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The Impact of Trade Openness on Economic Growth in Landlocked Developing Countries

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Abstract

The argument over trade openness and its relationship to economic growth remains active, predominantly for landlocked countries, notwithstanding the wave of liberalization that has been examined during the previous few decades. It is still unclear how much trade openness influences economic growth in landlocked nations because some recent researchers have identified favorable impacts, while others have found negligible or negative consequences. Using Kazakhstan and Mongolia as case studies, we inspect how trade openness and economic expansion affect developing nations that are landlocked. Employing an Autoregressive Distributed Lag (ARDL) model in this research, we examined the short- and long-term connections between trade openness and economic growth from 1993 to 2021. The outcome demonstrates that trade openness has a favorable Short-term and long-term impact on economic growth in both landlocked emerging nations, namely Kazakhstan and Mongolia.

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1. Introduction

The increasing incorporation of countries into the international economy is evident through recent developments in diplomatic relations, regional cooperation, and international trade. Trade openness, due to its substantial consequence on economic growth, has consistently held a central position in economic research and policy discussions. Nonetheless, variations in economic structures, technological levels, institutional capacities, human capital, natural resources, and other factors among countries create differences in their opportunities and abilities to harness the benefits of trade openness and engage in international trade. Trade openness emerges as a pivotal factor for economic growth, especially for landlocked countries (Deblock & Haji, 2008; Pegkas, 2015). Trade liberalization enhances domestic economies by facilitating access to imported intermediate inputs, thereby enhancing the technological capabilities of domestic producers and overall productivity (Rivera-Batiz & Romer, 1991). Additionally, it fosters technological advancements and productivity by transferring new technologies and innovations from developed to developing countries (Grossman & Helpman, 1991). Trade openness emerges as a crucial chauffeur of economic progress, influencing competitiveness and technological progress (Iyke, 2017; Sakyi et al., 2015). Furthermore, it plays a pivotal role in globalization, enabling the free stream of services and goods crossways borders, contributing to poverty decrease, geopolitical advantages, increasing incomes, and individual freedom and choice. Singh (2015) highlights that in terms of exports, trade openness optimizes the utilization of production resources and capabilities, promoting specialization. In the case of imports, it provides access to novel technologies and innovations while intensifying competition, ultimately enhancing productivity. However, many landlocked countries confront distinct geographical challenges in accessing global markets. Their exclusion from major transport and service networks, such as logistics, technology, and information technology, due to the absence of direct sea access, forces landlocked nations to rely on transit through neighboring countries for external trade. This reliance, coupled with lengthy distances, intricate transit procedures, and inadequate infrastructure, results in elevated transport and trade costs, stifling foreign trade and, subsequently, economic growth. Access to key markets becomes pivotal for landlocked developing countries in mitigating poverty, driving economic expansion, and expanding market access through regional economic integration (World Bank, 2014). In recent years, The Asia-Pacific region has established itself as the globe's most rapidly expanding region, marked by significant increases in economic competitiveness (WEF, 2013). The region's economic growth has been further fueled by China's expanding trade and investment, driven by the Belt and Road Initiative (BRI). This dynamic landscape presents opportunities for Asian landlocked developing countries to enhance regional cooperation and achieve sustainable economic growth. The primary aim of the current investigation was to measure the influence of trade openness on the economic progress of Asian landlocked developing nations, specifically Kazakhstan and Mongolia, over the period from 1993 to 2021. These two nations represent the largest landlocked developing countries (LLDCs) in Asia and globally. Following the termination of the former Soviet Union in 1991, Kazakhstan and Mongolia not only lost their traditional markets but also endured severe macroeconomic crises. By the 1990s, both countries observed a substantial deterioration in gross domestic product (GDP), rising unemployment, falling per capita GDP, increasing inflation, and soaring government budget deficits. Over the past three decades, they have expanded their foreign trade and regional cooperation efforts. Table 1 offers a comparison of average real GDP, GDP per capita, and growth among three aggregate groups: Kazakhstan and Mongolia, the average of landlocked countries, and the global average in 2021. It is noteworthy that Mongolia's average GDP in 2021 is projected to reach $15.29 billion USD, while the global average, based on data from 160 countries, stands at $9,653.00 billion USD.

