

# Trade and Economic Growth in Afghanistan: An Application of the ARDL Model

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**Abstract:** This study delves into the complex relationship between economic growth and foreign trade, specifically analyzing Afghanistan's economy from 1990 to 2019. Employing methodologies like the Structural Breakpoint method of ADF for data stability, the Bound test for assessing long-term relationships, and ARDL analysis, significant insights emerge. The research underscores that international trade has a distinctly positive and statistically significant influence on Afghanistan's economic growth over the long term. In the short term, both exports and imports significantly contribute to economic expansion. The Error Correction term (ECT) coefficient of -2 indicates a strong long-run relationship among the variables and a swift adjustment towards equilibrium. With an impressive adjusted R-Square of 90 percent, the model effectively explains the dependent variable using the independent variables. Drawing from these findings, the study recommends implementing import substitution policies to retain financial capital and stimulate domestic industries. Furthermore, reducing trade barriers such as tariffs, quotas, and other restrictions could bolster the flow of goods and services, thereby fostering economic growth in Afghanistan. In conclusion, the study highlights the crucial role of international trade in Afghanistan's economic development, advocating for policies that promote local industry while facilitating smoother trade interactions globally.

**JEL Codes:** B27, F1, F14, F23, F43, O4, O47

**Keywords:** Export, Import, Economic Growth, ARDL, Afghanistan

## 1. Introduction

Export and import are the two key components of international trade (Saadat & Montazeri, 2017). Economists and decision-makers have been debating the impact of trade on economic growth extensively (Balassa, 1978), (Feder, 1983), (Ram, 1985), (McNab & Moore, 1998) and (Bhattacharya & Bhattacharya, 2016). Exports refer to

products or services that originate from a specific country and are made available for trade in international markets, whereas imports are goods or services purchased from another country and transported into one's own country (Adeleye *et al.*, 2015).

Exporting goods and services can help a country increase its output and sales, which can create jobs and financial gain. By reducing a country's reliance on any industry or market, exporting can contribute to economic diversification. Additionally, exporting can produce foreign currency that can be utilized to pay off debt abroad, support domestic infrastructure and growth, or finance imports (Lawal & Ezeuchenne, 2017).

On the other hand, imports might help the economy grow. Importing items that a country cannot produce profitably or efficiently gives consumers access to a wider selection of products and services. The process could lead to increased competition and innovation since domestic producers must improve their products and services to stay competitive. Additionally, imports can help domestic companies cut their manufacturing expenses, reducing the price of goods and services for consumers.

The relationship between trade and economic growth is well-established. Trade plays a crucial role in stimulating economic growth for several reasons: increased market access, specialization and efficiency, innovation and technological progress, and resource allocation.

The economy's structure, the degree of competitiveness, and the policies of national and international organizations are only a few of the numerous factors that affect how exports and imports affect economic growth.

According to Arndt (1982) and Riedel (1988), foreign trade is the engine of growth in the economy of the countries. Contemporary researchers believe that it has the ability to change economic structure. Furthermore, the access where creates due to trade is immense, as it not only increase the diplomatic relationship but it helps in improving economy with the help of bi literal and multilateral market access, technological convergence, and resources. Moreover, as the economy increases, exploring the link between international trade and economic growth is necessary. This article focuses on foreign trade and economic growth in Afghanistan. In 2018, Afghanistan's commodities included 156 export products to 62 countries worth \$875 million and 331 import items from 104 countries worth \$7406 million (WITS, 2018). Seeing the above figures encourages us to investigate the impact of those numbers on economic growth, domestic potential, and creativity.

A critical research void exists regarding to which trade acts as a catalyst for economic growth in Afghanistan. This is a vital issue to be consider as Afghanistan's economic

viability heavily hinges on elements like Foreign Direct Investment (FDI), trade, and various capital sources. Notably, the study under discussion is well-aligned with recent regional developments and initiatives, including those related to the Chabahar Port, Lapis Lazuli corridor, and air corridors.

However, it is essential to highlight that a substantial, comprehensive body of literature on trade and its impact on economic growth within the context of Afghanistan is conspicuously lacking. Bridging through these vacuum would yield valuable insights into how trade can pushes Afghanistan's economic development. Ultimately, this research endeavor has the potential to make meaningful contributions to both the academic understanding and the practical strategies required to foster economic growth in Afghanistan

## 2. Review of Literature

Numerous empirical studies have investigated the relationships between imports, exports, openness, and economic growth at both national and international levels. Scholars have been divided into two camps regarding the impact of international trade on economic growth. One group supports a positive influence, while the other disputes its significance.

Regarding the impact of trade on GDP, the literature generally finds that exports positively affect economic growth, based on studies by Hesbon (2009), Lawal and Ezeuchenne (2017), Elias *et al.* (2018), Ahmad (2018), and others. Similarly, another body of research indicates that imports also contribute positively to economic growth, as evidenced by studies such as those by Markjackson *et al.* (2018), Ahmad (2018), and Afolabi *et al.* (2017). However, conflicting findings suggest a negative impact of imports on economic growth in studies by Hesbon (2009), Lawal and Ezeuchenne (2017), and others.

In terms of trade openness, most studies suggest a positive relationship with economic growth, supported by research from Javed *et al.* (2012), Zahonogo (2016), and Bojanic (2012). However, there are exceptions, with some studies noting adverse effects of increased trade openness on economic growth, as highlighted by Lawal and Ezeuchenne (2017) and Malefane & Odhiambo (2018).

