

Impact of Some Macroeconomic Variables on the Volume of Foreign Trade in Algeria during the Period 2000–2023, with a Focus on the Period of the Coronavirus Pandemic -EVALUATION STUDY

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KEYWORDS

macroeconomic variables, volume of foreign trade, COVID-19, exports and imports, foreign trade.

ABSTRACT

This study uses structural equation modelling (Smart PLS 4) to measure the impact of some macroeconomic variables (oil barrel price, global oil demand, government spending, inflation, incoming foreign direct investment and gross domestic product) on the volume of Algeria's foreign trade (exports, imports and trade balance) during the study period (2000–2023), with a focus on the period of the pandemic.

The study concluded that the examined variables had a direct positive effect on the formation of Algeria's foreign trade volume during the study period. The most significant of these was the fluctuation in global oil prices, which is considered the main driving force behind exports and imports in Algeria. Furthermore, the study found that the impact of the pandemic on the volume of foreign trade was direct and negative, and indirect through the variables (inflation, government spending, gross domestic product, foreign direct investment, and oil barrel price). ..

1. INTRODUCTION

Successive global economic crises culminated in the global health crisis of March 2020, which had the most significant repercussions for the global economy and international trade relations. This crisis affected both major and emerging economies, including the Algerian economy. Since liberalising foreign trade in 1990, Algeria has been influenced by global crises due to its reliance on oil revenues, the price of which is affected by rapid international events. This factor, along with exchange rates, incoming foreign direct investment, government spending, inflation, adopted trade policies, gross domestic product, the institutional framework, the digitisation of ports, economic diplomacy, and the global financial crisis of 2008, the global oil crisis of 2014 and, most recently, the global health crisis (Covid-19) in 2020, has contributed to the development of Algeria's foreign trade (oil exports) during the period from 2000 to 2023. This study will measure the extent to which these factors impacted Algeria's foreign trade during this period, with a focus on the impact of the global health crisis (Covid-19) in 2020. The study will examine how these factors affected Algeria's foreign trade through exports, imports, and the trade balance.

Based on the above, the main issue that the study aims to address is as follows:

What impact did these five factors have on the volume of Algeria's foreign trade from 2000 to 2023, particularly during the period of the global health crisis (2020)?

To answer the main research issue, we formulated the following sub-questions:

- Is there a statistically significant effect at the level of significance of the studied macroeconomic variables on the volume of Algeria's foreign trade?
- Is there a direct statistically significant effect at the level of significance of COVID-19 on the volume of Algeria's foreign trade?

Is there an indirect, statistically significant effect of the level of significance of the moderating variable, 'Covid-19', on the relationship between the studied macroeconomic variables and the volume of Algeria's foreign trade?

To address these issues, the following hypotheses will be tested

- There is a statistically significant effect ($\alpha \leq 0.05$) of the studied macroeconomic variables on the volume of Algeria's foreign trade.

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This research is highly relevant at present due to the profound changes affecting the global economy (economic globalisation). Liberalising trade is considered a fundamental source of economic convergence, enhancing the productive capacities of countries by promoting competition among production factors. Consequently, acquiring modern technologies improves productivity efficiency across various sectors. However, the global economic arena is not a stable or safe environment, and is subject to various kinds of global crisis that affect the economies of major, emerging and even developing countries. Against this backdrop, the present study aims to complement previous research and address a gap in the literature by examining the factors influencing the development of foreign trade over different time periods, with a specific focus on Algeria. This will be achieved by analysing and measuring certain macroeconomic variables during the pre- and pandemic periods, with the timeframe specified as 2000–2023.

The study relied on an inductive approach, employing several tools, including:

Description: Through which we realistically describe the phenomenon.

- Analysis: Analysing and interpreting forms and tables.

- Comparison: comparing events before and during the crisis to identify differences and variations.

Measurement: Using the latest trend in economic analysis, which relies on modelling with structural equation methodology with the help of the SMART PLS 4 programme. This includes providing a quantitative estimate of the values that measure economic relationships and their laws, predicting future behaviour quantitatively, and utilising mathematics and statistics to select hypotheses for policy formulation and decision-making and predict future economic phenomena. This diversity of methods and techniques aims to form an accurate understanding of the research problem.

To address the topic comprehensively, we will analyse a set of previous studies related to the subject under investigation.

One such study is titled:

“The Impact of the Coronavirus Pandemic on Foreign Trade: The Case of Algeria during the Period 2019–2021”.

This study aimed to analyse the impact of the pandemic on global foreign trade, with a focus on Algerian foreign trade during the period 2019–2021. The study employed an analytical deductive approach. The study concluded that accumulated losses had led to changes in global product expenditure and transportation costs. It recommended establishing crisis response cells in Algeria and yielded several results.

A decline in global trade and production in 2020.

- Recovery in global foreign trade starting in 2021.

- An increase in the provision of digital services, including communications, education and healthcare.

- A rise in global shipping prices leading to higher product prices. However, the study did not provide a comprehensive analysis of the factors affecting Algerian foreign trade during the pandemic, instead presenting data on exports and imports without analysing their components.

A study by Boudeif Samia and Dahmani Fatima (2022) titled:

‘The implications of imported inflation fluctuations on domestic inflation in Algeria during 1990–2019’.

This study aimed to understand the relationship between domestic inflation (represented by the relative change in the

consumer price index) and imported inflation (represented by the relative change in import prices), as well as its interaction with real gross domestic product, exchange rates, monetary policy indicators (represented by the broad money supply) and fiscal policies (represented by oil taxation). The analysis utilised the Autoregressive Distributed Lag (ARDL) method. The results showed that all variables were independent of the first difference, except for the real exchange rate, which remained stable. Structural transformations in inflation and imported inflation occurred in 1997 and 2017, respectively. Additionally, the importance of imported inflation in explaining the inflation rate in both the short and long term was revealed, showing a direct relationship between domestic inflation and the money supply and oil taxation, and an inverse relationship between real output and the real exchange rate. The results confirmed that inflationary pressures in Algeria arise from both internal and external factors.

