ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 06,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

FORMULATING OPTIMAL TARIFF AND QUOTA POLICIES FOR ENHANCING EFFICIENCY IN FOREIGN TRADE OPERATIONS

Farrukh Turdikulov
Senior Lecturer, Department of Economics and Tourism,Oriental University

Annotation: The relationship between foreign trade and tariffs is complex, and economists have not reached a full consensus on how they influence each other. This study investigates the issue by analyzing the impact of tariffs on foreign trade in four European economies over the period from 2005 to 2023. To explore these relationships, regression analysis was conducted using the STATA-14 software, employing the Ordinary Least Squares (OLS) method and the Autoregressive Distributed Lag (ARDL) model. The results indicate that all observed relationships are positive.

Keywords: Ordinary Least Squares (OLS) Method, Foreign Trade, Tariff, Import Duties, Autoregressive Distributed Lag (ARDL), Breusch–Godfrey Test, Breusch–Pagan Test

Introduction. Import duties—also referred to as import taxes or tariffs—are taxes imposed primarily by a country's government on goods brought in from abroad. These are collected by the importing country's customs authorities. There are two main reasons why countries implement customs duties:

To increase government revenue, as customs duties constitute an important source of income for many nations;

To protect domestic industries, as making imported goods more expensive can enhance the competitiveness of domestically produced products.

The consistent fulfillment of the profitable part of the state budget largely depends on the completeness and timeliness of customs payments, among which tariffs play a key role. The multifaceted nature of customs duties reflects their interpretation through different academic lenses: they are viewed as part of the non-tax revenues of the budget system, a specific type of customs charge, and as a tool of customs-tariff policy.

Linking collected tariffs to the import value allows for the calculation of applicable tariff rates, taking into account all pricing components and their usage. In many countries, the import of goods from certain nations is restricted through quota regimes, and the customs duty payment procedures may vary depending on the country of origin of the products.

According to preliminary data from the national statistical agency, Uzbekistan's foreign trade turnover reached USD 4.2 billion in January 2024. The top partner countries in terms of trade volume were as follows (in USD):

Country	**Trade Volume (USD million)**	**Share (%)**	**Exports (USD million)**	**Imports (USD million)**
China	1100.0	27.2	185.0	956.0
Russia	767.0	18.3	240.0	526.0
Kazakhstan	271.2	6.5	76.3	194.9
Turkey	213.9	5.1	83.4	130.5
South Korea	180.2	4.3	3.3	176.9
Germany	96.3	2.3	5.5	90.8

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 06,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

Japan	90.3	2.2	1.3	89.0
France	78.3	1.9	66.8	11.5
India	67.6	1.6	3.4	64.2
Czech Republic	64.0	1.5	4.3	59.7

The volume of foreign trade turnover decreased by USD 870.1 million, or 17.2%, compared to the corresponding period of 2023. In January 2024, Uzbekistan conducted trade relations with 137 countries worldwide. During the reporting month, exports amounted to USD 1.1 billion, marking a 47.1% decline, while imports totaled USD 3.1 billion, reflecting a 4.1% increase. As a result, the negative trade balance stood at USD 1.9 billion. [1]

Methodology. The statistical data for this study were obtained from the World Development Indicators (WDI) database maintained by the World Bank. The dataset covers the period 2005–2023 and includes four economically active countries in the Asian region: Turkey, Mexico, Syria, and Greece.

To achieve the objectives outlined above, the primary task was to construct an appropriate econometric model and collect relevant statistical data. The formation of the econometric model necessitated the use of socio-economic indicators as emphasized in the reviewed literature.

Accordingly, the structure of the model, the variables included, their sources, definitions, and the academic references from which they were derived are presented in the following sections.

$$\text{trade}_{it} = \beta_0 + \beta_1 \times \text{tariff}_{it} + u_{it} \qquad (1.1)$$

To begin examining the indicators incorporated into the model, it is important to consider the variable representing the foreign trade activity of a country. For this purpose, data were obtained from the World Bank's World Development Indicators, specifically the number of newly initiated trade operations within a given year for each country.