Overall, these findings underscore the complexity and varied outcomes observed in the relationship between international trade dynamics and economic growth across different empirical studies.

In addition, according to Javed *et al.* (2012), an increase in the import of raw materials led to an acceleration in production, employment, and out of Pakistan,

eventually leading to economic growth. Moreover, Gurgul & Lach (2010) stated that there is a positive direction of export toward GDP in Poland. Besides, there is a positive causality between import and GDP and export and GDP (Gnougougou, 2013). Similarly, exports have a single causal relationship with economic growth (Chen, 2009; Jayachandran & Seilan, 2010; Ashrafi & Kalaiah, 2020). On the other hand, Bouoiyour (2013) and Abhayaratne (1996) concluded that there is no evidence to show that foreign trade accelerates GDP. Furthermore, Kilic & Beser (2017) concluded that there is bi-directional causality between GDP and imports and stated that imports and exports are important for five Eurasian countries, and export and import will lead to economic growth.

In another stream of survey-based literature, showed the German, Chinese and American economies are trade dependent, showing continued growth despite being 2nd among mentioned countries. In contrast, the Russian economy decreased its dependence on international trade (Makhmutova & Mustafin, 2017). Similarly, Zetos & Tao (2002) found that export causes growth in USA but Causality is stronger in Canada which shows Canada dependency for trade is more

Nevertheless, Schneider (2005) presented evidence that technology imports significantly affect per capita GDP growth more than domestic technology.

In his seminal essay, Solow (1957) introduced the concept of technological progress and its profound impact on industrial processes. The model highlights total factor productivity growth, represented by parameter  $A$ , which signifies the accumulated stock of technology available. The production function in the foundational Solow model illustrates constant returns to scale and is considered capital-augmenting or Solow-neutral in terms of technological influence.

$$Y=f(A,K,L)=AK^\alpha L^{1-\alpha}$$

In this context:

- $Y$  represents economic growth or the level of output during a specific period,
- $A$  denotes an index reflecting total factor productivity,
- $K$  indicates the existing level of physical capital,
- $L$  signifies the available labor supply, and
- $\alpha$  represents a parameter that characterizes the elasticity of capital.

According to Solow's 1957 neo-classical theory of growth, tangible or physical capital accumulation serves as the primary engine of economic growth and is the focus of macroeconomists' interest. However, endogenous economic development first appeared in an effort to incorporate the causes of technical advancement and consequent sustained productivity increase inside the general equilibrium framework of neoclassical growth

theory. The process of economic growth is explained in the literature using a variety of different theories, each of which has unique empirical and policy ramifications. By presuming that technological development is an unexpected consequence of businesses specializing in investments, Romer's "AK model" promotes sustainable growth. Besides, all theoretical investigations are based on successful formulations of the "endogenous growth models." This model suggests that changing the policy environment might boost economic performance. Exponential growth models with the explicit introduction of human capital and knowledge have further developed the process of technological transformation. Where the new theory of endogenous growth, which was introduced by Arrow (1962) and further extended by Shell (1966), Romer (1986), Lucas (1988), and Romer (1990), is the foundation for our empirical analysis:

$$Y = f(A, K, L, T)$$

Y is GDP, L is active labor force, K is capital stock, A is the total factor productivity effect, and T denotes trade.

The context of Afghanistan's economy is very different from other countries. Afghanistan faced three decades of war. Moreover, it is a country where different ideologies and regimes have been tested; Communism or the Democratic Republic (1978-1992) [Soviet Invasion in 1979], Mujahideen or Islamic State (1992-1996), Taliban regime or Islamic Emirate (1996-2001) and Islamic Republic of Afghanistan (2002-2021). Besides, Afghanistan's blooming economy started after International Conference on Afghanistan, Bonn (2001), followed by international remittances and foreign aid, which consistently and notably increased the GDP from 4 billion dollars in 2002 to 19.4 billion dollars in 2018.

### 3. Theoretical Framework, Method, and Model Specification

The study employed several methodological steps to assess the impact of international trade on Afghanistan's economic growth. Initially, the study formulated a model to estimate, select, and elucidate the variables, followed by analyzing the collected data. Additionally, the study specified the tests and techniques applied within this framework.

Data for the study was sourced from various reputable sources including the IMF, The World Bank Open Data, World Bank Development Indicators, International Labour Organisation (ILO), ILOSTAT Database, Central Statistics Organisation of Afghanistan (CSO), and Country Economy Database. The data covers the period from 1990 to 2019.

In the study, economic growth, denoted as Y, was measured by GDP. Foreign Direct Investment (FDI), represented by F, was measured as the net inflows of FDI in current US dollars. The labor force, denoted as L, was measured as the total active population

of the country. Gross Fixed Capital Formation (GFCF Current US\$), serving as a proxy for capital investment, was denoted as K.

The study used GDP as a dependent variable instead of GDP per capita because the GDP gives an estimate of a nation's total economic production without considering the population. It is frequently used to assess overall economic performance. When deciding on economic policies or the general state of a country's economy, policymakers may find the GDP to be a valuable indicator. At the same time, it offers perceptions of a nation's general economic activity, investment levels, production capability, and job prospects. On the other hand, the GDP per capita is a measure of economic output on a per-person basis; however, it may not necessarily reflect the whole picture of an economy's performance or the complexity of economic analysis.

To study the effect of international trade on economic growth, the model is formulated using the production function, and it is as follows:

$$Y = f(A, K, L) \quad (1)$$

Y is GDP, L is active labor force, K is capital stock, and A is the total factor productivity effect.