Mohammad Imtiaz Subboni, Amber Osman and Rabia Khotar (2010).

‘Determining Saudi Barriers to Bilateral Trade: A Study on Developing Economies’.

The study highlighted several factors that drive the growth of international trade and reduce trade barriers. A comprehensive empirical investigation was conducted to confirm the reduction in trade and the increase in barriers, both of which are considered to be determinants of trade. The modified gravity model developed in this study analysed the impact of gross domestic product, distance, remittances, foreign direct investment, transportation costs, exchange rates, inflation, population, imports, exports and trade flows. It revealed that population size, import costs, transportation costs, distance, tariffs imposed by trading partners, foreign direct investment and the population of the trading country are significant determinants that greatly affect exports from developing economies. It also confirmed that transportation costs, distance, the population of the trading partner, foreign direct investment for both trading countries and remittances from the trading partner significantly impact the imports of developing countries.

Soonchan Park (2022)

“The Impact of the Coronavirus on Trade in Final Goods and International Inputs”

This paper investigates the impact of the Coronavirus on exports and imports, measuring the severity of the Coronavirus pandemic through mortality rates and deaths per 1,000 people. The research reveals that the mortality rate is an appropriate alternative variable for measuring the severity of the virus and for guiding effective policies. The impact of the virus on demand and supply was explored by distinguishing between trade in final goods and intermediate inputs and imports of final goods. This suggests that the virus encompasses aspects of both demand and consumption supply shocks.

Unlike previous studies, this research examines the impact of the novel coronavirus on the factors influencing Algerian foreign trade, comparing the situation to that in the pre-pandemic period. Using annual data and advanced econometrics, this study is likely to provide more accurate information regarding the impact of the pandemic on Algerian foreign trade through its development factors. Thus, while our study aligns with previous research on the effect of the pandemic on global and local foreign trade, it differs in several aspects. However, it differs in several respects, particularly with regard to the research gap addressed by this study, which includes:

- Linking the research problem to contemporary variables (the data for this study is recent and has been collected from reliable national and international official sources).

Utilising two research approaches in our study:

1. The first is qualitative, also known as descriptive methodology, which pertains to qualitative data. This approach benefited our study through written analyses, descriptive studies and articles, as well as integrating different perspectives to yield results that serve the research and respond to the study’s problem.

2. The second approach is quantitative, focusing on hypotheses and including research variables with scientific definitions. Using this method, we were able to select and measure the relationships between the independent and dependent variables, formulate hypotheses, and apply acquired theories and concepts in practice to clarify the relationships among the variables.

Theoretical Framework of the Study

This section analyses some macroeconomic variables, the evolution of the trade balance during the study period, the development of public expenditure, exports and non-hydrocarbon exports, the evolution of oil prices in global markets and the development of imports and incoming foreign direct investment, to address the factors influencing Algerian foreign trade.

Factors Influencing Algerian Foreign Trade

Foreign trade has been affected by many key factors through import and export activities. These include infrastructure (such as ports), skilled human capital with scientific expertise, science and technology, and innovation capacity (e.g. digitisation of the foreign trade sector and ports, and all related procedures). Additionally, advanced transportation and logistics systems play a crucial role in facilitating foreign trade, particularly when it comes to establishing robust national macroeconomic systems that target exchange rates, tariffs, customs duties, import and export fees, and export subsidies.

These systems are designed to encourage and enhance the multiplier effect of foreign trade, thereby driving economic development. Overall, these factors are essential for the sustainable development of foreign trade.

Analysis of the Impact of Some Economic Variables on Algerian Foreign Trade (2000–2023)

Evolution of the Algerian trade balance between 2000 and 2023

The following table presents some items of the Algerian trade balance for the studied time period.

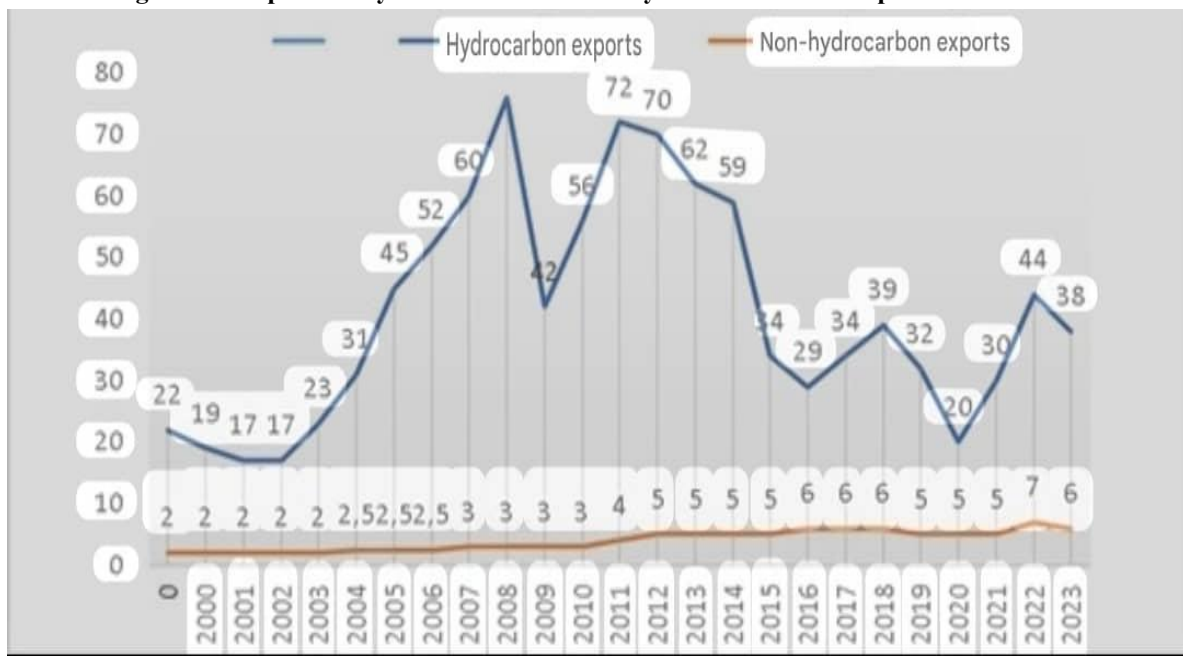
Table (01): Some items of the Algerian trade balance during the period 2000–2023

