首都经济贸易大学
CAPITAL UNIVERSITY OF ECONOMICS AND BUSINESS

博士学位论文

贸易开放和外国直接投资对环境的影响:以缅甸的二氧化碳排放为例

培养单位：经济学院

CAS institute: School of Economics

专业名称：国际经济

Major: International Trade

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The impact of trade openness and foreign direct investment on the environment: An assessment of CO2 emission in Myanmar

Candidate：Khin Thu Thu Thien

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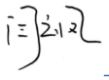

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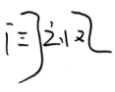

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~~Phd's Degree Thesis~~

~~The impact~~ Phd's Degree Thesis

~~of trade openness and foreign direct investment on the environmental quality: Myanmar~~

~~贸易开放和外国直接投对缅甸环境质量的影响~~

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Abbreviations

ADB	Asian Development Bank
ADF	AugmenteBd-Dickey-Fuller
ADF-GLS	Dickey-Fuller Generalized Least Squares
AIC	Akaike's information criterion
AMG	Augmented Mean Group
ARDL	Autoregressiven Distributed Lag
ASEAN	The Association of Southeast Asian Nations
BIC	Bayes information criterion
BRI	Belt and Road Initiative
BRIC	An acronym for the developing nations of Brazil, Russia, India, and China
CCEMG	Common Correlated Effects Mean Group
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO2	Carbon Dioxide
COVID-19	Coronavirus disease
CSO	Central Statistical Organization
CMP	Cut-Mark Pack
CUSUM	Cumulative sum
CUSUMSQ	Cumulative sum Square
DICA	Directorate of Investment and Company Association
ECI	Economic Complexity Index
ECM	Error Correction Model
EDEs	Emerging and developing economies
EIA	Environmental Impact Assessment
EKC	Environmental Kuznets curve
EPA	The Environmental Protection Agency (EPA)
EPI	Environmental Performance Index
FDI	Foreign Direct investment
FIL	Foreign Investment Law
GDP	Gross Domestic Product

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GHGs	Greenhouse gases
IF	Investment freedom
IPCC	Intergovernmental Panel on Climate Change
KEC	Kuznets Curve
LDCs	Least developed countries
MIFER	Ministry of Investment and Foreign Economic Relations
MIC	Myanmar Investment Commission
MSDP	Myanmar Sustainable Development Plan
N2O	Nitrous oxide
NAPA	National Adaptation Plan of Action
NCC	National Coordinating Committee
NCEA	Netherlands Commission for Environmental Assessment
NES	National Export Strategy
NEQE	National Environmental Quality Guidelines
MNEP	Myanmar National Environmental Policy
NLD	National League for Democracy
RCA	Reveal Comparative Advantage
RE	Renewable Energy
SC	Schwarz
SEEs	Sate Economic Enterprises
SEZs	Special Economic Zones
SLORC	State Law and Order Restoration Council
SME	Small and medium sized enterprises
UNEP	United Nations Environment Programme
US	United State
WTO	World Trade Organization

Abstract

There are two main patterns of the liberalization process in Myanmar. The first one, acted in September 1987, concerns the marketization and removal of restrictions in the sector of agriculture. The second one is the Foreign Investment Law of November 1988. This allows foreign capitals in a company from joint venture participation with a minimum of 35% of foreign holdings to a full detention with 100% of foreign equity.

However, there are few studies that examine how trade liberalization and FDI affect Myanmar's environment (as determined by CO2 emissions).

Using secondary data from the World Bank, Directorate of Investment and Company (DICA), Central Statistics Office (CSO), OECD and Konema webpage, the study specifically looks at the influence of trade liberalization on CO2 emissions in the long-run and short-run elasticity.

The impact of trade openness, FDI on Myanmar's CO2 emissions over a 27-year period from 1995 to 2021 is quantitatively assessed in this paper. The following research questions follow the research objectives:

1. What and how of the long run and short run relationships between FDI and trade liberalization and CO2 emissions of Myanmar?
2. What is the impact of economic liberalization of Myanmar in environmental quality?

To assess the effect of trade openness, on CO2 emissions in the short-run and long-run elasticity, an auto-regression distributed lag (ARDL) model was used.

Three-unit root tests were run on all variables at levels and first differences in

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this investigation. The augmented ADF test, ADF-GLS test, and PP tests are the ones that are employed. It should be noted that the lag duration for the ADF test is determined using the Akaike information criterion (AIC). There can be no more than six lags at a time. All of the series, with the exception of FDI and Tr (which becomes stationary after taking the first difference and is stationary at I (0)), are non-stationary at their levels. Hence, it can be inferred from the outcomes of the unit root tests that, at the 5% level of significance, all series are I (0) and I (1). The study can employ the ARDL methodology and continue with the investigation of I (0) and I (1). To check the robustness of the study used the Durbin-Watson Test, Breusch-pagan-Godfrey test, Histogram-, Jacque-Beta Test of Residuals and CUSM approach to test the stability of model.

The evidence of the ARDL – Bound Test and ECM estimation ,urbanization, trade openness, and electricity consumption have a considerable positive long-run elasticity on CO2 emissions in Myanmar. Both in the short and long terms, trade liberalization has a positive (growing impact) effect on CO2 emissions. More specifically, a 3.352% increase results from a 1% increase in trade openness leads to increase in CO2 emissions in the long-run elasticity.

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The Environmental Impact Assessment approach was used to analyze the potential regulatory consequences of trade liberalization with relation to the regulatory impact on the environment. The first looked at trade statistics from 2021 to 2017 to investigate Myanmar's export trends to partner nations, including the top 12 export data and the Revealed Competitive Advantage Index. Following that, we used the Environmental Impact Assessment approach to examine how trade liberalization affected the environment in Myanmar. The findings indicate that it is likely that the natural resources sector has high RCA indices and that this sector generated the majority of revenue. Thus, the Myanmar government should work to maximize endowment revenue and reinvest in other industries for sustainable development of Myanamar.

The empirical finding of FDI shows a long-term and short-term elasticity negative relationship with CO2 emission. Long-term CO2 emission decreased by 1.37% for every 1% increase in FDI of Myanmar. The Granger Causility demonstrated that there is a one-way causal relationship between GDP, CO2 emissions, and GDP does Granger cause Ur. The one-way causality links CO2 emission to electricity

consumption. Granger causality exists between LnPEC and LnIF.

This thesis makes a significant contribution by examining the impact of FDI and trade liberalization on Myanmar's CO2 emissions. The results of this study provide evidence of the possibility to keep and rehabilitate the environment along with Myanmar's industrialization and urbanization through trade liberalization. The results highlight how trade openness has a detrimental effect on environment through carbon dioxide emissions. This together with the positive impact of governance calls for effective regulations and legislations to realize green growth. As the developing and emerging Myanmar economies are on a transition path towards development, guaranteeing environmental sustainability. Myanmar government should be encourages the types of FDI which ensure tech know-how and building a clean environment.

Keywords: Trade Openness, Foreign Direct Investment, CO2 emission, ARDL model, Myanmar.

中文摘要

缅甸的自由化进程主要有两种模式。第一个协定于 1987 年 9 月生效，涉及农业部门的市场化和取消限制。第二个是 1988 年 11 月的《外国投资法》。这允许外国资本在一家公司中参与合资企业，至少持有 35%的外国股权，到完全持有 100%的外国股权。

然而，很少有研究考察贸易自由化和外国直接投资如何影响缅甸的环境(由二氧化碳排放决定)。

利用来自世界银行、投资和公司理事会(DICA)、中央统计局(CSO)、经合组织(OECD)和科内马(Konema)网页的二手数据，本文具体考察了贸易自由化对二氧化碳排放在长期和短期弹性方面的影响，定量评估了 1995 年—2021 年 27 年间贸易开放、FDI 对缅甸二氧化碳排放的影响，根据研究目标，提出以下研究问题：

1. 外国直接投资和贸易自由化与缅甸二氧化碳排放之间的长期和短期关系如何?

2. 缅甸经济自由化对环境质量的影响是什么?

为了评估贸易开放度对二氧化碳排放短期和长期弹性的影响，采用自回归分布滞后(ARDL)模型。

在本研究中，对所有变量在水平和第一差异上进行三单位根检验。采用的是增强 ADF 检验、ADF- gls 检验和 PP 检验。值得注意的是，ADF 测试的滞后时间是使用赤池信息准则(AIC)确定的。一次不能超过 6 个滞后。

所有的级数，除了 FDI 和 Tr(取第一个差值后变得平稳，在 I(0)处是平稳的)，在它们的水平上都是非平稳的。因此，从单位根检验的结果可以推断，在 5%显著性水平下，所有序列均为 I(0)和 I(1)。本研究可以采用 ARDL 方法，并继续对 I(0)和 I(1)进行调查。为了检验研究的稳健性，采用了 Durbin-Watson 检验、

Breusch-pagan-Godfrey 检验、直方图检验、残差的 jacques - beta 检验和 CUSM 方法检验模型的稳定性。

ARDL 约束检验和 ECM 估计的证据、城市化、贸易开放和用电量对缅甸的二氧化碳排放有相当大的正长期弹性。从短期和长期来看，贸易自由化对二氧化碳排放都有积极的(不断增长的)影响。更具体地说，在长期弹性中，贸易开放度增加 1%会导致二氧化碳排放增加，从而导致 3.352%的增长。

使用环境影响评价方法分析了贸易自由化的潜在管制后果与管制对环境的影响之间的关系。第一项研究着眼于 2021 年至 2017 年的贸易统计数据，以调查缅甸对伙伴国的出口趋势，包括前 12 名的出口数据和显示的竞争优势指数。在此之后，我们使用环境影响评估方法来研究贸易自由化如何影响缅甸的环境。调查结果表明，自然资源部门可能具有较高的 RCA 指数，并且该部门产生了大部分收入。因此，缅甸政府应努力将捐赠收入最大化，并将其再投资于其他行业，以实现缅甸的可持续发展。

实证结果表明，FDI 与 CO2 排放量之间存在长期和短期的弹性负相关关系。缅甸 FDI 每增加 1%，长期 CO2 排放量就减少 1.37%。格兰杰因果关系表明，GDP 和二氧化碳排放量之间存在单向因果关系，GDP 确实是 Ur 的格兰杰原因。二氧化碳排放与电力消耗之间存在单向因果关系。LnPEC 与 LnIF 之间存在格兰杰因果关系。

本文通过研究 FDI 和贸易自由化对缅甸二氧化碳排放的影响做出了重大贡献。本研究结果为通过贸易自由化保护和恢复缅甸工业化和城市化进程中的环境提供了证据。

研究结果强调了贸易开放如何通过二氧化碳排放对环境产生有害影响。这与治理的积极影响一起，需要有效的法规和立法来实现绿色增长。由于缅甸的发展中国家和新兴经济体正处于向发展过渡的道路上，确保了环境的可持续性。缅甸政府应该鼓励外国直接投资，以确保技术知识和建立一个清洁的环境。

关键词：贸易开放、外国直接投资、二氧化碳排放、ARDL 模型、缅甸。

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1Introduction

1.1 Background of the Study

Since the growing acceptance of the free trade theory, the significance of international trade has increased dramatically. Trade liberalization has allowed many countries to attract foreign investment that was previously scarce and frequently hampered by trade obstacles. Together with trade liberalization, this foreign investment aided nations in achieving respectable economic growth and actively taking part in globalization. As a result, foreign investment that generates employment opportunities and has a ripple effect on developing social-economic systems would assist nations in improving their living standards and becoming more globally competitive.

The effect of global trade on the environment has frequently been the focus of heated discussions. Environmental economics is now focusing on the problems of "pollution havens" and "race to the bottom" as a result of the globalization waves that have affected both industrialized and developing nations. The empirical research on trade and the environment uncovers evidence for both a decrease in environmental degradation and the unfavorable effects of trade on the environment, leaving the field with contradictory findings.

No agreement has been reached in the discussion of how FDI affects the host (Gönel, 2016), and part of the literature suggests that FDI might be detrimental to the development of the host (Aleksynska, 2013). The models place emphasis on the comparative advantage that less developed nations have in regards to lax environmental regulations and hypothesize that this will result in the concentration of industries that are pollutant-intensive and 'dirty' in the less developed nations while producing 'cleaner' goods in the more developed nations. ~~Research have~~Research has revealed evidence that environmental deterioration is decreasing in wealthy countries while developing countries with lax environmental controls are becoming pollution hotspots. The discussions on how trade~~commerce~~ affects the environment are important given the growth of global trade and the deterioration of the environment.

Environmental quality was impacted when trade, economic growth, investment flows, and urbanization experienced significant increases in emerging

and developing economies (EDEs). Environmental concerns have caught economists' attention, and scholars' focus on global trade ~~commerce~~ and environmental challenges has expanded (Weidman and Lenzen, 2018; Khan et al., 2020). Environmental considerations are not part of the conventional trade theory. The old paradigm of international commerce is clearly challenged by the advent of environmental issues. Sub-regional trade is a significant economic activity that closely relates to the environment (Bilgen, 2014).

For instance, many researches investigate the connection between economic growth and carbon emissions. The EKC hypothesis, which asserts inverted U-shaped connections between income and environmental pollution, is widely accepted. In order to build its economy, a developing nation may decide to sacrifice the environment (i.e., increase carbon emissions). Yet, as the nation's affluence rises, the cost of environmental management will fall, increasing public awareness of environmental quality and encouraging the nation to adopt more ecologically friendly practices (Grossman and Krueger, 1995; Harbaugh et al., 2002; Musah et al., 2021; Ren et al., 2021). Below is a summary of three effects of economic development on the environment provided by Grossman and Krueger in 1992. The scaling effect comes first. It suggests that a rise in economic activity unaccompanied by technical progress is linked to higher demands on natural resources, which results in higher waste and carbon emissions. In this instance, the increase in economic activity has a negative impact on the environment. The composition effect is the second. It suggests that changes in the institutional structure of production are associated with wealth accumulation.

When the economic structure transitions from rural to urban in industrial countries, environmental degradation increases, but it is reversed when the structural shift occurs from energy-intensive industries to technologically and knowledge-based services. The third is the impact of technology. Such an effect implies that when countries are wealthy enough to fund research and development costs, new technology will replace the outdated and guarantee environmental quality. This work is significant because it used the ARDL technique to explore trade-pollution correlations, whereas past studies used traditional econometric techniques to look at the relationship between trade liberalization and pollution.

With a geographic area of 676,578 square kilometers, Myanmar is the

second-largest country in Southeast Asia. With a population of 53 million as of 2019, it will likely reach 54.7 million by 2024, making it the fifth-largest country in the region. Myanmar is expected to have the highest GDP growth rate of 6.8% until 2024 among the ASEAN countries due to its strategic location between China and India, abundance of natural resources, and a long coastline. Myanmar also has significant potential as a regional player, which was largely unrealized during its nearly five decades of economic isolation under a crippling military regime.

Since March 2011, the quasi-civilian government has carried out a number of economic and political reforms that have attracted international investment to the market. The growth rate had a modest decline in 2015, but it has since rebounded and is anticipated to stabilize over the following five years.

With the progressive easing of restrictions on foreign investment in Myanmar, there has been an increase in foreign companies and robust manufacturing-led economic growth, which is predominantly supported by foreign direct investment (FDI). As one of the remaining accessible frontier markets in the world, Myanmar is developing at a faster rate than its Asian counterparts, such as Thailand and Vietnam, which are also going through rapid economic change.

The garment industry grew quickly, and by the late 1990s and the beginning of the 2000s, clothing was Myanmar's largest export. By 2002, natural gas was exploited, and gas exports increased.

Import restrictions became less necessary when the current account turned positive. Trade partners for Myanmar also altered. China became the biggest trading partner in terms of imports and exports, largely as a result of burgeoning cross-border trade. Manufacturing is just one of the numerous industries where there is a growing economic tie with China. Thailand has grown to be a significant trading partner. This latter trend was mostly brought about by Thailand's natural gas exports, but it also showed a rise in imports of numerous necessities, notably petroleum.

The following figure1 shows the sectorial contribution in industrial growth of Myanmar after economics reform. The manufacturing sector contribution is highest 75%, construction contribute 18% and other industries 7% in industrial development of Myanmar in 2019.

