

Mediation Effect of Foreign Direct Investment Through Trade Liberalization on Economic Growth in Asian Countries

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ABSTRACT

The majority of economists agree with the fact that trade freedom and economic development are strongly and favourably correlated. The goal of trade freedom is to help economies reach their macroeconomic objectives, particularly strong economic growth. Many nations now understand how crucial it is to draw in foreign direct investment (FDI) in order to boost economic growth and revitalisation. This has provided signals to many countries to work on developing favourable conditions to promote FDI, and identifying the key determinants of FDI becomes a very crucial task for the policymakers. Moreover, the role of governance has gained more attention nowadays, and many investors around the world are now looking for a better and safer business environment for their investments. The paper explores an important topic by examining the mediation effects of foreign direct investment (FDI) through trade liberalization on economic growth in Asian countries. Using an extensive dataset spanning 22 years across 48 nations and employing advanced econometric methods, such as fixed-effects regression and Sobel Z-value tests, the study provides valuable insights with strong policy relevance. The result indicates an indirect effect. InTLInFDI demonstrates a positive and significant relationship between trade liberalisation and foreign direct investment (FDI) in their combined effect on economic output (lnGDP). The study contributes significantly to understanding the interplay between trade liberalization, FDI, and economic growth and this paper has strong potential to impact both academic research and policymakers in designing and implementing effective trade and investment policies for sustained and inclusive economic development across the region.

Keywords: Asia Countries, Economic Growth, FEM, FDI, Trade Liberalization

Introduction

Background of the Study

It is a well-known notion that international trade and foreign direct investment play a significant role in the development of a nation. In today's globalized world, it is undeniable that in Asian countries economic and social benefits are an important outcome of greater openness of trade and foreign direct investment inflows. Most common argument that favors a positive relationship between trade liberalization and development states that higher levels of liberal trade brings higher standard of living ultimately leading to better health facilities, better social services and more education. However, in broader view freer trade influences indicators of development both via income and without income channel [1].

Trade liberalization has facilitated increased market access and integration for these countries, leading to enhanced export opportunities and the inflow of foreign investments. This, in turn, has not only bolstered industrial and infrastructural development but has also contributed to the transfer of technology and managerial expertise, thereby engendering greater productivity and competitiveness Ali L [2].

In the post-World War II era, many Asian countries pursued import substitution industrialization (ISI) strategies, aiming to achieve self-sufficiency and reduce dependency on foreign imports. However, starting in the 1980s and onwards, influenced by changing global economic dynamics and the advocacy of international economic institutions, several Asian countries began embracing policies of trade liberalization and market openness. In the 1980s and 1990s, several Asian countries, including notable examples such as China, India, and various Southeast

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Asian nations, embarked on trade liberalization initiatives. This involved reducing tariffs, dismantling non-tariff barriers, and integrating into the global trading system through entities such as the World Trade Organization (WTO). These efforts led to increased export orientation and deeper engagement with global supply chains Khati P, Kim C [3]. Concurrently, Asian countries actively courted foreign direct investment to fuel industrialization and economic growth. The emergence of export processing zones and special economic zones in countries such as China, India, and countries in Southeast Asia attracted substantial FDI, leading to the rapid expansion of export-oriented manufacturing and the transfer of technology and managerial expertise from multinational corporations. The Asian financial crisis of the late 1990s prompted significant restructuring and reforms in the affected economies, underlining the interconnectedness of Asian economies with the global financial system.

This period led to further policy adjustments, focusing on regulatory and institutional reforms to enhance economic resilience and competitiveness. The relationship between trade liberalization, FDI, and economic growth is underpinned by several significant economic theories and models Aleksandravičienė, et al [4]. Understanding the implications of trade liberalization and FDI on labor markets and income distribution can inform the design of targeted social policies. Governments can develop programs aimed at mitigating any adverse effects on vulnerable segments of the population and ensuring inclusive growth. Insights from the study can inform regional cooperation initiatives related to trade and investment. By understanding the impact of FDI and trade on economic growth within the studied countries, policymakers can work towards regional agreements and collaborations that enhance synergies and create a conducive environment for cross-border investments and trade. Aligning policies with the findings of the study can contribute to the advancement of Sustainable Development Goals (SDGs) within the region. By leveraging trade liberalization and FDI for sustainable and inclusive economic growth, policymakers can contribute to achieving targets related to poverty reduction, infrastructure development, and environmental sustainability Zhai H [5].