Years	Fuels exports	Oil price (dollars).	Fuel exports	Total exports	Percentage of fuel exports	Fuel exports as a percentage of total exports	Imports	Trade balance
2000	21,42	28,50	0,61	22,03	97,23	2,77	9,35+	12,30
2001	18,48	24,85	0,65	19,13	96,60	3,40	9,48+	9,61
2002	18,11	25,24	0,61	18,72	96,74	3,26	12,01+	6,70
2003	23,99	29,04	0,47	24,46	98,08	1,92	13,32+	11,14
2004	31,55	38,50	0,66	32,22	97,92	2,05	19,95+	14,47
2005	45,59	54,60	0,74	46,33	98,40	1,60	19,86+	26,47
2006	53,13	65,70	1,13	54,74	97,94	2,06	20,68+	34,06
2007	59,61	74,90	0,98	60,59	98,38	1,62	26,35+	34,23
2008	77,19	99,90	1,40	72,59	98,22	1,78	38,07+	40,52
2009	44,41	62,30	0,77	45,18	98,30	1,70	37,40+	7,78
2010	56,06	80,20	0,97	57,09	98,20	1,70	38,89+	18,20
2011	71,66	112,90	1,23	72,89	98,31	1,69	44,19+	28,47
2012	70,58	111,00	1,15	71,74	98,38	1,60	51,57+	20,17
2013	63,33	109,00	1,05	64,38	98,37	1,63	54,99+	9,38
2014	58,34	100,20	1,69	60,04	97,17	2,81	59,44+	4,59
2015	33,08	53,10	1,48	34,57	95,69	4,28	52,65+	13,17
2016	27,92	45,00	1,39	29,31	95,26	4,74	49,44+	17,06-
2017	33,20	54,10	1,37	34,57	96,04	3,96	48,98+	10,86-
2018	38,90	71,30	2,22	41,11	94,62	5,40	48,57+	5,02-
2019	33,24	64,40	2,07	35,31	94,14	5,86	44,63+	9,32-
2020	20,02	42,10	1,91	21,93	91,29	8,71	35,55+	13,62-
2021	34,068	72,7	4,58	38,64	88,15	11,85	37,47	12,31
2022	43,44	103,7	3,84	47,91	90,67	9,33	22,86	26,77
2023	37,44	82,88	4,48	41,92	89,32	10,68	31,33	10,94

Source: Prepared by the research team based on triennial statistical periods from the Bank of Algeria (Triennial Statistical Bulletins from the Bank of Algeria, 2018–2023).

The following graph illustrates the data from the previous table, presenting the results more clearly and comprehensively.

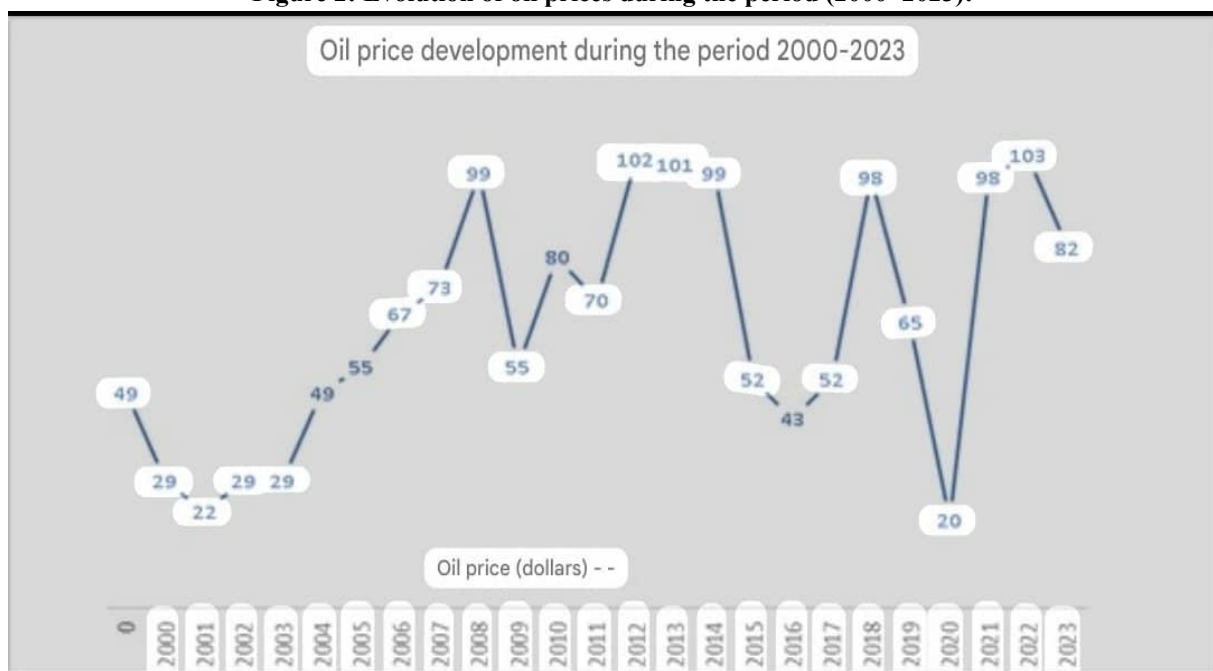
Figure 01: Exports of hydrocarbons and non-hydrocarbons for the period 2000–2023.



Source: prepared by the researcher based on Table 1 above.

Figure 2 presents the evolution of global oil prices during the study period from 2000 to 2023.

Figure 2: Evolution of oil prices during the period (2000–2023):



Source: Prepared based on the data from Table 01.