Table 1. The comparison of the average real GDP and GDP per capita (2021)

Country	Real GDP (USD billion)	growth (%) of Real GDP	GDP per capita (USD)	growth (%) of GDP per capita
Kazakhstan	197.11	4.30	10373.80	3.00
Mongolia	15.29	1.60	4566.10	1.60
Landlocked average	73.42	4.71	17041.10	3.66
World average	9653.00	5.87	12236.60	5.00

Source: WDI (World Development Indicators) of (WB) World Bank

A new time series spanning from 1993 to 2021 is included in this study that was absent from earlier research on the economies of Kazakhstan and Mongolia. This study thus adds to the body of existing literature. Both landlocked countries' economies could be severely impacted by the COVID-19 pandemic's continuous spread and its aftermath because of their remote locations, reliance on foreign trade, and weak social and economic institutions. Furthermore, around this time, China's "zero COVID" policy instigated supply chain difficulties for the study, which might have impacted the experimental results. This investigate adds to the current knowledge on the association between trade openness and economic development in two unique ways. Firstly, it employs trade openness and economic progress as aggregate variables to explore the dynamic relationships between them. The significance of the relation between trade openness and economic development has come to light more and more in recent years. Researchers have not yet come to a clear consensus on the effects of trade openness on economic growth, despite the majority of studies showing that it has a positive effect. Few investigations suggest that trade openness has a undesirable outcome. Numerous published studies (Hye et al., 2016; Zafar, 2020, for example) characterize trade openness as raising domestic productive activities, promoting innovation and productivity, and raising a nation's citizens' standard of life. According to a number of research (Akhter et al., 2020; Asmare & Haiyun, 2019), trade openness has a negligible and detrimental consequence on economic development. Second, our study looks at how trade openness and economic development relate in Kazakhstan and Mongolia, the two biggest LLDCs globally. Although maritime channels handle 90% of global trade, landlocked nations are not afforded the opportunity to engage in cheaper trade. Landlocked countries have substantially higher trade transaction costs because of their isolation and remoteness from global markets, more border crossings, laborious transit procedures, ineffective logistical systems, shoddy institutions, and inadequate infrastructure. In addition to having a detrimental effect on economic growth, these high expenses have a significant trade-restrictive effect that hinders their ability to fully support their efforts towards sustainable development. Drawing on prior research, we inspect the association between trade openness and economic growth in Kazakhstan and Mongolia, akin to other developing landlocked and least developed nations. The findings of this study will be crucial in shaping the trade strategies of landlocked nations like Mongolia, Kazakhstan, and other developing nations. The remainder of our work is structured like this, afterward the introduction section, we examine the related prior studies on the connection between commerce and economic growth in Section II. The study's methodology, model formulation, and data utilized in this study are covered in Section III, second. Third, the analytical and empirical outcomes are offered in Section IV. The results is lastly mentioned in the part V.

2. Literature Review

The association between trade openness and economic growth has been the subject of extensive empirical and theoretical debate in current decades. Different arguments have been made regarding how trade openness promotes economic progress. Some studies have identified a optimistic and robust correlation between trade openness and economic growth. However, in other instances, this connection has been less favorable and, in specific situations, found to be inconsequential. The conventional theory of comparative advantage (established by David Ricardo in 1817) was emphasizing the need for trade between nations to boost