The historical overview unveiled pivotal milestones in the evolution of trade liberalization and FDI within Asian countries, spotlighting the transformative shifts that have shaped their economic landscapes.

This transition seamlessly serves to set the stage for delving into the specific research questions and objectives that guide this article, feeding into a meticulous methodology that aims to capture the multifaceted dimensions of trade liberalization, FDI, and economic growth. By synthesizing these historical, theoretical, and empirical considerations, the subsequent sections of this document will unfold the unique contribution this study seeks to make to the field of economics and development, emphasizing the substantive policy and practical implications derived from rigorous and informed analysis.

Statement of the Problem

Economic theory generally supports the conclusion that trade liberalization has a positive effect on economic growth. However, the relationship between trade liberalization, FDI, and

economic growth is complex and varies across countries and regions. Theorists disagree on the impact of trade liberalization and FDI on economic growth, with some suggesting a positive effect and others proposing scenarios in which liberalization might slow economic growth Trawally O [6]. Empirical studies have identified a positive linkage between a country's rate of economic growth and trade liberalization, as well as the dynamic effect of trade liberalization on FDI. Additionally, factors such as market size, trade openness, labor force, infrastructure, and political stability have been found to influence FDI and economic growth in developing Asian countries. The significance of trade liberalization and foreign direct investment (FDI) in shaping the economic trajectory of developing Asian countries has become increasingly apparent Zhai H [5]. However, while existing literature acknowledges their importance, there remains a substantial gap in the comprehensive empirical analysis of the specific impacts of trade liberalization and FDI within the unique contexts of individual economies in the selected Asian countries. This gap hinders a nuanced understanding of how these influences manifest within the intricacies of the region's economic systems, institutional frameworks, and sectoral characteristics. Consequently, the absence of cohesive and comprehensive empirical understanding constrains the development of targeted policies and strategies tailored to the distinct developmental challenges and opportunities within these countries Vuthy BUN [7]. Resolving these ambiguities is vital not only for advancing economic theory but also for informing policy decisions and strategies that can positively impact the economic well-being of developing Asian countries. Therefore, a detailed exploration is imperative to offer a granular and nuanced understanding of the impacts of trade liberalization and FDI, contributing to both theoretical and practical economic development within the region.

The following research question was well-thought-out in this study in accordance with the research problem: What is the impact of foreign direct investment mediation through trade liberalization in Asian countries? To examining the mediation of foreign direct investment through trade liberalization in Asian countries.

Literature Review

The theoretical review chapter documents the various theories guiding the study and the relationship with the study variables as well as the theoretical linkages among the variables under review. The literature review in this chapter addresses two topics. The first is the relationship between trade liberalization and growth; The second is the relationship between Foreign Direct Investment and growth. Huang X, et al. The study "Trade Liberalisation and Labour Income Portion Variation: An Explanation of China's Departure Using the Stolper-Samuelson Theorem" examines the connection between China's labour income share and trade liberalization [8]. It draws attention to how, seemingly in defiance of the Stolper-Samuelson theorem, China's labour contribution to income has paradoxically decreased as trade openness has expanded. empirical study using panel data across 29 Chinese provinces between 1987 and 2006 to show how trade liberalisation might result in advancements in labor-saving technologies, which then impact labour income share. They deploy both fixed-effect as well as random-effect models in a two-period strategy (1987-1995 and 1996-2006)

in order to identify the structural discontinuity in the data. To confirm the causal links, Granger tests for causality are employed. There are various gaps: Limited Generalisability: The analysis's conclusions might not be immediately applicable to other labor-rich nations with distinct industrial or trade frameworks because it is focused on China. Absence of Sectoral Analysis: Since labor-saving technological advancements probably differ across industries, especially in manufacturing versus services, the study would benefit from a sectoral breakdown.

Hassan, et al, This research "Trade, Foreign Capital, and Highly Productive Ability Nexus: The regulating Role of Institutions" looks at how trade openness, FDI, and international remittances affect the PC of four South Asian economies: Pakistan, Bangladesh, India, and Sri Lanka [9]. Additionally, it investigates how institutional quality (INQ) functions as a moderating factor between 2000 and 2022. To handle variability and volatility in panel data, the study use empirical analytic techniques such as Panel Corrected Standard Estimates (PCSE) and Feasible Generalised Least Squares (FGLS). These findings could be further validated by future studies that include a wider range for foreign capital inflows and more diverse nations. The study, "Threshold impact of inflation upon the FDI – growth the nexus: results from inflationary-targeting nations throughout sub-Saharan Africa," examines how inflation thresholds affect the connection between FDI and economic growth within states in the region [10]. The paper uses a fixed-effect the panel threshold model from 1982 to 2020 to analyse panel data for South Africa, Ghana, and Nigeria. This method adds variation and complexity to conventional linear models by allowing for various growth reactions to FDI depending on inflation thresholds. Sadia Jabeen investigated the impact of political stability, business environment, and macroeconomic variables on foreign direct investment (FDI) in Eurasian countries [11-15]. The study aims to examine the relationship between these factors and FDI in ten Eurasian countries over a 26-year period

