

# The Impact of Trade Openness on Economic Growth: The Case of Ukraine



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**Abstract** The first quarter of the XXIst century is characterized by globalization and liberalization trends. For the development of mankind, they are manifested in change, economic, civic and political structures. Today, due to these trends, the economies of the world unite and form a single economic, information space on a global (planetary) scale. Globalization and liberalization are integral attributes of modern development. They help to remove barriers to trade, communication, capital movements, and so on. This is already an objective reality that is difficult to assess and improve; it is an objective process that is conditioned by the development of new types of products, new technologies, means of communication, transport, information, etc. And just in such modern conditions of world economic development countries become more and more open to mutual exchange, and become more and more dependent on each other.

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Therefore, in terms of economic growth the questions of influence of openness of economy of our state taking into account world globalization tendencies on economic growth remain actual. This topical research, based on empirical modeling, provides a further conception about the assessment of variables in the constructed model and in the time of Granger's causal relationships in foreign trade openness and economic growth. It is proved that exports have the greatest impact on economic growth. Outpacing of growth rate of imports of goods and services over exports leads to an increase of negative balance of foreign trade, as well as a faster growth of imports of goods and services than exports. The growth of the share of imports in relation to GDP is a negative factor, exacerbated by the imbalance compared to the share of exports in GDP and causes an increase of the share of negative trade balance to GDP. Domestic loans of the financial sector are of great importance for economic growth in current terms of national economic development. Thus, the openness of the economy is directly related with economic growth.

**Keywords** Open economy · Foreign trade · Real GDP · Domestic credit · Empirical modeling · Globalization · Liberalization

## 1 Introduction

The process of Ukraine's integration into the world community requires a research of the influence of open trade on the country's economy. The openness of the national economy is associated with the relations that determine the conditions for expansion and the limits of the economic system in the development of international cooperation. The openness of the country's economy, despite its complexity and ambiguity, is mostly considered from the point of view of influence of foreign trade and foreign investments on the economic development of the state.

The purpose of the research is to identify the influence of trade openness on the national economy in the context of globalization of economic development. Based on this goal, the tasks are to research the economic growth of the national economy and identify the impact of indicators of an open economy on it.

An open economy is an economy in which the direction of development is determined by global development trends in the context of globalization, internationalization, the importance of foreign economic relations is growing, and foreign trade turnover reaches the level at which it begins to stimulate overall economic growth. The openness of the national economy plays a significant role in reviving rates of economic growth. Parameters (criteria, indicators) of the level of openness remain a very controversial issue in modern economic science.

Theoretical and applied aspects of openness have been revealed in the works of both foreign and domestic scientists. The impact of trade openness on economic growth remains debatable. Especially for developing countries, such an impact can lead to a decline in economic growth [1].

The relationship between foreign trade and economic growth was researched in the study by Stancheva-Gigov, which showed that open trade is a key component of economic growth at the presence of human capital, investments, institutional quality, education, appropriate level of corruption, population growth rates and government spendings [2]. Such relationship between these determinants is evident. In her research, on the example of an economically developed country, Adeola argues that foreign trade is an economic force of the state, exports and imports are economically beneficial [3]. Such elements as government support, infrastructure, quality of labor, quality of life determine the impact of economic openness on its economic growth. Although international trade contributes to economic growth and global efficiency, it can lead to difficulties for local companies due to the presence of foreign producers.

Daniel Workman in his researches argues that exports, especially export of services, form an increasingly important engine of international trade [4].

The openness of the economy and its relationship with foreign trade has been researched by domestic specialists such as Mazaraki and others in the monograph "Foreign Trade of Ukraine: XXI Century". Foreign trade occupies an important place in the development of Ukraine's economy, and is one of the main components of foreign economic relations of the state [5]. Given the effective usage of comparative advantages, openness is a factor of economic development, which allows to use advanced world technologies and financial resources [6]. From the structure and volume of foreign trade largely depends the possibility of growth of the national economy in general and the well-being of each subject of the economic system in particular [7].