resource utilization and labor productivity. This idea states that as no nation has all the resources necessary to advance economically, nations should concentrate on producing the goods and services that they are highly skilled at producing or that can do so at a cost that is significantly lower. Countries now have the chance to flourish and earn more money as a result. Trade openness will increase competition in local markets, force local industries to shift their factor of production to other factors of production if they can't compete with international prices, and increase welfare through more efficient use of resources (Nteegah et al., 2017). The Solow model (1957) served as the basis for neoclassical growth theory, which was one of the first to describe the connection between trade openness and economic progress. According to the hypothesis, labor, capital, and technology are the three components that lead to economic growth. Although labor and capital resources in the economy are finite, technology's potential to spur growth is boundless. Trade openness may have an influence on economic progress if it fosters technical advancement. Neoclassical theory's perspective on how technology affects economic growth generally implies that long-term investments in technical advancement and innovation can have a major optimistic influence on economic growth. Trade openness can boost economic growth by advancing factor production and technical advancement, according to the New Growth Theory (Romer, 1986). Trade liberalization can impact economic growth by reallocating resources from the manufacturing to the R&D sectors (Rivera-Batiz & Romer, 1991). According to new development theories, trade openness increases the effective size of producers focused on the market, gives rise to new technologies, and facilitates access to imported inputs. These factors all increase the returns on innovation and can impact a nation's decision to specialize in production involving extensive research (Grossman & Helpman, 1991). When it comes to the availability of intermediate consumption and other production components required for their operations, trade openness gives companies greater flexibility (Iyke, 2017). Some empirical researches have demonstrated that trade openness has a detrimental consequence on economic growth, but recent empirical investigations have demonstrated that trade openness plays a substantial impact in promoting economic growth in countries. Zahonogo (2016) conducted a study utilizing the Pooled Mean Group (PMG) model to investigate the influence of trade liberalization on economic growth in developing countries, specifically focusing on Sub-Saharan Africa (SSA), between 1976 and 2014. The results show that more trade openness promotes economic expansion. Habibi (2015) evaluated the impact of trade openness on economic development for 120 countries between 2000 and 2013 using an Error Correction Model (ECM). The outcomes show a long-term association between trade openness and economic development. Manteli (2015) examined the relationship between trade openness and economic development for a sample of 87 industrialized and developing nations between 1970 and 2013 using the ordinary least squares (OLS) method. The results suggest that growth and openness are positively correlated in every country. Burange et al. (2019) investigated the causal relationship between trade openness and economic growth for the BRICS member nations using time series analysis as an econometric technique. The results align with the hypotheses of growth driven by imports in China and exports in South Africa, respectively. Still, the data provide no proof of a cause-and-effect connection between Brazil and Russia. Furthermore, Bharali & Chakraborty (2016) examine the association between trade openness and economic growth using a heterogeneous panel sample of five BRICS countries from 2004 to 2012. The findings demonstrate that trade openness benefits these nations' economic expansion. In their 2020 study, Yang and Shafiq investigate the effects of trade openness, inflation, money supply, and foreign direct investment on the economic growth of twenty developing Asian nations between 2007 and 2018. The results show that the rate of inflation and the growth of Asian economies are negatively correlated. Fetahi-Vehapi et al. (2015) looked at the impact of trade openness on economic growth in Southeast European countries between 1996 and 2012. The GMM estimation method

is used in the study to estimate growth rates as a function of trade openness and control factors, such as interaction variables, gross fixed capital creation, FDI (foreign direct investment), labor force participation, income per capita, and human capital. The results show that trade openness benefits countries with increased gross fixed capital formation, foreign direct investment, and per capita income. Bakari et al. (2019) examined the connection between domestic investment, imports, exports, and economic growth in Brazil between 1970 and 2017 using the VECM approach. The findings indicate that economic growth is mostly driven by imports, exports, and domestic investment in the short term. The findings demonstrate the beneficial effects of exports and domestic investment on economic growth over the long term. Economic growth is negatively impacted by imports. In his analysis of the connection between trade openness and economic growth in Turkey, Khalid (2016) paid particular attention to the variety of trade components and the possibility for resource development. The study employed the Autoregressive Distributed Lag (ARDL) bounds test to investigate the immediate and long-term impacts of trade openness on economic development between 1960 and 2014. Trade openness may boost economic development in the near term, but there is no sustained correlation between the two, as the results show. Hye et al. (2016) examined the long-term relationship between trade openness and economic development in China using data spanning from 1975 to 2009. It uses an endogenous economic growth model and an ARDL bounds test. The results show that trade openness promotes economic growth both in the short and long run. Pan et al. (2019) examined the concurrent causal links between Bangladesh's technical innovation, energy intensity, trade openness, and financial development. The findings show that trade openness significantly boosts Bangladesh's economic expansion. Hassan & Islam (2005) looked at the connection between Bangladesh's economic expansion and trade openness between 1974 and 2003. The results show a positive long-run equilibrium relationship between trade openness and economic growth. Zafar (2020) investigated the connection between trade openness and economic development in Pakistan between 1975 and 2016 using an Autoregressive Distributed Lag (ARDL) bounds test. The results show that trade openness and foreign direct investment (FDI) both considerably accelerate Pakistan's economic growth.

The majority of empirical research on landlocked nations demonstrates that trade openness boosts economic expansion. Malefane & Odhiambo (2021) examined how trade openness influenced the economy of Lesotho, a landlocked country with low levels of development, from 1975 to 2013 using the ARDL limits test. The results show that there is no evidence of a positive correlation between openness and economic growth. Using the Autoregressive Distributed Lag (ARDL) bounds test, Wani (2019) examined the connection between trade liberalization and economic growth in landlocked, least developed Afghanistan between 1995 and 2016. The findings imply that trade openness and economic growth have a strong, positive long-term link. Using the Autoregressive Distributed Lag (ARDL) bounds test, Parajuli (2021) examined the relationship between foreign trade and economic growth in landlocked Nepal's least developed areas from 1974–1975. The findings demonstrate that, over time, foreign trade benefits Nepal's economic expansion. Esaku (2021) examined the link between trade openness and economic growth in Uganda, the least developed landlocked nation, using the ARDL bounds test between 1983 and 2019. The findings indicate a favorable and statistically significant association between increases in imports and openness indices and longer-term economic growth. Asmare & Haiyun (2019) examined the effects of trade openness on economic growth in landlocked, least developed Ethiopia between 1981 and 2017 using the two-stage least squares (2SLS) technique. The results suggest that Ethiopia's economic growth is negatively impacted by trade openness. The findings also demonstrate that while foreign direct investment has detrimental consequences on Ethiopia, fixed capital formation, human capital, and labor force have