Import and export are crucial drivers of economic growth for most countries, offering significant insights into this relationship. Our empirical analysis is anchored in the new theory of endogenous growth, initially pioneered by Arrow (1962) and Shell (1966), and further developed by Romer (1986), Lucas (1988), Romer (1990), Grossman and Helpman (1991). Recent impactful studies by Alsamara *et al.* (2019), Kalai and Zghidi (2019), Wani (2019), Li *et al.* (2021), Mohamed *et al.* (2021), Sulaiman *et al.* (2015), Pahlavani *et al.* (2005), Bist and Bista (2018), as well as works by Kibritcioglu (2002) and Farhady (2004), also inform our approach.

Our analysis aims to elucidate economic growth through variables such as Foreign Direct Investment (FDI), exports, imports, and Gross Fixed Capital Formation (GFCF). To mitigate potential biases from omitted variables, the model incorporates labor and capital to account for additional factors influencing economic growth. The model employed in our study to examine this relationship is formulated as follows:

$$Y_t = A \cdot K_t^{\beta_1} \cdot L_t^{\beta_2} \cdot F_t^{\beta_3} \cdot E_t^{\beta_4} \cdot I_t^{\beta_5} \cdot e^{\varepsilon_t} \quad (2)$$

In this context:

- $Y_t$  represents the GDP of Afghanistan at time  $t$ ,
- K denotes Gross Fixed Capital Formation (GFCF),
- L stands for labor,
- F represents Foreign Direct Investment (FDI),

- E denotes exports,
- I stands for imports, and
- $\epsilon$  is the error term following the Gauss-Markov assumptions.

The logarithmic linearization of the model (2) provides the following simplified form:

$$\ln Y_t = \beta_0 + \beta_1 \ln K_t + \beta_2 \ln L_t + \beta_3 \ln F_t + \beta_4 \ln E_t + \beta_5 \ln I_t + \epsilon_t \quad (3)$$

In logarithmic form, eq. (3),  $\beta_0 = \log A$ , which is constant.

## 4. Results and Discussion

### 4.1. Description and Frequencies of the Data

**Table 1: Descriptive Statistics of the Variables (GDP, EXP, and IMP)**

	Y	E	I
Mean	22.65388	19.3208	21.29506
Median	22.46317	19.09309	21.45922
Maximum	23.74667	20.58994	22.87109
Minimum	21.47232	18.39434	19.77501
Std. Dev.	0.829897	0.676095	1.183151
Skewness	0.158561	0.472320	0.003704
Kurtosis	1.349289	2.015372	1.345400
Jarque-Bera	3.531766	2.327296	3.421367
Probability	0.171036	0.312345	0.180742
Observations	30	30	30

Source: The authors.

**Table 2: Descriptive Statistics of the Variables (GFCE, Labor Force, and FDI)**

	K	L	F
Mean	23.10224	15.61930	15.85497
Median	24.62492	15.66206	17.66903
Maximum	26.02444	16.18574	19.41763
Minimum	16.74759	14.93048	9.210340
Std. Dev.	3.201550	0.346294	3.249867
Skewness	-0.986908	-0.159107	-0.689001
Kurtosis	2.451936	2.154254	2.033723
Jarque-Bera	5.245402	1.020684	3.540728
Probability	0.072606	0.600290	0.170271
Observations	30	30	30

Source: The authors.

Tables 1 and 2 demonstrate a consistent relationship among the variables. Additionally, the low standard deviation values indicate minimal deviations of the real data from their mean values. Furthermore, Skewness and Kurtosis statistics provide essential insights into the normality and distribution characteristics of the data (Adebayo, 2023).

The next step involves conducting unit root tests. A time series with a unit root is considered non-stationary, indicating it exhibits trends or irregular variations that persist over time. Among the various unit root tests available, the Augmented Dickey-Fuller (ADF) test is widely employed (Irfan *et al.*, 2023).

#### 4.2. Unit Root Test

In the case of stationarity analysis, the integration qualities of the data are evaluated using the Structural Breakpoint method of Augmented Dickey-Fuller: minimized t-statistics Unit Root Tests (URT). The test mentioned above was performed to account for the potential occurrence of structural breaks within the time series data adopted by impactful studies like Alsamara *et al.* (2019), Wani (2019), and Bist and Bista (2018).

#### Structural Breakpoint method of Augmented Dickey-Fuller: minimized t-statistics

**Table 3: Summary results of the Augmented Dickey-Fuller (ADF) Minimized t-test at levels**

Series	Null Hypothesis	Critical Value (5% level)	ADF Test at levels	Equation Specification / Break Specification	P-Value (Prob.)	Conclusion
K	$H_0$ : K has a unit root	-4.859812	-5.129164	Intercept & Trend / Intercept	0.0222	Reject the Null Hypothesis because the prob. value is smaller than the $\alpha$ value (0.05)
L	$H_0$ : L has a unit root	-4.859812	-6.296718	Intercept & Trend / Intercept	< 0.01	
F	$H_0$ : F has a unit root	-4.859812	-4.948443	Intercept & Trend / Intercept	0.0384	
I	$H_0$ : I' has a unit root	-4.859812	-5.303547	Intercept & Trend / Intercept	0.0123	
E	$H_0$ : E has a unit root	-4.859812	-3.915098	Intercept & Trend / Intercept	0.4261	Cannot Reject Null Hypothesis
Y	$H_0$ : Y has a unit root	-4.859812	-2.757226	Intercept & Trend / Intercept	0.9602	

Source: The authors.