Our analysis of Figures 1 and 2 shows that Algeria relies heavily on hydrocarbons for its exports. These constituted 97% of exports between 2000 and 2014, coinciding with a rise in oil prices to record levels of around \$120 per barrel between 2011 and 2013. In contrast, the share of non-hydrocarbon exports remained minimal, never exceeding 4% during this period. From 2015 to 2020, there was a slight increase in non-hydrocarbon exports, reaching 8.7% by the end of 2020, thanks to Algeria's policy of promoting non-hydrocarbon exports. However, there was a significant decline due to the deterioration of oil prices in the global market as a result of the repercussions of the global health crisis caused by the SARS-CoV-2 virus on the global economy, and the reduction in global demand for hydrocarbons, particularly from China, the largest global importer of hydrocarbons. The Russia-Ukraine crisis further exacerbated the effects of the health crisis, leading countries to adopt cautious policies involving lockdowns and a focus on securing domestic demand. This resulted in a reluctance to export many goods and commodities in an uncertain international market environment.

Subsequently, Algerian exports of hydrocarbons increased significantly in 2021, reaching \$34.06 billion compared to \$20.02 billion in 2020. The price of oil also increased significantly to \$72.70 per barrel in 2021, up from \$42 per barrel in 2020 at the height of the health crisis caused by the SARS-CoV-2 virus (Covid-19), which was attributed to a decrease in global demand for oil. In 2022, hydrocarbon exports continued to rise, reaching \$43.44 billion at an average price of \$103.70 per barrel — an increase of \$3 per barrel compared to 2021. Conversely, non-hydrocarbon exports remained at the same level as in 2020, valued at \$1.91 billion. These were estimated at \$4.58 billion, \$3.84 billion and \$44.48 billion for the years 2021, 2022 and 2023 respectively.

Figure 3 illustrates the evolution of the Algerian trade balance during the period 2000–2023.

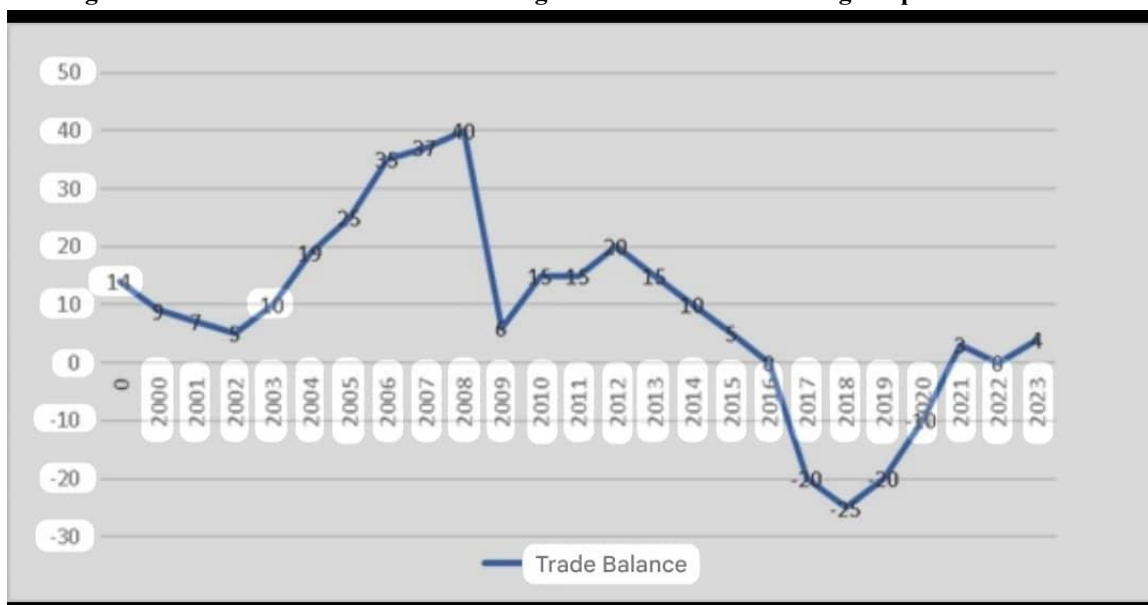


Figure 3: Evolution of the Algerian Trade Balance (2000–2023).

Source: Prepared by the researcher based on data from Table 01.

From the above figure, we can see that, during the period 2000–2014, the trade balance achieved surpluses of varying degrees. This was due to the increase in hydrocarbon revenues, which represented a significant proportion of total exports at 97%. This increase in hydrocarbon revenues was due to the rise in oil prices during this period, which increased substantially from \$28.50 per barrel in 2000 to \$109 per barrel in 2013.

The years 2008–2009 also saw a significant decline in the trade balance, amounting to a deficit of \$7.17 billion. This was due to the repercussions of the global financial crisis (the subprime mortgage crisis), which affected oil prices during this period and consequently impacted the trade balance. It is also notable that the trade balance recorded a clear deficit during the years 2015–2020.

Table (02): Evolution of Algerian Foreign Trade and the Studied Macroeconomic Variables during the Period.

Year	exports	Imports	Foreign Trade	Governme nt agreement	Gross Domestic Product (GDP):	Inflation	Foreign Direct Investment (FDI)
2000	21,65	9,35	31	157K	54,79	0,3	0,5
2001	19,13	9,48	28,61	173K	54,74	4,2	2,0
2002	18,72	12,01	330,73	219K	56,76	1,4	1,9
2003	24,46	13,22	37,78	243K	67,86	4,3	0,9-
2004	32,22	17,95	550,17	260K	85,33	4	1,0
2005	46,33	19,86	66,19	251K	103,20	1,4	1,1
2006	54,74	20,86	75,6	300K	117,03	2,3	1,6
2007	60,59	26,35	86,94	308K	134,98	3,7	1,2
2008	48,59	38,07	116,66	397K	171,00	4,9	1,5
2009	45,18	37,40	82,58	424K	137,21	5,7	2,0
2010	57,09	38,89	95,98	492K	161,21	3,9	1,4
2011	72,89	44,19	117,08	642K	200,01	4,5	1,3
2012	71,74	51,57	123,31	653K	209,06	8,9	0,7
2013	64,8	54,99	119,37	641K	209,76	3,3	0,8
2014	60,04	59,44	119,48	636K	213,81	2,9	0,7
2015	34,57	52,65	87,22	713K	165,98	4,8	0,3-
2016	29,31	49,44	79,29	620K	160,03	6,4	1,0
2017	34,57	48,98	83,55	529K	170,10	5,6	0,7
2018	41,11	48,57	89,86	539K	174,97	4,3	0,8
2019	35,31	44,63	80,56	607K	171,76	2,0	0,8
2020	21,93	35,55	57,48	307K	145,74	2,4	0,8
2021	38,64	37,46	76,1	479K	163,47	7,2	0,5
2022	47,91	22,86	70,77	488K	195	9,3	0,05
2023	41,92	31,33	73,25	497K	200,56	9,1	0,08

Source: World Bank triennial statistical data from the Bank of Algeria (2000–2023).