beneficial effects. Using a Vector Error Correction Model (VECM), Mbingui & Etoka-Beka (2021) examined the effects of trade openness on economic growth in the landlocked, least developed Republic of Congo between 1986 and 2016. The outcome demonstrates that trade openness has a negative short- and long-term impact on Congo's economic growth. Malefane (2020) assessed the dynamic influence of trade openness on the economic growth of landlocked least developed Botswana between 1975 and 2014 using the Autoregressive Distributed Lag (ARDL) bounds testing technique. The results show that trade openness both temporarily and permanently increases economic development. In their 2022 study, Outtanasith & Srithilat used ARDL bounds testing to investigate the impact of foreign direct investment and trade openness on economic development in the landlocked Lao PDR from 1990 to 2025. The results show how important trade liberalization and foreign direct investment (FDI) are to the Lao PDR's long-term economic growth. In 2022, Akhter et al. conducted a study on the impact of trade openness on economic growth in Kazakhstan, a developing landlocked nation. The Autoregressive Distributed Lag (ARDL) bound test was used in the research from 1992 to 2020. The findings indicate that whereas capital formation, labor quantity and quality, and natural resources all have a positive impact on the economy, trade has a negative short- and long-term impact on GDP. The lack of effective institutions, ineffective management, the nation's economic structure, its development policies, and the fact that imports offset exports' beneficial impacts could all contribute to trade's negative repercussions. Amirov & Avazov (2022) examined how trade openness, foreign direct investment, and digital infrastructure affect economic growth in landlocked developing Uzbekistan. From 2010 to 2021, the least squares model (NLS and ARMA) was employed in the investigation. The findings indicate that trade openness and foreign direct investment have a substantial positive correlation with Uzbekistan's economic growth.

3. Data analysis and Methodology

The model, estimation method, and data description used to test for both the short- and long-term relationships between the variables are presented in this section.

3.1 Variable Description and Data Sources

We employed ARDL bound testing to inspect the association between trade openness and economic development using the World Bank's WDI (World Development Indicators). Annual statistics for Kazakhstan and Mongolia from 1993 to 2021 were also included in the study. Table 2 provides a description of the variables used in the study model.

Table 2. Description of the variables

Variable	Description
Economic growth (EG)	GDP growth (annual %)
Trade openness (TO)	The sum of exports and imports as a share of GDP
Inflation (INF)	Consumer prices (annual %)
Foreign direct investment (FDI)	Net inflow of foreign direct investment (% of GDP)

Source: World Bank

3.2 Study's Methodology and Specific Model.

3.2.1 Unit root test (URT)

Unit root tests (URTs) were run to regulate the order in which the variables were integrated. The assessments that are employed include the Phillips–Peron (PP) test (Phillips and Peron, 1988), the Augmented Dickey–Fuller (ADF) test (Dickey and Fuller, 1979, 1981), and the Kwiatkowski–Phillips–Schmidt-Shin (KPSS) unit root test. In each test, the null states that the sequence has a unit root, whereas the alternate claims that the series is motionless.

3.2.2 Empirical Model Specification

The empirical model used in the current study was adapted from Jin (2000) and looks at how trade openness, inflation, FDI, and labor force participation affect economic development. The model condition investigates the link between economic growth (EG), trade openness (TO), FDI, inflation (INF), and the labor force (LAB). It is based on a simple multivariate framework. The portrayal of the connection is as follows:

$$EG = (TO, INF, FDI, LAB)$$

Where TO stands for trade openness measures, INF is for inflation, or annual consumer prices to GDP, FDI stands for net inflow of foreign direct investment to GDP, and LAB stands for labor force participation rate. EG stands for economic growth as defined by growth rate of GDP (annual percent).