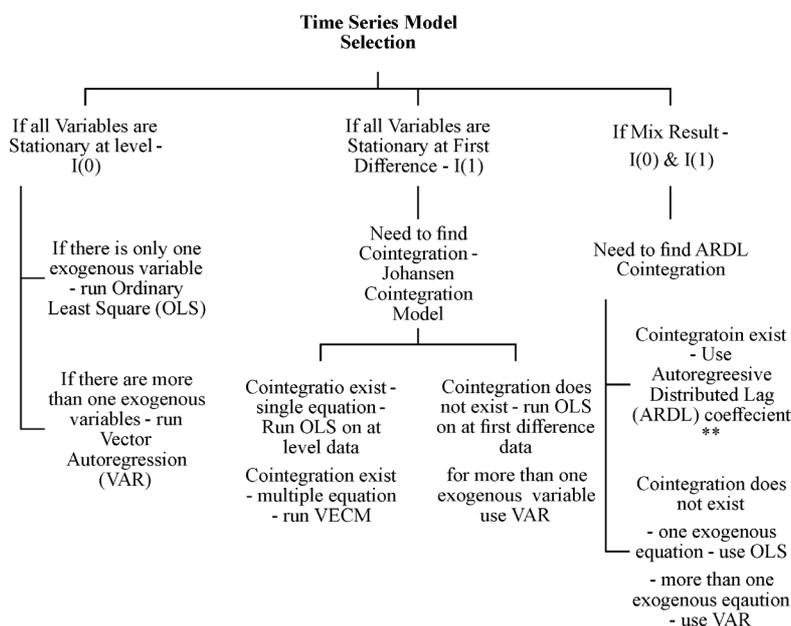
**Table 4: Summary Results of the Augmented Dickey-Fuller (ADF) Minimized t-test at First Difference**

Series	Null Hypothesis	Critical Value (5% level)	ADF Test at 1 <sup>st</sup> difference	Equation Specification / Break Specification	P-Value (Prob.)	Conclusion
D(E)	H <sub>0</sub> : D(E) has a unit root	-4.859812	-9.901771	Intercept & Trend / Intercept	< 0.01	Reject the Null Hypothesis because the prob. value is smaller than the $\alpha$ value (0.05)
D(Y)	H <sub>0</sub> : D(Y) has a unit root	-4.859812	-7.414309	Intercept & Trend / Intercept	< 0.01	

Source: The authors.

Tables 3 and 4 indicate that all variables except exports and GDP are stationary at first difference at a significance level of 5 percent. This finding, combined with insights from the literature review and considerations of data stationarity, informs the selection of our statistical model.

### 4.3. Time Series Model Selection



**Figure 1: Time Series Model Selection**

Source: Jawaid (2020) and Shrestha & Bhatta (2018)

When selecting a suitable model to explore interactions, impacts, associations, and relationships between variables, several criteria guide the choice:

1. If all variables are stationary at level or  $I(0)$  and there is only one exogenous variable, Ordinary Least Squares (OLS) regression is appropriate. For multiple exogenous variables, the Vector Autoregression (VAR) model is recommended.
2. If all variables are stationary at first difference or  $I(1)$ , the focus shifts to testing for cointegration among variables:
  - If cointegration exists with one cointegrating equation, OLS can be applied directly on level data. For multiple cointegrating equations, the Vector Error Correction Model (VECM) is suitable.
  - If cointegration is absent and there is only one exogenous variable, OLS should be conducted on first difference data. For multiple exogenous variables, VAR is preferred.
3. When variables have mixed stationarity (some  $I(0)$  and some  $I(1)$ ), the Autoregressive Distributed Lag (ARDL) cointegration model is employed:
  - If cointegration is confirmed, the Autoregressive Distributed Lag (ARDL) coefficients are used.
  - If cointegration is not present and there is only one exogenous variable, OLS is applied.
  - If cointegration is not present and there are multiple exogenous variables, VAR is the suitable model.

The study opted for the ARDL model due to mixed stationarity levels. Before applying ARDL to investigate the impact of trade on economic growth, it is crucial to:

- Determine the Lag Order Criteria.
- Test for cointegration between variables using the long-run and bounds test of ARDL.

#### 4.4. Lag Order Selection Criteria

**Table 5: VAR Lag Order Selection Criteria**

Lags	LogL	LR	FPE	AIC	SC	HQ
0	-94.41330	NA	5.25e-05	7.172379	7.457851	1.595939
1	66.30755	241.0813	7.57e-09	-1.736253	0.262053	-6.433693
2	141.8490	80.93730*	6.68e-10*	<b>-4.560645*</b>	-0.849504*	-3.426112*

Source: The authors.

Notes: \*Indicates lag order selected by the above-mentioned criterion

Based on the result from the criteria, the lowest value is considered the optimal lag length. Therefore, Akaike Criterion is considered as the optimal lag to choose as it shows the lowest value among other criterion which is 2 lags.