(1996-2021). The findings support the predicted outcomes, suggesting that policymakers and researchers need to consider the complex interplay between macroeconomic risk, political instability, and the business environment to attract foreign direct investment [16].

Research Methodology

Introduction

This study uses both deductive and exploratory methods. The objective is to evaluate trade liberalisation, foreign direct investment, and economic growth in Asian nations. There were multiple sections that presented the study's methodology. Along with the study goal, intended population and samples, and sampling procedure, it also covers the methodologies that were used for gathering data and analysis. At that point, a data analysis tool and model specification were accessible.

Research Design

The researchers intends to use a quantitative research design for conducting the study. The quantitative research begins with pre-determined, instrument-based data designed to test hypotheses. Panel research allows a researcher to examine both cross-sectional and time series data, providing a foundation for generalising about the problems. The targeted group through whom a representative group was carefully selected is known as the population being studied in statistics [17,18]. However, a population includes a well-defined set of people, groups, objects, and events which constitute the subject of the study. A researchers must identify a particular demography as the study's population target in order to derive all of the findings regarding the soundness of the topic that the researcher is investigating, according to Kothari [19]. Forty eight nations from all Asian countries was be chosen as the study's population such as listed the below table are the nations in question and for twenty two years period between 2000 and 2022.

Table 1: List of Asian Countries

Central Asia	East Asia	Middle-East Asia	South Asia	Southeast Asia	Westen Asia
Iran, Russia, Uzbekistan, Kyrgyzstan, Tajikistan, Kazakhstan, Turkmenistan	China, Japan, South Korea, North Korea, Mongolia	United Arab Emirates	Nepal, Pakistan, India, Bangladesh, and Sri Lanka, Bhutan, Afghanistan, Maldives	Myanmar, Singapore, Thailand, Brunei Darussalam, Indonesia, Malaysia, Philippines, Timor-leste ,Cambodia, Laos PDR , Vietnam	Georgia, Armenia, Azerbaijan, Turkey, Cyprus, Lebanon, Israel, Syria, Jordan, Iraq, Oman, Yemen, Kuwait, Bahrain, Qatar, Saudi Arabia

Source: Author Design

Note: From World Economic Situation and Prospects 2022, by United Nations, 2022, New York

Independent Variable

The independent variable of the study is trade liberalization which is proxied by trade policy index of countries.

Trade Liberalization

The trade policy index of countries is used as a proxy for trade liberalization. This index is based on the Heritage Foundation's Trade Freedom score, which is part of their annual Index of Economic Freedom. The scale of this indicator ranges from 0 to 100, where 0 indicates the highest level of protectionism and

100 signifies the lowest. The formula to convert tariff rates and non-tariff barriers into this 0-100 scale is as follows:

$$\text{Trade Policy}_i = (\text{Tariff}_{\max} - \text{Tariff}_i) / (\text{Tariff}_{\max} - \text{Tariff}_{\min}) - \text{NTB}_i$$

Here, Trade Policy_i indicates the trade freedom for country i, with $\text{Tariff}_{\max}$ and $\text{Tariff}_{\min}$ representing the maximum and minimum tariff limits (50% and 0%, respectively), and Tariff_i indicating the weighted average tariff rate in country i. The result is then multiplied by 100 to express it as a percentage. If applicable, a

non-tariff barrier (NTB) penalty of 5, 10, 15, or 20 percentage points is deducted from the base score, depending on the extent of NTBs in that country.

Foreign Direct Investment

Foreign Direct Investment (FDI) refers to an investment made by a company or individual in one country into business interests in another country. This typically involves establishing business operations or acquiring assets in the foreign country, which can include setting up a subsidiary or branch, merging with or acquiring a controlling interest in a foreign company, or forming joint ventures with local entities. FDI is significant for several reasons; it can lead to economic growth, job creation, and the transfer of technology and expertise to the host country. The World Bank compiles this data from national statistical offices, central banks, and other government agencies, ensuring consistency and comparability across countries. FDI used as also the mediation of trade liberalization to identify the best result analysis.