3.2.3 Estimation techniques

As an substitute to the co-integration model for panel data series in different order I(1) and I(0) concurrently, Pesaran et al. (2001) presented the ARDL (Autoregressive Distributed Lag) limits testing technique to test for co-integration (Engle & Granger, 1987; Keho, 2017). In the study, the short- and long-term connections between variables are observed using the ARDL model. One alternative way to formulate the ARDL bound testing technique for cointegration is as follows:

$$\Delta EG = \alpha_0 + \sum_{i=1}^{n} \beta_{1i}\, \Delta EG_{t-i} + \sum_{i=0}^{n} \beta_{2i}\, \Delta TO_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta INF_{t-i} + \sum_{i=0}^{n} \beta_{4i}\, \Delta FDI_{t-i} + \sum_{i=0}^{n} \beta_{5i} \Delta LAB_{t-i} + \varphi_1 EG_{t-1} + \varphi_2 TO_{t-1} + \varphi_3 INF_{t-1} + \varphi_4 FDI_{t-1} + \varphi_5 LAB_{t-1} + \mu_t$$

In equation where the Δ is defined as the first difference operator, ΔEG_t refers for the natural log of Gross domestic product per capital, ΔTO_t refers for the natural log of trade openness index, ΔINF_t is the inflation, ΔFDI_t is the natural log of foreign direct investment, ΔLAB_t is the labor force and μ_t refers for the error correction term.

In the aftermath of the equation-based cointegration test, the ECM (Error Correction Model) may be written as follows:

$$\Delta EG_t = \alpha_0 + \sum_{i=0}^{n} \alpha_{1i}\, \Delta EG_{t-i} + \sum_{i=0}^{n} \alpha_{2i}\, \Delta TO_{t-i} + \sum_{i=0}^{n} \alpha_{3i}\, \Delta INF_{t-i} + \sum_{i=0}^{n} \alpha_{4i}\, \Delta FDI_{t-i} + \sum_{i=0}^{n} \alpha_{5i}\, \Delta LAB_{t-i} + \varphi ECT_{t-1} + \mu_t$$

3.2.4 Diagnostic Test

In order to determine the goodness of ARDL model's fit obtains accurate and trustworthy findings, Also the stability tests and diagnostic tests are carried out. The diagnostic test looks at normalcy, heteroscedasticity, serial correlation LM test, and ARCH test. Because errors can happen and because these checks aid in the deduction of valid and reliable data, they are crucial. Within the stability test, two metrics are employed: the CUSUM (cumulative residual) and the CUSUMSQ (cumulative sum of squares of recursive residuals).

4. Empirical Results

4.1 Descriptive Statistics

Table 3 and 4 shows the preliminary statistics for the variables in the study model of Kazakhstan and Mongolia in the period 1993-2021. In terms of the mean over the entire study period, the mean value of EG of Kazakhstan is 3.94%. The average value of TO of Kazakhstan is

77.21%, the average value of INF is 154.33%, the average value of FDI is 6.73%, and the average value of LAB rate is 70.43%.

Table 3. Descriptive statistics. (Kazakhstan)

Variables	EG	TO	INF	FDI	LAB
Mean	3.94	77.21	154.33	6.73	70.43
Median	4.30	74.14	7.60	5.40	70.40
Maximum	13.50	105.70	2169.80	13.00	71.61
Minimum	-12.60	53.05	5.10	0.20	69.07
Std. Dev.	6.26	14.83	520.19	3.74	0.72
Skewness	-0.97	0.10	3.41	0.36	-0.15
Kurtosis	3.56	1.81	12.79	1.95	2.18
Jarque-Bera	4.97	1.76	172.28	1.96	0.93
Probability	0.08	0.41	0.00	0.38	0.63

Source: Author's computation

It can be seen that the mean value of EG of Mongolia is 5.29%. The average value of TO of Mongolia is 111.64%, the average value of INF is 22.17%, the average value of FDI is 8.54%, and the average value of LAB rate is 59.94%.

Table 4. Descriptive statistics. (Mongolia)

Variables	EG	TO	INF	FDI	LAB
Mean	5.29	111.64	22.17	8.54	59.94
Median	5.60	112.93	8.20	7.20	60.08
Maximum	17.29	131.33	268.20	43.90	60.92
Minimum	-4.56	77.97	0.00	-37.20	58.40
Std. Dev.	4.76	13.40	50.46	13.46	0.73
Skewness	0.20	-0.82	4.27	-0.47	-0.75
Kurtosis	3.18	3.20	21.03	7.34	2.49
Jarque-Bera	0.23	3.26	480.88	23.78	3.02
Probability	0.89	0.20	0.00	0.00	0.22

Source: Author's computation

4.2 Unit root test

Tables 5 and 6 provide the findings of the unit root tests for Kazakhstan and Mongolia, demonstrating that every variable is either stationary at levels or at first difference.