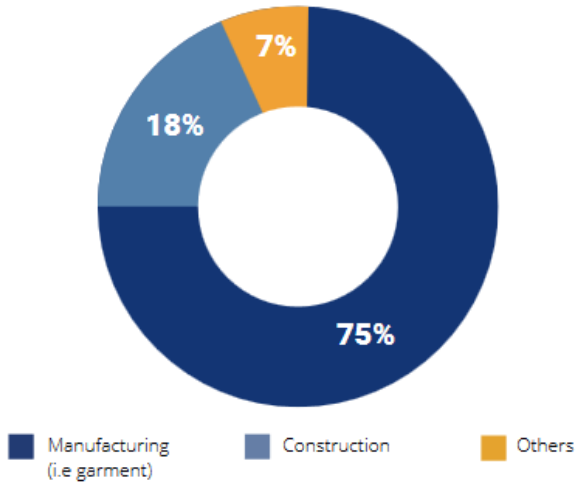

Figure 1 : Industry Growth Contribution by Sector

Sources: Asian Development Bank, 2019

The annual growth rate of Myanmar's GDP rose from 12.3% in 2001 to 12.6% in 2005, then fell precipitously after that year but continued to expand until 2020 (World Bank, 2020). Myanmar, however, experienced a negative development rate in 2021 as a result of the Covid19 pandemic and the military junta's effects. Myanmar's GDP per capita increased steadily from 11.3% in 2001 to 12.6% in 2005. From 2006 to 2021, the growth rate has been marginally declining. Additionally, the GDP per capita grew from 765.2 in 2010 to 1209.9 in 2021 (World Bank, 2020).

1.1.1 Trade

The largest nation in Southeast Asia by area is Myanmar, which has undergone rapid and significant political, economic, and development changes in recent years. (Asian Development Bank 2012).Myanmar has depended heavily on the agricultural industry, which continues to employ more than 60% of the population, despite being cut off from the global economy for decades. As a result, the government of Myanmar continues to place a high emphasis on the agriculture

industry. The output of this sector, which made up a third of the Myanmar economy in 2011 with USD 19.5 billion, has gradually decreased over time, falling to a quarter in 2018 with USD 17.5 billion in output. Agriculture is a priority industry for the National Export Strategy (NES) 2015-2019 and the updated NES 2020-2025, which has reaffirmed the significance of agriculture.

Rice, pulses, beans, oilseed crops, fishery, and rubber are some of the key agricultural sectors listed in the NES. Through a structured roadmap to efficiently allocate financial, technical, and institutional resources, the NES seeks to address the volatility in the supply of agricultural goods as well as their commodity prices, with the goal of enhancing international competitiveness and diversification. Nearly 70% of the population relies on natural resources, such as agriculture, for their livelihood, and the economy is heavily dependent on these industries. Figures 1 and 2 depict the shifting sectorial contributions to Myanmar's GDP.

The sectoral composition of the GDP is also rapidly changing, with the proportion of forestry and agriculture decreasing and the manufacturing and resource extraction sectors growing (The Organization for Economic Cooperation and Development 2014). It is clear that the quality of natural resources is strongly influenced by the variability of the climate and ecosystem, which in turn affects Myanmar's economic development and per capita income generation. The sectorial contribution of Myanmar’s GDP components change can see in figure 2. The agriculture sector contribution was highest in 2019 during period from 2017-2021. In 2021 negatively change occurred due to COVID-19 and political crisis. Both industry and service sector contribution continually higher across 2017- 2020 but seriously decline in 2021.

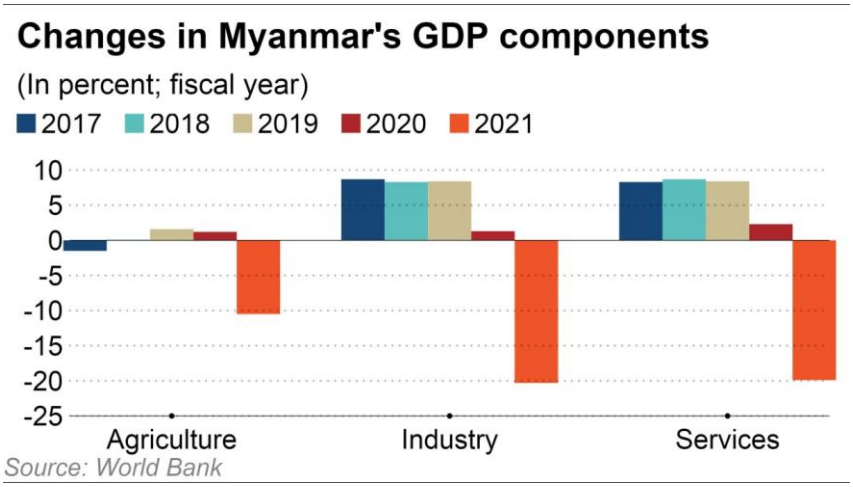

Figure 2 : Change in Myanmar's GDP Components from 2017 - 2021

In spite of the introduction of an open market economy and the Foreign Investment Law in 1988, Living standard of average people did not change oil significantly and the export earnings could not contribute to the improvement of the whole economy. Myanmar's external sector has improved since 2000 largely because of the emergence of new export commodities, namely garments and natural gas. Foreign direct investments in Myanmar wide ranging natural resource extraction sectors, including and gas, and mining, most of which result in extensive adverse environmental impacts (The Myanmar Centre for Responsible Businesses 2015).

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~~1.2~~1.1.2 Foreign Direct Investment

In the mid-1970s the government implemented various economic reforms such as agricultural reforms, state economic enterprises (SEEs) reforms as well as an increase in acceptance of foreign aids. However, in the mid-1980s the economy became depressed due to the declining prices of primary commodities, which were principal exports goods, decreased oil production, sluggish agricultural production and poor performance of SEEs, etc. In 1987 the country was designed a least Less-developed country. During the third period from 1988 to the present, efforts

have been made to shift to a market economy and to open up the economy to foreign countries.

The government has been reforming and liberalizing various fields such as agriculture, the SEEs, finance and trade based on the objectives of development of agriculture as the base and all round development of other sectors of the economy as well, proper evolution of the market oriented economic system, development of the economy inviting participation in terms of technical know-how and investments from sources inside the country and abroad and the initiative to shape the national economy must be kept in the hands of the State and national peoples.

Myanmar military government has approved $3.8 billion in foreign investment since a coup a year ago. The projects approved included $ 2.5 billion in liquefied natural gas power plant. That figure accounted for two-thirds of overall amount cited. In the 2019-2020 and 2020-2021fiscal years, Myanmar's foreign investment fell from $4.9 billion to $3.8 billion (DICA). Table –present the foreign investment of permitted enterprises by sector in 2019.

Table 1 : Foreign Investment of existing Enterprise by Sector, 2019 (million)

	Cumulative Total as of September 30,2019			
Sectors	***No of Enterprises***	***Total Investment***	***Foreign***	
		(US$)	***Kyat***	***US$***
Total	***282***	***5406016.2***	***5406016.2***	***4158.47***
Agriculture	***6***	***24854.7***	***24854.7***	***19.12***
Livestock and Fishery	***14***	***203967.4****	***203967.4***	***156.9***
Mining	-	-	-	-
Oil and Gas		***13265.2****	***13265.2***	***10.2***
Manufacturing	***225***	***1752172.5****	***1752172.5***	***1347.83 ****
Power	***2***	***121264***	***121264***	***93.28***
Transport and	***4***	***1999920****	***1999920***	***1538.40 ****

Communication				
Hotel and Tourism	***7***	***107408.6****	***107408.6***	***82.62***
Real Estate Development	***4***	***274212.9***	***274212.9***	***210.93***
Industrial Estate	***1***	***62986.3***	***62986.3***	***48.45***
Construction				
Other Services	***19***	***845964.6***	***845964.6***	***650.74 ****

Source: Directorate of Investment and Company Administration.

Note: * Increased in investment value.

According to the table -1, the number of enterprises permitted in 2019, was 282 enterprise and highest in manufacturing (79%) of total investment in term of monetary as $ 4158.47 million.

Within the first two years of their investment, foreign investors are required to hire at least 25% of their skilled workers from the local labor pool. For the third and fourth years, the local job ratio rises to 50%, and for the fifth and sixth years, it rises to 75% for the fifth and sixth years.

Foreign investors are not compelled to purchase products or technology with domestic content. Information technology (IT) and data protection laws, rules, and regulations are currently being developed in Burma, however there are no current obligations for international IT providers to turn over source code or grant access to surveillance. Data localization rules do not exist in Burma.

~~1.2.1~~1.1.3 Environment

One of Asia's nation’s most vulnerable to natural catastrophes is Myanmar, where floods are thought to be the cause of 50% of all disasters. Every year, flooding of fields is brought on by monsoon rain (which typically occurs from June to August) and rising water levels on key rivers, endangering the nation's food security and agricultural livelihood. Paddy plantations made for 79% of the flood-damaged areas in 2015, and rice cultivation accounted for 89% of the lost crops. More than 500,000

acres of agricultural land were impacted by the severe monsoon-related flood in 2018, and about 250,000 acres of paddy, sesame, maize, as well as other beans and pulses, were completely destroyed.

Southeast Asian developing nations' urbanization, industrialisation, steep rise in FDI, and population expansion significantly contribute to the world's GHG emissions, particularly CO2 and CH4 (Asian Development Bank 2015). The introduction of an open-door policy significantly expanded the volume of Myanmar's external trade throughout the 1990s and up until 2005.

In addition, 95% of Myanmar's population relies on solid fuels, which contributes to extensive deforestation and CO2 emissions (United Nations Development Program 2013). The nation is prone to a number of climate hazards, including an increase in the likelihood of tropical storms, floods, heavy rain, drought, sea level increases, and severe temperature, with an expected increase of 0.8 to 1.4 °C by 2050 (Ministry of Natural Resources and Environmental Conservation 2016). Environmental issues are growing quickly.

The amount of forest cover has decreased by around 10 million hectares between 1990 and 2015, or 1.2 percent per year on average. The Myanmar Country Environmental Analysis (CEA) is based on a thorough examination of the nation's environmental and natural resource problems, and it identifies strategic recommendations to address the root causes of the degradation as well as to support better environmental management, investment, and expenditure practices.

The exploitation of natural resources has been crucial to Myanmar's economic development, and now that major environmental problems are developing, it is crucial to have an effective Environmental Impact Assessment (EIA) system. While mining and industrial waste, as well as urban trash creates new and worsening environmental health problems, air quality is likewise becoming more and more impaired. Increased pressures are brought on by Myanmar's rapid urbanization.

On June 13, 1997, Myanmar joined the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and on September 11, 1997, CITES became effective in Myanmar. CITES was created to control the international trade in specific endangered species to make sure that trade does not damage the species' ability to survive.

With its numerous environmental assets and newly emerging industrial pressure,

Myanmar could successfully create policies and regulations to guarantee both sustainable growth and the preservation of vital natural resources. The future ability of Myanmar's environment to support essential services would be reduced if prompt action is not done, endangering economic growth trajectories over longer time periods.

As the country's population rises, urbanization advances, and the economy expand, it is anticipated that Myanmar's energy needs would rise dramatically over the coming decades. A "business as usual" approach to energy is becoming more and more problematic in light of the global commitments to climate mitigation that Myanmar has adopted. At all scales, low-carbon energy systems are becoming more competitive, suitable, and adoptable due to the falling costs of renewable energy and ongoing innovation in energy service delivery methods. While this is happening, it is becoming more difficult to increase demand-side efficiency and support the substantial section of the population that still relies on wood, charcoal, and agricultural waste as their primary sources of energy for cooking.

The average temperature is expected to increase from 0.8 to 1.4 degrees Celsius in 2050, according to Myanmar's National Adaptation Plan of Action (NAPA) to climate change from 2012. Building performance is used to minimize energy consumption, which will also assist regulate CO2 emissions and aid in climate change adaptation. Building energy consumption is almost 35% of the whole economic sector's energy consumption, while CO2 emission from buildings is almost 30% of the total.

In the Doing Business 2020 report from the World Bank Group, Burma was ranked 165. Burma is one of the least developed nations in the world in terms of environmental management and legislation, with a score of 179 out of 180 on the Environmental Performance Index in 2020. EPI rank and EPI- Score of Myanmar regarding the selected components can see in table -2.

Table 2 : EPI Scores for Myanmar

Component	*Rank*	*EPI - Score*	*10year Change*
EPI	***179***	***19.40***	***-3.80***
Ecosystem Vitality	***177***	***20.2***	***-4.5***
Ecosystem Services	***94***	***26***	***-8.5***
Air Quality	***165***	***16.9***	***4.4***
CO2	***151***	***23.1***	***14.4***
Climate Change	***174***	***17.3***	***8.1***
CO2 growth rate	***165***	***NA***	***17***

Source: epi.yale.com

In this essay, the author uses the ARDL model to analyze the relationship between environmental attributes, trade openness, fuel consumption, urbanization, and household income. He then evaluates the effectiveness of current policy initiatives in addressing the causes of environmental degradation and offers policy suggestions.

1.2 Significance of the Study

In order to protect the environment throughout Myanmar's economic expansion after 1988, this study aims to access the environmental effects of trade liberalization. According to extensive research by Managi, Hibiki, and Tsurumi (2009), the impact of trade ~~commerce~~ on the environment varies depending on the nation and the nature of environmental contaminants. The next generation of the society will suffer if a nation fails to adequately handle the environmental impact of economic expansion during the transitional economy period. The finding of the study helps to answer the following research question

1. What and how of the long run and short run relationships between FDI and trade liberalization and CO2 emissions of Myanmar?
2. What is the impact of economic liberalization of Myanmar in environmental quality?

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1.3 Research Objectives

The objectives of the study are

1. To investigate the impact of foreign direct investment on environmental quality.
2. To investigate the impact of trade openness on environmental quality.

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1.4 Conceptual Frame works

The recent economic literature on the subject is more encouraging; it aims to empirically verify theories about how trade or economic growth affects the environment, which is essential for resolving current policy discussions. The pollution haven hypothesis (PHH) refers to the concept that weaker environmental rules may have an impact on foreign investment.

The pollution haven hypothesis thus has two empirical implications, namely that pollution in developing nations is positively correlated with FDI inflow and that FDI outflow in rich countries is positively correlated with the strictness of environmental policy.

This cycle of production serves as a gauge for measuring how humans affect the environment. Agriculture, manufacturing, and global trade are just a few of the human endeavors that support population expansion. These human activities, however, harm the ecosystem.

As general environmental concerns enter the major public policy agenda, it is becoming more and more crucial to understand how economic expansion affects environmental quality. Other environmental degradation indicators, such as deforestation, carbon emissions, and urban garbage, have also been examined using the EKC theory. In general, two major categories can be used to classify an increased number of studies on the EKC hypothesis.

The first category examines the dynamic connection between a country's economic development and environmental pollutants, or between a country's economic development, energy use, and environmental pollutants. The second category includes current research that look at the dynamic interaction between commerce, energy use, environmental pollution, and economic growth. These studies include Ang (2008), Baek and Kim (2013), Hossain (2012), Jalil and Mahmud

(2009), Ren et al. (2014), and Zambrano-Monserrate, Garcia-Alban, and Henk-Vera (2016), which used additional variables to better capture the effect of economic development on the environment. These variables included foreign direct investment (FDI), export, import, trade openness, population density, and urbanization ratio. In order to evaluate the effects of economic development on the environment, Baek and Kim (2013) and Zambrano-Monserrate et al. (2016) looked at energy consumption, GDP, and trade using the same approach.

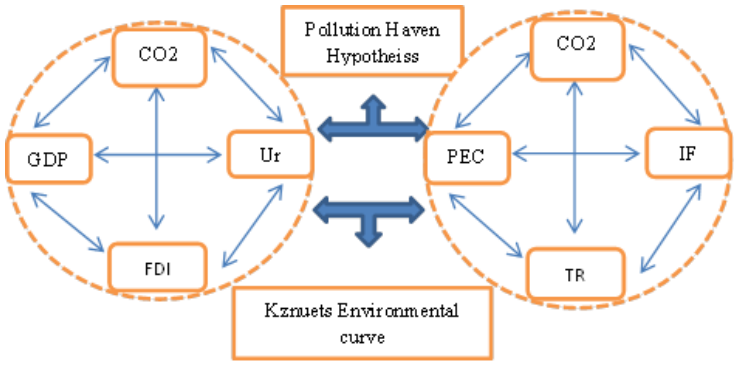

Figure 3: Conceptual framework for this study

The two theories Environmental Kuznets Curve (KEC) and Pollution Haven Hypothesis (PHH) are applied as the main theoretical frameworks in this thesis to investigate the relationship between FDI, trade liberalization, and environmental quality in Myanmar.

1.5 Structure of the thesis

The study framework of the thesis is as follows

Chapter one- introduces the research rationale, research purpose, research questions and objectives and the conceptual framework of the study.

Chapter two represents the views of literature on the theoretical approaches and practical applications of environmental impact estimation of trade liberalization. The published studies on the linkage between trade liberalization and the environment can see in this chapter.