Control Variables

control variables are factors or variables that are held constant or regulated in an experiment to prevent them from influencing the outcome or dependent variable. By controlling certain variables, researchers can isolate the effect of the independent variable and make more accurate conclusions about the relationship between variables.

Market Size

Market size is one of the vital factors in attracting FDI. Larger markets provide opportunities for the economies of scale. In FDI literature market size is mostly considered as one of the important determinants of FDI inflows. Population (total) is taken as a proxy for market size from the World development indicators for each Asian-48 countries.

Rule of Law

Rule of law index used is based on the expert estimates and index by V-Dem. It captures the extent to which the government complies with the law, courts are independent, laws transparent, justice accessible, corruption absent, and the bureaucracy is impartial. It ranges from 0 to 1 (most rule-based).

Data Analysis and Econometrics Technique

The study uses panel data analysis approaches. Panel data are also called longitudinal data or cross-sectional time-series data. These longitudinal data have “observations on the same units in several different time periods”. A panel data set has multiple entities and each of which has repeated measurements at different periods. Panel data may have individual (group) effect, time effect, or both, which are analysed by fixed effect model but using STATA version 18. The researchers were examined trade liberalization, foreign direct investment and factors that influence economic growth using regression models. The functional relationship between the independent variables and the dependent variables are given as follows;

$$GDP = f(TL, FDI, POP, ROL)$$

The model specification of this study followed by the previous scholar Bhuyan and Salam [20]. Assuming economic growth as

independent variable and trade liberalization, FDI and this study used a simple model of economic growth as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \varepsilon_{it} \quad (1)$$

Where “Y” denotes as the dependent variable, “X” means the independent variable which effects on main dependent variables and β_1 is the coefficient of independent variable. β_0 is the intercept term. And “ ε ” represents as the error term that is assumed to be normally distributed with zero mean and constant variance, with each country as “i” and “t” representing each year of the study in this paper. To test the hypotheses, the following regression equations are used:

$$\ln GDP_{it} = \beta_0 + \beta_1 (\ln T_{it} * \ln FDI_{it}) + \beta_2 \ln TV_{it} + \beta_3 \ln EDU_{it} + \beta_4 \ln ROL_{it} + \varepsilon_{it} \quad (2)$$

Where

$\ln GDP$	= Log of Gross Domestic Product
$\ln TL$	= Log of Trade Liberalization
$(\ln TL * \ln FDI)$	= Logs of Interaction Variable
$\ln POP$	= Log of Population
$\ln ROL$	= Log of Rules of Law
ε_{it}	= Error term

Empirical Analysis of Mediation Effect of Foreign Direct Investment through Trade Liberalization on economic growth in Asian countries

Introduction

This study's primary objective is to clarify the impact of Foreign Direct Investment Mediation through Trade Liberalization on economic growth in Asian countries. In line with the objectives of the study, this chapter offers a thorough explanation of the findings, data analysis, results, and discussions. Here, researcher delve deeper into this relationship by exploring the potential mediation role of foreign direct investment (FDI) in the context of trade liberalization and its impact on the economic growth of Asian countries. The Bootstrap fixed-effects regression model aims to analyze how the independent variables influence the dependent variable $\ln GDP$ (log of GDP) across 48 countries, accounting for country-specific effects for twenty two years (2000-2022) and Sobel Z-value test also applied, for specifically using to know the mediation significance of the model. This chapter contains the following procedures: Includes, method, empirical analysis, test of endogeneity, robustness check and interpretation of empirical result by using different models taking into account.

Empirical Strategies and Model

This study examines the connection between trade liberalisation and foreign direct investment using a fixed-effect model, namely Equation (1). It then employs the Generalised Methods of Moments (GMM) estimate to mitigate endogeneity issues. In order to investigate the possible mediators in this procedure, the three stages recommended by the Sobel z-value test and bootstrap are also followed. To investigate the association between trade liberalization and FDI inflows on Economic growth study specifies the empirical model as follows:

$$\ln \text{GDP}_{it} = \beta_0 + \beta_1 \ln \text{TL}_{it} + \ln \text{FDI}_{it} + \sum_{j=1}^k \beta_j \text{CV}_{j,it} + \varepsilon_{it} \quad (3)$$

Here, the subscript *i* represents the country, *t* denotes the year, and *k* stands for the number of control variables. *CV_j* is the control variable *j*.

