JPB REVIEW
INTERNATIONAL JOURNAL OF PROFESSIONAL BUSINESS REVIEW
ISSN: 2525-3654
OPEN ACCESS

EXAMINING THE RELATIONSHIP BETWEEN TRADE OPENNESS AND ECONOMIC GROWTH IN ALGERIA USING SELF-REGRESSION OF DISTRIBUTED SLOWDOWN PERIODS (ARDL) DURING THE PERIOD 1980-2022

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ARTICLE INFO

Article history:

Received: Jul, 12th 2024

Accepted: Sep, 13th 2024

Keywords:

Algeria;
ARDL;
Trade Openness;
Economic Growth.

ABSTRACT

Objective: This research paper aims to try to measure the impact of trade openness on economic growth in Algeria during the period 1980-2022, and in order to achieve the objectives of the study, the standard approach was used through the use of the autoregressive model for distributed slowdown periods (ARDL) As for the study data, it was obtained from the World Bank Group of Statistics 2024.

Theoretical Framework: The study relies on an attempt to familiarize himself with the various theoretical literature that analyzed the relationship between foreign trade liberalization and economic growth theoretically, in addition to trying to highlight previous applied studies that examined the relationship between these two variables, which we divided into studies that denied and studies that proved a relationship between economic growth and foreign trade liberalization.

Method: the research is devoted to studying the relationship between economic growth and trade openness in Algeria during the period 2000-2022 in order to assert the type of relationship between the two variables.

Result and discussion: The results of the study revealed a positive impact of trade openness on economic growth represented by GDP, in addition to the existence of a long-term equilibrium relationship between the variables of the study.

Research Implication: The study of the subject of trade openness as a mechanism to achieve economic growth aims to understand the mechanisms of economic growth associated with the liberalization of foreign trade, analyze the effects of openness on the volume of trade exchange, exports and imports, and identify the factors affecting the achievement of economic growth through trade liberalization. As for Algeria the liberalization of foreign trade can drive economic development, improve the livelihood of the population, raise levels of economic performance and improve the quality of domestic goods that are forced to compete with sophisticated foreign goods.

Originality/Value: This study analyzes the economic effects of foreign trade liberalization on economic growth in Algeria while trying to separate the results of previous studies applied to the Algerian economy on the nature of the actual relationship between these two variables.

Doi: https://doi.org/10.26668/businessreview/2024.v9i10.5028

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EXAME DA RELAÇÃO ENTRE A ABERTURA COMERCIAL E O CRESCIMENTO ECONÔMICO NA ARGÉLIA USANDO A AUTORREGRESSÃO DE PERÍODOS DE DESACELERAÇÃO DISTRIBUÍDOS (ARDL) DURANTE O PERÍODO DE 1980 A 2022

RESUMO

Objetivo: Este trabalho de pesquisa tem como objetivo tentar medir o impacto da abertura comercial sobre o crescimento econômico na Argélia durante o período de 1980 a 2022 e, para atingir os objetivos do estudo, foi utilizada a abordagem padrão por meio do uso do modelo autorregressivo para períodos de desaceleração distribuídos (ARDL).

Quadro Teórico: O estudo se baseia na tentativa de se familiarizar com as várias literaturas teóricas que analisaram teoricamente a relação entre a liberalização do comércio exterior e o crescimento econômico, além de tentar destacar estudos aplicados anteriores que examinaram a relação entre essas duas variáveis, que dividimos em estudos que negaram e estudos que comprovaram uma relação entre o crescimento econômico e a liberalização do comércio exterior.

Método: A pesquisa se dedica a estudar a relação entre o crescimento econômico e a abertura comercial na Argélia durante o período de 2000 a 2022, a fim de afirmar o tipo de relação entre as duas variáveis.

Resultados e Discussão: Os resultados do estudo revelaram um impacto positivo da abertura comercial sobre o crescimento econômico representado pelo PIB, além da existência de uma relação de equilíbrio de longo prazo entre as variáveis do estudo.

Implicações para a Pesquisa: O estudo do tema da abertura comercial como um mecanismo para alcançar o crescimento econômico tem como objetivo compreender os mecanismos de crescimento econômico associados à liberalização do comércio exterior, analisar os efeitos da abertura sobre o volume de trocas comerciais, exportações e importações e identificar os fatores que afetam a obtenção do crescimento econômico por meio da liberalização do comércio. No caso da Argélia, a liberalização do comércio exterior pode impulsionar o desenvolvimento econômico, melhorar a subsistência da população, elevar os níveis de desempenho econômico e melhorar a qualidade dos produtos nacionais que são forçados a competir com produtos estrangeiros sofisticados.

Originalidade/Valor: Este estudo analisa os efeitos econômicos da liberalização do comércio exterior sobre o crescimento econômico na Argélia, tentando separar os resultados de estudos anteriores aplicados à economia argelina sobre a natureza da relação real entre essas duas variáveis.

Palavras-chave: Argélia, ARDL, Abertura Comercial, Crescimento Econômico.