Chapters three present the theoretical background of the study.

Chapter four included the environmental matters of Myanmar, the background of the trade liberalization after 1988.The resource management system of Myanmar government after the implementation of trade liberalization system also discuss in this part.

Empirical results of the short run and long-run relationships between CO2 emissions, FDI, urbanization and GDP per capita discuss in the chapter five.

Data and methodology of the research are present in chapter six which including a ARDL method of short run and long-run relationships between CO2 emissions and trade liberalization in Myanmar and the environmental impact assessment method of trade policy.

Chapters seven concludes the major finding of the study, suggest academic implication and highlight limitation and provides recommendations for future research.

1.6 Methodology: Data collection and analysis methods

The methodology for this investigation is presented in this section. An ARDL model is used to analyze the environmental effects of trade liberalization. This study separately access the quantitative analysis of the impact of trade openness, investment freedom and power consumption on CO2 emission and the impact of quantitative accesses foreign direct investment, urbanizing and gross domestic product on CO2 emission of Myanmar based on the patterns of trade liberalization process. Only the empirical model specification and the study's estimation techniques are covered in this section. Chapters 5 and 6 provide explanations of the detail method.

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1.6.1 Data collection techniques

This study uses current data that was gathered from publications or surveys produced by the government, including those from the Central Statistics Organization (CSO), the Directorate of Investment and Business Association (DICA), the World Bank Dataset, and Konema. Creswell (2014) suggested the following factors for choosing a study approach: A) identifies parallels Creswell (2014) suggested the following factors for choosing a study approach: draws out connections between problems and the strategy, personal experiences, and audience, among other things. When an issue requires identifying components that affect the outcome and comprehending the best predictors of outcomes, a quantitative approach is recommended. A quantitative technique could quantify the influence of FDI and trade liberalization, urbanization, and other factors, according to the literature evaluation, research objectives, and research questions. . Table - describes the key terms and meanings used in this thesis.

Table 3 : Key definitions and terminologies used in this thesis are described

Terms	*Definition*
CO2 Emission	*Colorless, odorless, and non-poisonous GHGs include CO2.*
Trade Openness	*The direction of a nation's economy—whether it is export- or import-oriented.*
Urbanization	*The process by which many people permanently congregate in comparatively small regions to establish cities is known as urbanization.*
Foreign Direct Investment	*An acquisition of a certain organization's stock by another foreign organization is referred to as a foreign direct investment.*
Gross Domestic Per Capita	*The process by which many people permanently congregate in comparatively small regions to establish cities is known as urbanization.*
Investment Freedom	*The Investment Freedom Index assesses various investing limitations.*
Power Electric Consumption	*The form of energy consumption that uses electrical energy.*

1.6.2 Analysis Methods

The autoregressive distributed lag model is used in this study to determine whether there is a long-term link between the time series variables. The ARDL technique's ability to be used regardless of whether the variable is I(0), I(1), or fractionally co-integrated is one of its key benefits (Pesaran & Pesaran, 1997). The ARDL model has enough lags to account for the dynamical implications of all dependent and independent variables, as well as those of the error term. Moreover, the error correction model (ECM) is created by deriving ARDL from a straightforward linear transformation. Without sacrificing long-run data, ECM combines short-run changes with long-run equilibrium. Moreover, Perasan and Shin (1999) showed how the issues caused by serial correlation and endogeneity issues are eliminated from the ARDL framework by simultaneous estimate of long-run and short-run components and the use of the proper delays. These are the estimating techniques.

i) Unit Root Test for Stationary

In applying time series data in regression analysis, it is important to determine whether a time stationary or non-stationary to avoid the spurious regression problem. Although the ARDL techniques can be applied in time series data if the data is I(0) or I(1). The Augmented-Dickey-Fuller (ADF) test, ADF-GLS test and Phillip- Perron test will apply in this study.

Additionally, we apply the Johansen co-integration test to determine whether there is a long-term equilibrium between the variables at the levels of household final consumption spending, consumption of fossil fuels, trade openness, net inflows of foreign direct investment, and CO2 emissions. Information on the existence of co-integrations among the variables is provided by the Johansen co-integration test. The size of the potential long-term damage is not calculated as part of the test, though. In order to estimate the short- and long-term co-integration among the variables, we then go on to the Bounds test (also known as the F-test).

ii) Optimal Lag Length of Each Variable

The Johansen co-integration test is also used to evaluate whether the variables are in a long-term equilibrium at the levels of household final consumption spending, fossil fuel consumption, trade openness, net inflows of foreign direct investment, and CO2 emissions. The Johansen co-integration test provides data on whether co-integrations between the variables exist. But no calculations are made as part of the test to determine the extent of the potential long-term harm. The Bounds test is the next step, which is used to assess the variables' short- and long-term co-integration (also known as the F-test).

iii) Co-integration among Variables

A comparison is made between the computed F-statistic value and two sets of critical values offered by Pesaran et al (2001). In one set, all variables are regarded as I(0), while in the other, they are regarded as I. (1). Regardless of whether the variable is I(0) or I, the null hypothesis of no co-integration will be rejected if the F-statistics surpass the upper critical threshold (1). The null hypothesis of no co-integration cannot be ruled out if it is below the lower critical value. The test is inconclusive if it falls inside the crucial value band.

iv) Estimation of the Long-run and Short-run Elasticity

The error correcting method enables a variety of short-run dynamics while assisting the variables in moving together closely over time (Engle & Granger, 1987, as cited in Baek & Kim, 2013). The error correction model illustrating the short-run and long-run adjustment parameters describes this dynamic relationship. We can gauge the rate of adjustment necessary to return to long-run equilibrium following a short-term shock using the ECM data. It is anticipated that the ECM term's coefficient will be statistically significant and negative. The long-run relationship between the variables can be calculated for equations using the ordinary least square (OLS) approach once the ARDL model has been chosen by the AIC or BIC criterion. Next, the ECM frameworks for equations are estimated.

v) The Granger Causality Test

Granger (1969) created the Granger Causality test, a statistical hypothesis test for detecting if one time series is helpful in predicting another. Granger proposed the term "causation" to describe the capacity to forecast future values of a time series using the prior values of another time series. Econometricians note that the Granger test only detects "predictive causality, and Granger causality is good described as "precedence" or "temporally related". If a signal X "Granger-causes" a signal Y, then former values of X reflect information contained in the past value of Y alone, according to the Granger causality.

vi) Diagnostic Tests and Stability of the Estimated Mode

This paper's main goal is to use the ARDL technique to examine the long-term cointegration of environmental equality and trade liberalization for Myanmar. The critical actions that must be taken in order to evaluate the cointegration among the variables being considered are as follows:

~~i)~~ Test for stationary to avoid the bias relationship.

i)

~~ii)~~ The optimal lag selection

ii)

~~iii)~~ Test for long-run relationship among variables with the decision of F-tests.

iii)

~~iv)~~ Long –run and short-run coefficients estimation

iv)

~~v)~~ The granger causality test

v)

~~vi)~~ Test of Goodness of fit

~~vii) Test of histogram Jarque-Beta Test of Residuals~~

vi)

~~viii)~~vii) CUSUM and CUSUMSQ stability test by using the model of Brown et.al (1975).

The estimate technique for the chosen ARDL specification is tested for robustness ~~in the following figure (3),~~ including the checks for normality, heteroscedasticity, freedom from serial correlation, and stability.

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1.6.3 Environmental impact assessment methods

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There are numerous analytical tools, techniques, and strategies available to evaluate how commerce impacts the environment. Classical environmental assessment methods have been used in too many different ways to be evaluated in detail here; suffice it to say that any advantages or disadvantages found are inherent in the general methodologies used and are not always connected to their application to trade-specific analysis. The basic objectives of an environmental impact assessment (EIA) are to reduce negative consequences of a project while staying within engineering and other restrictions, and to educate decision-makers of the environmental effects of the scheme on people and the environment. . In the mid-1990s, a major international review of the effectiveness of EIA was implemented (Sadler, 1996).The main advantages and benefits of EIA are:

- enhanced project siting and design;
- making more informed decisions
- making more ecologically conscious choices;
- making more environmentally responsible decisions;
- making more ecologically conscious choices;
- greater responsibility and openness throughout the development process
- improved integration of projects into their environmental and social setting;
- enhanced integration of projects into their social and environmental contexts;
- decreased environmental harm;
- projects that are more successful in achieving their financial and/or socioeconomic goals;

To encourage better procedural compliance and efficient process execution, practical EIA guidance is helpful. The appropriate EIA administrative or expert body will often issue guidelines, which should give a clear and authoritative understanding of the measures that must be taken and by whom. A crucial component of the EIA process is public participation. A plan and its effects should be subject to appropriate provision for affected and interested parties to comment on. In many developing nations, development projects that receive international funding or support may be subject to two or more EIA regimes. To the greatest extent practicable, these should be coordinated and harmonized to prevent needless overlapping, duplication, or

fragmentation.

An analysis of how ASEAN plus China might alter Myanmar's production pattern is done using this combination as a case study. We also take into account how that change would affect energy use, the influence of manufacturing investment freedom, and CO2 emissions; and finally, what Myanmar might do to lower CO2 emissions as a result of trade liberalization.

The following sections covered i) the need for an EIA on trade policy, (ii) analysis the RCA indices of major top export of ~~Myanmar and~~Myanmar and (iii) the precise steps to apply the EIA approach to ASEAN plus China in this study.

i) The need for an EIA on trade policy

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International organizations like the World Trade Organization (WTO, 1999), the European Union (SECSO, 2006), the Organization for Economic Co-operation and Development (OECD, 1994), and the United Nations Environment Programme (UNEP, 2005) typically include information on economic and social impacts in addition to environmental impacts in their published guidelines (Mao et al., 2015).

There are two stages at which the environmental impact assessment can be done. The first level, also known as "sect–oral evaluation," looks into how a free trade agreement will affect the environment. The second stage is a "regulatory assessment," which aims to analyze the FTA's text in order to determine how it might impact a nation's capacity to create, uphold, or enforce its environmental protection laws (Gallagher et al., 2002).

T~~T~~he stages conducting an environmental assessment on a proposed policy in developed countries such as the US and Canada were

i) Identification of the economic effects of a proposed free trade agreement;
ii) Identification of the likely environmental impact of economic changes;
iii) Consideration of the significance of the identified likely environmental impacts;
iv) Identification of enhancement or mitigation options.

The contents of each stage are described below

~~i)~~ Identification of the economic effects of a proposed free trade agreement

i)

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In this step, the potential economic effects of a proposed trade policy are determined. This includes any prospective changes to trade flows and associated

economic activity. This process, sometimes known as "screening," serves to limit trade agreements and calls for additional thought regarding the effects on the environment (GoJ, 2004). There are three main techniques mentioned in the literature for determining which industries or product groupings can grow or shrink as a result of a free trade agreement: the trade indicator, the SMART- WITS model15, and the CGE-GTAP model (Global Trade Analysis Project) (Plummer et al., 2010).

The easiest and most straightforward way to determine if a country's production pattern is increasing or declining with respect to a certain product group is to use a trade indicator. An index or ratio known as a "trade indicator" can be used to define and evaluate the state of an economy's trade flows and trade patterns (Mikic & Gilbert, 2007).

In some research, the CGE model is used to forecast how changes in trade policy will affect domestic production (such as the EIA on FTA reports conducted by the Canadian and US governments). CGE models can only be used for simulation because they are calibrated models based on the applicability of the general equilibrium theory. CGE models cannot be used for testing; instead, they can only be used for simulation because they are calibrated models based on the applicability of the general equilibrium theory (Rauscher, 2005; Berman, 2005). A vast amount of data is needed, including input-output, SAM data, labor, etc.

. In this study, the change in domestic output in Myanmar as a result of trade liberalization was predicted using the RCA index. Using the RCA index has the benefit of taking into account the inherent advantages of a given export good and being consistent with changes in an economy's factor endowment and productivity (Nguyen, 2011). Despite its inherent flaws, the RCA index is a straightforward effective tool that is most frequently utilized in the literature (Grigorovici, 2009; Le, 2010). Despite the method's simplicity, it is sufficient to respond to our study's third and fourth research questions by applying trade indicator analysis. In terms of data availability, time and budget allocation, and effectiveness, the trade indicator analysis method is also appropriate for our study.

ii) Identification of the Likely Environmental Impact of Economic Changes

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This process aids in addressing issues like the effects of economic transformation on the environment. What caused them, and how much of an impact

did scale have? This process, known as "scoping," focuses on the key areas and industries that have a significant impact on the environment as a result of changes in the industrial and economic structure. A crucial step in the creation of an EIA is scoping. It aids in determining the information needs essential for future study as well as the most significant environmental issues that are likely to emerge. It offers a qualitative measurement in the form of the following statements: I Not probable; (ii) Growing Likely; and (iii) Certain with a probability of 0% or 100%.

This section of the study might offer general criteria and guidelines that will be used in deciphering the effects of trade liberalization. Unfortunately, this provision of the CPTPP does not include any pertinent potential environmental effects. As a result, more research or assessment of the effects on the environment is not needed. By ensuring the biosafety and quality of the traded goods, the expanded use of SPS measures in trade activities may reduce environmental concerns. Hence, the SPS chapter might have a favorable impact on the environment.

iii) Assessment of the Significance of the Identified Likely Environmental Impacts

The levels of significance of the positive and negative environmental impacts identified in step 2 are assessed after additional assessment of their nature, geographic scope, magnitude, frequency, and duration, timing, severity of the environmental impacts, and potential synergies between them.

.

iv) Identification of Enhancement or Mitigation Options

This stage aids in determining the best ways to enhance the beneficial effects and lessen the detrimental effects of a trade policy on the environment. A number of suggested legislation, rules, and policy actions make up the solutions.

1.7 Innovation points of research

The purpose of this study is to analysis the impact of trade labialization on the environmental quality of Myanmar used two separate equation base on the process of trade labialization process.

The majority of studies on Myanmar have used time series data from 1970 to

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2014 to examine the connection between trade and the environment (Aung et al. 2017) and other studies ,Aung et al. 2021 used survey data from 296 Chinese and 125 Japanese companies operating in Myanmar to test the validity of the Environmental Kuznets curve (EKC) in the context of Myanmar. This study is the first to look at Myanmar's environmental quality and trade liberalization in almost 27 years (2015-2021). Using annual time series data covering the years 2015-2021, this empirical study investigates the short- and long-term relationships between economic liberalization indices and CO2 emissions as an environmental pollution indicator in Myanmar. Since free trade negotiations and implementation have a close relationship with government policy and institutional structures and have a significant impact, these factors must be changed in order to lessen their negative environmental impacts.

The literature on the relationship between trade liberalization and the environment can be split into two main divisions based on the goals of the works. There are publications that focus heavily on determining the causal linkages between the variables, and there are others that examine how trade affects the environment. By conceptualizing power consumption and investment freedom from new viewpoints and findings at the national level, this study acts as a link between the existing trade openness and environment research.

The author used the RCA index and EIA method for trade policy in this analysis to access the impact of trade liberalization on the environment of Myanmar. Using the RCA index has the benefit of taking into account the inherent advantages of a given export good and being consistent with changes in an economy's factor endowment and productivity (Nguyen, 2011). Despite its inherent flaws, the RCA index is a straightforward effective tool that is most frequently utilized in the literature (Grigorovici, 2009; Le, 2010).

The second section of the paper makes an effort to quantify the effect of FID on Myanmar's environmental quality, which has not been covered in earlier research. If the results hold true, FDI has a negative influence on Myanmar's environment. While these effects may not be easy to recognize (or quantify) at this time, they will be impossible to avoid for future generations.

Firstly analysis trade statistical data, including export partner shares, export product shares and the Revealed Comparative Advantage index to examine the

export pattern of Myanmar to trade partners countries. Next, we apply the Environmental Impact Assessment method on trade policy to screen and scope potential trade openness on Myanmar's environment due to the major export of Myanmar's came from the natural resources sector.

This study specifically looks at the effects of Myanmar's urbanization and energy use on the environmental quality of other country's contents, both with and without environmental protections.

Finding evidence for the Pollution Haven Hypothesis and environmental Kuznets Curve analysis are the primary directions taken by the research explaining how wealth affects the environment (PHH).

In essence, the findings of this study suggest that greater attention be paid to the development of a comprehensive strategy and policy yielding stick to assess the environmental impact both before and after the negotiation of a free trade agreement and economic change.