Figure 04: Curve of Inflation Rate Development: Consumer Price Index and Foreign Direct Investment as a Percentage of GDP for the Period 2000–2023

Inflation (%): Consumer Prices: Foreign Direct Investment (% of GDP):



Source: Prepared by the researcher based on data from Table 2.

From the above, we can see how both exports and imports have evolved alongside macroeconomic variables (2000–2023), which leads us to the following conclusions:

- Exports experienced significant fluctuations throughout the period, declining from \$21.65 billion in 2000 to \$18.72 billion in 2018. This value then increased until 2008, reaching \$78.89 billion. The lowest export value was recorded in 2002 at \$18.72 billion, and the highest in 2008 at \$78.59 billion.

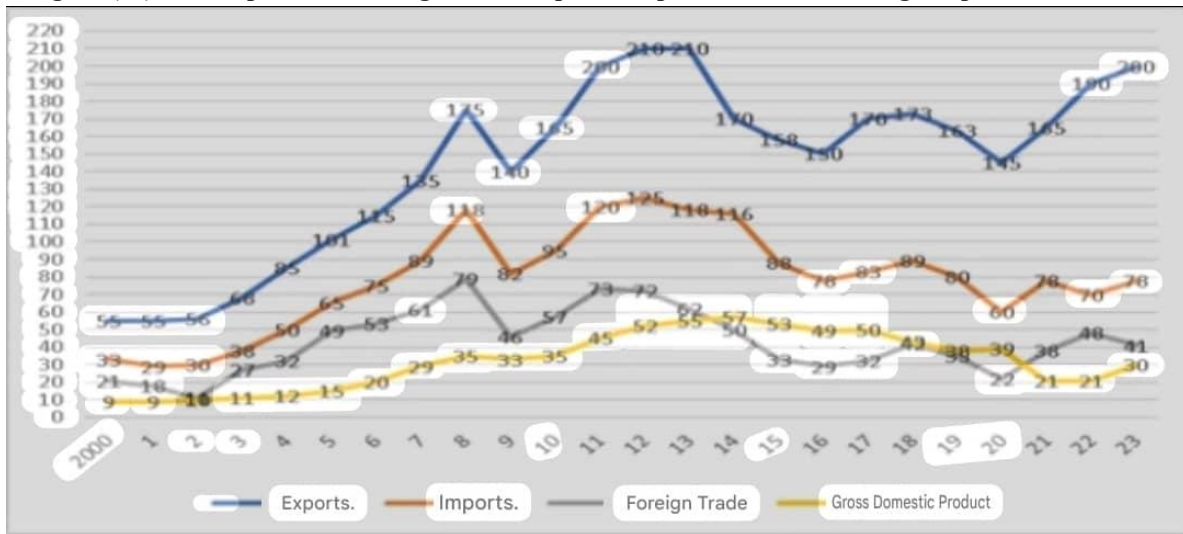
The value of imports showed consistent growth from 2000 to 2014, increasing from \$9.35 billion to \$59.44 billion, before declining continuously after the oil crisis of 2014 and the 2020 health crisis caused by the SARS-CoV-2 virus, alongside the resulting economic conditions.

Examining the trend in foreign trade (exports and imports) reveals fluctuations and instability during this period. Government spending also increased during this period, but declined sharply in 2016, reaching its lowest value at 620 billion dinars compared to 713 billion dinars. This decline continued over the next two years, with spending recorded at 529 billion dinars in 2017 and 539 billion dinars in 2018, before rising slightly to 607 billion dinars in 2019. However, in 2020, government spending dropped by almost 50% to 307 billion dinars due to the health crisis caused by the SARS-CoV-2 virus and the subsequent crash in global oil prices. Public spending stabilised relatively in 2021, 2022 and 2023, settling at 479, 488 and 497 billion dinars respectively.

Throughout the period from 2000 to 2023, there was instability in the inflation rate, with the highest rate recorded at 9.1% in 2023. This rate declined consistently during the years 2014–2019 due to the 2014 oil crisis and the intensification of the global health crisis of the 2019–2020 pandemic, with the inflation rate recorded at 2.9% in 2014 and 2.4% for the years 2019–2020.

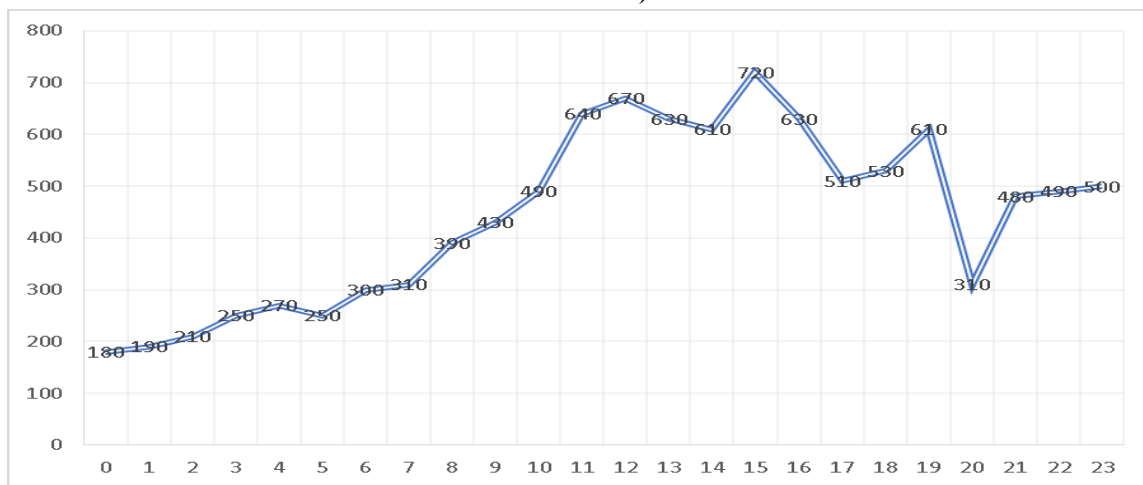
Despite its low percentages, peaking at an average of 2% of GDP during 2001–2009, foreign direct investment is considered one of the key economic variables impacting the evolution of foreign trade. This then declined in subsequent years, reaching a negative value of 23% in 2015 due to Algeria settling debts with the Egyptian mobile phone company Orascom. Low rates were also recorded in 2020, 2021, 2022 and 2023, which were attributed to prevailing economic policies.