Table 5. ADF, PP and KPSS unit root tests on log levels of variables. (Kazakhstan)

Kazakhstan				
Variables	At level		At first difference	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
ADF				
LNEG	-2.58	-2.26	-5.33***	-6.12***
LNTO	-1.19	-1.98	-5.83***	-5.78***
LNINF	-5.29***	-3.94**	-3.09**	-4.46***
LNFDI	-3.09**	-3.35*	-7.71***	-3.53*
LNLAB	-1.34	-2.39	-5.34***	-5.22***
PP				
LNEG	-2.58	-2.14	-5.33***	-6.15***
LNTO	-1.13	-1.95	-5.33***	-5.78***
LNINF	-8.12***	-6.12***	-3.09**	-3.92**
LNFDI	-3.03**	-3.28*	-10.03***	-22.34***
LNLAB	-1.24	-2.39	-7.15***	-6.56***
KPSS				
LNEG	0.23	0.15**	0.21	0.11
LNTO	0.43*	0.14*	0.15	0.11
LNINF	0.43*	0.15**	0.38*	0.14*
LNFDI	0.25	0.18**	0.50**	0.50***
LNLAB	0.42*	0.09	0.15	0.10

Note: *, **, ***, represent significance at 10%, 5% and 1% levels, respectively.

Source: Author's computation.

Table 6. ADF, PP and KPSS unit root tests on log levels of variables. (Mongolia)

Mongolia				
Variables	At level		At first difference	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
ADF				
LNEG	-3.68**	-3.49*	-5.88***	-5.86***
LNTO	-2.91*	-3.16	-5.25***	-5.34***
LNINF	-5.56***	-5.56***	-12.86***	-12.53***
LNFDI	-4.90***	-4.82***	0.43	-3.81**
LNLAB	-3.10**	-3.67**	-6.18***	-6.14***
PP				
LNEG	-3.64**	-3.42*	-8.03***	-12.94***
LNTO	-3.09**	-3.32*	-10.61***	-9.84***
LNINF	-6.03***	-5.95***	-8.90***	-10.38***
LNFDI	-4.90***	-4.81***	-16.61***	-15.94***
LNLAB	-2.86*	-3.57*	-7.84***	-8.53***
KPSS				
LNEG	0.23	0.19**	0.50**	0.44***
LNTO	0.15	0.10	0.11	0.08
LNINF	0.47**	0.14*	0.31	0.14*
LNFDI	0.08	0.06	0.43*	0.43***
LNLAB	0.40*	0.30***	0.36*	0.28***

Note: *, **, ***, represent significance at 10%, 5% and 1% levels, respectively
Source: Author's computation

Depending on the assessment method and whether the trend is encompassed or not, the stationarity test findings, which are shown in Tables 5 and 6, show that the study's variables are either motionless in levels or immobile after primary differencing. Following the stationarity test findings, which indicated that the variables were integrated of either order zero or order one, the ARDL limits testing procedure was carried out.

4.3 ARDL Bound Test

The results of the ARDL bound test are shown in Table 7. Since the estimated F-statistics for Kazakhstan and Mongolia are more than the critical values of 1%, the null hypothesis that there is no long-term relationship is rejected. These results are consistent with the findings of see Dollar & Kraay (2004), Frankel & Romer (1999), Karras (2003), Keho (2017), and Yanikkaya (2003). Estimates of the short- and long-term dynamics of the variables are developed once a long-term relationship is found. The model selection criteria that are used are the Akaike information criterion (AIC).

Table 7. Bound testing cointegration results

Country	F-statistic	
Kazakhstan	12.60***	
Mongolia	5.71***	
Critical value bounds		
Significance	Lower bounds I(0)	Upper bounds I(1)
1%	3.74	5.06
5%	2.86	4.01
10%	2.45	3.52