Thus, the research of economic openness through foreign trade in the context of further development of globalization and liberalization tendencies is of great importance. Ukraine has a huge export potential and prospects for economic growth [8–10]. That is why the authors of this article prove the relevance and necessity of empirical research for further economic growth of the national economy.

The relationship between the openness of the national economy and economic growth is based on econometric modeling using the E-Views program.

## 2 Materials and Methods

This article examines the impact of trade openness on Ukraine's economic growth. Given the use of tools, the usage of E-Views software is relevant to the tasks. Due to this software product, the following tasks can be solved: to analyze scientific information, to model the impact of the most important factors on economic growth, to forecast trends of further economic growth.

A multifactor regression model was built and the hypothesis on the impact of trade openness on economic growth was tested:

$$Y = f(F_1, F_2, \dots, F_n), \quad (1)$$

where,  $F_n$ —various influencing factors.

The formation of set of factors influencing on economic growth was carried out on the basis of following principles:

- information accessibility, which means the use of official data (State Statistics Service, Ministry of Finance, National Bank of Ukraine);
- representativeness, which means the inclusion into the analysis of the most significant and influential indicators on economic growth;
- multiplier, which means that an increase of each factor leads to economic growth. The principle shows the dependence of economic growth from the growth of selected factors for analysis.

The model includes 16 observations, statistics data for analysis were taken and calculated for the period 2005–2020 (Table 1).

The dependent variable of the empirical model is economic growth, which is represented by real gross domestic product (RGDP). The most important independent variables are open trade and financial development. Openness of trade is determined

**Table 1** Some indicators of openness of Ukraine economy

Year	Million, USD					% in real GDP	
	Export of goods	Import of goods	Export of services	Import of services	Real GDP	Share of total exports and imports (FT)	Share of domestic loans of financial sector (L)
2005	34,228.4	36,136.3	6443.2	2941.8	27,986.6	110.9	38.9
2006	38,368.0	45,038.6	7791.8	3730.6	48,560.4	97.4	49.8
2007	49,296.1	60,618	9435.1	4995.5	84,528.1	102.7	69.8
2008	66,967.3	85,535.3	12,260.1	6481.5	139,357.2	117.5	95.6
2009	39,695.7	45,433.1	10,129.7	5186.4	92,836.1	93.1	86.0
2010	51,405.2	60,742.2	12,324.2	5467.2	92,346.3	108.6	77.2
2011	68,394.2	82,608.2	11,936.3	5421.6	99,365.4	119.3	70.4
2012	68,830.4	84,717.6	14,180.3	6214.2	101,702.1	106.9	62.5
2013	63,320.7	76,986.8	14,096.2	6650.1	114,752.9	90.6	64.6
2014	53,901.7	54,428.7	14,233.2	7523	85,866.3	113.3	74.7
2015	38,127.1	37,516.4	11,520.8	6373.1	46,253.4	138.8	68.6
2016	36,361.7	39,249.8	9736.6	5523	39,101.6	114.1	49.1
2017	43,264.7	49,607.2	9868	5326.5	38,225.1	117.5	41.6
2018	47,335	57,187.6	10,714.3	5476.1	39,452.6	106.5	34.8
2019	50,054.6	60,800.2	15,618.3	6945.5	37,602.9	93.8	26.4
2020	49,212.9	54,091.3	11,167.0	5209.2	35,180.8	84.5	24.8

Source compiled and calculated by the authors on the basis [15–17]

by the ratio of exports and imports to GDP; financial development is determined by the ratio of domestic loans of the financial sector to GDP. Independent variables are taken into account on the basis of past empirical researches [1, 11–14].