**ARDL Bound Tests for Cointegration** The ARDL Bound Tests for Cointegration assesses long-run cointegration between variables, particularly advantageous when variables are not integrated of the same order, making it suitable for small sample sizes. This study opted for a bound test due to the variables exhibiting different orders of stationarity. Developed by Pesaran and Shin (1999), and subsequently elaborated by Pesaran *et al.* (2001), the model in this study is formulated as follows:

$$\begin{aligned}
 \Delta \text{Ln}Y_t = & c_1 + \sum_{j=1}^p c_{1j} \Delta \text{Ln}Y_{t-j} + \sum_{j=0}^{q1} c_{2j} \Delta \text{Ln}K_{t-j} + \sum_{j=0}^{q2} c_{3j} \Delta \text{Ln}L_{t-j} \\
 & + \sum_{j=0}^{q3} c_{4j} \Delta \text{Ln}F_{t-j} + \sum_{j=0}^{q4} c_{5j} \Delta \text{Ln}E_{t-j} + \sum_{j=0}^{q5} c_{6j} \Delta \text{Ln}I_{t-j} \\
 & + c_2 \text{Ln}Y_{t-1} + c_3 \text{Ln}K_{t-1} + c_4 \text{Ln}L_{t-1} + c_5 \text{Ln}F_{t-1} + c_6 \text{Ln}E_{t-1} \\
 & + c_7 \text{Ln}I_{t-1} + \varepsilon_{1t}
 \end{aligned}
 \tag{4}$$

$$\begin{aligned}
 \Delta \text{Ln}Y_t = & c_1 + c_2 \text{Ln}Y_{t-1} + c_3 \text{Ln}K_{t-1} + c_4 \text{Ln}L_{t-1} + c_5 \text{Ln}F_{t-1} + c_6 \text{Ln}E_{t-1} + c_7 \text{Ln}I_{t-1} \\
 & + \sum_{j=1}^p c_{1j} \Delta \text{Ln}Y_{t-j} + \sum_{j=0}^{q1} c_{2j} \Delta \text{Ln}K_{t-j} + \sum_{j=0}^{q2} c_{3j} \Delta \text{Ln}L_{t-j} + \sum_{j=0}^{q3} c_{4j} \Delta \text{Ln}F_{t-j} \\
 & + \sum_{j=0}^{q4} c_{5j} \Delta \text{Ln}E_{t-j} + \sum_{j=0}^{q5} c_{6j} \Delta \text{Ln}I_{t-j} + \varepsilon_{1t}
 \end{aligned}
 \tag{5}$$

'p, q's are the lag length, 'p' refers to the dependent variable lag length, and 'q' refers to the independent variable lag length, so the combined lag length is (p, q1, q2, q3, q4, and q5).

The model expanded after selecting Lag Criteria and expressed as follows:

$$\begin{aligned}
\Delta \text{Ln}Y_t = & c_1 + c_2 \text{Ln}Y_{t-1} + c_3 \text{Ln}K_{t-1} + c_4 \text{Ln}L_{t-1} + c_5 \text{Ln}F_{t-1} + c_6 \text{Ln}E_{t-1} + c_7 \text{Ln}I_{t-1} \\
& + \sum_{j=1}^2 c_{1j} \Delta \text{Ln}Y_{t-j} + \sum_{j=0}^2 c_{2j} \Delta \text{Ln}K_{t-j} + \sum_{j=0}^2 c_{3j} \Delta \text{Ln}L_{t-j} + \sum_{j=0}^2 c_{4j} \Delta \text{Ln}F_{t-j} \\
& + \sum_{j=0}^1 c_{5j} \Delta \text{Ln}E_{t-j} + \sum_{j=0}^2 c_{6j} \Delta \text{Ln}I_{t-j} + \varepsilon_{1t}
\end{aligned}
\tag{6}$$

There are three possible outcomes in determining the long-run cointegration through bound tests:

1. If the calculated F-statistic exceeds the upper bound critical value ( $I(1)$ ), it indicates cointegration, suggesting a long-run relationship. The Null Hypothesis is rejected in this case, and the study should proceed to estimate the long-run model, specifically the Error Correction Model (ECM).
2. If the F-statistic falls between the upper and lower bound values, the results are inconclusive regarding cointegration.
3. If the F-statistic is lower than the lower bound critical value ( $I(0)$ ), it indicates no cointegration. In such instances, the Null Hypothesis is not rejected, suggesting no long-run relationship. The study should then estimate the short-run model, such as the Autoregressive Distributed Lag (ARDL) model.

**Table 6: ARDL Cointegration or Bounds Test**

Test Stats	Value	Sig.	$I(0)$	$I(1)$
F-stats	12.69189	10%	2.26	3.35
		5%	2.62	3.79
K	5	2.5%	2.96	4.18
		1%	3.41	4.68

Source: The authors.

According to Table 6, based on the criteria and hypotheses derived from Pesaran and Shin (1999) and Pesaran *et al.* (2001). The null hypothesis ( $H_0$ ) states that there is no cointegrating equation. The study rejects this null hypothesis because the calculated F-statistic exceeds the upper bound critical value, indicating cointegration. This finding implies that when the F-statistic surpasses the critical value for upper bound  $I(1)$ , it confirms the presence of cointegration and thus establishes a long-run relationship among the variables.

**Table 7: Long-run Association**

Variable	Coefficient	Std. Error	t-Stats	Prob.
lnF	-0.056440	0.010928	-5.164652	0.0003
lnK	-0.004220	0.025323	-0.166638	0.8707
lnI	1.003181	0.032027	31.32260	0.0000
lnE	0.168073	0.055752	3.014635	0.0118
lnL	-0.961407	0.265759	-3.617584	0.0040

Source: The authors.

The findings in Table 7 indicate that, with the exception of Capital Stock (K), all other variables (FDI, labor force, Export, and Import) exhibit a long-run impact on Economic Growth (Y) in Afghanistan. This observation aligns with previous research findings from studies such as Edoumiekumo & Opukri (2013), Afolabi *et al.* (2017), Markjackson *et al.* (2018), and Ahmad (2018).