As can be seen from the above table, the value of gross domestic product (GDP) has increased continuously during the period (2000–2023). However, the value in 2009 was lower than in the years before and after, at \$137.21 billion compared to \$171 billion and \$161 billion in 2008 and 2010 respectively. This decline was caused by the global financial crisis and its impact on oil prices, which represent 93% of Algeria's national income. GDP then increased until 2015, reaching \$165 billion compared to \$213 billion in 2014, due to the oil crisis at that time. GDP continued to rise until 2020, when the global health crisis peaked, with a value of \$145 billion compared to \$174 billion in 2019. Following a resumption of economic activity and an increase in global energy demand, Algeria's GDP increased in 2021, 2022 and 2023, reaching \$163 billion, \$195 billion and \$200.54 billion respectively.

Figure (05): Developments in foreign trade: exports, imports and GDP during the period 2000–2023.

Source: prepared by the researcher based on data from Table 2 above.

Figure 06 shows the evolution of government spending in Algeria from 2000 to 2023.

Figure 06: Curve showing the evolution of government spending in Algeria during the period 2000–2023 (in billion DZD):

Source: Prepared by the researcher based on data from Table 2.

Observing the trends in trade (exports and imports) and government spending in Figure (06), it can be seen that the trade curve takes the shape of the export curve. This indicates that exports dominate the components of trade (exports \approx imports). Additionally, the GDP curve mirrors the export curve, as GDP evolves alongside export development, which relies on oil revenues.

Empirical framework of the study:

Applying the PLS Methodology to the Study Model:

Structural model of the study:

The current study aimed to determine the impact of some macroeconomic variables (government spending, global oil demand, GDP, incoming foreign direct investment and oil barrel price) on the volume of Algerian foreign trade across its three dimensions (exports, imports and trade balance), with the moderating variable of the relationship being the impact of the pandemic (with its two dimensions: number of deaths and number of infections).

Coding latent and observed variables:

Due to latent variables being unmeasurable by their very nature, they must be accompanied by observable variables that contribute to their quantitative expression given that these variables are measurable. Combining latent and observed variables allows us to form a measurement model. To facilitate the interpretation of both latent and observed variables, we used the table below. In our study, the latent variable is represented by macroeconomic variables and their measurement indicators, such as government spending, GDP, oil prices, foreign direct investment inflows, and global oil demand. The observed variable is foreign trade volume with its measurement indicators, such as exports, imports and the trade balance. Additionally, the moderating variable is the impact of the pandemic, with indicators of the number of infections and deaths.

Table 03 shows the coding of latent and observed variables specific to the study.

Variables	Measurement indicators	Coding
Determinants of Foreign Trade	Foreign direct investment inflows Real gross domestic product (GDP) Government spending Oil price per barrel Global oil demand	-FDI -R-GDP -EXPEND -OIL-P -WOD
Trade Volume	Exports Imports Trade balance	-EXPORT -IMPORT -T/ B
Covid-19	Number of infections Number of deaths	-CVC -CVD

Source: prepared by the researcher.

Hypotheses of the structural model

This research is based on a set of hypotheses that are grounded in previous studies and align with the literature. These hypotheses are as follows:

H1: There is a statistically significant positive effect of trade determinants on the volume of foreign trade.

- H2: Second hypothesis: there is a direct negative effect of the pandemic on the volume of foreign trade.

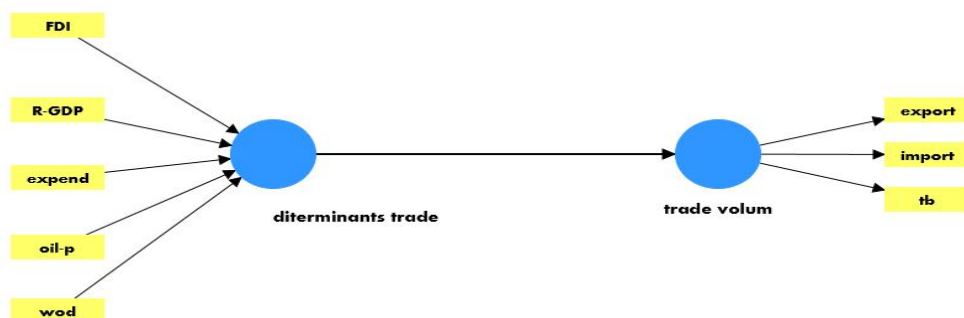
- H3: Third hypothesis: There is a negative moderating effect of the relationship between trade determinants and the volume of foreign trade due to the impact of the pandemic.

Methodology and Tools

Preliminary study model outputs from Smart PLS 4:

The following figure shows the general structure of the study model before the moderating variable is introduced into the relationship between the five macroeconomic variables and the volume of Algerian foreign trade.