This indicator is reported in absolute numbers, and its descriptive statistics are presented following the introduction of all model variables. In the STATA software environment, this variable is labeled as "foreign trade" (or simply "trade") to facilitate the ease of command execution and result interpretation.

In the context of the model, foreign trade volume serves as the primary dependent variable.

Table 1. Descriptive Statistics of the Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
tariff	53	2.618	2.145	1.39	14.18

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23

American Academic publishers, volume 05, issue 06,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

trade	71	120.672	104.983	35.369	333.121

The descriptive statistics for the variables included in the model—tariff and trade—are presented to provide an initial understanding of the data distribution and variability.

The tariff variable, representing average import duties (presumably in percentage terms), consists of 53 observations. The mean tariff rate across the sample is 2.618, with a standard deviation of 2.145, indicating a moderate level of dispersion around the mean. The minimum value recorded is 1.39, while the maximum reaches 14.18, suggesting that although most countries or years have relatively low tariff rates, there are a few instances where tariffs are significantly higher.

The trade variable, which serves as the dependent variable in the model and reflects the volume of foreign trade activity, includes 71 observations. The average trade volume is 120.672, with a standard deviation of 104.983, reflecting considerable variation across countries and/or time. The lowest observed trade value is 35.369, while the highest is 333.121, indicating substantial differences in the scale of international trade engagement among the sampled countries.

These statistics suggest both variables exhibit a relatively wide range of values, which is important for the robustness and generalizability of the regression analysis that follows.

Placing greater emphasis on the descriptive statistics of the key variables, it is essential to examine the distribution pattern of the datasets and assess the degree to which they approximate a normal distribution. To achieve this, it is advisable to construct histograms of the variables using STATA software and compare them with the corresponding normal distribution curves. This graphical comparison provides useful insights into the statistical properties of the variables and their suitability for further econometric analysis.

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23

American Academic publishers, volume 05, issue 06,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

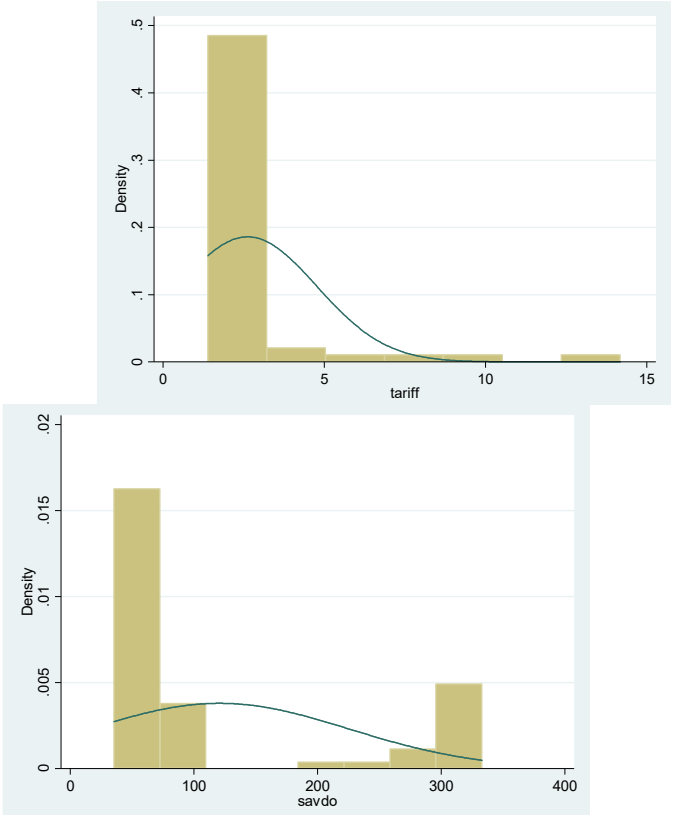

Figure 1. Distribution of Tariff Activity IndicatorFigure 2. Distribution of Trade Activity Indicator

Figure 1 illustrates the distribution of the tariff activity indicator, along with a normal distribution curve constructed based on its arithmetic mean and standard deviation. As observed from the graph, the tariff data closely follow a normal distribution.