EXAMEN DE LA RELACIÓN ENTRE APERTURA COMERCIAL Y CRECIMIENTO ECONÓMICO EN ARGELIA MEDIANTE AUTORREGRESIÓN DE PERIODOS DE DESACELERACIÓN DISTRIBUIDOS (ARDL) DURANTE EL PERIODO 1980-2022

RESUMEN

Objetivo: Este trabajo de investigación tiene como objetivo tratar de medir el impacto de la apertura comercial sobre el crecimiento económico en Argelia durante el período 1980-2022, y para lograr los objetivos del estudio, se utilizó el enfoque estándar mediante el uso del modelo autorregresivo de períodos de desaceleración distribuida (ARDL) En cuanto a los datos de estudio, se obtuvieron del Grupo de Estadísticas del Banco Mundial 2024.

Marco Teórico: El estudio se basa en un intento de familiarizarse con la diversa literatura teórica que analizó teóricamente la relación entre la liberalización del comercio exterior y el crecimiento económico, además de tratar de destacar los estudios aplicados anteriores que examinaron la relación entre estas dos variables, que dividimos en estudios que negaron y estudios que probaron una relación entre el crecimiento económico y la liberalización del comercio exterior.

Método: La investigación se dedica a estudiar la relación entre el crecimiento económico y la apertura comercial en Argelia durante el periodo 2000-2022 con el fin de afirmar el tipo de relación entre ambas variables.

Resultado y discusión: Los resultados del estudio revelaron un impacto positivo de la apertura comercial sobre el crecimiento económico representado por el PIB, además de la existencia de una relación de equilibrio a largo plazo entre las variables del estudio.

Implicación de la Investigación: El estudio del tema de la apertura comercial como mecanismo para lograr el crecimiento económico tiene como objetivo comprender los mecanismos de crecimiento económico asociados a la liberalización del comercio exterior, analizar los efectos de la apertura sobre el volumen de intercambio comercial, las exportaciones y las importaciones, e identificar los factores que afectan a la consecución del crecimiento económico a través de la liberalización del comercio. En cuanto a Argelia, la liberalización del comercio exterior puede impulsar el desarrollo económico, mejorar los medios de subsistencia de la población, elevar los niveles de rendimiento económico y mejorar la calidad de los productos nacionales que se ven obligados a competir con productos extranjeros sofisticados.

Originalidad/Valor: Este estudio analiza los efectos económicos de la liberalización del comercio exterior sobre el crecimiento económico en Argelia, al tiempo que intenta separar los resultados de estudios anteriores aplicados a la economía argelina sobre la naturaleza de la relación real entre estas dos variables.

Palabras clave: Argelia, ARDL, Apertura Comercial, Crecimiento Económico.

1 INTRODUCTION

Trade openness is one of the most important factors promoting economic growth, as it constitutes a basic basis for the development of national economies and the promotion of investment and innovation opportunities. Economic growth through trade openness is based on several principles and mechanisms. First, liberalization contributes to increasing the volume of foreign trade and expanding export markets, thereby boosting production and creating new jobs. Second, liberalization promotes competition, stimulates innovation, and improves product quality and cost, enhancing the competitiveness of the national economy at the global level. Third, liberalization provides new investment opportunities and foreign capital flows, contributing to the development of infrastructure and enhancing the country's competitiveness.

However, the potential challenges of trade openness must also be considered. Liberalization may have temporary negative effects on some traditional economic sectors and unskilled labor. In addition, openness can cause increased dependence on imported goods and services, affecting a country's trade balance and ability to meet its basic needs.

Trade openness is also a vital topic in economic debates, with studies and opinions varying on its role in economic growth. There are those who see it as an effective mechanism to promote economic growth, while others oppose it and emphasize their reservations and their potential negative effects.

On the part of proponents, support for trade openness for economic growth is attributed to several factors. First, expanding markets and increasing the volume of foreign trade is an opportunity for companies to reach new consumers and expand their operations. Second, foreign trade can boost an economy's productivity by stimulating competition and sharing technologies and knowledge. Finally, it contributes to the development of the economy and reduces dependence on specific economic sectors.

However, there are also reservations and inconsistencies in studies on trade openness. Some studies suggest that trade openness can exacerbate social justice and income disparities between different social groups. Trade openness may also cause damage to some fragile

national sectors and loss of local jobs. There are also concerns about enhanced reliability on imported goods and the effects of exchange rate volatility.

Historically, Algeria has had an economic sector mainly linked to oil and natural gas, resulting in a high dependence on the energy sector. However, Algeria has been exposed to new economic challenges in recent years, such as low oil and gas prices and the effects of the Covid-19 pandemic, which prompted decision-makers to consider other alternatives as a mechanism to advance the national economy, hence trade openness emerges as one of the most important development strategies in the country.

Based on the above, our study seeks to decide on the nature of the impact that openness causes on economic growth, and from here the problem of the study can be raised: **What is the impact of trade openness on economic growth in Algeria during the period 1980-2022?**

Our research proceeds from the premise that the high index of openness to the outside world led to a high growth rate in Algeria.

2 THEORETICAL LITERATURE

First, we must recognize the importance of foreign trade theories in global economic life. When we talk about openness, we refer to the exchange of goods and services between countries, and this process is one of the main factors for economic growth and prosperity. Understanding foreign trade theories helps us analyze and interpret this international exchange and understand the factors that affect it. Therefore, we will present the most important theories affecting the field of foreign trade.