The empirical model is given below:

$$RGDP_t = C(1) * FT_t + C(2) * I_t + C(3) * L_t + C(4)\varepsilon_t \quad (2)$$

where,

- RGDP real gross domestic product;
- FT percentage of foreign trade in real GDP;
- L percentage of domestic loans of financial sector in real GDP;
- C regression coefficients (unknown parameters);
- $\varepsilon$  random variable;
- t time, period.

In the empirical model the results of multifactor regression of real GDP growth were analyzed, the presence of autocorrelation of the first and second orders were checked, heteroskedasticity and quality as a linear equation were tested out. The model studied the causal relationships between selected variables and real GDP, analyzed characteristics of model's variables.

Analysis of Table 1 showed that the percentage of foreign trade in real GDP over the period is in average between 90 and 110%. At the same time, the periods 2007–2008, 2010–2012, 2014–2018 have the highest indicators exceeding 100%; the last two years have been characterized by a decline in this indicator and negative trends in the country's foreign trade. The share of domestic loans of the financial sector has declined significantly over the past ten years, reaching the low level of 25%, which is a negative trend for the development of national businesses.

### 3 Empirical Result and Discussion

We use the multifactor regression method to identify the link between economic growth and open trade. A correlation matrix was constructed on the basis of multifactor regression (Table 2).

The correlation matrix allows to establish the relationship between the selected variables. Based on the matrix data, we have a positive relationship: a strong relationship between the share of domestic loans of the financial sector and real GDP, the correlation coefficient is 84.4%, and a positive weak relationship with a correlation coefficient of 1% between the share of total foreign trade and real GDP. The relationship between the variables is within acceptable limits, which indicates the absence of multicollinearity. It can be assumed that favorable domestic lending is more attractive for economic growth in Ukraine.

The results of the assessment of possible influence of trade openness on economic growth within selected time periods are given in Table 3.

**Table 2** Correlation matrix of selected variables

	RGDP	FT	L
RGDP	1	0.0103	0.8443
FT	0.0103	1	0.3302
L	0.8443	0.3302	1

*Source* authors' development

This table represents a correlation matrix that explains the relationship between selected variables and shows their influence on real GDP. Matrix constructed by us confirms the success of the model

**Table 3** The results of multi-factor regression of RGDP

Method: least squares	Sample		Included observations: 16	
	2005	2020		
Variable	Coefficient	Std. error	t-statistic	Prob.
FT	-773.2520	342.4528	-2.257981	0.0418
L	1548.593	218.9299	7.073466	0.0000
C	62,629.85	34,932.86	1.792864	0.0963
R-squared	0.793784	Mean dependent var.		70,194.86
Adjusted R-squared	0.762058	S.D. dependent var.		34,748.39
S.E. of regression	16,950.01	Akaike info criterion		22.48129
Sum squared resid	3.73E+09	Schwarz criterion		22.62615
Log likelihood	-176.8503	Hannan-Quinn criter		22.48870
F-statistic	25.02032	Durbin-Watson stat		1.553718
Prob. (F-statistic)	0.000035			

*Source* authors' development

This table shows the results of multi-factor regression using the least squares method and different coefficients, which as a whole prove the significance of the equation

Analysis of results in Table 3 multifactor regression of real GDP growth led to the following conclusions:

- the selected variables are statistically significant, as they are within 10% of the significance level: the share of foreign trade in real GDP is 4%, the share of domestic loans of the financial sector in real GDP is 0%; Constanta, in this case it is also significant (9%);
- with a 1% increase of the share of foreign trade, real GDP decreases by 773 million USD. This means that the openness of foreign trade at this level (in most cases more than 100% of real GDP) does not lead to GDP growth. The most effective factor that influences on real GDP growth is the share of domestic loans of the financial sector. With a 1% increase in the share of domestic loans of financial sector, real GDP will grow by 1548 million USD;