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2 Literature Review

This chapter reviews the research on theoretical frameworks and practical

implementations of trade openness impact assessment on the environment. Many empirical studies have been conducted in recent years on the relationships between several environmental indicators, including deforestation, CO2 emissions, air and water pollution, ecological footprints, and land degradation, and global economic development. The environmental Kuznets curve, which states that as wealth increases beyond a certain point, the environmental impact of development activities reduces, serves as an example of this relationship (UNEP 2011). Trade's impact on the environment is discussed in Section 2.1, FDI's impact on the environment is discussed in Section 2.2, and the relationship between the environment and economic growth is discussed in Section 2.3.

2.1 Trade and environment

Theoretically, there are two primary roles that connect the environment system, which includes the natural resources, to the economic system. First, the environment offers natural resources as an input for production, and second, the environment dissolves industrial wastes, with CO2 serving as the primary gas discharged (Pearce & Turner, 1990). Studies already conducted on the topic of commerce and the environment provides evidence of both clear and ambiguous consequences. The Environmental Kuznets Curve study forms the key part of the research strategy used to explain how wealth affects the environment. According to EKC research, some pollutants see a rise in pollution with income while others see a decrease. Studies that discovered evidence for the N-shaped curve, a monotonically rising curve, and an inverted U-shaped EKC (Copeland et al. 2004, Dasgupta et al. 2002 & Dinda 2004). One school of thought in the literature contends that trade benefits everyone by boosting competitiveness and bringing advanced technologies to developing nations Copeland et al. 2004.

In the context of China, Cole et al. (2011) examined the connection between economic growth, FDI, and the environment. The study identifies an EKC association between waste water and petroleum-like materials and establishes that foreign-owned companies have a negative impact on emissions, but less so than local companies. Sharma (2011) used a dynamic panel data model to investigate the factors that affect carbon dioxide emissions in the setting of 69 nations. The study indicated that while GDP increases and urbanization decreases CO2 emissions, there was no discernible effect of trade openness on the environment in the worldwide

panel.

By separating domestic and interregional commerce using the MRIO-based SDA technique for the years 1997–2011, Zho et al. (2018) investigated the factors that influence variations in province energy consumption. They discovered that (1) final demand per capita was the main driver of increases in provincial energy consumption, while both energy intensity and production structure counterbalanced provincial energy changes, (2) the majority of the 30 provinces were outsourcers as a result of strong interprovincial ties, and (3) raw materials and product flows from resource-dependent upstream provinces were supplied to the coastal provinces, which are the centers of manufacturing.

By utilizing wavelet-coherence analysis, phase-difference approach, and Breitung and Candelon's (2006) causality test, Jun et al. (2019) explore the effect of trade openness on pollution in China. The findings show that increased commercial openness has led to more pollution in China, particularly since China joined the WTO in 2001. The findings imply that China should implement the necessary measures while maintaining its trade openness policy in order to prevent pollution.

According to Qi et al. (2019), the Belt and Road Initiative (BRI), which aims to increase economic development through free trade, is divisive since the construction of extensive infrastructure could increase energy consumption and harm the environment in BRI nations. The panel smooth transition model and the convergence model are combined in this study to examine the impact of China-BRI trade on the energy intensity convergence of 59 BRI countries between 1996 and 2015, taking into account the trade scale effect, the technology effect, the composite effect, and the tempo-spatial variations in energy intensity convergence rates. The scale of trade between China and the BRI countries, when it exceeds the trade threshold value, facilitates the energy intensity convergence rate by about 13% for BRI countries. Additionally, the technology spillover effect for high-skill and low-medium skill workers raises the energy intensity convergence rate. The empirical findings demonstrate that the scale of China-BRI trade facilitates energy intensity convergence rate by about 13% of BRI countries when exceeding the trade threshold value, and that the high-skill and low-medium skill technology spillover effects increase the rate by 12% and 15%, respectively. The composite effect, however, appears to have little bearing on the energy intensity convergence of BRI countries

and BRI countries with larger bilateral trade scale or more energy-intensive industries.

Wang et al. (2020) used the structural decomposition analysis method to divide the factors influencing China's emission transfer into five parts: emission intensity, export per capita, export structure, population, and production structure. Wang et al. (2020) analyzed the intermediate carbon emission transfer effort of 140 countries/regions in the global production network using data from the Global Trade Analysis Project database. The findings indicate that commerce between China and developed regions, especially those in North America and Western Europe, particularly in the fields of mechanical and electronic equipment and chemical, rubber, and plastic items, is the primary cause of China's net inflow of emissions. They concluded by recommending that China improve its trading framework and support low-carbon technology. (Shuhong Wang , 2020).

Jijian et al. (2021) looked into how the Belt and Road Initiative's (BRI) rapid increase in trade impacts carbon emissions and economic growth. Out of the 65 nations that joined the BRI in 2013, fifty-two were employed in this study's empirical research. The study used panel data from 1993 to 2018 and the estimate techniques Common Correlated Effects Mean Group (CCEMG) and Augmented Mean Group (AMG) for the empirical analysis. This study advised that, in addition to fostering international trade, environmental protection clauses be incorporated into numerous international treaties and domestic legislation in order to regulate the environment and preserve ecological balance.

2.1 Foreign Direct Investment and Environment

The main goal of FDI syndicates is to make it easier for highly skilled workers, cutting-edge technologies, and financial resources to relocate from their home nations to other countries where they are going (Lasbrey et al., 2018). Industrialization and trade are fueled by direct foreign investment. FDI and economic development are positively correlated, according to an analysis of a heterogeneous panel covering the years 1983 to 2008 (Gaur et al., 2018).The influence of FDI on the environment is one of the most significant and frequently brought up topics in this area (Antoci et al., 2015; Cole et al., 2017). Most governments have been more

selective in the source and type of FDI entering into their country as a result of being aware of the possible environmental harm that FDI may cause (Demena and Afesorgbor, 2020).

Existing research suggests that how these pressures interact may affect how sustainably foreign investors engage (Antonietti and Marzucchi, 2014). Large-scale FDI has the potential to hasten environmental deterioration in host nations, but it also has the potential to help safeguard the environment, particularly if it is accompanied with more eco-friendly technologies and sustainable management techniques (Demena and Afesorgbor, 2020).

There hasn't been enough empirical research on how FDI performs in terms of the environment at the business level, despite the fact that an increasing number of studies discuss it as a two-edged sword that can either have a beneficial or bad influence on the environment of the host country (Cole et al., 2017). Some studies look at how well domestic companies function environmentally (Liu and Ye, 2012). Research on the factors influencing business environmental performance has looked at the motivations for Previous research concerned with the FDI–environment relationship has mostly focused on the impacts of domestic regulation on aggregate FDI flows and the effects of FDI on the local environment, mainly relating it to the environmental Kuznets curve and the pollution havenhypothesis (Aung et al., 2017; Bruvoll and Fæhn, 2006; Rezza, 2013).Direct investment in foreign countries leads to industrialization and commerce. An analysis of heterogeneous panel over 1983–2008 finds that FDI and economic development are positively linked (Gaur et al., 2018).

Some studies look at how well domestic companies function environmentally (Liu and Ye, 2012). The motivations for businesses to adopt environmentally responsible activities have been addressed in research on the factors influencing corporate environmental performance (Nikolaou et al., 2018).

2.2 Economic Growth and Carbon emission

Energy usage and inevitably its emissions have a significant impact on economic growth. The main cause of environmental pollution is CO2 emissions. Environmental difficulties, according to Andrée et al. (2019), are the degradation of

environmental quality or ecological harm brought on by human or natural activity. Carbon emissions are produced directly or indirectly during the production of a variety of goods (Bekun et al., 2019; Sarkodie and Strezov, 2019).

Salahuddin et al. (2018) for Kuwait, Mirza and Kanwal (2017) for Pakistan, Shahiduzzaman and Alam (2017) for Australia, Mbarek et al. (2014) for Tunisia, Tiwari (2011) for India, and Say and Yücel (2006) for Turkey all found significant positive relationships between economic growth and CO2 emissions. Single-country studies have also found these relationships. Also, a number of research have been carried out in certain regions, areas, countries, and international organizations. Also, a number of ~~research~~researches have been carried out in certain regions, areas, countries, and international organizations. For GCC nations, Salahuddin et al. (2015) found that there is a bidirectional causal relationship between economic growth and CO2 emissions. Pao and Tsai (2011) for the BRIC countries and Saboori et al. (2014) for the OECD countries found a significant positive long-term bidirectional association with economic growth. Environmental scientists claim that the percentage of CO2 in the atmosphere has significantly increased over the previous few years, with CO2 emissions being 42% greater in 2014 than they were in 1990. (International Energy Agency 2015 and US EPA 2014).

In developing nations, CO2 is the main greenhouse gas released, followed by CH4 and N2O, with energy and agriculture being the two biggest sources of emissions (United Nation Environment Program 2015).

The recent study of the link between aggregate income and carbon dioxide ~~emission revealed the evidence of EKC in the Dominican Republic (Davalos 2016). The research done on Pakistan to examine the short- and long-run relationship among~~ CO2, energy consumption, and economic growth using Johensen cointegration emission revealed the evidence of EKC in the Dominican Republic (Davalos 2016). The research done on Pakistan to examine the short- and long-run relationship among approach indicated the existence of EKC in long run but not in short run (Ali et al. 2015). The EKC however remains controversial theoretically and empirically. The evidence of EKC relationship varies across regions and pollutants. Much of the current literature has focused on examining the validity of EKC hypothesis for cross-country and individual case studies by using various economic models and econometric approaches.

The places and timeframes the research is conducted in affect the EKC for deforestation results across studies (Choumert et al. 2013). Many research have used the bound test of cointegration or ARDL cointegration technique created by Pesaran and Pesaran (1997) and Pesaran et al. (2001) to look at the long- and short-term correlations between economic indicators and environmental variables. The research on FDI, environmental quality, and trade openness are listed in table -41 .

Table 4: The selected Studies on the relationship between FDI, trade openness and environment

Author	*Title*	*Studies Period*	*Econometrics Approach*	*Variables used*	*Results*
Thiri Shwesin et al.	*Economic growth and environmental pollution in Myanmar: an analysis of environmental Kuznets curve*	*1970–2014*	*ARDL*	*CO2, methane emissions, nitrous oxide, (GDP), (CTI) , urbanization growth , the Chinn-Ito index (financial openness).*	*Long-term environmental quality in Myanmar will be improved by financial and trade liberalization.*
Thiri Shwesin Aung et al.	*Environmental performance of foreign firms: Chinese and Japanese firms in Myanmar*	*October 2019 to March 2020*	*A hierarchical multiple linear regression*	*environmental impact, managerial environmental Knowledge, Assets, size, Investment in R&D, Environmental policy impact*	*When analyzing the impact of environmental restrictions on FDI in developing nations, both resource-based and institutional theories are helpful.*

Table 4 : The selected Studies on the relationship between FDI, trade openness and environment (Continued)

Author	*Title*	*Studies Period*	*Econometrics Approach*	*Variables used*	*Results*
Shakoor Ahmed	*Empirical Analysis of Dynamic Relationship Between Energy, Militarization, CO2 emissions and Economic Growth in Myanmar.*	*1990–2016*	*OLS and Gregory–Hansen cointegration*	*Economic growth. militarization, energy consumption , CO2 emission*	*There is a bidirectional causal relationship between militarization and both energy consumption and economic expansion.*
Zhang Jijian et al.	*Empirical study on the impact of international trade and foreign direct investment on carbon emission for belt and road countries*	*1993-2018*	*CCEMG AMG*	*FDI, Ex,IM, CO2*	*Carbon emissions and imports have a positive relationship. On the other hand, exports showed a negative correlation with carbon emissions, whereas foreign direct investment inflows showed a marginally positive correlation with consumption-based carbon emissions.*

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Table 4 : The selected Studies on the relationship between FDI, trade openness and environment (Continued)

Author	*Title*	*Studies Period*	*Econometrics Approach*	*Variables used*	*Results*

Mohammad Rafiqul Islam et al.	*International Trade and Carbon Emissions (CO2): The case of Bangladesh*	*1976-2008.*	*Durbin-Watson "d" Statistics*	*CO2 EX*	*The exploration of the situation only and consequently draws attention on the environmental regulations without causing harm to international relation.*
Aliyu, Mohammed Aminu	*Foreign Direct Investment and the Environment: Pollution Haven Hypothesis Revisited*	*1990 -2000*	*OLS GLS*	*FDI GDP*	*The level of pollution and energy use in fourteen non-OECD nations cannot be explained by FDI inflow.*
Wen Jun & Hamid Mahood & Muhammad Zakai	*Impact of trade openess on environemt in China*		*Phase-difference technique ,Breitung Candelon (2006) causality test. wavelet-coherence analysis*	*CO2 Trade openess*	*According to the results of the spectral domain causality test, trade openness has a direct impact on carbon emissions in the short, medium, and long terms.*

Table 4 : The selected Studies on the relationship between FDI, trade openness and environment (Continued)

Author	*Title*	*Studies Period*	*Econometrics Approach*	*Variables used*	*Results*

Peilei Fan et al.	*Urbanization, economic development, and environmental changes in transitional economies in the global south: a case of Yangon*	*1990-2020*	*Correlation (r) matrix*	*urbanization, economic development, environmental changes*	*A positive correlation exists between population and economic development and the concentration of PM2.5 is highly associated with population, the economy, and the number of vehicles*
Abdul Jalil & Syed F. Mahmud	*Environment Kuznets curve for CO 2 emissions: A cointegration analysis for China*	*1971–2005*	*ARDL*	*Energy consumption, Income, Trade openess*	*On a long term basis, income and energy use are the key factors influencing carbon emissions. Although statistically insignificant, trade has a positive effect on CO2 emissions.*

Table 4 : The selected Studies on the relationship between FDI, trade openness and environment (Continued)

Author	*Title*	*Studies Period*	*Econometrics Approach*	*Variables used*	*Results*
V.G.R.	*The impacts of transport energy consumption, foreign direct investment*	*1971 - 2008*	*Granger causality the Johansen cointegration*	*CO 2 ECt,*	*These studies advise policymakers to*

Chandran & Chor Foon Tang	*and income on CO 2 emissions in ASEAN-5 economies*		*test,*	*FDI, GDPt* GDP_t^2	*prioritize energy-efficient transportation systems and measures to reduce the use of fossil fuels.*
Fahri Seker & Hasan Murat Ertugrul & Murat Cetin	*The impact of foreign direct investment on environmental quality: A bounds testing and causality analysis for Turkey*	*1974–2010*	*ARDL*	*GDP FDI CO2*	*The results suggest that Turkey should encourage additional FDI inflows, particularly in technology-intensive and environmentally friendly companies, in order to improve environmental quality.*

3Theoretical Analysis

3.1 Pollution Haven Hypothesis

According to the pollution haven hypothesis (PHH), under free trade, multinational corporations will move the manufacturing of their products that produce a lot of pollution to poorer nations, where there is less environmental oversight. Eventually, emerging nations will gain a competitive edge in businesses that produce large amounts of pollution and turn into "havens" for the world's polluting industries. Hence, it is anticipated that wealthy countries will gain from trade in terms of environmental quality while poor countries will suffer.

In less developed countries, foreign investment is expected to close the internal resource and savings gap, improve managerial capabilities, lessen the currency shortage, and improve the country's overall balance of payments. The free movement of finance and trade have also grown in importance as environmental issues. Some contend that environmental quality is an ordinary benefit and that economic progress brought about by free trade will result in a cleaner environment.

The idea of a pollution haven involves three components.

The relocation of heavily polluting companies from rich nations with strict environmental regulations that are lax or not enforced is the first step in nt environmental policies to developing countries where such regulations do not exist. In light of this, global free trade would encourage the relocation of polluting industries and processes to nations with lax environmental regulations.

The second factor is the discharge of hazardous waste into developing nations that is produced in industrialized nations and by nuclear energy production. The last factor is the indiscriminate exploitation of non-renewable natural resources in emerging nations by multinational companies that are involved in the production of petroleum and petroleum products, lumber and other forest resources, etc.

The pollution haven hypothesis thus has two empirical implications, namely that pollution in developing nations is positively correlated with FDI inflow and that FDI outflow in rich countries is positively correlated with the strictness of environmental

policy.

Using international data on industrial productivity, commerce, and environmental regulation for the years 1960–1995, Mani and Wheeler (1997) study the PHH. The outcome of their cross-country analysis is in line with the PHH. They discover that the amount of manufacturing output that is pollution-intensive has continuously decreased in OECD economies while steadily increasing in developing nations. Additionally, it is discovered that periods of rapid growth in net exports of products with high levels of pollution also coincide with periods of significant growth in the price of pollution control in OECD nations.