#### Short-run dynamics

The short-run dynamic indicates a short-term relationship among variables, and the study investigates the short-run dynamic using Error Correction Model (ECM).

The study formulates the short-run to simplify the model, and it is as follows:

$$\begin{aligned}
 \Delta \ln Y_t = & c_1 + \sum_{j=1}^p c_{1j} \Delta \ln Y_{t-j} + \sum_{j=0}^{q1} c_{2j} \Delta \ln K_{t-j} + \sum_{j=0}^{q2} c_{3j} \Delta \ln L_{t-j} \\
 & + \sum_{j=0}^{q3} c_{4j} \Delta \ln F_{t-j} + \sum_{j=0}^{q4} c_{5j} \Delta \ln E_{t-j} + \sum_{j=0}^{q5} c_{6j} \Delta \ln I_{t-j} \\
 & + c_2 \ln Y_{t-1} + c_3 \ln K_{t-1} + c_4 \ln L_{t-1} + c_5 \ln F_{t-1} + c_6 \ln E_{t-1} \\
 & + c_7 \ln I_{t-1} + \varepsilon_{1t}
 \end{aligned}
 \tag{7}$$

$$\begin{aligned}
 \Delta \ln Y_t = & c_1 + c_{1,1} \Delta \ln Y_{t-1} + c_{2,0} \Delta \ln K_t + c_{2,1} \Delta \ln K_{t-1} + c_{3,0} \Delta \ln L_t + c_{3,1} \Delta \ln L_{t-1} \\
 & + c_{4,0} \Delta \ln F_t + c_{4,1} \Delta \ln F_{t-1} + c_{5,0} \Delta \ln E_t + c_{6,0} \Delta \ln E_t + c_{6,1} \Delta \ln I_{t-1} \\
 & + c_2 \ln Y_{t-1} + c_3 \ln K_{t-1} + c_4 \ln L_{t-1} + c_5 \ln F_{t-1} + c_6 \ln E_{t-1} + c_7 \ln I_{t-1} \\
 & + \varepsilon_{1t}
 \end{aligned}
 \tag{8}$$

$$\Delta \text{Ln}Y_t = c_1 + c_2 \Delta \text{Ln}Y_{t-1} + c_3 \Delta \text{Ln}K_t + c_4 \Delta \text{Ln}K_{t-1} + c_5 \Delta \text{Ln}L_t + c_6 \Delta \text{Ln}F_t + c_7 \Delta \text{Ln}E_t + c_8 \Delta \text{Ln}E_{t-1} + c_9 \Delta \text{Ln}I_t + c_{10} \Delta \text{Ln}I_{t-1} + ECT(-1) \quad (9)$$

The tabular form of ARDL Error Correction Regression is as follows:

**Table 8: ARDL Error Correction Regression**

Variable	Coefficient	Std. Error	t-Stats	Prob.
C	29.19337	2.761371	10.57206	0.0000
D(LnY(-1))	0.520483	0.129226	4.027691	0.0020
D(LnK)	-0.045933	0.029197	-1.573196	0.1440
D(LnK(-1))	0.078112	0.028784	2.713773	0.0202
D(LnL)	3.611916	1.250574	2.888206	0.0148
D(LnL(-1))	-7.1226656	1.242945	-5.814138	0.0001
D(LnF)	-0.003649	0.008602	-0.424220	0.6796
D(LnF(-1))	0.058388	0.012231	4.773643	0.0006
D(LnE)	0.126583	0.042488	2.979292	0.0125
D(LnI)	0.763811	0.083887	9.105203	0.0000
D(LnI(-1))	-0.625288	0.100626	-6.213988	0.0001
ECT(-1)*	-2.066623	0.196363	-10.52452	0.0000
R-squared	0.945532		Mean dependent var	0.061708
Adjusted R-squared	0.908086		S.D. dependent var	0.188891
S.E. of regression	0.057267		Akaike info criterion	-2.584666
Sum squared resid	0.052472		Schwarz criterion	-2.013721
Log-likelihood	48.18532		Hanan-Quinn criteria.	-2.410122
F-Statistic	25.25023		Durbin-Watson stat	2.546533
Prob(F-statistic)	0.000000			

Source: The authors.

Table 8 figures indicate that exports and imports significantly and positively impact economic growth at a 5 percent significant level in the short-run period.

R-Square, Durbin Watson Statistics, and F-statistics show that the model is a good fit.

To conclude both long-run and short-run coefficient results, the study minimizes the above two EViews result in a comprehensive Table.

**Table 9: Short-run and long-run coefficient**

<i>The dependent variable, LnY<sub>t</sub></i>	<i>Coefficients</i>	<i>t-stats.</i>	<i>(ρ value)</i>
The long-run results			
<b><i>LnK<sub>t</sub></i></b>	-0.004220	0.025323	0.8707
<b><i>LnL<sub>t</sub></i></b>	-0.961407	0.265759	0.0040***
<b><i>LnF<sub>t</sub></i></b>	-0.056440	-5.164652	0.0003***
<b><i>LnE<sub>t</sub></i></b>	0.168073	3.014635	0.0118**
<b><i>LnI<sub>t</sub></i></b>	1.003181	31.32260	0.0000***
The short-run results			
Constant	29.19337	10.57206	0.0000***
<b><i>ΔLnY<sub>t-1</sub></i></b>	0.520483	4.027691	0.0020***
<b><i>ΔLnK<sub>t</sub></i></b>	-0.045933	-1.573196	0.1440
<b><i>ΔLnL<sub>t</sub></i></b>	3.611916	2.888206	0.0148**
<b><i>ΔLnF<sub>t</sub></i></b>	-0.003649	-0.424220	0.6796
<b><i>ΔLnE<sub>t</sub></i></b>	0.126583	2.979292	0.0125**
<b><i>ΔLnI<sub>t</sub></i></b>	0.763811	9.105203	0.0000***
<b><i>ECT (-1)</i></b>	-2.066623	-10.52452	0.0000***
Adjusted R <sup>2</sup>	0.90		
Durbin-Watson Stats	2.546		
F-stats	25.25		0.0000 ***

Source: The authors.