- the value of regression  $R^2$  is 79.4% and shows how selected variables are associated with real GDP growth. Adjusted R is 76.2%. This indicates that there is a strong enough link, as there are other quantitative and qualitative factors that affect real GDP growth;
- the probability of accepting the null hypothesis is close to zero (F-statistic = 0.00), which confirms the alternative hypothesis, which indicates the significance of the equation as a whole. According to Fisher's F-statistics, all coefficients of the regression equation do not simultaneously equal zero;
- information criteria, Akaike, Schwarz, Hannan-Quinn are small, confirming the success of the model;
- using the Durbin-Watson test, we check the equation for the presence of first-order autocorrelation. The value of the DW criterion is in the range from 0 to 4. From Table 3 could be seen that this criterion (DW) is 1.5537. Using Durbin-Watson statistics, we determine the critical points  $d_L$  and  $d_U$ . For the number of observations 16 and 3 variables at a significance level of  $\alpha = 1\%$ ,  $0.737 < DW < 1.232$ ; at the significance level  $\alpha = 5\%$ ,  $0.982 < DW < 1.539$ . In this model, DW means that there is no reason to reject the null hypothesis (there is no autocorrelation of residues).

The presence of second-order autocorrelation is checked using the Breusch-Godfrey test (Table 4).

Analysis of the table of autocorrelation of the highest order have values of Prob. F (2.11) and Prob. Chi-Square (2) 40.9% and 30.1%, respectively. This is the evidence of absence of higher-order autocorrelation. When using the following lags, we also observe the absence of autocorrelation. Therefore, we accept the null hypothesis.

We test this model on heteroskedasticity using tests: White, Harvey, Glejser, ARCH. The results of the tests are shown in Table 5.

The probability of accepting the null hypothesis according to the White tests is in the range from 5 to 10%, which may indicate the presence of heteroscedasticity.

The next test in the model—Ramsey test, shows the sufficient quality of this model and shows the absence of heteroscedasticity (52.7%). The equation is identified and can be linear (Table 6).

We test this model for explanatory ability. We ascertain in this model to what extent it reflects the dynamics of real GDP growth, i.e. we check it on the explanatory ability (Fig. 1).

The graph shows that simulated values (Fitted) fairly accurately reflect the actual values (Actual), therefore, according to the criterion of explanatory power the model is completely acceptable.

The research of causal relationships between selected variables and real GDP is carried out using the Granger test (Table 7).

The criterion for accepting a hypothesis is the value of the probability of accepting the hypothesis. If Prob. is less than 0.05, then the null hypothesis is not accepted. Feedback is checked at the same time. If two coefficients are statistically significant at the same time, the dependence is two-way or with feedback; may mean the existence

**Table 4** Breusch-Godfrey serial correlation LM test

F-statistic	0.969244	Prob. F(2,11)	0.4095	
Obs*R-squared	2.397175	Prob. Chi-square(2)	0.3016	
Dependent variable: RESID				
Method: least squares				
Sample: 2005 2020				
Included observations: 16				
Presample missing value lagged residuals set to zero				
Variable	Coefficient	Std. error	t-statistic	Prob.
FT	123.4989	371.4421	0.332485	0.7458
L	-17.02050	221.4361	-0.076864	0.9401
C	-12,382.48	37,553.23	-0.329731	0.7478
RESID (-1)	0.318602	0.307313	1.036733	0.3221
RESID (-2)	-0.321515	0.286594	-1.121848	0.2858
R-squared	0.149823	Mean dependent var.	-8.92E-12	
Adjusted R-squared	-0.159332	S.D. dependent var.	15,779.60	
S.E. of regression	16,990.25	Akaike info criterion	22.56897	
Sum squared resid	3.18E+09	Schwarz criterion	22.81041	
Log likelihood	-175.5518	Hannan-Quinn criter	22.58134	
F-statistic	0.484622	Durbin-Watson stat	2.062259	
Prob. (F-statistic)	0.747020			