In Figure 2, the distribution and corresponding normal curve pertain to the trade activity indicator. Unlike the first figure, this graph indicates that the primary dependent variable does not exhibit a normal distribution.

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23

American Academic publishers, volume 05, issue 06,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

To gain an initial understanding of the direction and strength of the relationship between these two key economic indicators, Figure 3 has been constructed.

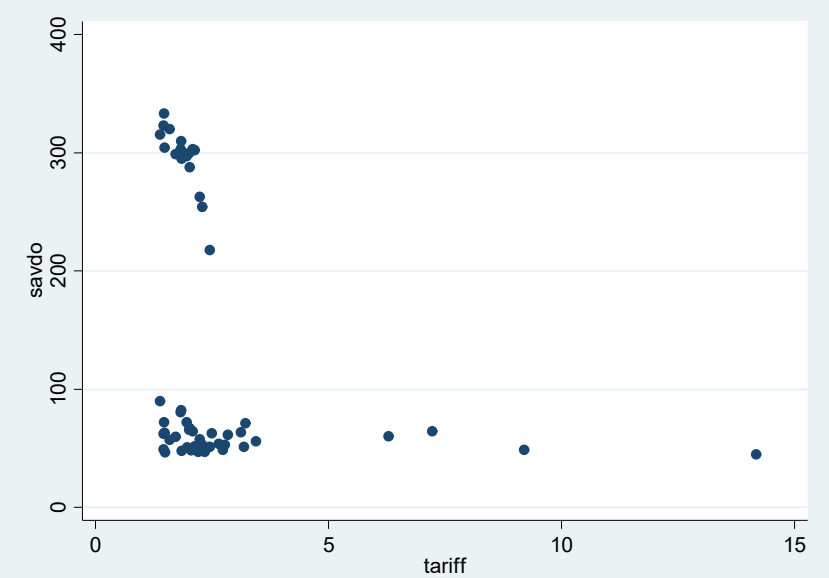

Figure 3. Relationship Between Trade Activity and Tariff Coverage

As can be observed from this scatterplot, there appears to be no clear relationship between the two economic indicators. To explore this further and assess the strength of their association, the correlation results are presented in Table 2.

Table 2. Correlation Coefficient Matrix

Variables	(1)	(2)
(1) trade	1.000	
(2) tariff	-0.267	1.000

According to the correlation results, the coefficients indicate a weak negative relationship between the variables. Taking these characteristics into account, the primary objective of this study is to determine the interdependence between the examined economic indicators using a regression model.

To achieve this, calculations were carried out in STATA 14 software using the Ordinary Least Squares (OLS) method. The results of this analysis and their interpretation are presented in the following section.

Results. To investigate the relationship between foreign trade and customs tariffs, the Ordinary Least Squares (OLS) method was employed. The analysis begins with the estimation of model parameters under this method. Further examination involves verifying the econometric model against the Gauss–Markov assumptions to ensure the reliability and consistency of the estimators.

In this regard, the model is tested for potential econometric violations—specifically:

Heteroskedasticity is tested using the Breusch–Pagan test;

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 06,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

Autocorrelation is examined using the Breusch–Godfrey test.
These diagnostic checks help validate the robustness of the regression model.

Table 3. OLS Linear Regression Results

trade	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
tariff	-14.059	7.109	-1.98	.053	-28.331	.213	*
Constant	171.507	23.97	7.16	0	123.387	219.628	***

Mean dependent var	134.701	SD dependent var	113.005
R-squared	0.071	Number of obs	53
F-test	3.911	Prob > F	0.053
Akaike crit. (AIC)	650.590	Bayesian crit. (BIC)	654.530

*** p<.01, ** p<.05, * p<.1

When discussing the results of the conducted regression analysis, it is appropriate to begin with the interpretation of the initial regression estimates, which are presented in Table 3. The results indicate that a one-unit increase in trade volume leads to a decrease of approximately 14.059 units in tariff levels. The associated p-value is 0.053, which implies that the effect of tariffs on foreign trade is statistically significant at the 10% level. This finding suggests a negative and weakly significant relationship between trade activity and tariff rates within the observed sample.