(If a foreign country can supply us with a cheaper commodity if we make it ourselves, it will consist of better buying it from that country. We focus on producing and selling the goods we produce with high efficiency) (Gean Pierre, 1995, p. 136)

Adam Smith, a British classical economist, supports the view that international trade promotes economic growth by taking advantage of the advantages it can bring by engaging in international trade. Its name is associated with the theory of international trade, which relies on the concept of absolute expenditure as the basis for the emergence of international trade. According to Smith, the state, just as individuals should, specialize in producing goods that it has at absolute advantage and at a lower cost, and be able to offer them on the international market at competitive prices. This capacity varies based on differences in

natural resources, geographical conditions, technology, and human skills of the parties to the exchange, and therefore costs vary.

Smith considers that international trade mainly serves to explain the surplus of domestic production and overcome the tightness of the domestic market. By integrating into international trade, the country can benefit from specialization and the international division of labor, which leads to increased productivity and improved efficiency. This specialization has a significant impact on small and private industries that meet the needs and desires of a limited category of individuals, where the number of workers is small and they work as a team to produce a specific commodity. In this way, international trade leads to the expansion of the scope of production and the promotion of economic growth by benefiting from the advantages achieved by the state through international trade exchange. These benefits are reflected in the national economy by increasing productivity and providing more economic opportunities and development (Adam, 2000, p. 9).

In his book The Wealth of Nations, published in 1776, Adam Smith offered many criticisms about the source of wealth for mercantiles, pointing out that the primary source of wealth was foreign trade, specifically the precious metal, gold. Through his theory of absolute costs, Smith explained that the division of labor leads to technical development and increased productivity and returns, thus contributing to an increase in wealth. Through his theory of the value of labor, Smith asserted that the value of products is measured by the number of hours of work spent producing them. (Reinhard, 2012, p. 13), he also asserted that labor is the basis of wealth and that the latter is not measured by the state's precious metals but by the capacity for productivity, as foreign trade can increase the rate of capital by increasing the productivity of labor (Alain, 1993, p. 66). Smith pointed to the importance of free international trade in increasing wealth for trading nations, placing productivity as a measure of wealth that can be multiplied through the division of labor. He stressed that the country may have higher efficiency in producing a commodity compared to other countries, and regardless of the difference in efficiency between the two countries, each country can benefit if each of them specializes in producing the commodity more efficiently than the other country.

According to David Ricardo, openness to the outside brings benefits to all countries involved in international trade, whatever their level of development (Bernard & Annie, 2003, p. 5). Ricardo's theory of comparative advantage is considered one of the most important contributions to the field of economics, where Ricardo made a critique of the theory of absolute advantage. Ricardo explained that absolute advantage alone is not enough to explain the trade

exchange between the two countries, but goes beyond that. It was inferred that labor is the main element of the production process, as the value of a product is linked to the amount of work expended in its manufacture. (Centre international de documentation, 2017, p. 10) Foreign trade does not necessarily require that one of the two countries have an absolute advantage in the production of a particular commodity. Trade can take place between two countries even if one of them has an absolute advantage in the production of two goods, if that advantage is greater in one of the two goods (Paul et al., 2012, p. 80). According to David Ricardo, this is trade between two countries with closed economies that produce two different commodities (Méchel, 1999). Although some countries may be less efficient in producing some products than others, we still have an opportunity to establish international exchanges. The first country specializes in producing and exporting a product that has a lower production cost than the second, while buying a product that has a higher production cost.

The Heccher-Olin-Samuelson model is an extension of the theory of comparative advantage in international trade. This model suggests that the main reason behind international trade is the difference in relative costs. The model attributes this difference to the availability of production elements in different proportions and abundance in different countries, and how they are mixed in the production processes of goods.

In light of this difference, countries specialize their production and focus on producing goods where they have a comparative advantage. Based on this model, trade openness encourages specialization and production of goods that depend on the factors of production that are relatively available in countries. (Jean, 1989, p. 78). Heckscher and Olin argue that the reason for international trade is due to different costs between countries, which in turn results from the different abundance of factors of production between countries. Accordingly, the abundance or scarcity of these factors determines prices, and they agree with the law of relative expenditures. For example, if a country had a large abundance of agricultural land, the price of agricultural products would be low for a country that did not have such abundance. Conversely, if States have with a huge abundance of technology and capital, its price will be relatively lower for countries that do not enjoy the same abundance.

The first practical experiment with the factor ratio model belonged to the Russian economist VasilyLeonitev from 1953 to 1956, who conducted an applied study on the United States of America. At the time, it was believed that the United States had a comparative advantage in the capital factor and a relative scarcity of labour compared to the rest of the world (collection, p. 7), and UNITIV and other economists expected the economy to import

labour-intensive goods and to export capital-intensive goods. But in the test results, the exact opposite happened, surprising many economists. This was contrary to the Hecscher-Olin-Olein theorem. Completely (Dominick S., 2008, pp. 168-175). These findings have been known in the literature of economic thought as the UNICEF puzzle, which showed that the difference in the abundance of production elements cannot explain the pattern of foreign trade and for this theory to have great explanatory power it must take into account the technological considerations of the country (Paul et al., 2006, p. 77). The Leonitev study noted that its findings do not constitute a critique of the Hecscher-Oline theory. This is because the US is three times more productive than other countries, and the productivity of the labor component is attributed to skill and advanced education. This mystery sparked a wide controversy in the middle, and led to the division of some thinkers into two currents. The former advocated the demolition of the Hecscher-Olin-model and the other promoted model development through the development of comparative advantage theory and factor theory, and models compatible with global development.