Source: authors' development

This table shows the second-order autocorrelation

**Table 5** Results of Heteroskedasticity Test

Harvey	F-statistic	3.671213	Prob. F(2,13)	0.0545
	Obs*R-squared	5.775065	Prob. Chi-Square(2)	0.0557
Glejser	F-statistic	4.100895	Prob. F(2,13)	0.0416
	Obs*R-squared	6.189507	Prob. Chi-Square(2)	0.0453
ARCH	F-statistic	0.269649	Prob. F(1,13)	0.6123
	Obs*R-squared	0.304811	Prob. Chi-Square(1)	0.5809
White	F-statistic	2.783989	Prob. F(5,10)	0.0790
	Obs*R-squared	9.311021	Prob. Chi-Square(5)	0.0973

Source authors' development

This table shows the presence or absence of heteroskedasticity



**Table 6** Ramsey RESET test

Ramsey RESET test			
Equation: EQ03			
Specification: RGDP FT L C			
Omitted variables: squares of fitted values			
	<b>Value</b>	<b>df</b>	<b>Probability</b>
t-statistic	0.650822	12	0.5274
F-statistic	0.423569	(1, 12)	0.5274
Likelihood ratio	0.555020	1	0.4563
<i>F-test summary</i>			
	<b>Sum of Sq</b>	<b>df</b>	<b>Mean squares</b>
Test SSR	1.27E+08	1	1.27E+08
Restricted SSR	3.73E+09	13	2.87E+08
Unrestricted SSR	3.61E+09	12	3.01E+08
Unrestricted SSR	3.61E+09	12	3.01E+08
<i>LR test summary</i>			
	<b>Value</b>	<b>df</b>	
Restricted LogL	-176.8503	13	
Unrestricted LogL	-176.5728	12	

Source authors' development

This table shows the quality of the model



**Fig. 1** Explanatory ability of the model. Source authors' development

**Table 7** Pairwise granger causality test on all the variables, 2005–2020

	The null hypothesis	Lag 2			Lag 3		Lag 4	
		F-Stat	Prob	Conclusion	F-Stat	Prob	F-Stat	Prob
1	FT does not granger cause RGDP	0.3164	0.7365	Accept	0.1473	0.9277	0.2002	0.9229
	RGDP does not granger cause FT	1.1095	0.3709	Accept	0.8831	0.5011	1.0512	0.5039
2	L does not granger cause RGDP	0.2607	0.7761	Accept	0.2650	0.8484	5.3904	0.0989
	RGDP does not granger cause L	0.3425	0.7188	Accept	0.2935	0.8291	7.4028	0.0659
3	L does not granger cause FT	0.6008	0.5689	Accept	0.5025	0.6944	0.2557	0.8896
	FT does not granger cause L	3.1598	0.0913	Accept	1.6896	0.2674	23.616	0.0133

*Source: authors' development*  
 This table shows the causal relationships

of a third variable, which is the real cause of changes of those two variables that are represented in the equation.

Descriptive characteristics of the variables are given in the following Table 8.

**Table 8** Descriptive characteristics of variables

	RGDP	FT	L
Mean	70,194.86	107.2498	58.43763
Median	66,544.26	107.7464	63.53720
Maximum	139,357.2	138.7918	95.58113
Minimum	27,986.61	84.48186	24.83690
Std. Dev	34,748.39	13.53899	21.17785
Skewness	0.387755	0.367063	-0.071542
Kurtosis	1.871213	3.101170	1.979872
Jarque–Bera	1.250385	0.366118	0.707422
Probability	0.535159	0.832719	0.702078
Sum	1,123,118	1715.997	935.0021
Sum Sq. Dev	1.81E+10	2749.562	6727.519

*Source* authors' development  
 This table shows the main characteristics of the selected variables

The largest standard deviation has real GDP, that confirms the influence of external and internal factors on this indicator.