Empirical Results

Prior to calculating how (lnTL) and (lnFDI) mediate growth in GDP in Asian nations. The dependent variable, GDP, and the independent factors are first subjected to heterogeneity in this study. In order to accurately represent the variation of lnGDP by quantile, panel quantile regression analysis is utilised. Table 2 presents the findings of the panel quantile regression regarding the 10th, 25th, 50th, 75th, and the 90th the percentiles of a conditional distribution for economic growth. All of the lnTL coefficients are positive, and they have been significant for every lnGDP percentile. Additionally, the correlations vary with quantile of lnGDP. In particular, trade liberalisation improves economic growth with Asian nations; yet, this effect varies considerably across GDP by quantile, putting it in line with H1. In particular, the effect of trade liberalisation falls monotonically from 0.227 to 0.141 when the lnGDP quantile rises from 25th to 90th. Interestingly, however, for nations with low levels of economic development, the GDP is in the 10th percentile.

Table 2: Panel Quantile Regression Results

Variables	(1)	(2)	(3)	(4)	(5)
Quantile	lnGDP 10 th	lnGDP 25 th	lnGDP 50 th	lnGDP 75 th	lnGDP 90 th
LnTL	0.246*** (3.857)	0.227*** (4.654)	0.197*** (5.307)	0.162*** (3.042)	0.141** (1.987)
lnFDI	0.432*** (22.05)	0.432*** (28.86)	0.432*** (38.18)	0.433*** (26.64)	0.433*** (19.99)
lnPop	0.208*** (3.348)	0.220*** (4.637)	0.240*** (6.672)	0.263*** (5.096)	0.277*** (4.020)
lnROL	0.571*** (3.453)	0.478*** (3.778)	0.328*** (3.396)	0.155 (1.129)	0.0526 (0.288)
Observations	1,104	1,104	1,104	1,104	1,104
No. country	48	48	48	48	48

Z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: STATA 18.0 Results, 2024

Notes: The ***, **, and * stand for the significance level of 1%, 5%, and 10%, respectively.

Therefore according to the above result and quantile regression one variable effect on other variables at different quantile regression result and it indicate quantile 10th and 25th impacts for low level of income and 75th and 90th for high level of income countries.

The Test of Endogeneity

Numerous other factors that have not been included in this study may also have an impact on the amount of GDP. It suggests that an endogeneity issue might exist. As a result, this work uses techniques to remove endogeneity-induced estimation bias. In this work, the dynamic General Moments Method (GMM) estimation is carried out and the first-order lag factor of the lnGDP is introduced. The model in the present research can be estimated using the GMM approach, according to the Arellano-Bond test result, which displays a statistic of 163.76 and a p-value of 0.000. The result of the GMM estimation is presented by Model 6 in Table 3. The result indicates that foreign direct investment has a significantly positive impact on economic growth in Asia countries. The estimation result is also presented in Models 7 to 11, in Table 3.

Table 3: The Test of Endogeneity

Variables	(6)	(7)	(8)	(9)	(10)	(11)
	lnGDP GMM	lnGDP 10 th	lnGDP 25 th	lnGDP 50 th	lnGDP 75 th	lnGDP 90 th
lnGDP	0.823*** (163.76)					
lnFDI	0.078*** (30.16)	0.460*** (20.22)	0.459*** (28.03)	0.458*** (28.72)	0.457*** (15.58)	0.456*** (12.05)
lnPop	0.003*** (3.35)	0.211*** (2.629)	0.224*** (3.883)	0.244*** (4.333)	0.270*** (2.607)	0.283** (2.116)
lnROL	-0.00498 (-0.32)	0.657*** (2.890)	0.536*** (3.271)	0.362** (2.264)	0.132 (0.450)	0.0161 (0.0427)
Observations	1,104	1,104	1,104	1,104	1,104	1,104
No. country	48	48	48	48	48	48

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: STATA 18.0 Results, 2024

Robustness Check

A robust check is a technique used in quantitative research, such as econometrics or statistical analysis, to evaluate the stability and dependability of a study's primary findings or conclusions. It entails determining if the results are consistent with alternative hypotheses, models, or data requirements. The goal is to ascertain whether the results are susceptible to slight variations or if they stay the same, which would increase the conclusions' credibility. For the following reasons, robustness is crucial: confirms that research findings are credible, evaluates the analysis for any biases or limits, increases trust that the findings can be applied to more general circumstances. High-quality research always includes robustness assessments to show that the findings are comprehensive and resilient to change or other circumstances. In order to properly accomplish the robustness, this study carried out related checks in several ways. First, it re-estimated the model using the fixed effect regression approach; the outcome is shown in the model below. According to both models' results, FDI and TL have a favourable and considerable impact on economic growth.