Note: *** is significance level at 1%.
Source: Author's computation

Estimating the combined F-statistic in relation to the specified bounds testing will determine whether or not the null hypothesis of no cointegration is rejected. The bounds testing technique begins with a suitable latency of two. The joined F-statistic for Kazakhstan (12.59689) and Mongolia (5.711608) is more than the upper bound critical value of 3.74 and 5.06 at the 1% level of significance, according to Table 7's calculation of the joined F-statistic with the

provided lag order. This suggests that the variables in the model have a long-term cointegration relationship, rejecting the null hypothesis that there is no cointegration. Table 8 presents the long-term estimates for Mongolia and Kazakhstan. In Kazakhstan, TO is substantial at the 1% level and has a beneficial effect on EG. In Kazakhstan, a 1% rise in TO corresponds to a 0.60% increase in EG. In Mongolia, TO is substantial at the 1% level and has a beneficial effect on EG. In Mongolia, a 1% rise in TO causes a 0.71% increase in EG. EG in Kazakhstan is negatively but negligibly impacted by INF. However, in Kazakhstan and Mongolia, FDI has a negligible negative impact on EG. In Kazakhstan and Mongolia, LAB is statistically significant and positively signed on EG.

Table 8. Long-run relationships. Dependent variable: EG

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Kazakhstan				
TO	0.64***	0.13	5.07	0.00
INF	-0.23***	0.02	-10.02	0.00
FDI	-0.33**	0.31	-1.09	0.29
LAB	-0.49**	2.19	-0.22	0.83
C	2.03***	0.24	8.63	0.00
Mongolia				
TO	0.71**	0.41	1.7	0.10
INF	0.03**	0.07	0.39	0.70
FDI	-0.01**	0.05	-0.23	0.82
LAB	11.90**	4.90	2.43	0.02
C	-16.01***	2.76	-5.81	0.00

Note: *** and **is statistically significant level at 1% and 5% respectively.
Source: Author's computation

Table 9 displays the estimates for the near future. In the near term, TO has a major and favorable effect on EG in Kazakhstan and Mongolia. According to the findings, the TO index positively affects EG and is statistically significant at the 1% level. This means that in Kazakhstan, a 1% rise in the overall effect of TO is associated with a 0.69789% increase in EG. In Mongolia, an increase of 1% in the total effect of TO is associated with an increase of 0.839076% in EG.

Table 9. Short-run relationships. Dependent variable: D(EG)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Kazakhstan				
D(LNEG(-1))	-0.93	0.12	-7.67	0.00
D(LNTO)	0.59	0.13	4.47	0.00
D(LNINF)	-0.22	0.03	-7.05	0.00
D(LNFDI)	-0.31	0.28	-1.13	0.27
D(LNLAB)	-0.45	2.06	-0.22	0.83
ECM(-1)	-0.93	0.10	-9.04	0.00
R-squared	0.67			
F-statistic	4.52			
DW-statistic	2.39			
Mongolia				
D(LNEG(-1))	-0.68	0.15	-4.53	0.00
D(LNTO)	0.49	0.27	1.83	0.08
D(LNINF)	0.02	0.05	0.39	0.70
D(LNFDI)	-0.01	0.04	-0.23	0.82
D(LNLAB)	8.11	2.94	2.76	0.01
ECM(-1)	-0.68	0.12	-5.81	0.00
R-squared	0.58			
F-statistic	3.76			
DW-statistic	2.08			

Note: *** and **is statistically significant level at 1% and 5% respectively.
Source: Author's computation

Furthermore, all diagnostic tests for heteroscedasticity, serial correlation (LM test), normality of errors (Jarque–Bera test), and ARCH pass for every variable. The diagnostic test results are shown in Table 10.

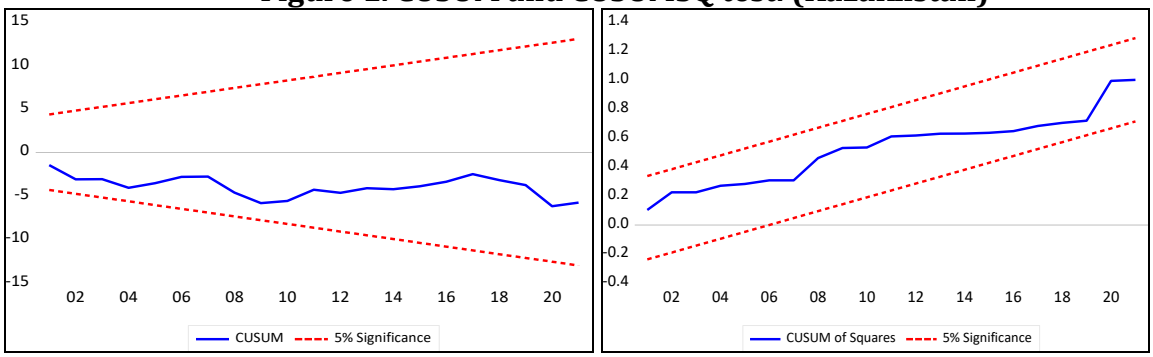
Table 10. Diagnostic test.