Characterizing the forms of distribution, let's us analyze the coefficients of asymmetry (skewness) and excess (kurtosis). Positive asymmetry coefficients for GDP and foreign trade indicate that in the series of distribution could be values that are higher than the average level (for them the heaviest value is more likely). For the share of domestic loans of the financial sector, in the series of distribution are dominated values lower than the average value (the lowest value is more likely).

The indicator of excess (kurtosis) shows the amplitude of the deviations of variables. If the indicator of excess is greater than 0, then the distribution is acute-vertex and the amplitude is considered significant, if the coefficient of excess is less than zero, the distribution is considered flat-vertex and the amplitude is considered insignificant. The excess of characteristics with a normal distribution is usually in the range from 2 to 4. In our model, all indicators of excess are greater than zero, the distribution is acute-vertex, and are within normal limits. This indicates the compliance of the researched data with the normal distribution law. That is, all the descriptive characteristics of the variables reflect the real GDP with sufficient depth.

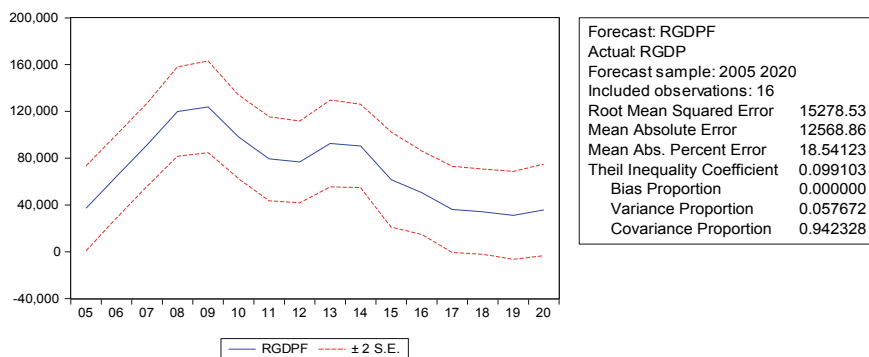
We check the model for predictive quality, the MARE criterion is in the range of 10–20, which indicates the normal quality of this model (Fig. 2).

The general form of the model of the dependence of real GDP from the independent variables can be described by the following equation:

*Substituted Coefficients:*

$$RGDP = -773.252005193 * FT + 1548.59309177 * L + 62629.8549022 \quad (3)$$

The results of the author's model proved its adequacy and high quality.



**Fig. 2** Forecast. *Source* authors' development

## 4 Conclusion

In terms of globalization, more and more countries are liberalizing their economies and are entering foreign markets. International trade has the influence on the national economy, which plays a leading role in the country's economic growth. At the same time, the impact of trade openness on economic growth remains controversial, especially for the group of developing countries.

This research analyzed the relationship between economic openness and foreign trade. The relationship between the openness of the national economy and economic growth was more thoroughly made basing on econometric modeling on the example of a country with transition economy—Ukraine. The choice of factors influencing on economic growth, according to the authors, was based on the principles of information accessibility, representativeness and multiplicity. 16 observations were used to build the model. To independent variables, which according to our opinion are the most important, we included trade openness and financial development. In the empirical model, we analyzed the results of multifactor regression of real GDP growth, tested the presence of autocorrelation of the first and second orders, tested for heteroskedasticity and quality as a linear equation.

This model shows the dependence of real GDP from the foreign trade and domestic loans of the financial sector. The coefficients of the equation show the influence of each factor on the resultant indicator with the constancy of other indicators. In foreign trade of Ukraine import is dominated, so an increase in foreign trade under such conditions by 1% leads to a decrease in real GDP by 773 million USD. To eliminate/reduce this value, it is necessary to promote export-oriented sectors of economy. A 1% increase in domestic loans of the financial sector (under normal conditions) contributes to GDP growth of 1548 million USD.

Therefore, by using programs of support and crediting of the real sector of the economy, as well as export-oriented industries in an open economy of Ukraine, we will have economic growth, which will have a positive impact on all economic entities in the country.

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