3 APPLIED LITERATURE

The divergence of different opinions and interests is reflected in conflicting studies on the effectiveness of trade openness as a means of achieving economic growth. While some see opening markets and expanding foreign trade as a means to boost growth and prosperity, others question their potential negative effects and emphasize the importance of domestic protection and dependence.

3.1 STUDIES THAT HAVE PROVEN THE IMPACT OF FOREIGN TRADE LIBERALIZATION ON ECONOMIC GROWTH

Previous studies have shown many results suggesting that trade openness can have a positive impact on economic growth. Among these findings, the following can be mentioned:

(Grossman & Helpman, 1991) This study was conducted to explore the impact of the trade system on long-term economic growth, with a focus on the technological channel. The results of the research showed that the foreign trade liberalization policy boosts the country's imports of services and goods containing new technology. For example, technological imports of intermediate goods boost productivity and contribute to increased productivity of labor

elements and total production. The study also notes that foreign trade between R&D-focused countries contributes to the creation of significant opportunities for technological advancement, making production more efficient and increasing overall productivity. Thus, open economies are growing at faster rates than closed economies. The researchers also point out that the opening up of small-scale economies usually leads to specialization in sectors with limited returns, leaving them underdeveloped. Therefore, resorting to protectionist policies at early stages of economic growth is necessary, and gradually shifting to liberalization policies later.

(Dollar & Kray, 2004) This study was conducted on a sample of 24 developed and developing countries from 1970 to 1995 to explore the impact of globalization on inequality and poverty. This paper seeks to shed light on this relationship and examine the effects of trade on poverty in more detail, as the evidence available at the time was limited, a group of developing countries that are most involved in globalization were identified, including China and some other major countries. It was noted that the advocates of globalization witnessed significant increases in the volume of trade and a significant reduction in tariffs during the twenty years over the period in question. The study also noted the effects of trade on poverty, as there was a lack of methodological evidence at the time on the relationship between changes in trade volume and income distribution among poor groups, and the increase in growth rates associated with expanded trade. These highlighted economic growth and changing GDP per capita, as well as the opening up of the economy and its impact on a range of variables such as total exports and imports, investment in GDP, government consumption in GDP, and tariff intensity. Transverse linear regression techniques for OLS and the value of the existing variable were used to estimate the results. The results of the study revealed a catalytic role for trade and institutions in the long term, as well as a significant role for long-term growth rates in the impact of trade in the short term. Trade and institutions are important factors in explaining the differences that occur in poverty levels. A decrease in poverty rates was also observed in developing countries that had adopted policies of globalization and tariff reduction. This research supports the view that open systems and high-quality institutions contribute to accelerating growth and reducing poverty in developing countries.

(Madson, 2009) This study examined the impact of trade openness on economic growth by analyzing a panel dataset of 16 countries in a long period from 1870 to 2006. The hypothesis that trade openness can enable countries to import knowledge produced in other countries has been tested, which is consistent with theories of internal growth. The results showed that the diffusion effect of knowledge through imports positively affects economic growth over the

periods Studied temporality. The study also confirms that the diffusion effect through imports contributes to boosting economic growth positively. In addition, the hypothesis that trade openness affects economic growth by enabling countries to import knowledge produced in exporting countries has been tested and validated over the time periods studied.

(Okuyan et al., 2012) This study aims to examine the relationship between trade openness and economic growth in a sample of developing countries. 17 countries were selected from the 2005 ITI report and were categorized into four groups without relying on stability data, posing a challenge in analyzing economic data over time. Cointegration and causality tests developed by researchers were used to analyze the relationship between trade liberalization and growth Economic. According to the results of the analysis, a co-integration relationship was found in six countries of the sample, and long-term positive coefficients were detected between the variables studied. Causality has also been detected in eight countries, with results indicating that trade openness leads to economic growth in four of them, and vice versa in the other four.

3.2 STUDIES THAT DENIED THE IMPACT OF FOREIGN TRADE LIBERALIZATION ON ECONOMIC GROWTH

Previous studies have raised doubts about the impact of foreign trade liberalization on economic growth. These studies suggest that there are many other factors that influence economic growth more than foreign trade policies, such as investment, innovation and infrastructure. Indeed, these other aspects of economic growth play a crucial role in achieving economic progress:

(Taylor, 1988) Through this paper, Tayler defends the view that trade openness cannot be thought of as the only factor that can lead to economic development. Rather, the historical and institutional context of each country must be considered individually to decide on trade openness. The researcher's main focus is on whether trade is an effective strategy for the development process. The researcher conducted his study on a sample of 50 developing countries from 1980 to 1982, drawing on economic growth rates from 1964 to 1982. Based on the analysis of trade ratios in the studied countries, the researcher reached several important conclusions. Among these conclusions, trade shows no close correlation with countries' economic performance, and that there is no evidence to support the idea that exports contribute to economic growth contrary to previous claims. In addition, no relationship between high exports and high-performance economies has been found ,the ratio of industrial exports to

primary exports has not been linked to growth rates (Taylor, 1988, p. 8), or that less or more open countries with rapid growth levels follow different patterns of specialization, and their success is not clearly dependent solely on exports (Taylor, 1988, p. 10). He points out that the interventionist policies of the South Korean government have been instrumental in boosting productivity, in addition to its long history of manufacturing and its application of strict labor standards. Hence, he assures us that the idea of a positive correlation between foreign trade liberalization and economic growth rates may be difficult to attain and cannot be supported by available evidence (Taylor, 1988, p. 32).