Table 4: Robustness Check

Variables	(1)	(2)
	lnGDP FE Robust	lnGDP FE conventional
LnTL	0.194** (2.140)	0.194*** (5.813)
lnFDI	0.432*** (15.97)	0.432*** (35.43)
lnPop	0.242* (1.931)	0.242*** (6.501)
lnROL	0.315 (1.072)	0.315*** (3.294)
Constant	9.254*** (4.918)	9.254*** (17.95)
Observations	1,173	1,173
R-squared	0.723	0.723
Number of Country	48	48
F	131.0	730.5

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: STATA 18.0 Results, 2024

Notes: Model 1 is estimated by the approach of the robust fixed effect regression, and Models 2 is estimated by the method of conventional fixed effect panel regression. The numbers in parentheses are robust t- statistics, and ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.

Mediation Effect Between (lnTL) and (lnFDI) on Economic Growth

This findings presented where it was established that trade liberalization, when considered in isolation, has a limited

effect on economic growth. Here, researcher delve deeper into this relationship by exploring the potential mediation role of foreign direct investment (FDI) in the context of trade liberalization and its impact on the economic growth of Asian countries. The Bootstrap fixed-effects regression model aims to analyze how the independent variables influence the dependent variable lnGDP (log of GDP) across 48 countries, accounting for country-specific effects for twenty two years (2000-2022) and Sobel Z-value test also applied, for specifically using to know the mediation significance of the model. This adjustment ensures that hypothesis tests (e.g., t-tests) and confidence intervals remain accurate and reliable, despite the presence of non-constant variance in the errors. The table provided displays the results of Bootstrap fixed-effects models for the dependent variable lnGDP, indicating results. There are several channels, including trade barriers, trade liberalization, and the economic channel (GDP) and substitution channel (FDI). Examining how trade liberalization affects economic growth by mediating the effects of foreign direct investment. This study offered the results of coefficient test over the three channels. We specifically created the three equations shown below:

$$Y = cX + \varepsilon_1 \quad (4)$$

$$M = aX + \varepsilon_2 \quad (5)$$

$$Y = c'X + bm + \varepsilon_3 \quad (6)$$

Equation (2) uses X to represent the variable that is independent of trade liberalization and Y to represent the variable that is the dependent component of GDP. Additionally, M stands for the mediating variables that will be examined, which include trade barriers (trade liberalization), the economic channel (GDP), and the substitution channel (FDI).

Specifically, to test z-statistics constructed:

$$Z = \frac{ab}{sab} \quad (7)$$

The estimate of a, the estimation method of b, and the standard errors of the estimated of ab are represented by the letters a, b, and sab in Equation (5). This study established a CI of 95% by estimating the standard error using the Bootstrap method, which yielded a reasonably accurate standard error. If 0 is removed in the CI, the combinations of coefficients were statistical significant, indicating the mediating effect occurs.

Table 5 displays the outcome of the indirect mediation effect. First, FDI was selected as a mediating variable in this study with regard to the FDI-substitution channel. According to the results of the Bootstrap approach, the 95% CI excludes 0, the related z-statistic is considerably different from 0, meaning the coefficient is positive. Consequently, there is a positive indirect support through FDI.

Table 5: Mediating Effects

Channel	Mediating variable	Coefficient	Bootstrap Standard Error	z-Statistic	p-Value	95% CI
Economic channel	lnGDP	0.8644	0.1824	4.740	0.000	(0.4981165, 1.230693)
Substitution Channel	lnFDI	0.5030	0.0241	20.84	0.000	(0.4544929, 0.5514545)
Trade barreirs	lnTL	0.1092	0.0054	20.21	0.000	(0.0986122, .1197883)

Source: STATA 18.0 Results, 2024

Therefore the FDI Coefficient (0.5030): Indicates a positive and significant effect of the substitution channel (lnFDI) on the dependent variable. Bootstrap Standard Error (0.0241): Very small variability in the coefficient estimate. z-Statistic (20.84): Extremely high z-statistic, showing strong evidence against the null hypothesis. p-Value (0.000): The effect is highly statistically significant. 95% CI (0.4545, 0.5515): The confidence interval is narrow and does not include zero, indicating precise and significant results.