Notes: ECT=Error Correction Term

\*Significant at 10% level. \*\*Significant at 5% level. \*\*\*Significant at 1% level.

Table 9 provides the results of both the long-run and short-run equations, outlining the effects of Import and Export on Afghanistan's Gross Domestic Product (GDP). In the long-term analysis, the study finds that international trade, represented by both imports (I) and exports (E), significantly and positively influences economic growth at a 5% significance level. This finding is consistent with prior research by Lawal & Ezeuchenne (2017), Elias *et al.* (2018), Ahmad (2018), Hesamiazizi (2008), Abubakar & Shehu (2015), Enu *et al.* (2013), and Dinc *et al.* (2017). Specifically, a one-unit increase in exports leads to a 0.16 unit increase in economic growth, while a one-unit increase in imports results in a 1 unit increase in economic growth in Afghanistan.

In the short-term, the results show that both exports and imports continue to exert a significant positive impact on economic growth at a 5% significance level. This finding is supported by previous studies such as Boakye & Gyamfi (2017), Mogoe & Mongale (2014), Omoju & Adensaya (2012), Hussain & Haque (2016), Abdullahi *et al.* (2016), Afolabi *et al.* (2017), and Edoumiekumo & Opukri (2013). Additionally, the Error Correction Term (ECT) coefficient of -2 indicates the presence of a long-run relationship and causality among the variables, reflecting a rapid adjustment speed towards long-run equilibrium.

The Adjusted R-Square, Durbin-Watson statistic, and F-statistic values from the regression models suggest that the model fits the data well, indicating a good overall model fit.

#### 4.7. Pairwise Granger Causality Test

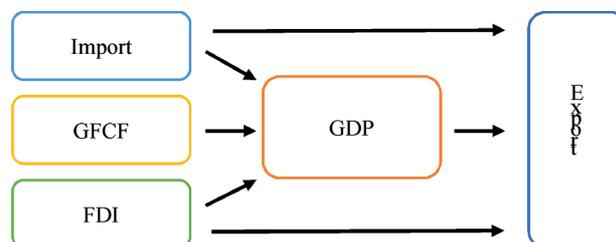
The Granger Causality Test serves as an initial exploration into potential relationships among variables. The results from Table 3 indicate that GDP influences exports, but the reverse relationship is not supported. Gross Fixed Capital Formation, Imports, and Foreign Direct Investment (FDI) significantly influence GDP at a 5 percent significance level. Additionally, imports significantly affect exports at a 5 percent significance level.

For better illustration and clarification, Table 10 and Figure 2 are designed to show the relationship and Granger directions among variables.

**Table 10: Granger Causality Test**

Causality Direction	F-Statistic	Prob.
Gross Domestic Product (GDP) → Export	4.11876	0.0296
Import → Gross Domestic Product (GDP)	4.95946	0.0162
Foreign Direct Investment (FDI) → GDP	5.76328	0.0094
Import → Export	4.08044	0.0304
Foreign Direct Investment (FDI) → Export	4.85179	0.0175
Gross Fixed Capital Formation (K) → GDP	5.53862	0.0109

Source: The authors.



**Figure 2: Pairwise Granger Causality Test Diagram**

Source: The authors.

The pairwise Granger Causality test was conducted for 28 years of the data. The findings from Table 11 and Figure 2 shows several key insights. Firstly, it was found that imports, Gross Fixed Capital Formation (GFCF), and Foreign Direct Investment (FDI) positively contribute to GDP growth in Afghanistan. Secondly, the data indicated a one-way causal relationship where GDP influences exports. Thirdly, imports and FDI were identified as stimulants for exports at a 5% significance level. These results underscore the significant role of international trade and FDI in driving economic growth in Afghanistan. This conclusion is supported by prior research from scholars such as Chen (2009), Jayachandran & Seilan (2010), Gnougougou (2013), and Ashrafi & Kalaiah (2020).

## 5. Residual and Stability Diagnostic Tests

### 5.1. Diagnostic Tests

The tests which conducted are useful to find out whether the model which the study run is stable or not, the presence of Homoskedasticity, Serial correlation, and ARCH Effect phenomena can distort the result of study, hence to understand and remedy of it is vital. Nevertheless from the result it indicates that all the diagnostic test from Table 12 accept null hypothesis, which means that the model incorporated in the study is free from mentioned phenomena.