–According to the PHH, a country's comparative advantage is primarily based on how strict its pollution regulations are in comparison to other nations. So, as a result of trade, less developed nations with weaker environmental policies become dirtier as they specialize in the production of dirty goods. There are three main explanations for why underdeveloped nations set lower standards. First off, developing nations generally have higher costs associated with monitoring and enforcing pollution standards.

Second, wealthy developed nations create a greater demand for clean water and air. Third, economic development in emerging nations means a switch from agricultural to manufacturing, which prompts a quick urbanization process and significant investments in urban infrastructure, increasing pollution levels. Yet, growth in wealthy nations indicates a move from production to services, which results in a reduction of pollution sensitivity.

3.2 Low-carbon economy and sustainable development theory

Its goal is to mandate lower pollution emissions when creating economic benefits, such as goods for the global market, against the backdrop of the carbon emission period. ~~In order to successfully cut CO2 emissions and maintain economic growth.~~

Many nations have started looking for new development avenues, with low-carbon development emerging as one of the most popular. Many terms related to low-carbon development have been used in literature, including low-carbon energy, low-carbon life, low-carbon society, low-carbon city, low-carbon community,

low-carbon tourist, and low-carbon globe. The low-carbon development is depicted in the following three-stage diagram, which summarizes and unifies many low-carbon-related notions from literature (Yuan et al. 2011). (see Figure 4).

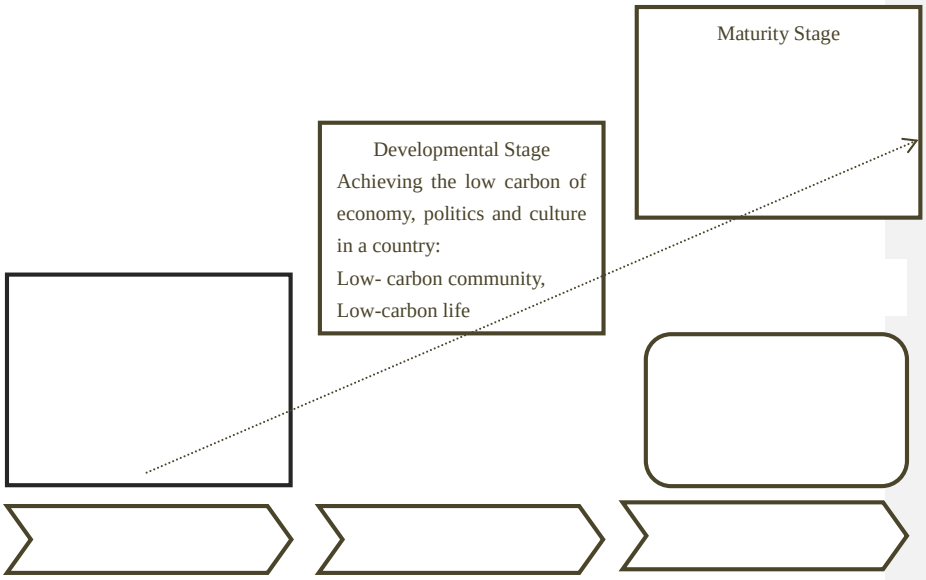

Figure 4 : Three Phase of low carbon development

Source: Hu Yuana, Peng Zhoua & Dequn Zhou, 2011

The low-carbon economy is the initial stage of low-carbon development, when lowering CO2 emissions from economic growth is the major objective. To do this, a nation must create a detailed plan to encourage low carbonization in its economic growth. The plan calls for funding research and development of low-carbon technologies through financial, fiscal, and legal support, the creation and use of low-carbon energy, and the modification of the economy to favor low-carbon industries.

As the low-carbon economy stage is finished, low-carbon development moves into the low-carbon society stage, which includes low-carbon lifestyles, low-carbon cultures, low-carbon politics, etc. At this point, the government should work to

promote low-carbon consumption and lifestyle choices, such as by enticing citizens to use low-carbon forms of transportation. When an economy, way of life, and culture are all low in carbon, that society will be considered to be one. We require numerous sensors to monitor development performance in the low-carbon development process.

3.2 Environmental Kuznets curve

According to the Environmental Kuznets curve hypothesis, which is depicted in Figure 1, the relationship between GDP per capita and environmental pollutants, or the long-term relationship between economic growth and environmental damage, can be expressed as a parabolic function or an inverted U-curve. It is a theoretical instrument that has been widely used to investigate how economic factors affect the environment (Tan et al., 2014; Ren et al., 2014).Figure 5: Environmental Kuznet Curve.

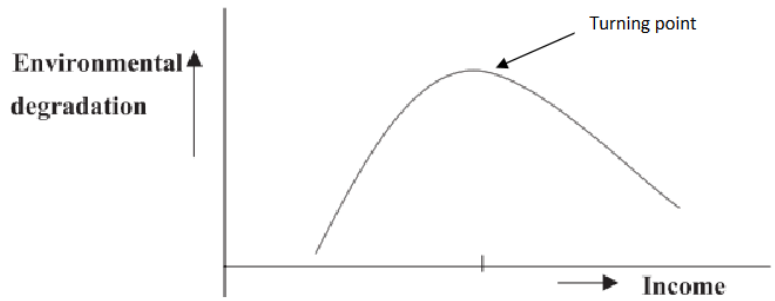

Figure 5 : Environmenatal Kuznet Curve
Source: Dinda ,2004

In the early stages of economic growth, pollution emissions increase and environmental quality declines, but beyond some level of per capita income (which will vary for different indicators) the trend reverses, so that at high income levels, economic growth leads to environmental improvement. This implies that environmental impacts or emissions per capita are an inverted U-shaped function of per capita income. The EKC is named after Simon Kuznets who proposed that income inequality first rises and then falls as economic development proceeds.

Since Grossman and Krueger (1991) first presented the EKC, it has been the standard method used by economists to model ambient pollution concentrations and aggregate emissions. The EKC is mostly an empirical phenomenon, yet the majority of EKC model estimates are not statistically reliable. The impact of growth outweighs these other factors in middle-income nations that are experiencing rapid growth. In developed nations, development is slower and the growth effect can be offset by measures to reduce pollution. Evidence that developing economies are actually addressing environmental issues lends support to these econometric findings. (Stern, 2020).

3.3 The Impact of Trade Openness on Income and Environment

The implications of a trade openness policy are often expected to change an economy's scale, technology, composition, and/or rules. The three main economic activities that will affect the environment as a result of economic developments are production, consumption, and transportation (Fauchald & Vennemo, 2011). Trade openness policies or trade liberalization may cause environmental harm or the loss of natural resources. A lot of variables, including the research nation, its economic development, and its domestic environmental protection legislation, affect how complex a trade openness influence on the environment.

Scale, composition, and technique effects are the traditional divisions of the total impact of trade liberalization on the environment (Antweiler et al., 2001; Coxhead & Jayasuriya, 2003; Cole & Elliott, 2003; Fauchald & Vennemo, 2011; Managi et al., 2009; UNEP, 2000, 2005). The division of trade liberalization policies' overall effects may include a focus on lowering pollution and protecting the environment, which has a favorable impact on the demand for a healthy environment (Muradian & Martinez-Alier, 2001). Environmental degradation and trade openness have a positive correlation, as shown by a general trend of rising pollution levels during the early stages of economic development. A nation that passes the EKC curve's turning point experiences increased trade. A country experiences a higher degree of trade openness once it passes the EKC curve's turning point. This could lead to a shift in the domestic production system of the nation in favor of cleaner, more environmentally friendly industry (Kohler, 2013).

Trade openness can benefit a nation's economy and welfare to the point where the government may need to regulate new tax and resource exploitation regulations as a result of the trade openness policy. Trade liberalization is anticipated to raise per capita income, according to Cole and Elliott (2003). This will therefore enhance the need for environmental protection measures. Grossman and Kruger were the first to break down the effects of the environment into scale, composition, and method effects (1991).

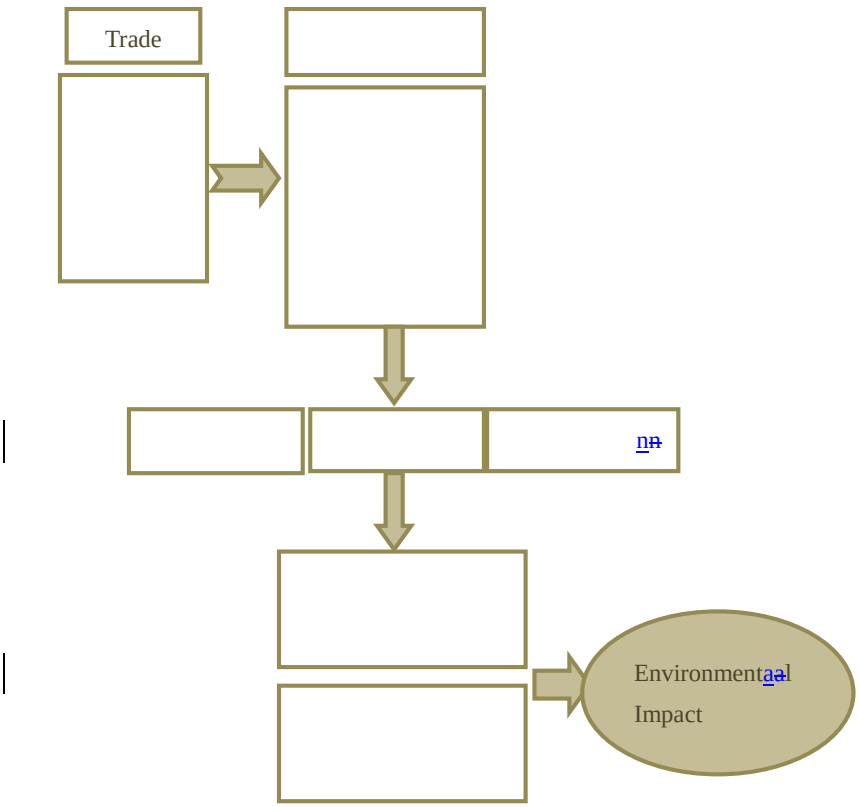

Figure 6: Impact of Trade on the Environment

Sources: Adapted from Fauchald & Vennemo (2011)

4 The situation of trade, FDI and environment in Myanmar

Trade openness can benefit a nation's economy and welfare to the point where the government may need to regulate new tax and resource exploitation regulations as a result of the trade openness policy. Trade liberalization is anticipated to raise per capita income, according to Cole and Elliott (2003). This will therefore enhance the need for environmental protection measures. Grossman and Kruger were the first to break down the effects of the environment into scale, composition, and method effects (1991).

4.1 Myanmar Integration with Global Economy

On June 19, 2011, President Thein Sein announced that the second phase of Myanmar's reform program had begun. Development of agricultural and overall development, proportionate and balanced growth across regions and states, inclusive growth, the formation of trustworthy statistics, and enhancement of the statistical system are all part of the second phase of economic reform. As Myanmar's governmental initiatives to create incentives for Foreign Direct Investment (FDI) and its export-oriented growth plan are crucial for the success of economic reforms ratify. However, other crucial policy components like gradually enhancing administrative and infrastructure, diversifying export products, creating jobs, gradually relying less on imported intermediate inputs, transferring technology, and disseminating their benefits are necessary for the positive effects of an export-oriented growth strategy to materialize national economy. Regarding the prospective growth of Myanmar's non-resource exports, the majority of these would flow to the economies of the US and the EU, as exports to nearby nations typically fall under the same labor-intensive product category.

Moreover, President Thein Sein's second phase of economic strategy under the framework of the Myanmar Comprehensive Economic Vision includes a strong emphasis on farm policy (MCDV). Understanding Myanmar's shift from informal to legal foreign exchange transactions is crucial as the country's economy opens up and

it steadily engages in international trade. Prior to its economic liberalization in March 2011, Myanmar had a well-established black market for foreign exchange and an unofficial method for sending money abroad. Due to the regime of foreign exchange controls and the significant expenses associated with transactions made through a formal banking channel, this method triumphed.

To make Myanmar's economy competitive and export-driven as a component of the regional production network, investment in manufacturing and service sectors, rather than trading as in the past, and the creation of a level playing field for all market players, both local and international, are necessary. The only ASEAN nation that shares borders with these fast expanding Asian "Giants" is Myanmar. Significant adjustments to Myanmar's relations with these nations would have a significant impact on the country's economic reforms and prospects for future economic growth.

Political and economic reforms in Myanmar after the election of the new administration in March 2011 have increased and widened trade prospects with all nations, including China and India. China faces a challenge from the political and economic reforms in Myanmar as well as the improved relations between Burma and Western nations. Statistics show that during the early 2000s and the 1990s, the GDP growth rate increased. These rates, though, have recently decreased and even seen negative growth. In terms of per capita GDP, Myanmar's economy has been in decline for the previous three decades; in 2008, the per capita GDP was $479, which is only 2.5% of South Korea's and 12% of Thailand's. Current account deficits are no longer present.

Since 2002, natural gas revenues have eliminated current account deficits; yet, the government's monopoly regime on gas exploration has aggravated its economy. Table 2 shows that Myanmar's yearly GDP growth has increased from 2001 but has somewhat decreased from 2010 to the present. Due to the volatility and irrationality of the foreign exchange market, foreign direct investment (FDI) has been fluctuating. For instance, the significant discrepancy between the official exchange rate and an unofficially created market-based rate was brought about by several laws on foreign exchange. The volume of FDI flow has decreased recently after peaking in 2015.

Table 5 : Myanmar's Major Economic Indicators for Selected Year

	2001	2005	2010	2015	2020
GDP growth rate %	12.5	13.7	12.5	3.3	3.2
GDP per capita %	11.3	12.6	9.2	2.5	2.4
FDI % of GDP	3.34	2.22	2.38	6.48	2.42
Trade Balance	(+) 1573.6	(+) 2448.3	(-) 5441.0	(-) 5259.5	(-) 1026.2
Export (million $)	3558.0	8861.0	11136.9	11951.6	17060.4
Import (million $)	1984.4	6412.7	16577.9	17211.1	18086.6

Sources: CSO 2020

Table 6 : Direction of Export by Major Trading Partner (Million $)

	2005 -2006	2010-2011	2015- 2016	2018-2019
Singapore	262.85	456.99	725.43	343.60
Malaysia	92.90	437.80	161.32	194.77
Thailand	1360.95	2905.18	2893.18	3277.58
China,People'sRep.of	366.95	1203.56	4596.96	5063.54
China, Hong Kong SAR	255.42	1894.69	282.81	214.95
India	488.97	871.59	904.16	682.78

Source: CSO 2020

This nation has a young labor force, abundant natural resources, and is close to some of the world's most vibrant economies, including China and India. The top export partners of Myanmar are included in table 3 in accordance with data from the Myanmar Central Statistical Organization from 2018 released by the MINISTRY OF PLANNING AND FINANCE (2020). India has been Myanmar's main trading partner since 2005, with annual trade volume growth. China holds the second-highest share in the years 2018–2019.

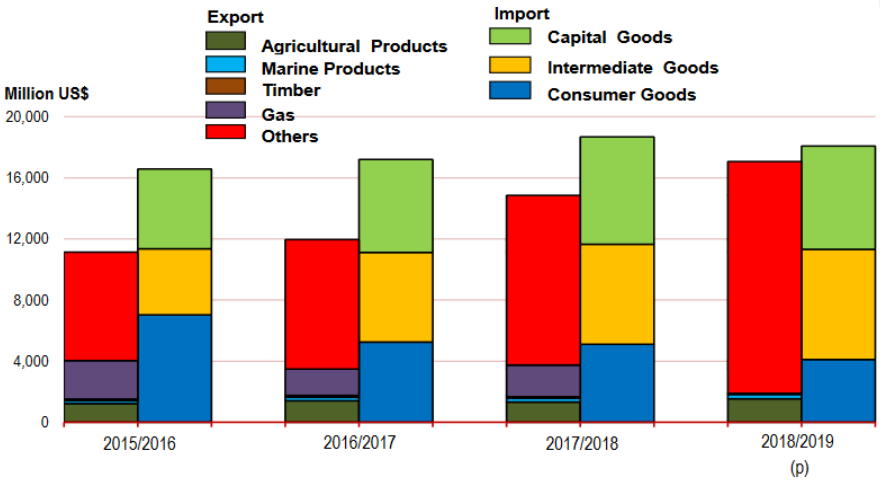

Figure 7 : Value of Foreign Trade by sector

Source: 1. Customs Department.
2. Department of Electric Power Planning.
3. Myanmar Petroleum Product Enterprise.
4. Myanmar National Airlines.
5. Myanmar Airways International.