Interpretation: The substitution channel (lnFDI) is a significant mediator, with a trade liberalization effect size. A 1-unit increase in lnFDI corresponds to a 0.5030-unit increase in the dependent variable.

Table 6: Indirect Effect Between (lnTL) and (lnFDI) on Economic Growth: Bootstrap

Variables	(1)	(2)
	lnGDP FE Bootstrap	lnGDP FE Bootstrap with Quantile
lnTL	0.0357*** (26.14)	0.142*** (23.49)
lnFDI	0.363*** (8.645)	-0.247*** (-2.688)
lnPOP	0.0287 (1.512)	1.066*** (3.037)
lnROL	0.392*** (3.104)	-1.225*** (-6.198)
Constant	19.55*** (41.39)	-15.13* (-1.806)
R-squared	0.515	
Number of Country	48	
F	296.5	

*** p<0.01, ** p<0.05, * p<0.1

Source: STATA 18.0 Results, 2024

Interpretation

The Modern approach of statistical test of mediation is bootstrapping model, The variable lnTL and lnFDI which indicate indirect effect on Economic growth by considering the significance and Confidence interval. Regression analysis with bootstrapping for testing the indirect effect between Trade Liberalization (lnTL) and Foreign Direct Investment (lnFDI) on Economic Growth (lnGDP), with different specifications for the model (FE Bootstrap vs. FE Bootstrap with Quantile). Here's how to interpret this effect variable: Interpretation of lnTL and lnFDI: Definition: The variable lnTL and lnFDI is likely constructed as the product of the log-transformed trade liberalization variable (lnTL) and the log-transformed foreign direct investment

variable (lnFDI). This effect term helps in understanding whether the effect of trade liberalization on lnGDP depends on the level of foreign direct investment, or vice versa. Coefficient Interpretation:

Indirect Effect(Mediation Effect of Fdi) Analysis

The indirect effect measures how much of the impact trade liberalization on Economic growth occurs via FDI. Bootstrap analysis shows: mean of indirect Coefficient Value (0.0357): The positive coefficient (0.0357) for lnTL and lnFDI indicates that there is a positive indirect effect between trade liberalization and foreign direct investment on lnGDP. Specifically, for a 1% increase in the product of lnTL and lnFDI, lnGDP is expected to increase by approximately 0.036%, holding other factors constant. Significance: This coefficient is highly significant ($p < 0.01$) in both models, with a t-statistic of 26.14 in the FEM bootstrap model and 6.543 in the FE Bootstrap Quantile model and CI is not zero which it indicate FDI(mediator) indirect effect through trade liberalization on Economic growth. This suggests that both lnTL and lnFDI together have a positive and statistically significant effect on economic growth, with the effect being larger when quantile regression is applied. This suggests a consistent positive and meaningful impact of the indirect effect between trade liberalization and FDI on economic growth. This suggests that when both trade liberalization and foreign direct investment increase together, their combined impact on economic output (lnGDP) is amplified. For instance, a country that opens up its trade policies (higher lnTL) while also attracting more foreign direct investment (higher lnFDI) tends to see greater economic growth than if only one of these variables increased independently. The significance and positive nature of the coefficient imply that policies promoting both trade liberalization and foreign direct investment can mutually reinforce each other's impact on economic growth. This could mean that in countries where trade policies are open and there is a significant flow of foreign investments, the economic gains are higher due to the complementary nature of these two economic factors.

Conclusion, The indirect effect of lnTL and lnFDI reflects how the combined presence of trade liberalization and foreign direct investment influences economic output. Its positive and significant coefficient suggests that these two factors have a synergistic effect on lnGDP, implying that coordinated policy efforts in both areas could be more effective in fostering economic growth than focusing on them in isolation. Statistical Significance: The results show a generally strong relationship between FDI, trade liberalization, and economic growth, through the direction and strength of the effects change somewhat between the two models, especially with respect to the quantile adjustments by mean value.

Sobel Z-value test for mediation effect of FDI through TL on Economic Growth

The Sobel Z-value test is used to assess the significance of an indirect (mediated) effect in a mediation model. It's typically applied in the context of social science research where you want to understand the relationship between a mediator variable and the dependent variable. Mediation Model Overview

- **Independent Variable (X):** The predictor or causal variable.
- **Mediator (M):** A variable that explains the relationship between the independent and dependent variable.
- **Dependent Variable (Y):** The outcome or effect you're measuring.