(Grossman & Helpman, 1991) According to the study, there are cases in which trade appears to be useless in promoting economic growth, or not achieving positive results that enhance the development process. For example, in countries with technological backwardness, imports of traditional goods can lead to ignoring technological development and achieving low growth rates. In addition, research has shown that the protection of the local economy by the state can contribute to promoting economic growth, through government intervention that promotes domestic investment using the country's competitive advantages. Also, the researchers found that the quality of commercial goods positively affects production efficiency. When technology is embedded in imported goods, it can increase labour productivity and overall factor productivity. The researchers also pointed out that trade can boost economic growth rates through the exchange of goods between countries with a high level of research and development, providing greater opportunities to keep pace with progress and development, especially in light of the lower costs of innovation compared to tradition.

(Rodrik et al., 2004) In this paper, researchers address the idea that the impact of foreign trade policy on economic growth may be unclear and overlapping with the effects of other policies. Thus, they consider it difficult to measure the impact of trade liberalization separately on economic growth. They noted that previous studies using empirical methods could not individually determine the impact of trade policy on the effects of other policy variables on economic growth. Thus, they see trade as an ineffective variable in economic growth equations, which instead rely on more important institutional characteristics, such as the rule of law, a coherent legal system, property rights, etc.

(Hamad et al., 2014) This study aims to analyze the impact of foreign trade on economic growth in Tanzania, a developing country that adopted a policy of economic liberalization in the eighties. The simple linear model was used to analyze the relationship between GDP and trade openness. Time series covering the period from 1970 to 2010 were used, divided into two periods:

the closed economy period and the open economy period. Least squares were used to estimate the model, and data was collected from the Bank of Tanzania. All variables were converted to the natural logarithm form to improve accuracy. The study found that there is a strong 94% correlation between trade openness and economic growth, with trade liberalization promoting increased trade and thus positively impacting economic growth. Although the period of the closed economy was characterized by government intervention and limited foreign investment, trade still had an important impact in this period. In the period of the open economy, trade openness has also had a positive impact on economic growth, despite Tanzania's trade deficit due to imports outpacing exports. This is due to the export of low-value primary commodities and the import of manufactured goods, which is the main factor behind these results.

4 STANDARD STUDY

This part of the research is devoted to studying the relationship between economic growth and trade openness in Algeria during the period 2000-2023 in order to assert the type of relationship between the two variables.

4.1 DATA AND METHODOLOGY

In this study, we will use the ARDL methodology developed by Pesaran 1997, Shinand and Sun 1998 and Pesaran et al. 2001 as this test does not require that the time series be integrated of the same degree. Pesaran argues that the boundary test under ARDL can be applied regardless of the characteristics of the time series, whether they are stable at the plane, first-order complementary, or a combination of the two. The only condition for the application of this test is that the time series are not integrated in the second order (2) and the Pesaran method has better characteristics in the case of short time series compared to other methods typical of the cointegration test such as the Granger-Engel 1987 two-stage method and the joint integration test in terms of Durben Watson, or the Johansen Cointegration Test under the VAR model (Dahmani & Nassour, 2013).

The long-term relationship is estimated according to the following equation (Bin Suleiman & Noi Taha, 2018, p. 41):

$$\Delta Y_t = c + B_1 Y_{t-1} + B_2 X_{1t-1} + B_3 X_{2t-1} + \ldots\ldots + B_{k+1} X_{kt-1} + \mu_t \qquad (1)$$

As for the short-term parameters

$$\Delta Y_t = \sum_{i=1}^{p-1} \lambda_{1i}\, \Delta Y_{t-i} + \sum_{i=0}^{q_1-1} \lambda_{2i}\, \Delta X_{1t-i} + \sum_{i=0}^{q_2-1} \lambda_{3i}\, \Delta X_{2t-i} + \ldots\ldots + \sum_{i=0}^{q_k-1} \lambda_{(k+1)i}\, \Delta X_{kt-i} + \mu_t \qquad (2)$$

As for the variables of the study, we used both the data of economic growth GDP, trade openness OP and foreign direct investment (INV) obtained from reports (World Bank, 2024).

4.2 TESTING ITS STABILITY AND TIME SERIES

There are several ways to test the root of the unit, the most important of which is the Augmented dickey fuller test, which we will use to examine the series. We say that the time series is stable if the fluctuation around the arithmetic mean is constant independent of time, but if the data is in a state of rise or fall and depends on a time trend, the time series is unstable, and this leads to a false correlation between the variables.