The above shows that the trade balance of Myanmar from 2015 to 2019. In 2020, Myanmar was the number 67 economy in the world in terms of GDP (current US$), the number 69 in total exports, the number 69 in total imports, the number 169 economy in terms of GDP per capita (current US$) and the number 110 most complex economy according to the Economic Complexity Index (ECI).

~~The graph above displays Myanmar's trade balance from 2015 to 2019. According to the Economic Complexity Index, Myanmar had the 67th largest economy in the world in terms of GDP (current US dollars), the 69th largest economy in terms of total exports, the 69th largest economy in terms of total imports, the 169th largest economy in terms of GDP per capita (current US dollars), and the 110th most complex economy (ECI).~~ Petroleum Gas ($2.99 billion), Rice ($1.15 billion), Non-Knit Women's Coats ($984 million), Refined Copper ($974 million), and Dried Legumes ($894 million) are Myanmar's top exports, with the majority going to China ($5.37 billion), Thailand ($2.75 billion), Japan ($1.45 billion), Germany ($1.31 billion), and the United States ($1.14 billion).

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Rare-Earth Metal Compounds ($388M), Citrus and Melon Peels ($23.8M), Non-powered Aircraft ($18M), and Silk-worm Cocoons ($3.32M) were Myanmar's top exports in 2020.

4.2 The Market Oriented Foreign Direct Investment and Investment Law

4.2.1 Overview of Foreign Investment of Myanmar after 1988

The policy of liberalization orienting Myanmar legislation toward an open market economy is referred to as economic liberalization of Myanmar. The amount of trade openness that draws foreign commerce can be used to gauge how essential and significant Myanmar's foreign trade is to the country's economy. The State Law and Order Restoration Council (SLORC), which came into political control in 1988, enacted a market-oriented economy and concentrated on foreign affairs. The SLORC government has economic reforms as one of its major priorities. This involves fostering independent thought and business ventures. They include increasing exports and allowing FDI into the economy. Foreign commerce was liberalized in 1989, allowing for both private participation and ~~a~~ "open" stance toward enterprises engaging in both foreign direct investment and trading. Attempts have been undertaken to transition to a market economy and open up the economy to foreign nations during the third phase, which runs from 1988 to the present. Based on the goals of developing agriculture as the foundation and overall development of other sectors of the economy, proper evolution of the market-oriented economic system, development of the economy inviting participation in terms of technical know-how and investments from sources inside and outside of the country, and the initiative to shape the economy, the government has been reforming and liberalizing various fields such as agriculture, the SEEs, finance, and trade.

Financial and fiscal reforms, price and market reforms, businesses reforms, and legal changes have all been implemented in order to be in line with the

market-oriented system and to attract and promote foreign investment and the expansion of trade.

Financial and fiscal reforms

Fiscal and financial changes The Central Bank of Myanmar Law, the Financial Institutions of Myanmar Law, and the Myanmar Agricultural and Rural Development Bank Law were all passed as part of the country's transition to a market-oriented economy in order to strengthen the financial system and increase the effectiveness of financial activities. In addition, new laws governing insurance and savings banks have been passed in Myanmar. Privately owned banks were allowed to conduct business under the Financial Institutions of Burma Law. Twenty domestic private banks have opened so far, and some of them are now permitted to conduct foreign currency trading.

In all 14 of Burma's states and regions, as well as the capital territory, tax breaks for investments made in five priority areas were announced by the Ministry of Investment and Foreign Economic Relations (MIFER) in January 2020.

According to the Myanmar Special Economic Zones Law, investors who are based in a SEZ are eligible to petition for an income tax exemption for the first five years following the start of business operations, followed by a 50% decrease in the income tax rate for the following five years.

Foreign banks were authorized to open branches in Myanmar under the 1990 Banking Law, but they are not permitted to operate in the local market. For both domestic and international clients, these offices can act as a trade and commerce liaison. Despite the government permitting 49 international banks to build branches in Myanmar, there are still 27 foreign bank representatives' offices there. A joint venture agreement was struck by the Myanmar Economic Bank with the Japanese company Daiwa Institute of Research Ltd to establish a stock exchange and related businesses. Nowadays, controlling monetary expansion, interest rate policies, reserve requirements, and quantitative credit regulations are the core goals of monetary policy.

In accordance with the Ministry of Finance and Revenue's directives, the Controller of Foreign Exchange manages Exchange control. Myanmar's central bank set a reference exchange rate of 818 kyat per U.S. dollar on April 1, 2012, ending the more than 20-year-old parallel market currency exchange rate system. It is currently challenging to change the foreign currency rate.

Price and market reforms:

The Myanmar government has appointed reform-minded individuals to significant posts, reorganized a number of economic regulating institutions, established a number of new service organizations, and dismissed reactionary officials. The government established a central committee in January 2013 for the growth of small and medium-sized businesses, consisting of 27 members, with President Thein Sein serving as its chairman (SME). The administration has also actively sought the privatization of state-owned businesses, reducing state control in a variety of industries, including finance, energy, and telecommunications. The administration intends to foster an environment that will allow the private sector to participate in the reform process and add more dynamism to the economy. The contribution of the private sector to the national economy keeps increasing. The contribution of the private sector to the national economy keeps increasing. This promotes competition in the pertinent business sectors, creates more jobs, boosts productivity, and benefits the general public by resulting in competitive pricing and better services.

4.2.2 Attraction Foreign Direct Investment

The government of Myanmar is working to entice FDI from ASEAN, the United States, the European Union, Japan, China, India, South Korea, and other nations. Myanmar invited Chinese businesses to invest in Myanmar by sending a delegation to China on May 23, 2012, to explore optimal FDI policies. Early in November 2012, a new foreign investment law was published, allowing foreign companies to wholly acquire businesses and providing tax benefits and long-term land leases. Foreign businesses can now invest in a variety of industries, including telecommunications, hotels, tourism, oil, and energy. If foreign and domestic businesses agree on the investment ratio, the Myanmar Investment Commission, which has been restructured

to better serve investors, is in charge of authorizing joint ventures. . Moreover, the Ministry of Commerce is crucial to the shift toward the establishment of a market-based economic system.

According to a statement released by the IMF in May 2013, Myanmar's reforms are having an impact and its economy is expanding quickly: In comparison to the forecast 6.5 percent growth in the prior year, the GDP of Myanmar is predicted to rise by 6.75 percent in the fiscal year 2013 that ends in March 2014. Myanmar's economic links with China, India, ASEAN, Japan, Russia, and Western nations are growing. Many sanctions have been lifted, new markets for Myanmar exports have been opened with low or even no tariffs, and foreign investment has started in Myanmar.

Myanmar is well positioned to facilitate trade and the movement of materials and goods between South Asia and Southeast Asia. In this regard, Myanmar is creating a number of special economic zones that will aid in its development as a regional hub for goods and logistics. These initiatives include the creation of a special economic zone in Dawei, close to the border between Myanmar and Thailand, Kyauk Phyu, near the Indian Ocean, and Thilawa, close to Yangon Port on the Andaman Sea. By creating these special economic zones, Myanmar can better capitalize on its geographic advantages and further its development. Along with having abundant natural resources, Burma is lucky to have vast forests of teak and other hardwoods. Foreign investment is permitted in 12 industries by the government, including Myanmar is well positioned to facilitate trade and the movement of materials and goods between South Asia and Southeast Asia.

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power, oil and gas, building and construction, communications, hotels and tourism real estate, industrial zones and services.

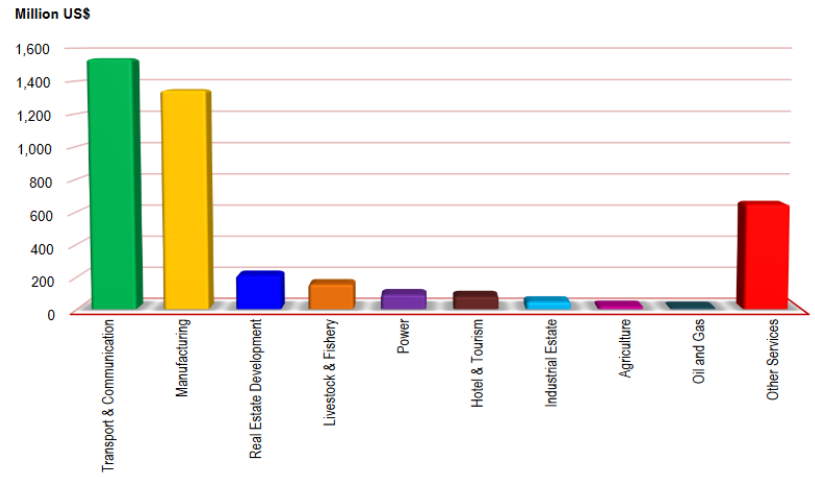

Figure 8 : Sectorial Contribution of Foreign Direct Investment in Myanmar, 2020
Source: Directorate of Investment and Company Administration

The aforementioned graph demonstrates that the transport and communications sector is the primary industry in which FDI is permitted. The second-place manufacturing industry is followed by the third-place other sector. The number of domestic and international investments surged fivefold between 2011–12 and 2012–13, according to a statement made by President Thein Sein on May 12, 2013 (fiscal years). Also, from the beginning of the fiscal year on April 1 to the end of August, Burma approved FDI projects totaling more than $1.8 billion, compared to $1.4 billion for the entire prior fiscal year.

During the first seven months of the fiscal year 2022–2023, Myanmar received approximately US$ 1.45 billion in foreign investment, with Singapore serving as the principal source, according to data from the Directorate of Investment and Corporate Administration (DICA). The following table lists the nations and the absolute amount of investment that came to Myanmar between April and the end of October of the fiscal year 2022.

Table 7 : Major Foreign Direct Investor in Myanmar, 2020

Rank	*Country*	*$ million*
1	*Singaspore*	*1154.286*
2	*Hong Kong*	*163.019*
3	*China*	*90.028*
4	*Japan*	*21.4*
5	*Thailand*	*6*
6	*Republic of Korea*	*4.8*
7	*Switzerland*	*4.677*
8	*Chinese Taipei*	*3*
9	*India*	*1.545*
10	*Belize*	*1.5*
11	*Bangladesh*	*1*
12	*Seychelles*	*0.338*
13	*UK*	*0.3*

Sources: Directorate of Investment and Company Administration-DICA

In comparison to the previous quarter, when it climbed by 281.4 USD million, Myanmar's Foreign Direct Investment (FDI) increased by 316.3 USD million in March 2022. Myanmar Foreign Direct Investment: USD million net flows data is provided from March 1976 through March 2022 and is updated quarterly. The information peaked at 2.0 USD billion in December 2017 and hit a record low of 0.0 USD million in September 1989.

4.2.~~1~~ 3 Rules and Opportunities of Foreign Investment Law

The Myanmar Investment Commission (MIC) categorizes a sizable list of investments as supported investment activities and a minor number of investments as restricted investment activities under the Myanmar Investment Law 2016 (MIL). Restricted investment activities are further broken down into categories such as those that can only be carried out by the union government (federal government), those that are prohibited for foreign investors, those that can only be carried out in the form of joint ventures with any citizen-owned entity or any other Myanmar citizen, and those that require the approval of the relevant ministries.

Also, investments that are promoted can qualify for tax deductions and reliefs from both local and foreign investors. A permit for some investment operations is required by the MIL. These include projects that are crucial to the government's strategy, involve large capital investments, are likely to have a significant negative impact on the environment and the local community, involve investment companies using state-owned property, and involve investment companies that are mandated by the government to submit a permit proposal to the MIC. Just investment endorsement would be necessary for other investment types.

In February 2019, the Central Bank of Myanmar (CBM) switched from using a controlled floating exchange rate regime as the reference exchange rate it had been using since 2012 to one based on a market-based weighted average rate.

While the MCL governs business incorporation, the MIL supervises all investment operations outside of special economic zones. Specific to all investment activity in Myanmar's special economic zones is the MSEZL. The TIPRA prohibits foreign individuals and entities from holding land and other immovable properties (except short-term lease of up to one year). The MIL and the MSEZL, as an exemption to the TIPRA, permit foreign investors to get long-term leases of up to 70 years (50+10+10) with approval. Foreign participants in the insurance and banking industries must obtain licenses from the CBM and the Insurance Business Regulatory Board, respectively.

The administration of electric power systems by the government and private investors (domestic or foreign) is not permitted. These activities include manufacturing goods for security and defense, manufacturing and maintaining weapons and ammunition for national defense, providing air traffic services, providing pilotage services, studying the viability of producing radioactive metals like uranium and thorium, and producing pilots. Foreign investors are not permitted to invest in some investment operations, such as the publication and distribution of periodicals in ethnic languages, including Burmese.

4.3 Environment Performance of Myanmar and Management System

Myanmar has a wealth of environmental resources and, as of yet, little environmental pollution. Large tracts of forest, an abundance of fisheries, little waste production, and few polluting enterprises can all be found there. Nonetheless, environmental deterioration is on the rise, and a number of impending factors will exacerbate environmental pressure. The Asian Development Bank (ADB) and United Nations Environment Programme (UNEP) funded the Environmental Performance Assessment in order to gain a deeper understanding of environmental challenges in Burma and to identify significant environmental concerns. For that exercise, the National Coordination Committee (NCC) identified seven major environmental challenges in Myanmar (Table 5).

Table 8 : Principal Environmental concern of Myanmar

	Priority Environmental Concern	***Description Concern***
1	***Forest resources***	***Losses of forest vegetation, forest area, decline of forest products, and forest services.***

2	*Water resources and quality status*	*Declining surface and groundwater resources for human and domestic consumption, and use of safe water.Pollution of surface water bodies in urban and nonurban areas.*
3.	*Land degradation*	*Soil erosion, decline of soil fertility and increase of land salinity.*
4.	*Climate change*	*Increased emission of greenhouse gases.*
5.	*Inadequate solid waste management*	*Inadequate collection, disposal and management of solid waste from household, municipal, and industrial premises.*
6.	*Threats to biodiversity*	*Loss of habitat, fragile ecosystems, and extinction of plant and animal species. Poaching, mining activities, and social impacts.* *Natural genetic resources*
7.	*Impacts of mining industry on environment*	*Land degradation, land contamination, surface and underground water pollution, air pollution due to industrial processes.*

Source: National Commission for Environment al Affairs (NCEA) and United Nations Environment Programme (UNEP) Regional Resource Center for Asia and the Pacific 2008.

4.4 Trade Integration and Resource Management of Myanmar

4.4.1 Forest Management

Forests provide important economic goods, such as timber, firewood and nontimber products important for livelihoods, as well as important environmental services. Forested areas, which are public and formally under the ownership of the state, are important to maintaining Myanmar's ecological balance. During insurgencies in the 1980s and the 1990s, the state relied heavily on the extraction of forest and mineral resources to generate funds for political and military undertakings. Documented timber constituted about 6.7% ($594 million) of the country's total export earnings in fiscal year (FY) 2010 (CSO 2012), while undocumented illegal timber exports may be four times higher than the documented value (UNODC 2013).

This deforestation has resulted from a variety of factors, some of which may be anticipated to rise: Commercial logging, plantation development, agricultural growth, road construction/improved access, fuel wood extraction, hydropower and dams, and agricultural expansion are only a few examples.

4Commercial Logging

Since the government expanded the sector to include more commercial logging operations in order to optimize revenue for expansion, private forest concessions have increased. Similarly, between FY2006 and FY2009, the volume of official timber extraction increased 5.9% yearly. All commercial logging is currently carried out under the supervision of the Myanmar Timber Enterprise (MTE), a commercial division of the Ministry of Environmental Conservation and Forestry, since the government of Myanmar outright outlawed private sector logging in 1993. (MOECAF). All legally harvested timber in Myanmar must be transported by boat from Yangon. Exports over land boundaries are regarded as unlawful and excluded from official production figures (Woods and Canby 2011).

5Plantation Expansion

In recent years, Myanmar's plantation area has significantly increased and presently occupies more than 2 million hectares. Since 2010, the private sector has been responsible for the majority of plantation development, much of it on a huge scale. Examples include 200,000 acres of cassava under corporate control in Kachin State, 120 000 acres of rubber purportedly under foreign management in Rakhine State, and 1,000,000 acres of oil palm concessions awarded to corporate interests (LRAN 2012).

6Agricultural Expansion

The change is presently in its early stages in Myanmar. Physically, the percentage of its land area used for agriculture has increased by 20% over the previous 20 years, with increases in permanent crops accounting for half of the growth. This is in line with the notion of forest transition, which contends that as an economy based on agricultural expansion develops, agricultural land rent rises, leading to an increase in deforestation (Barbier, Burgess, and Grainger 2010). Physically, the percentage of its land area used for agriculture has increased by 20% over the previous 20 years, with increases in permanent crops accounting for half of the growth. Between 1990 and 2011, the combined area of temporary crops and agriculture increased by 7.73 million hectares, almost exactly balancing the reduction in forest area of 7.75 million hectares.