The Sobel test examines whether the indirect effect of X on Y through the mediator M is statistically significant. The indirect effect is computed as the product of two coefficients:

- The path from **X to M** (a)
- The path from **M to Y** (b)

Thus, the indirect effect = $a \times b$

Sobel Z-value Formula

The Sobel test calculates a **Z-value** for the significance of the indirect effect, given by:

$$Z = \frac{a \cdot b}{\sqrt{b^2 \cdot Sa^2 + a^2 \cdot Sb^2}}$$

Where:

a and b are the regression coefficients.

Sea and SEb are the standard errors of aaa and bbb, respectively.

Table 7: Indirect Effect Between (lnTL) and (lnFDI) on Economic Growth: Sobel Z-value

Variables	(1)	(2)
	lnFDI(a)	lnGDP(b)
lnGDP		
LnTL	1.968*** (0.2048)	-0.869*** (0.1164)
lnFDI		1.057*** (0.060)
Constant	16.36*** (0.8623)	2.412*** (.5394)
Observations	1,173	1,173
R-squared	0.073	0.793
F	92.36	2245
chi2		
Z- Value Test = 9.49		

T-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: STATA 18.0 Results, 2024

Based on the above Z value test calcaulation:

$$Z \text{ value Test} = \frac{a \cdot b}{\sqrt{b^2 \cdot Sa^2 + a^2 \cdot Sb^2}}$$

Where

a is coefficient of independent

sa is standard error of variable

b is the coefficient of mediation variable

sb is standard error of mediation variable

So; a= 1.968 sa =0.2048, b = 1.057, sb = 0.0160

Therefore, Z- Value Test = 9.49

Interpreting the Sobel Z-value

- **Large Z-value** (usually > 1.96 or < -1.96) indicates that the indirect effect is statistically significant.
- **Small Z-value** (close to 0) suggests that the indirect effect is not significant.

According the Sobel Test model there are different two linear regression applied on the above table. The first one is based on this model mediator means FDI as dependent and tradel liberalization as indendepent variable and The second is Economic growth as dependent and TL and FDI as independent which result the above value.

Based on the above Z value test of Sobel model rule: If the Z value is greater than 1.96 then the “M” is significantly mediating between the X and Y. A Z-value of 9.49 from a Sobel test suggests a very strong result. The Sobel test is used to assess the significance of a mediation effect, i.e., whether the indirect effect of an independent variable on a dependent variable through a mediator is statistically significant. Conclusion based on a Z-value of 9.49:

1. **Statistical Significance:** A Z-value of 9.49 is quite large, indicating that the indirect effect is statistically significant. The critical Z-value for a two-tailed test at the 0.05 significance level is approximately ± 1.96 , so a Z-value of 9.49 is far beyond this threshold.
2. **Interpretation:** The result strongly supports the presence of a significant mediation effect. In other words, the mediator variable plays a statistically significant role in the relationship between the independent and dependent variables.
3. **P-Value:** With such a high Z-value, the corresponding p-value would be extremely small (much less than 0.01), indicating that the null hypothesis (which suggests no mediation effect) can be rejected.

Therefore, the Sobel Z value test is 9.49 which is greater than 1.96. so, FDI plays a crucial mediating role in the relation ship between trade liberalization and economic growth. Policy makers should focus on stragies that attract FDI as a channel through which trade liberalization benefits economic growth.

Conclusion

The analysis of the indirect effect of lnTLlnFDI demonstrates a positive and significant relationship between trade liberalization and foreign direct investment (FDI) in their combined effect on economic output (lnGDP). The coefficient (0.0357) indicates that when trade policies are liberalized and foreign direct investments are simultaneously increased, their indirect effect contributes to a greater economic boost than each factor alone. This synergistic effect suggests that open trade policies and the presence of foreign investments reinforce each other, leading

to more substantial economic growth. This indirect effect indicates that policies fostering an environment that encourages both open trade and the influx of foreign capital can contribute more effectively to economic growth than pursuing them separately. Countries aiming to enhance GDP growth should consider implementing integrated strategies that promote both trade openness and favorable conditions for foreign investors to maximize their combined impact on the economy. The model findings underscore the importance of policy coordination in economic planning. Governments and policymakers should recognize the interplay between trade policies and foreign investment initiatives, as leveraging both in tandem can lead to a significant boost in economic output. The Sobel Z-value of 9.49, indicates that the indirect effect is highly significant, meaning the mediation of TL between FDI and Economic Growth is statistically supported.

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