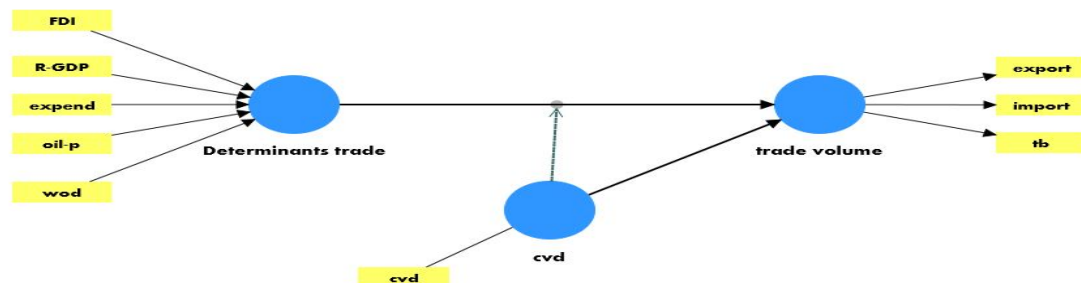
Figure 07: Graphical representation of the study model (before introducing the moderating variable).



Source: Smart PLS 4 Program

The following figure illustrates the general structure of the study model following the introduction of the moderating variable into the relationship between the five macroeconomic variables and the volume of Algerian foreign trade.

Figure 8: Graphical representation of the study model (after introducing the moderating variable of the impact of the Coronavirus pandemic).



Source: SmartPLS 4 programme

Sample and data analysis

To test the study model and its hypotheses, indicators measuring macroeconomic variables representing the determinants or dimensions of foreign trade (government spending, oil prices, foreign direct investment inflows, real GDP and global oil demand) were utilised for the period from 2000 to 2023. These variables constitute the latent variable (i.e. the determinants of foreign trade), while the volume of foreign trade was measured using its indicators (i.e. exports, imports and the trade balance), alongside the moderating variable of the impact of the pandemic (i.e. the number of deaths and infections). These were measured using structural equation modelling (SEM) with partial least squares (PLS-SEM), relying on the Smart PLS 4 programme. This model was chosen for several reasons, including the presence of latent variables in the study model, the small sample size, the need to test causal relationships between variables in the theoretical model, and its predictive ability.

Study results and analysis:

Testing the study model

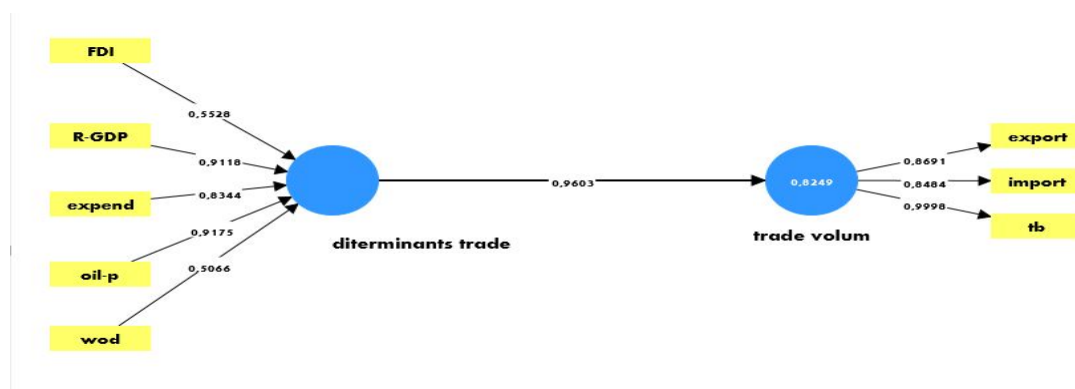
Any model is evaluated using the SEM methodology through measurement and structural model assessment to determine the relationships between latent variables (Hain and Charsted, Smart PLS, 2022).

- Measurement model assessment:

Evaluating the measurement model requires three criteria: internal consistency reliability (construct validity), convergent validity and discriminant validity. Internal consistency reliability is assessed using Cronbach's alpha (Rho-a) and composite reliability (CR) values. Convergent validity is tested using the average variance extracted (AVE), while discriminant validity is assessed using the Fornell–Larcker criterion (Hain & Charsted, Smart PLS, 2011).

The following figure and table illustrate the results of the measurement model assessment for our study.

Figure 09: Graphical representation of the overall study model and its outputs.



Source: Outputs from Smart PLS 4

The following table shows how we can measure the quality of the overall study model:

Table 04: Quality criteria for the overall measurement model

Path	Path coefficients	P.value	T.test
Determinants of Trade ↓ Volume of Foreign Trade	0.9603	0.0001	20.7192

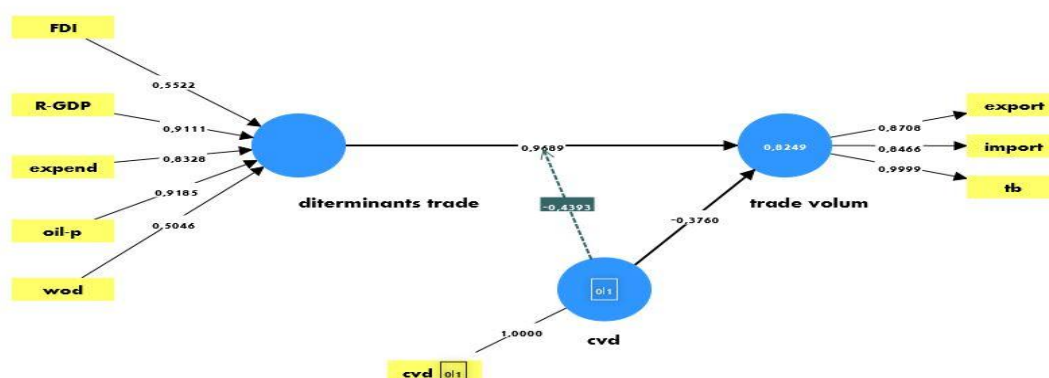
Source: Outputs from Smart PLS 4

From the previous data, the path coefficient value (0.9603) indicates a very strong relationship between trade determinants and the volume of foreign trade. The closer the value is to 1, the stronger the relationship. This means that changes (increases) in trade determinants lead to an increase in the volume of foreign trade.

The positive sign (0.9603) indicates a direct relationship: an increase in trade determinants results in an increase in the volume of foreign trade and vice versa. Therefore, trade determinants play a significant role in determining the volume of foreign trade.