7Road Construction/Improved Access

There are numerous significant road projects in Myanmar that are either planned or being built. In general, the number of kilometers of roads in Myanmar increased at a rate of 4.9% each year between 1990 and 2010. (CSO 2012). According to the von Thünen-originally suggested land rent system, more road infrastructure lowers transportation costs for rest wood and agricultural products, with the latter becoming reflected in land values (1826). This rise in the value of cleared land and timber improves the profits from forest encroachment and clearing, which also leads to more deforestation.

8Fuel wood Extraction

Fuelwood accounts for over 60% of national energy production (ADB 2012). This puts a lot of strain on the forest resources, and that strain is increasing: the amount of fuel wood increased from 18.6 million tons in 2000 to 23.2 million tons in 2009. (CSO,2012). The government has established guidelines to encourage community fuel wood plantations and plans to establish 2.27 million acres by 2030 in order to address this issue. Yet, since 1995, only 0.11 million have been established (BEWG 2011).

9Hydropower and Dams

Dams can put pressure on deforestation when they flood vast tracts of forest. Observations show that politically connected elites have frequently allowed for the clearing of forests in areas that will be flooded by dam development, paying scant royalties on the wood that was removed (McCoy 2007). A total of 88 more dams with a combined capacity of 14,000 MW are planned, in addition to the 40 hydroelectric dams with a capacity of 3,000 MW that have already been constructed.

4.4.2 Pollution Management

i) Land Waste

Wastewater and solid waste management have become more difficult as a result of industrialization and urbanization. About 54% of the 2,900 tons of solid garbage that are produced every day in Yangon city is collected each day (Aye 2005). In Myanmar, organic materials make up the majority of municipal solid trash (73%), followed by paper and cardboard (18%) and non-biodegradable items like plastic (2%). The ratio of collected solid trash to total garbage created, a measure of waste collection capability, has been rising for many major cities. With the expansion of the urban population and the nation's industrialization, trash volumes and composition will alter. To handle the increased waste pressure, a more effective solid waste management system will be required.

ii) Water

The amount of land-based pollutants from municipal, agricultural, and industrial operations will rise as the nation experiences industrialization and economic development. The important economic sector of mining is a significant and expanding source of water pollution. The Ministry of Mines has given hundreds of formal and unofficial mining concessions to both domestic and foreign firms since the government began to welcome foreign investors. Water contamination is projected to become a problem in the near future due to materials, pollutant discharges, and waste water treatment.

iii) Air

Urban areas are starting to experience air pollution problems. If these issues are not addressed, they are expected to get substantially worse given the sharp increase in the number of motorized vehicles on the road (the overall number of cars more than tripled between 2007 and 2012). Another factor contributing to the high levels of particulate matter in the air, according to MOECAF (2010), is the widespread use of biomass, notably fuel wood and charcoal for cooking and heating in homes. More broadly, there are no air quality standards, monitoring stations, or monitoring systems in place in Myanmar (Bathan-Baterina, Patdu, and Ajero 2013). As long as the majority of natural gas is exported, it won't be able to replace much diesel and petrol and the resulting emissions. It is obvious that significant regulatory development is required to address the demands on air quality that will come with economic diversification and growth.

iv) Greenhouse Gas Emissions

Due in significant part to the forestry sector's reductions in remnant forest stands, Myanmar presently has zero net emissions of greenhouse gases. As forest areas get smaller and worse off, this carbon removal decreases. As a global public benefit, Myanmar's forests today provide the rest of the world with substantial carbon sequestration. In the absence of forest sinks, per capita emission levels are still minimal.

4.5 The content of Myanmar CO2 emission

The Intergovernmental Panel on Climate Change (IPCC) claims that the production of greenhouse gases (GHGs) and climate change issues are becoming more widely acknowledged as severe environmental challenges with worldwide negative effects (IPCC 2014). By 2040, the US Energy Information Administration (EIA) predicts that developing nations would generate 127% more carbon dioxide than the most developed economy in the world. In developing nations, CO2 is the main greenhouse gas released, followed by CH4 and N2O, with energy and agriculture being the main sources of emissions (United Nation Environment Program 2015).

Myanmar's CO2 emissions in 2020 were 40.1 million tons. Despite significant recent fluctuations in Myanmar's CO2 emissions, they tended to rise from 1972 to 2021. The following table displays Myanmar's annual emissions of fossil carbon dioxide (CO2) (2011- 2021).

According to the table 9- Fossil CO2 emissions in Myanmar were 9.2 million tons in 2011 gradually increase in 40.2 million ton in 2021. CO2 emissions per capita in Myanmar are equivalent to 0.175 tons per person and increase by 0.72 tons per person registered in 2011; this represents a change of 3.11% to 5.27 % in CO2 emissions per capita. Myanmar CO2 emission contribution in world total increase annually since 2011 but it can be hard to put these numbers in context of the global total.

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Table 9 : Fossil Carbon Dioxide (CO2) emissions of Myanmar (2011- 2021)

Year	*Fossil Fuel CO2 emission Million(tons)*	*CO2 emission per capita (tons)*	*CO2 emission Change%*	*Share of world CO2 emission %*
2011	*9.2*	*0.175*	*3.11*	*0.02*
2012	*12.6*	*0.238*	*1.37*	*0.03*
2013	*14.2*	*0.269*	*1.36*	*0.03*
2014	*17.7*	*0.334*	*0.62*	*0.04*
2015	*19.6*	*0.370*	*-0.3*	*0.04*
2016	*22.8*	*0.421*	*0.25*	*0.05*
2017	*33.5*	*0.622*	*1.71*	*0.07*

2018	***34.8***	***0.625***	***2.33***	***0.09***
2019	***39***	***0.692***	***0.31***	***0.09***
2020	***39.7***	***0.720***	***-5.35***	***0.1***
2021	***40.1***	***0.720***	***5.27***	***0.1***

Source: Konema.com

~~According to the table – Fossil CO2 emissions in Myanmar were 9.2 million tons in 2011 gradually increase in 40.2 million ton in 2021. CO2 emissions per capita in Myanmar are equivalent to 0.175 tons per person and increase by 0.72 tons per person registered in 2011; this represents a change of 3.11% to 5.27 % in CO2 emissions per capita. Myanmar CO2 emission contribution in world total increase annually since 2011 but it can be hard to put these numbers in context of the global total.~~

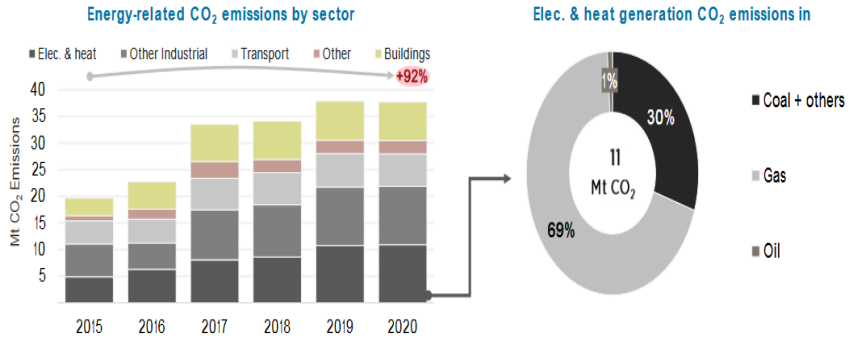

Figure 9 : Fossil fuel CO2 emission in Myanmar by sector

Source: IRENA (2022)

——According to the data, in 2020, the industrial sector produced the majority of Myanmar's CO2 emissions (approximately 27%), followed by the electricity and heat generation sector (16%), with gas being the largest source of these emissions.

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5 Impact of Trade Openness on Environmental Quality of Myanmar

Regarding the environment and its effects, the argument over free trade agreements (FTAs) is still contentious. Trade has an impact on emissions due to the scale effect and the technology effect because it boosts productivity and wealth. In terms of the scale effect, commerce has a beneficial influence on environmental deterioration due to increasing production and wealth rather than the cost of environmentally friendly technology, as environmental degradation increases quickly in the early phases of growth. Examining the long-term cointegration of environmental pollution and trade freedom for Myanmar is the primary goal of this study. This section demonstrated the connection between the ARDL model and trade liberalization.

5.1 Variables Description and data source

i) Data

The total volume of trade and the ratio of total trade to GDP were employed in the study to quantify trade openness and its impact on pollution. Trade to GDP ratio is typically used to assess how open a market is (Squalli & Wilson, 2011). Yet given that trade openness intensity might alter due to changes in trade and GDP, this measurement might not account for it (Busse & Koeniger, 2015). ~~In order to capture the impact of trade liberalization on environmental quality, the author included two additional metrics to the study: the index of investment flexibility and electricity usage. CO2 emission per capita is a measure of environmental quality.~~

To define the impact of trade liberalization on CO2 emission, investment freedom needs to be a measurable category. By easing restriction on private and foreign investment that proliferation the manufacturing industries and increase fuel or power electricity use as well as CO2 emission in Myanmar. In order to capture the impact of trade liberalization on environmental quality, the author included two additional metrics to the study: the index of investment flexibility and electricity

usage. CO2 emission per capita is a measure of environmental quality.

Data on trade openness, investment freedom, CO2 emissions, and power consumption variables were gathered from Knoema and the World Bank., the period 1996- 2021.

Table – 10 lists the variables and data description.

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Table 10 : Summary of the variables

Types	*Cods*	*Meaning*	*Measurement*	*Expected Sign*
Dependent variables	*C*	*CO2 emissions*	*Per capita CO2 emissions(tons)*	
Explanatory variables	*Tr*	*Trade Openness*	*The total sum of import and export for goods (% of GDP)*	+
	Pec	*Power Electricity Consumption*	*Kg of oil equivalent per capita*	+
	If	*Investment Freedom*	*Points are deducted from the ideal score of 100 for each of the restrictions found in a country's investment regime.*	+

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ii) Hypothesis

H12: An international trade affects pollution emissions negatively by affecting output and income.

5.2 Model Specification

To test for the empirical relationship, the authors adopted and modified Shahbaz et al. (2013), which is given in (Eq. (1))

$$LnC_t = \beta_0 + \beta_1 LnIF_t + \beta_2 LnITR_t + \beta_3 LnPEC_t + \varepsilon \quad (1)$$

Where

LnC_t = Natural logarithm of carbon dioxide emissions CO2 per capita

$LnIF_t$ = Natural logarithm of Investment Freedom

$LnTR_t$ = Natural logarithm of Trade Openess

$LnPEC_t$ = Natural logarithm of Power Electricity Consumption.

$\beta_0, \beta_1, \beta_2, \beta_3$ =Constant and Coefficient

ε = the error term

5.3 Descriptive Results and Findings

The Descriptive Statistics in Table 11 revealed that the average CO2 emission for Myanmar with maximum and minimum values of 3.691 and 0.009 respectively. This suggests that the amount of carbon dioxide emitted per person is quite modest. This demonstrates the high level of Myanmar's green economy compliance.

Table 11 : Descriptive analysis

Variable	*Mean*	*Medium*	*SD*	*Minimum*	*Maximum*
LnC_t	*2.566*	*2.388*	*0.775*	*0.009*	*3.691*
$LnIF_t$	*2.785*	*2.708*	*0.510*	*2.302*	*3.433*
$LnTR_t$	*3.797*	*3.806*	*0.115*	*3.61*	*3.988*
$LnPEC_t$	*4.30*	*4.291*	*0.115*	*3.663*	*5.372*

Regarding the explanatory variables, trade openness revealed an average of 3.797 and a medium of 3.806. The Minimum and maximum ~~import~~ trade values recorded were3.988 and 3.61 respectively, showing that the trade volume is relatively small. A standard deviation of trade openness is 0.115 showing that the dataset is widely dispersed from the mean.

Energy consumption denoted by the symbol PEC revealed a mean and median value of 4.3 and 4.291 respectively, showing the asymmetrical distribution of the dataset. The maximum (5.372) and minimum value (3.662) of energy consumption revealed the energy consumption are moderate in situation. All of the research variables' positive values over 1.0 for skewness indicate a dataset with a very positive

skew. That is, the distribution of the data is symmetric. The distribution of these components is not quite in line with the usual transmission, as evidenced by the kurtosis values of LNC reported for the research variables being above 3.

5.4 Estimation strategy

When level or non-stationary time series data are used, the problem of spurious regression may occur. Making the series steady via diffencing is one solution. A relatively new technique that was developed by Pesaran and Pesaran (1997), Pesaran and Smith (1998), Pesaran and Shin (1999), and Pesaran et al. has been used to get around this issue (2001). This approach is based on the general-to-specific modeling strategy and is known as the autoregressive distributed lag model (ARDL). This technique's ability to be used whether the variable is I(0), I(1), or fractionally cointegrated is one of its key benefits (Pesaran and Pesaran, 1997). The cointegration between the variables under investigation is being tested using the ARDL method. The following essential actions are necessary for applying the approach.

5.4.1 Unit Root Test

The variable's I(0) or I state is irrelevant when using the ARDL approaches (1). According to Ouattara (2004), Pesaran et al. (2001)'s estimated F-statistics are invalid in the presence of I (2) variables. In order to make sure that none of the variables are I(2) or beyond, unit root tests may still need to be added to the ARDL function. The traditional Augmented Dicky Fuller (ADF), Dickey Fuller FLS, and Phillip-Perron tests are used in the study for this purpose.

Table 12 : The results of Unit Root test

t- statistics		*LnCt*	*LNPECt*	*LnTr t*	*LnIF t*
ADF	*level*	*-1.89*	*1.290*	*-3.862****	*-1.09*
	1st Difference	*-8.154****	*-5.129****	*na*	*-4.842****
Dicky Fuller GLS	*level*	*-0.153*	*1.287*	*-3.925****	*-1.101*
	1st Difference	*-8.326****	*- 4.328****	*na*	*-4.739****

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PPS	***level***	***1.612***	***2.271***	***-1.442***	***-1.220***
	1st Difference	***-12.345******	***-5.154******	***-4.478******	***-4.842******

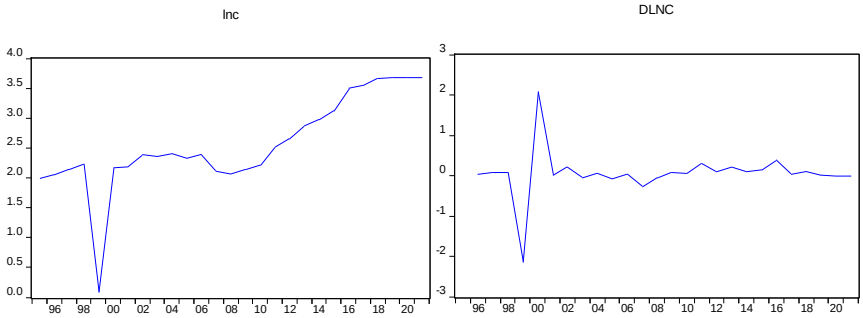
Note: *** denotes the significant at all 5%, 10% and 1% .

For the ADF and GLS tests: The null hypothesis (Ho) states a unit root (non- stationary) which will be rejected if p-value of the time series variables > 5%.

For the PPS: The null hypothesis (Ho) identified non-stationary, which will be reject if t statistics value < test critical value.

Table -12 lists the outcomes of traditional stationary testing. Table 12 indicates that the null hypothesis for the ADF, Dicky Fuller GLS test, and PPP tests is that the series comprise unit root. The estimated t statistics in the ADF and GLS tests are smaller than the critical values in the level forms of all the variables, excluding LnTr_t, and more than the critical values in the differenced forms. After differencing, all variables except LnTr_t are stationary, indicating that they are integrated of order I. (1). The estimated t statistics for the LnTr_t variable are higher than critical values in its level form, indicating that LnTr_t is I (0) in the Augment Dicky fuller GLS and ADF. Table -13 displays the panel correlation matrix for the relevant series.

Figure 10 exhibits the visual time trends of the variables in the levels and in the first differences. The graphs on the left hand side describe the trend of data on the level, including LnC_t, LnPEC_t, LnTr_t and LnIF_t.The data on the first differences, are plotted and displayed on the right hand side of Figure10.