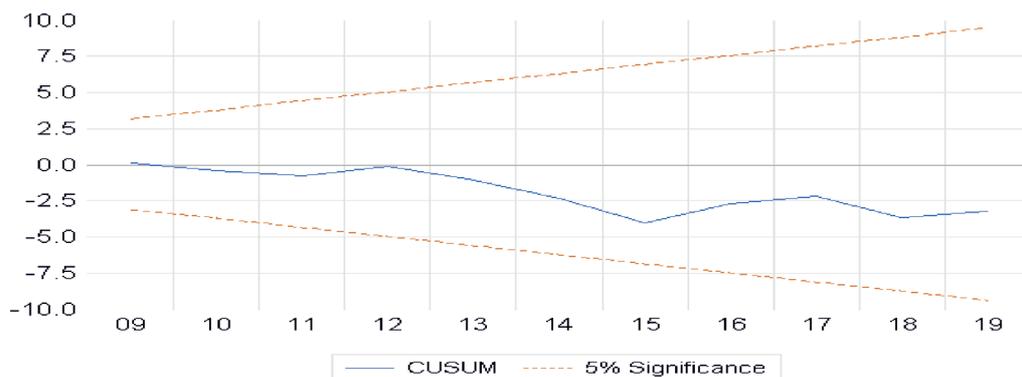
**Table 11: Summary of Diagnostic Tests**

<i>Tests</i>	<i>F-statistic</i>	<i>Prob. Chi-Square</i>	<i>Prob</i>
Jarque-Bera Normality Test	1.927		0.3813
Homoskedasticity	0.449066	0.8056	0.9292
Serial correlation LM Test	1.350642	0.0395	0.3069
ARCH Effect	0.031272	0.8543	0.8611

Source: Computed by Author

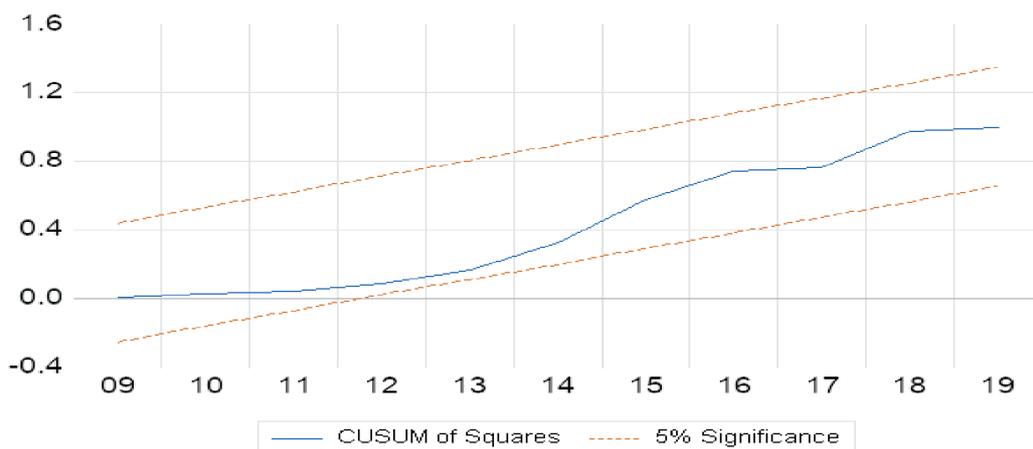
### 5.2. Stability or Cumulative Sum (CUSUM) Test

The CUSUM test shows the stability of the model, the test suggests in order the model to be stable it should be inside critical line of 5 percent. Therefore, from the result of CUSUM and CUSUMQ highlights the stability of the model, as the stability line is in between critical line.



**Figure 4: The Plot of the Cumulative Sum (CUSUM) Test**

Source: The authors.



**Figure 5: The Plot of the Cumulative Sum (CUSUM) of Squares Test**

Source: The authors.

## 6. Conclusion and Policy Suggestions

This study explores the impact of trade on Afghanistan's economic development. To assess data stationarity, Augmented Dickey-Fuller tests with minimized t-statistics were employed. Given the mixed nature of the data, an ARDL test was chosen. The study initially determined Lag Order Criteria and subsequently used a long-run and bound test of ARDL to investigate cointegration between variables. The findings indicate that international trade, represented by imports and exports, significantly enhances economic growth at a 5% significance level. Specifically, a one-unit increase in exports

leads to a 0.16 unit rise in economic growth, while a similar increase in imports results in a 1 unit growth in Afghanistan.

In the short run, exports and imports also exhibit significant positive impacts on economic growth at a 5% significance level. The Pairwise Granger Causality Test revealed a unidirectional relationship among variables: imports, Gross Fixed Capital Formation (GFCF), and Foreign Direct Investment (FDI) have the potential to increase GDP. Additionally, GDP influences exports, and exports are significantly stimulated by imports and FDI at a 5% level.

Based on these findings, policy recommendations include encouraging private sector investment across various sectors to reduce Afghanistan's reliance on imports, stimulate job creation, and bolster economic growth. Implementing import substitution policies could help balance trade volumes, enhance capacity building, and foster economic resilience. Moreover, reducing trade barriers such as tariffs and quotas can facilitate smoother trade flows and attract more investments, thereby optimizing resource allocation.

Historically, Afghanistan has faced challenges in economic development and trade due to prolonged instability. Efforts to revive the economy have included international aid, particularly from the United States, World Bank, and IMF. Afghanistan's trade policy aims to strengthen ties with other nations and improve regional connectivity through infrastructure development and regional trade agreements like CAREC. However, recent political changes may influence trade relations and policy dynamics, necessitating ongoing adaptation.

Foreign Direct Investment (FDI) is highlighted as crucial for Afghanistan's economic growth, offering benefits such as infrastructure development, job creation, technology transfer, enhanced trade opportunities, increased productivity, and capital formation. Continued focus on attracting FDI can play a pivotal role in advancing Afghanistan's economic prospects amidst evolving global and domestic landscapes.

### **Declaration of Conflicting Interests**

The authors declared no potential conflicts of interest concerning this article's research, authorship, and publication.

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