Table 1

Unit root testing of model variables series using the ADF test

UNIT ROOT TEST TABLE (ADF)

At Level				
		GDP	OPEN	INV
With Constant	t-Statistic	-3.9075	-2.2608	-2.6967
	Prob.	***0.0053***	***0.1902***	***0.0856***
		***	n0	*
With Constant & Trend	t-Statistic	-3.8421	-1.8732	-2.4750
	Prob.	***0.0270***	***0.6448***	***0.3373***
		**	n0	n0
Without Constant & Trend	t-Statistic	-1.2615	0.2134	-1.5062
	Prob.	***0.1861***	***0.7417***	***0.1216***
		n0	n0	n0
At First Difference				
		d(GDP)	d(OPEN)	d(INV)
With Constant	t-Statistic	-9.1411	-5.8099	-5.6480
	Prob.	***0.0000***	***0.0000***	***0.0001***
		***	***	***
With Constant & Trend	t-Statistic	-9.0192	-5.7709	-5.9534
	Prob.	***0.0000***	***0.0003***	***0.0002***
		***	***	***
Without Constant & Trend	t-Statistic	-9.2636	-5.9025	-5.7524
	Prob.	***0.0000***	***0.0000***	***0.0000***
		***	***	***

Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant
*MacKinnon (1996) one-sided p-values.

Source: EViews 12 outputs

It is clear from Table 1 that the results of the ADF test proved that all variables are unstable at the level because the p-values are greater than the critical value at the level of 5%.

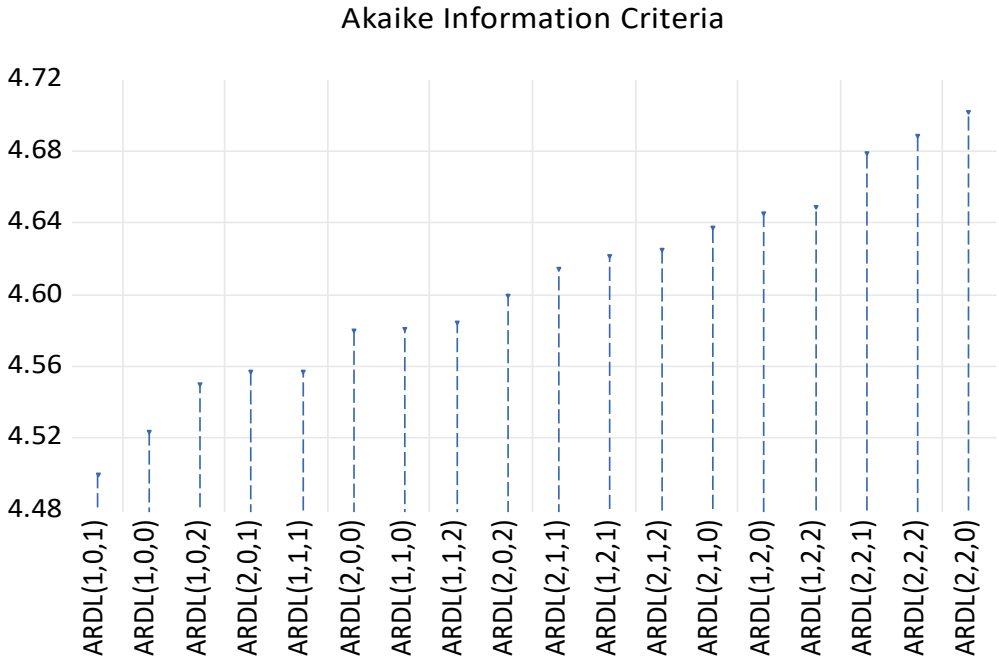
At the first difference, all p-values are less than 5%, i.e. the variables are stable in the first difference at a significant level of 5% and we say that they are integrated in the first degree I (1). This allows us to use **the ARDL** methodology.

4.3 SELECTION OF THE OPTIMAL SLOWDOWN PERIOD FOR CHANGES IN ARDL ESTIMATION

We use the bounds test to detect the existence of co-integration between variables in the long and short term, so that we can estimate these relationships simultaneously using the ARDL model. But before that, the degree of delays must be determined based on several criteria (AIC, BIC, SC, HQ).) This is in order to cancel the self-link to the error limit where we will choose the lowest value and the following figure shows the degree of delay of the optimal tricks of the AIC standard:

Figure 1

Testing of optimal delay degrees according to the AIC standard



Source: EViews 12 outputs

The results indicate that the ARDL (1.0.1) model was taken on the basis of the largest value for the corrected coefficient of determination criterion and the lowest value for the rest of the criteria values, and the limits will be tested from this model.

4.4 COINTEGRATION TESTING THROUGH ARDL BOUNDS TESTS

To detect a long-term equilibrium relationship between variables we will use the boundary test by comparing the calculated Fisher statistical value of the slow-down explanatory variables coefficients for one period with the tabular critical value.

Table 2

ARDL Bounds Test

Null hypothesis: No levels relationship
Number of cointegrating variables: 2
Trend type: Unrest. constant (Case 3)
Sample size: 32

Test Statistic	Value
F-statistic	6.411705
t-statistic	-4.363978

	10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
			F-Statistic			
30	3.437	4.470	4.267	5.473	6.183	7.873
35	3.393	4.410	4.183	5.333	6.140	7.607
Asymptotic	3.170	4.140	3.790	4.850	5.150	6.360
			t-Statistic			
Asymptotic	-2.570	-3.210	-2.860	-3.530	-3.430	-4.100

* I(0) and I(1) are respectively the stationary and non-stationary bounds.