Country	Kazakhstan		Mongolia	
	Statistic-value	Probability	Statistic-value	Probability
Normality	0.95	0.62	0.03	0.99
Serial correlation LM test	0.81	0.74	0.28	0.19
Heteroscedasticity	1.06	0.42	1.72	0.17
ARCH test	0.30	0.59	0.01	0.94

Source: Author's computation

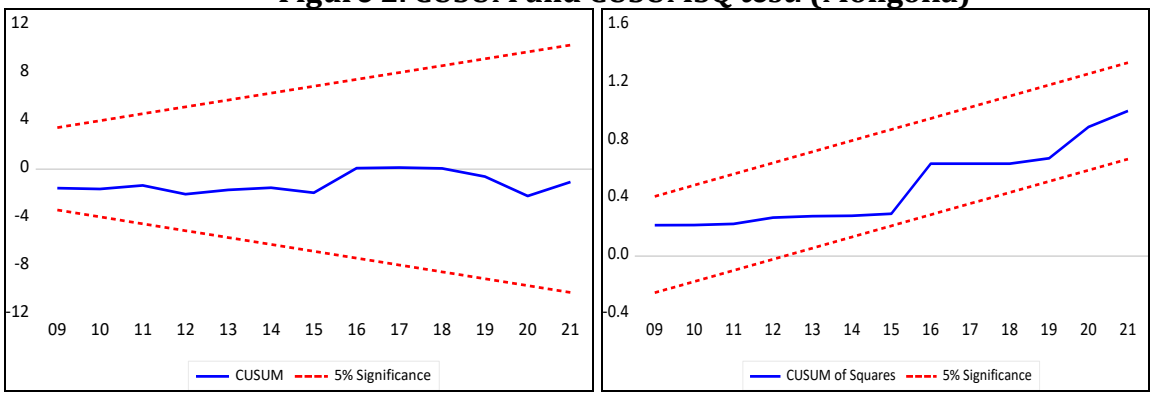
To assess the stability of the coefficients, the cumulative sum of recursive residuals (CUSUM) test is run for Kazakhstan and Mongolia. The models for Kazakhstan and Mongolia are demonstrated to be stable as the plots in the CUSUM graphs in Figures 1 and 2 are contained within the crucial bands of the 5% confidence range.

Figure 1. CUSUM and CUSUMSQ test. (Kazakhstan)



Source: Author's computation.

Figure 2. CUSUM and CUSUMSQ test. (Mongolia)



Source: Author's computation

5. Conclusions

Based on its impact on the integration of regional and global economies and the creation of new and larger markets for various countries worldwide, trade openness is thought to promote economic growth, according to the majority of research. Geographical information is useful for trade. There are many problems, such as geographical location, political instability, transportation and logistics issues, resources (ocean resources), small population, and small market size. Landlocked developing countries have an inherent disadvantage over coastal countries when it comes to exporting goods to foreign markets because their goods must pass through neighboring countries to reach the nearest port. Imports face the same challenge, but in the opposite direction. Higher shipping costs, coupled with administrative expenses, make

transactions more complex and expensive. Thus, this study uses the ARDL limits test to investigate the relationship between trade openness and economic growth in landlocked developing nations, specifically focusing on Kazakhstan and Mongolia, from 1993 to 2021. The world's two biggest landlocked nations are Kazakhstan and Mongolia. Furthermore, two of Asia's landlocked developing nations with the quickest rates of growth are Kazakhstan and Mongolia. The findings demonstrate that trade openness has a favorable short- and long-term impact on economic growth in landlocked Kazakhstan and Mongolia. A dependent and explanatory variable have an association relationship, according to the outcome of an empirical model based on the bounds testing approach (ARDL). The combined F-statistics of 11.60 (Kazakhstan) and 5.71 (Mongolia) indicate that the null hypothesis of no cointegration has been rejected because of their bigger than upper bound critical value of 5.06. From an economic and strategic perspective, it would not be an exaggeration to say that the survival and prosperity of landlocked countries depends on their freedom to contract and trade. For landlocked countries, regional integration and cooperation are crucial for development by improving connectivity, enhancing competitiveness and trade capacity, expanding markets and upgrading value chains. Engaging landlocked countries in regional economic integration activities is therefore a top foreign policy priority for these countries. As a result, both countries need to actively promote regional economic cooperation.

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