The P-value of 0.0001 and the T-test value of 20.7192 indicate a very strong relationship between the variables, which is highly statistically significant. This supports the idea that there is a real effect of the trade determinants (OIL-P, EXPEND, WOD, FDI and R-GDP) on the volume of foreign trade (EXPORT, IMPORT and TRADE BALANCE).

Figure 10 and Table 042 below show the model outputs used to determine and measure the quality of the model when introducing the moderating variable of the impact of the Coronavirus pandemic on the relationship between trade determinants and the volume of Algerian foreign trade.



Source: Outputs from SMART PLS 4

The following table shows the quality criteria for the measurement model of the study, which considers the effect of the moderating variable of the relationship in the context of the pandemic.

Table 05: Quality criteria for the measurement model with the moderating variable of ‘covid-19’

	Covid-19	Determinants Trade	Trade volume	Covid-19 x d.trade - t.volume	Rhoa	AVE	CR
Covid-19	1.0000	-0.0175	-0.3760	-0.0984	0.8906	0.8249	0.9336

Source: Prepared by the researcher based on data from Smart PLS 4.

From the above table, we can see that Cronbach’s alpha coefficient is 0.8906 and the composite reliability (CR) value is 0.9336. Both of these exceed the threshold of 0.7. Additionally, the average variance extracted (AVE) value is 0.8249, which is greater than 0.5. Furthermore, the latent variables exhibit discriminant validity, as the square root of the AVE is greater than the correlations among the variables. This indicates the existence of a valid measurement model.

Structural Model Assessment:

The structural model is evaluated by examining the significance of the path coefficients between the internal and external latent variables.

Table 06: Structural Model Assessment

Hypothesis	Path	Path Coefficients	P.value	R ²	Decision
H1	- Determinants of Trade ↓ - Volume of foreign trade	0.9689	0.0001	0.9307	Accepted
H2	- Covid-19 ↙ - Volume of foreign trade	-0.3760	0.0001	0.9318	Accepted
H3	- Determinants of trade ↘ - Impact of the pandemic on foreign trade	-0.4393	0.0001		

Source: prepared by the researcher based on the outputs of the Smart PLS 4 programme.

Based on the results achieved through the structural model assessment table, it is evident that:

- There is a very strong positive effect (0.9686), approaching one (1) and statistically significant, of foreign trade determinants (some macroeconomic variables) on the volume of foreign trade. The recorded p-value = 0.0001 < 0.05. Therefore:

We accept the first hypothesis (H1): There is a statistically significant positive effect of trade determinants on the volume of foreign trade.

- There is a statistically significant negative effect of the pandemic on the volume of foreign trade (-0.3760), which is a value less than one. The recorded P-value is 0.0001, which is less than 0.05. Therefore:

We accept the second hypothesis (H2): - The volume of foreign trade is directly affected by the negative effects of the pandemic.

There is a statistically significant negative effect of -0.4393, which is less than one, of the moderating relationship between trade determinants and the volume of foreign trade. The recorded P-value is less than 0.05. Therefore:

We accept the third hypothesis (H3): 'The relationship between trade determinants and the volume of foreign trade is negatively moderated by the impact of the pandemic.'

The results in the table also show that the value of the coefficient of determination (R²) for the dependent variable is 0.9307, indicating that the independent variables explain 93.07% of the variance in foreign trade volume. This value is considered very good, indicating that the model used in our study has a high predictive ability in explaining the internal (dependent) variable. Furthermore, the quality of the model has improved, with R² increasing to 0.9418 and providing a more comprehensive explanation of the variance in the dependent variable.

2. CONCLUSION:

The composition that determines the volume of Algerian foreign trade establishes a direct relationship between it and the trade determinants (i.e. some macroeconomic variables). As oil revenues dominate public treasury inputs and confer the characteristics of a rentier economy on the Algerian economy, these determinants influence the volume of Algerian foreign trade through macroeconomic oil-related indicators such as global demand, prices, government spending and foreign direct investment. These determinants are positively correlated with the volume of Algerian foreign trade: as their value increases, so does the volume of foreign trade, and any external impact on them subsequently affects this volume.

The impact of the pandemic on the oil sector negatively affected the volume of Algerian foreign trade through its

determinants. The severe negative impact on the energy sector, particularly oil, arose from the collapse in global market prices due to decreased global demand for oil. This was the result of policies implemented by countries, such as lockdowns and restrictions on air and maritime transport, which adversely affected global supply chains. Fears of the spread of the virus led to the closure of factories and layoffs, especially in major oil-consuming countries involved in production processes, such as China, the United States, and various Asian countries. As oil revenues are the primary determinant of foreign trade volume, they have a direct and indirect impact through trade determinants such as oil prices, exchange rates, global oil demand, foreign direct investment inflows and government spending.

The statistical model for the variables was highly acceptable, facilitating interpretation and analysis. The coefficients of determination for the variables effectively explained the relationships between the independent and dependent variables, as well as the two moderating variables.

The relationship between trade determinants and the volume of foreign trade was consistent with economic theory, indicating a positive correlation. Furthermore, the impact of the pandemic on the volume of foreign trade in Algeria is direct and manifests through its components (exports, imports, and trade balance). Furthermore, it has a moderating effect on the relationship between trade determinants and the volume of foreign trade in Algeria.

3. FUTURE PERSPECTIVES OF THE STUDY:

After analysing and measuring the impact of trade determinants on the volume of foreign trade in Algeria, it became evident that there is a significant correlation between them based on the rentier nature of the Algerian economy. In light of the negative impact that the spread of the SARS-CoV-2 virus has had on foreign trade volumes in Algeria, the following are planned:

Studying the impact of other factors on foreign trade. This will allow for the diversification of the Algerian economy, reducing its reliance on fluctuating oil prices, which are influenced by artificial and external factors.

- Exploring investment opportunities beyond the hydrocarbon sector: This aims to extricate the Algerian economy from its singular dependence on oil revenues.

- Conducting future studies linking rentier income savings with investment in renewable and diverse resources, which will contribute to a more sustainable economic framework.

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