Source: EViews 12 outputs

Through the table, we note that the calculated Fisher value of 6.41 is greater than the maximum critical values of the bound test at the level of morality 5%, meaning that we reject the null hypothesis and accept the alternative hypothesis that there is a long-term equilibrium relationship between trade openness and economic growth, and the calculated student value of -4.36 is greater than the critical values at the level of morality 5%., meaning that the relationship between the variable is real and not false.

4.5 ESTIMATION OF THE MODEL ACCORDING TO THE AUTOREGRESSIVE APPROACH TO SLOWED DISTRIBUTED TIME GAPS

After confirming the existence of an integration relationship within the bound test between (GDP), (OP) and (INV), we measured the long-term relationship within the framework of the ARDL model using Eviews 12 The model was estimated according to the criterion

(Akiaki info criterion AIC) with the following sluggish values (ARDL (1.0.1) and the features of the model are shown in the long term as shown in the following table:

Table 3

Estimation of the model according to the autoregressive approach to slowed distributed time gaps

Dependent Variable: D(GDP)
Method: ARDL

Sample: 1991 2022
Included observations: 32
Dependent lags: 2 (Automatic)
Automatic-lag linear regressors (2 max. lags): INV OPEN
Deterministics: Unrestricted constant and no trend (Case 3)
Model selection method: Akaike info criterion (AIC)
Number of models evaluated: 18
Selected model: ARDL(1,0,1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)*	-0.820592	0.188038	-4.363978	0.0002
INV**	0.334470	0.908175	0.368288	0.7155
OPEN(-1)	0.091413	0.068603	1.332492	0.1938
D(OPEN)	0.187065	0.090419	2.068859	0.0483
C	-2.985971	3.011466	-0.991534	0.3302

R-squared	0.459700	Mean dependent var	0.075000
Adjusted R-squared	0.379655	S.D. dependent var	2.801152
S.E. of regression	2.206243	Akaike info criterion	4.563060
Sum squared resid	131.4227	Schwarz criterion	4.792081
Log likelihood	-68.00896	Hannan-Quinn criter.	4.638974
F-statistic	5.743049	Durbin-Watson stat	1.977400
Prob(F-statistic)	0.001771		

* p-values are incompatible with t-bounds distribution.
** Zero-lag variable.

Source: Eviews 12 outputs

Through the table, it appears that the value of the error correction parameter COINTEQ* has reached -0.082, which is negative and significant, and therefore we confirm the existence of a long-term equilibrium relationship between the study variables represented in economic growth and foreign trade liberalization, where the speed of error correction reached 1.21 = (1/0.82) for a year, meaning 0.82 of the deviations in economic growth during the previous period from its equilibrium value in the long term is corrected every year. We also note a positive relationship between the liberalization of foreign trade represented by the trade openness index and the economic growth index represented by the GDP index, meaning that the rise in the trade openness index by one unit leads to a rise in economic growth by 18%.

4.6 ESTIMATION OF ERROR CORRECTION FORMULA (ECM) FOR SLOWED DISTRIBUTED TIME GAP SELF-REGRESSION MODEL (ARDL))

The error correction vector model (CointEq (-1), which measures the speed of adaptation of short-term imbalances to long-term equilibrium, was applied to estimate the economic relationships between the variables under study, and the following table shows the results:

Table 4

ECM (short-term) error correction model estimates

Dependent Variable: D(GDP)
Method: ARDL

Sample: 1991 2022
Included observations: 32
Dependent lags: 2 (Automatic)
Automatic-lag linear regressors (2 max. lags): INV OPEN
Deterministics: Unrestricted constant and no trend (Case 3)
Model selection method: Akaike info criterion (AIC)
Number of models evaluated: 18
Selected model: ARDL(1,0,1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.820592	0.180536	-4.545320	0.0001
D(OPEN)	0.187065	0.080534	2.322806	0.0274
C	-2.985971	0.757283	-3.943007	0.0005

R-squared	0.459700	Mean dependent var	0.075000
Adjusted R-squared	0.422437	S.D. dependent var	2.801152
S.E. of regression	2.128806	Akaike info criterion	4.438060
Sum squared resid	131.4227	Schwarz criterion	4.575473
Log likelihood	-68.00896	Hannan-Quinn criter.	4.483608
F-statistic	12.33692	Durbin-Watson stat	1.977400
Prob(F-statistic)	0.000133		

* p-values are incompatible with t-Bounds distribution.

Source: Eviews 12 outputs

From the table above, it is clear that there is a short-term dynamic relationship between the study variables, as the error limit coefficient sign is negative (-0.82). Its significance is at 1%, meaning that the error correction mechanism in the model needs about one year and two months to return to equilibrium in the long term.

4.7 STANDARD TESTS

The following standard tests show us the suitability of the model used and ensure that it is free of problems, which are as follows:

4.7.1 Correlation test (LM)

The correlation test shows us that the model is free of the problem of autocorrelation of errors as the value of P-value is greater than the level of significance 5% and the results in the following table show us that the model is free of the problem of serial correlation since the value of P-value 0.74 is greater than the level of significance 5%.

