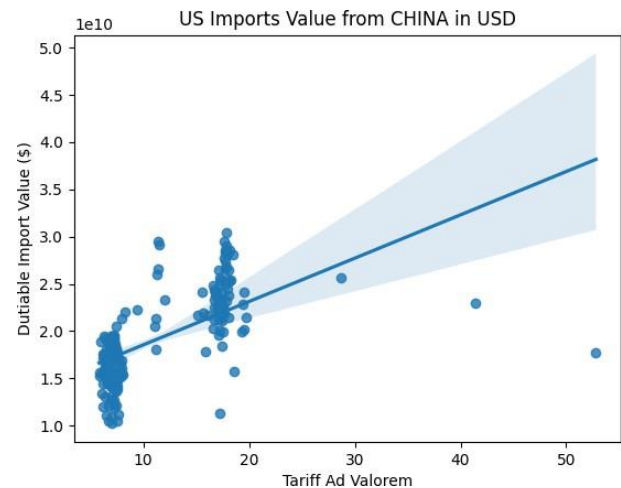

FIGURE 2 ILLUSTRATES THE TOTAL IMPORT VALUE OF THE US FROM CHINA IN RELATION TO THE US TARIFFS.

The US import value from China is very different to their revenue. The Laffer Curve is still seen in the data, however, contradictory to the previous one, a 41% tariff is far too high for maximum imports. Ignoring the noise at tariffs around 12% and 18%, the tariff in March of about 28% resulted in a maximum for import value from China. If the US should prioritize revenue, a tariff of about 41% would remain ideal and would also help grow domestic businesses due to the decrease in imports from China. Under the scenario that the US pushes the tariffs further to grow domestic businesses, the 50% mark provided a relatively high US income from tariffs and decreased the number of imports from China by about 30%. In fact, the 50% tariff mark provides the highest recorded income for the US from tariffs on China whilst having a very major impact of about 30% less imports. Contrasting results are seen when considering the largest US trade partners together.
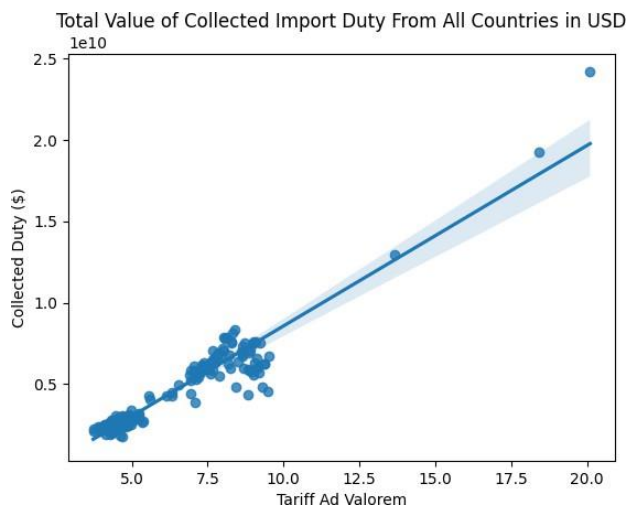
FIGURE 3 ILLUSTRATES THE TOTAL REVENUE OF THE US FROM ALL IMPORTS IN RELATION TO THE US TARIFFS

When the data for all US trade partners is aggregated and the impact of the US tariffs is analyzed, it is evident that overall, the US stands to gain revenue by increasing its tariffs. In fact, the amount of income that the US collects from its tariffs follows a linear relationship where higher tariffs result in higher income. As the tariffs increased, the amount of revenue increased at a faster rate than the line of best fit. Although the US tariffs are seemingly vastly beneficial, there is one factor that is not modeled in this relationship. Companies started stock piling goods once high tariffs were announced which would result in increased imports thus potentially hiding the true impacts that these tariffs will have. This is more visible in the import value of the US from the world.
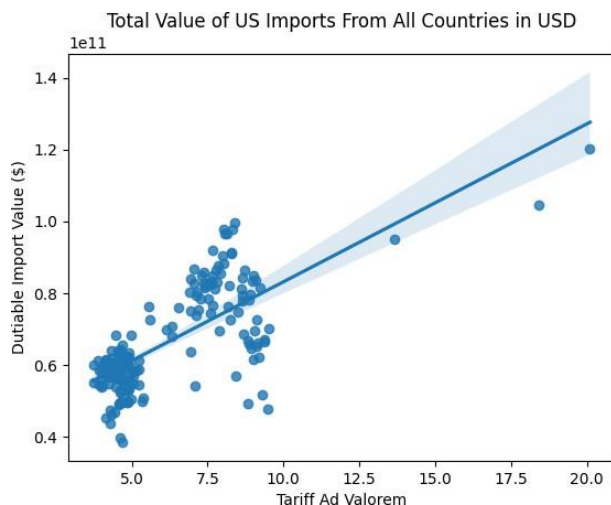

FIGURE 4 ILLUSTRATES THE TOTAL IMPORT VALUE OF THE US FROM THE WORLD IN RELATION TO THE US TARIFFS

The US averages tariffs of around 5-10% globally which results in high import value reaching a maximum of 100 billion dollars. However, when the US increased its global tariff average to around 13.5%, the amount of US imports fell below the

prediction from the line of best fit indicating a future loss in US import value. Yet, it maintained the 95% confidence mark and was nearly as high as ever before. There was a further increase when tariffs reached around 18% on a global average with April 2025 being the highest US import value since 2010. Ignoring the higher tariff of May at 20%, a Laffer Curve is visible. This indicates that the US approached its near maximum import value despite increasing tariffs to 18%. May was a contradictory month because it once again was in the 95% confidence mark for the line of best fit and a new high that did not fit the Laffer Curve. However, as stated before, this could be due to company stock piling and their attempt to import as many goods as possible into the nation before the tariffs got even higher.

Similar patterns were also observed with other large US trading patterns such as the European Union, Canada, Mexico, Japan, and Germany. Since trade with China decreased the most due to the highest US tariffs, the US cannot maintain high tariffs on China without severe consequences. Tariffs of around 20% provided the best US revenue and highest US imports while being sustainable.

VI. CONCLUSION

To conclude, using regression and machine learning to predict the impact of the 2025 US tariffs proved useful. It allowed for more accurate predictions of the impact on US revenue and US import value. Although, it had limited scope and was unable to identify common economic structures such as the Laffer Curve, classical intuition combined with the predictions allowed for a more accurate result. Machine learning is necessary for the future of economic predictions due to its vast capabilities. The ability to train and test countless models was a guiding tool to find areas that required deeper analysis. The accurate predictions of these models provides estimates, patterns, and potentially unexpected results. For example, increased government revenue for the US was not a commonly predicted impact. This can be taken further through LSTM and RNN model training to use data more intuitively and not be limited to just the previous month. This would allow for grasping long-term economic patterns and ideologies that are otherwise absent. The US tariffs provide many beneficial results for the government through increased profit and increased imports with most countries. However, the US will face large consequences from the tariffs on China. These tariffs will most likely benefit countries with large labor or low tariffs from the US such as Vietnam and Mexico. Overall, the US tariffs are expected to be beneficial with all trade partners except China which will create massive repercussions.

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