Table 4. Breusch–Pagan Heteroskedasticity Test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of savdo
chi2(1) = 2.06
Prob > chi2 = 0.1509

According to the results of the Breusch–Pagan heteroskedasticity test, the model is free from heteroskedasticity issues. This implies that the variance of the error terms is constant, and the model satisfies the assumption of homoskedasticity.

Table 5. Breusch–Godfrey Autocorrelation Test

Number of gaps in sample: 13	df	Prob>Chi2
Breusch-Godfrey LM test for autocorrelation		

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 06,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

chi2		
27.683	1	0.000

H0: no serial correlation

The results of the Breusch–Godfrey test reveal the presence of autocorrelation within the model. This suggests that the error terms are correlated with each other, meaning that one error may influence another. Such issues are common in datasets with time series characteristics. To correct this issue, the model is re-estimated using an Autoregressive Distributed Lag (ARDL) approach.

Table 6. Autoregressive Distributed Lag (ARDL) Model

savdo	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
tariff	.241	.745	0.32	.748	-1.259	1.74	
L	1.009	.015	69.49	0	.98	1.038	***
Constant	1.476	3.498	0.42	.675	-5.561	8.513	

Mean dependent var	136.490	SD dependent var	114.478
R-squared	0.991	Number of obs	50
F-test	2622.769	Prob > F	0.000
Akaike crit. (AIC)	384.727	Bayesian crit. (BIC)	390.463

*** p<.01, ** p<.05, * p<.1

To address the problem of autocorrelation, the lag of the dependent variable was included in the model, transforming it into an ARDL specification. The results of this modified model are presented in Table 6. According to the estimates, a 1% increase in import tariffs leads to a 0.24% increase in the share of foreign trade in GDP. Moreover, the Breusch–Godfrey test results confirm that the autocorrelation issue has been successfully resolved in the ARDL model.

Number of gaps in sample:	df	Prob>Chi2
Breusch-Godfrey LM test for autocorrelation chi2		
0.083	1	0.773

Bryush-Godfri testi natijalariga ko’ra avtokorrellatsiya muammosi bartaraf etildi.

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 06,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

Conclusion. This study investigates the impact of tariff rates on foreign trade across four countries of the European region over the period 2005–2023. The analysis was conducted using Ordinary Least Squares (OLS) and Autoregressive Distributed Lag (ARDL) models within the STATA 14 environment. The results indicate that the relationships are statistically significant and positive.

These findings suggest that customs duties do have an influence on foreign trade, but contrary to traditional expectations, the impact is not negative. The positive relationship implies that an increase in tariffs is associated with an increase in the foreign trade-to-GDP ratio. This counterintuitive result may initially raise concerns about data or model specification. However, it is important to note that the trade indicator used in this study reflects the sum of a country's exports and imports as a percentage of GDP.

An increase in tariff rates may reduce imports, but it may also encourage the development of domestic industries and the substitution of imports with locally produced goods. Strengthened domestic production, in turn, may boost exports, resulting in an overall increase in the share of foreign trade in GDP. To validate this hypothesis, it would be necessary to collect and analyze the separate shares of exports and imports in GDP for each country in the sample.

References:

1. daryo.uz
2. https://www.lifesciencesite.com.
3. Fuli, J., (2022). An Appraisal of Complexities in Customs Duties and Taxes on Imported Goods in Cameroon. International Journal of Managerial Studies and Research. ISSN 2349-0330 (Print) & ISSN 2349-0349 (Online). http://dx.doi.org/10.20431/2349-0349.1010002
4. https://onlinelibrary.wiley.com.
5. Chan, A.K.K., (2006). P.R.C. VAT and Customs Rules On Import-Export Transactions. Tax Analysts.
6. https://www.proquest.com.
7. Grainger, A., (2013). TRADE AND CUSTOMS PROCEDURES: THE
8. COMPLIANCE COSTS FOR UK MEAT IMPORTS. Nottingham University Business School
9. https://www.worldbank.org