Table 5

Correlation test (LM)

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.299039	Prob. F(2,25)	0.7441
Obs*R-squared	0.747654	Prob. Chi-Square(2)	0.6881

Source: Eviews 12 outputs

4.7.2 Homoskedasticity test

Which shows that the model is free of the problem of instability of variance, considering that the value of P-value is greater than the level of significance 5%, and the results are shown to us in the following table:

Table 6

Homoskedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.823830	Prob. F(4,27)	0.1533
Obs*R-squared	6.807058	Prob. Chi-Square(4)	0.1464
Scaled explained SS	5.752000	Prob. Chi-Square(4)	0.2185

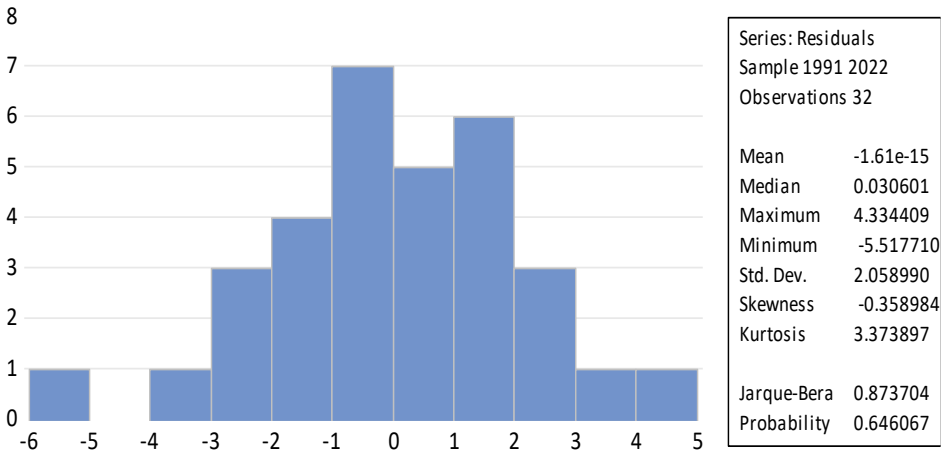
Source: Eviews 12 outputs

4.7.3 JB normal distribution moderation test

The table and the following figure show the test of the normal distribution of the remainder so that all variables indicate that they follow the normal distribution according to the JB test, which shows that the p-value estimated at 0.64 is greater than 5%, and therefore we accept the hypothesis of the normal distribution of the residues

Figure 2

Test of normal residue distribution



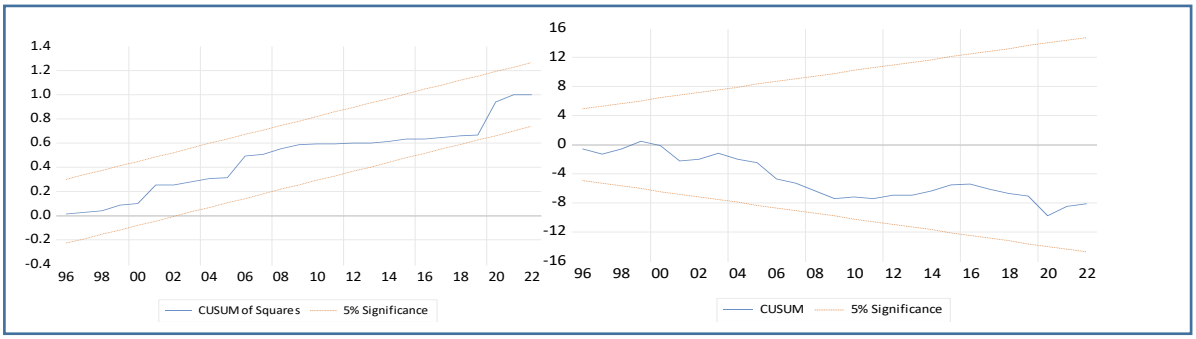
Source: eviews 12 outputs

4.7.4 Model stability test

In order to ensure that the data used in this study is free of any structural changes in it, it is necessary to use one of the appropriate tests for that, such as: the cumulative sum of residuals (CUSUM) as well as the cumulative sum of the squares of residual squares (CUSUM of squares) and these two tests are one of the most important tests in this field because it clarifies two important things, namely showing the existence of any structural change in the data, and the stability and harmony of long-term parameters with short-term parameters. The structural stability of the estimated coefficients of the error correction formula of the autoregressive model of the distributed time gaps is achieved if the graph of the CUSUM and CUSUM of squares tests falls within the critical limits of 5% and therefore we did these tests proposed by Brown, Dublin and Evans 1975.

Figure 3

Cusum test and Cusum of squares test



Source: EViews 12 outputs

The above two diagrams show us the stability of the model and the suitability of the linear formula of the data at the level of significance 5%, which indicates that there is no effect of shocks that reduce the quality of the model

5 CONCLUSION

The policy of liberalizing foreign trade has become an urgent necessity that imposes itself at the present time, both for developing and developed countries, by enabling them to discharge their surplus products to the markets of developing countries on the one hand and by benefiting developing countries from the equipment, technology, expertise and hard currencies they need on the other hand, which enables them to enhance levels of economic growth and raise the welfare of peoples. After studying the asymmetric impact of foreign trade liberalization on economic growth in Algeria during the period(2022-1980)

We came up with a set of **results** that can be presented as follows:

- the results of the bounds test proved a long-term equilibrium relationship between the study variables;
- the results showed a positive significant effect of positive trade openness on economic growth in Algeria in the short and long term;
- and finally, the results of the standard analysis proved that the structural stability of the model coefficients was achieved in the short and long-term using the (CUSUM) test and the (CUSUM of squares) test, and the model does not suffer from standard problems.

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