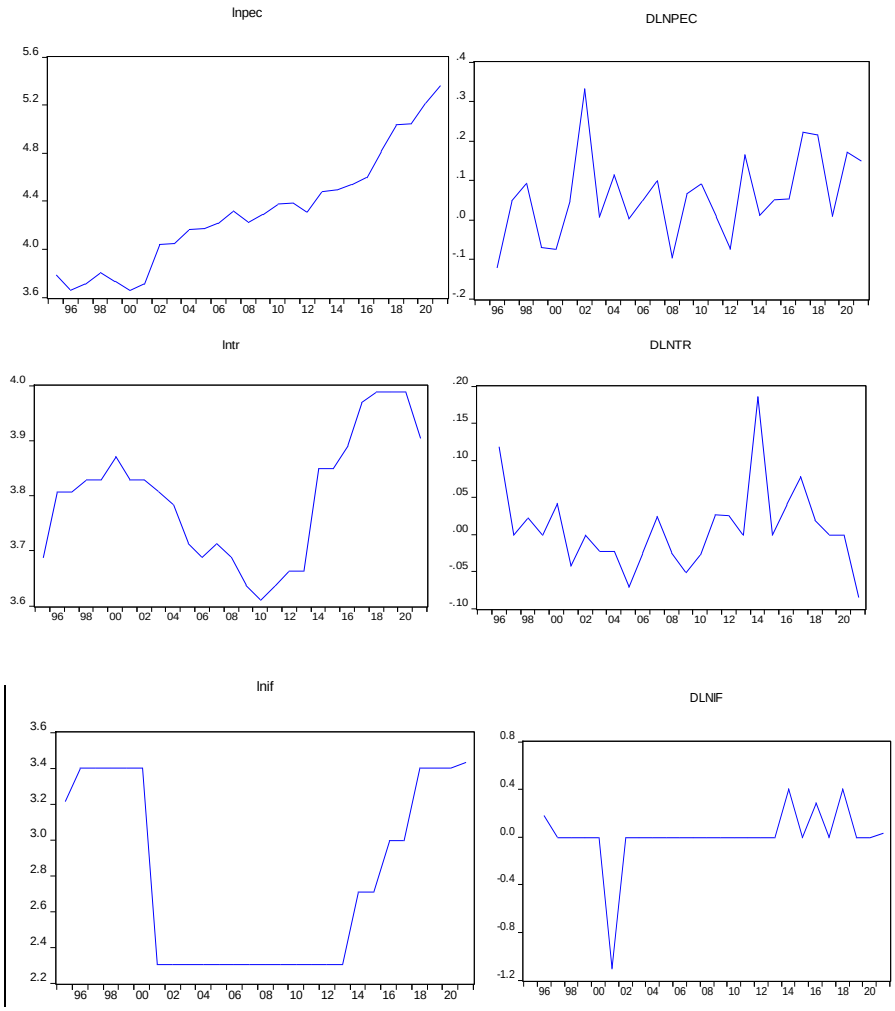


Figure 10: Plots for CO2 emission, power energy consumption, trade openness and Investment freedom index in the level and first differences

Note: LnC_t - CO2 emissions per capita; DLnC_t - the first difference of C_t; LnPEC_t – Power consumption energy use per capita; D LnPEC_t - the first difference of PEC_t; LnTr_t- Trade openness ; D Ln Tr_t - the first difference of LnTr_t ; LnIF_t

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– Investment freedom index. D LnIF_t- the first difference of LnIF_t.

It is noticeable that except for an extraordinary decrease of LnIF_t of in 2000 , two variables Ln C_t and Ln PEC_t the variables seemed to move with the same increasing trend under the period from 2001 to 2021 (see Figure10 - left hand side). The similarity in downward trends of LnTr_t and LnIF_t from 2010 to 2013 cautions us to be aware of forged regression among variables. In terms of data on the first difference, it is observable that LnC_t, LnPEC_t, LnIF_t and LnTr_tvary around a straight line. By incorporating an intercept term and/or a trend term into the Augmented Dickey-Fuller test equation, the Unit root test can be correctly chosen.

Table 13 : The Corelation Matrix for Eq - 1

Correlation Probability	***LnC$_t$***	***LNPEC$_t$***	***LnTr $_t$***	***LnIF $_t$***
LnC$_t$	***1.000***			
LNPEC$_t$	***0.82***	***1.000***		
LnTr $_t$	***0.514***	***0.431***	***1.000***	
LnIF $_t$	***0.155***	***0.130***	***0.685***	***1.000***

According to the table 13 – LnIF and LnTr has correlation (0.685), there exists no correlation among other independent variables (see Table 13). This means that there has no multi-collineary in the regression model. If variables have multi-collinear each other's, their coefficients may become unstable and difficult to interpret.

5.4.2 Selection of Lags Optimal and Test of Johansen Co-integration

In order to choose optimal lag length for each variable, the ARDL method estimate $(P+1)^k$ number of regressions.– where k is the number of variables in the equation and p is the maximum number of delays. Schawrtz-Bayesian criteria (SBC) and Akaike's information criteria can be used to choose the model (AIC). The SBC is a parsimonious model since it chooses the shortest lag length possible. Although AIC is renowned for choosing the longest relevant lag possible. The lag structure for the eq 1 is displayed in the table below.

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-6.85	NA	3.02	0.943	1.141	0.993
1	67.629	116.577	1.92	-4.141	-3.154	-3.893
2	98.544	37.635	6.09	-5.438	-3.661	-3.661
3	124.74	22.779	3.84	-6.325	-3.758	-5.679
4	159.565	18.169	2.19	-7.962	-4.605	32.77379

Table 131314 : Lag Selection

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-6.85	NA	3.02	0.943	1.141	0.993
1	67.629	116.577	1.92	-4.141	-3.154	-3.893
2	98.544	37.635*	6.09	-5.438	-3.661	-3.661
3	124.74	22.779	3.84	-6.325	-3.758	-5.679
4	159.565	18.169	2.198	-7.962*	-4.605*	32.773*

*Indicates la g order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

According to the table – 14, Maximum lag number for UECM model is taken 4 and by employing LR test statistics the lag number is found 2.Co-integration rank is determined using the Johansen co-integration test methodology. Two probability estimators exist for the rank of co-integration. Non-stationary variables must be at the level for this phase; however, after we convert all the variables to first differences, they will become stationary. The results are summarized in Table 15. To investigate the notion that the null hypothesis cannot be accepted if a trace statistic is greater than the critical value. Given that the trace statistic is below the crucial value, the test can accept the null hypothesis. Three variables are co-integrated and have a long-term relationship. The max-Eigen statistic must be smaller than the critical threshold in order for us to accept the null hypothesis. The Max-Eigen statistic is below the critical

threshold, thus we can accept the null hypothesis. Four factors are cointegrated and have a long-term relationship.

Table 1415 : Johansen Cointegration Test

H_0	H_1	*Trace Statistic*	*5% Critical Value*	*Prob*	H_0	H_1	*Max-Eigen Statistics*	*5% Critical Value*	*Prob*
*r=0**	*r>1*	*74*	*47.85*	*0.0000*	*r=0**	*r>1*	*48.051*	*27.58*	*0.000*
*r<1**	*r=1*	*28.32*	*29.79*	*0.125*	*r<1**	*r=1*	*16.405*	*21.13*	*0.202*
r<2	*r=2*	*9.87*	*15.49*	*0.303*	*r<2*	*r=2*	*9.238*	*14.26*	*0.2669*
r<3	*r=3*	*0.53*	*3.84*	*0.49*	*r<3*	*r=3*	*0.476*	*3.84*	*0.490*

Note: Trace test and maximum Eigen statistics indicates 1 cointegration eqn(s) at the 0.05 level *denotes rejection of the hypothesis at the 0.05 level

Factors are not co-intgrated (r=0) against the alternative of one or more co-integrating vectors (r>0), we have to see at the value of TRACE statistics and Max- Eigen value .Colum 5 and 10 of the Table 15 shows the probability of the co-integrating vector. The probability of Trace Statistics and Max- Eigen Statistics are less than 5% (95% significance level) at (r=0) , accept the null hypothesis of no co-integrating vectors and cannot reject the null hypothesis. The probability of row 2 (r= 1) in the table (15) is greater than 5% significance level, reject the null hypothesis, there are at least 1 variable are co-integration. This advises that the amount of co-integration vectors is more than one.

5.4.3 The Bounds Tests for Co-integration of ARDL Models

The bound test is the first step in the ARDL model testing process. Estimating Eq. (11) using the ordinary least square (OLS) method is the first step in the ARDL bounds test methodology. The F-test is used to determine whether there is a long-term association between the variables.

$$\Delta LnC_t = \beta_o + \sum_{i=1}^{p} \delta_i \Delta LnC_{t-i} + \sum_{i=1}^{p} \emptyset_i \Delta LnPEC_{t-i} + \sum_{i=1}^{p} \omega_i \Delta LnTR_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta LnIF_{t-i} + \sigma_1 LnC_{t-1} + \sigma_2 LnPEC_{t-1} + \sigma_3 LnTr_{t-1} +$$

$$\sigma_4 LnIF_{t-1} + U_t \quad (2)$$

The null hypothesis in the equation is H_0: $\sigma_1 = \sigma_2 = \sigma_3 = \sigma_4 = 0$.This means the non-existence of long-run relation-ship. While the alternative is $H_{1:}$ $\sigma_1 \neq \sigma_2 \neq \sigma_3 \neq \sigma_4 \neq 0$. If the computed F-statistic is outside the upper and lower boundaries, a conclusion concerning the co-integration relationship can be made without knowing the repressor's integration order.

Table 15~~16~~ : The results of F- Bound Test

F –Bound Test	*Value*	*Signif*	*I (0)*	*I(1)*
			Lower Bound	*Upper Bound*
F – statistic	*9.193*	*10%*	*2.72*	*3.77*
		5%	*3.23*	*4.35*
		1%	*4.29*	*5.61*

Note: No level relationship

According to Table 16, F statistics 9.193 is greater than the upper bound values (3.77, 4.35, and 5.61) 10%, 5% and 1% significant level respectively, and reject no co-integration null hypothesis. As a result, it is found a significant co-integration relationship between CO2 and the other variables according to bound test analysis.

5.4.4 Error Correction Estimation and ARDL long-run Estimate

Long term ARDL model (4,3,4,3) coefficients are presented in Table 17 and all of the long term coefficients are found statistically significant.

Table 16~~17~~ : ARDL model long and short term parameter estimations.

Error Correction Regression			*ARDL Long-run*		
Regressor	*Cofficient*	*P- value*	*Regressor*	*Cofficient*	*P- value*
Coint Eq(-1)	*-4.842*	*0.0006***	$LnPEC_t$	*1.007*	*0.0001****
$D(\boldsymbol{LnPEC_t})$	*0.54*	*0.4811*	$LnTr_t$	*3.352*	*0.0005****

D($LnTr_t$)	*8.007*	*0.0004****	*$LnIF_t$*	*-0.234*	*0.0662*
D($LnIF_t$)	*0.43371*	*0.533*	*C*	*-66.84*	*0.012****
R-Square = 0.9.72 , P(F- statistics) = 0.0001 , Durbin Watson test= 2.37					

The long-run results of ARDL model (4, 3, 4, and 3) are presented in Table 17.The results can be rewrite as following equation

EC =LnC – (1.0071*LnPEC+ 3.3525*LnTr – 0.2345 * LnIF) (3)

As the coefficient of LnPEC is 0.1.007 and statistically significant, it is implied that a 1% increase in power energy consumption per person will eventually result in a 1% rise in CO2 emissions per person. The results show that per capita consumption has a favorable and large impact, which is consistent with Liu (2005) and Ang (2007, 2008, and 2009). Together with economic expansion, energy consumption plays a significant role in determining CO2 emissions. Many investigations have been conducted in this area since the groundbreaking pivotal work by Kraft and Kraft (1978).

Masih and Masih (1996), Yang (2000), Wolde-Rufael (2006), Narayan and Singh (2007), and Narayan et al. (2008), for instance, evaluate the relationship between energy consumption and economic growth using various methodologies and panels of nations. Similar to this, the calculated GDP coefficient shows that LnTr is 3.352 and statistically significant, all other things being equal. Long-term CO2 emissions rise by 3.352% for every 1% increase in trade openness. The results are consistent with Wang et al., 2020; nonetheless, after extensive academic discussion, there is still no unambiguous agreement regarding the environmental implications of trade liberalization. Although LnIf has a negative correlation, it is negligible.

Table 17 also includes a short run Error Correction Model (ECM) from the ARDL model (4,3,4,3). The short-run coefficients of all the explanatory factors other than Tr are determined to be statistically significant, as can be shown in Table 17. In conclusion, Tr's short-run findings are in line with those of the long-run model.

The elimination rate of the short run disequilibrium in the long run is shown by the error correction term, ~~ECT(~~ECT (-1). The calculated value of the ECT coefficient is

4.842. It indicates that the current year roughly eliminates the disequilibrium caused by the shock of the preceding year. This suggests that in the event that the model experiences a shock, an adjustment process would be fairly quick.

The following provides an explanation of the empirical model estimation findings for equations-3 about the short- and long-term elasticity effects of economic development, trade openness, and power energy use and investment freedom on CO2 emissions of Myanmar.

The empirical results shows in table – 17 shows that Tr is significant in both the short run and long run (8.007 and 3.352) respectively. The results inculcated that the trade openness has a long run and a short run negative impact on CO2 emission. If the government promotes trade 1%, CO2 emissions will increase 8% in short run and 3.35% in long run.

Trade openness increases the CO2 emission with two ways. Firstly, the economic liberalization of Myanmar refers to the policy of liberalization orienting Myanmar laws toward an open market economy. This will created the wider market size of domestics and create more employment opportunities for the citizen. Since late 2010, trade liberalization measures have created a significant shift in the economy of Myanmar, which was previously dominated by agriculture. The citizens earned more money for consumption and used fuel incentive living appliances for their daily life. So, power consumption is significant and positively related with CO2 emission in long run (-eq – 3). If the people consumption of power energy increase 1% ,%, the total amount of CO2 emission from daily use appliance such as the various fuel source

quantities used for cooking , the various fuel sources for various household appliances and shows space-heating, refrigeration, and pumping is primarily driven by electricity whereas batteries and torches are a significant fuel source for lighting will increase 1.007% of CO2 emission.

The GDP per person in Myanmar fell by 18.11% from 2020 to $1,210 in 2021. The GDP per person in Myanmar increased by 14.07% from 2019 to $1,477 in 2020. Myanmar's GDP per person increased by 1.59% from 2018 to $1,295 in 2019. The GDP per person in Myanmar increased by 8.48% from 2017 to $1,275 in 2018. The more income created higher used of luxury goods. Since 2010, the government has relaxed import restrictions on cars, which has resulted in a large rise in the number of

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private vehicles.

The number of automobiles in Yangon doubled between 2007 and 2014, rising from over 18,000 in 2007 to more than 37,000 in 2014. While the overall number of vehicles increased significantly, private automobiles' or uses' average speed during peak travel times fell. Emissions soared 32 percent between 2000 and 2010, and in 2020 totaled 34.81 billion metric tons. Co2 emission per person increase 2.2 ton per person (2010) to 3.69 ton per person (2021). This was one of major source of high pollution of Myanmar.

The value of apparel exports increased by 500% between 2012 and 2018, from about USD 900 million to USD 4.6 billion by that year. An rise of 26% over the previous year, Myanmar's clothing sector exported garments worth US$5.7 billion and footwear and handbags worth another US$1 billion in 2019Myanmar pulled income of $4.4 billion from exports in the garment sector working on a Cutting-Making and Packaging (CMP) basis. Myanmar's manufacturing industry is mostly focused on cutting, creating, and packaging textiles and apparel. Imported raw materials are used to make final goods.

The most bad and proximate impacts garment factories in Myanmar have on the environment are

1. Air pollution from boilers
2. over-extraction of water
3. Water pollution
4. disposal of hazardous and solid waste
5. contribution to deforestation brought on by boilers using wood as fuel.

According to our dependent variables- CO2 emission –directly related with fuel burning for boiler. ~~A brand new coal-fired boiler at a Yangon clothing manufacturing company.~~ Manufacturers in Myanmar frequently use coal and wood fuel for boilers, which contributes to deforestation, deteriorating local air quality, and increasing greenhouse gas emissions. These regulations on emissions are also poorly enforced, with almost no restrictions on the fuel sources that are used.

At least six garment manufacturers in Myanmar have solar photovoltaic systems installed as of mid-2019, with a total peak generation capacity of about 500 kW. Rainwater harvesting devices have reportedly been installed in five additional textile companies. A few enterprises have biomass boilers installed.

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Myanmar has had severe power outages and high fuel prices in addition to political turbulence and civil unrest, forcing its military administration to import fuel oil for use in power plants. So, many manufacturing production continue use diesel and other types of fuel to run their production, this lead to continuous higher CO2 emission in the long run.

5.4.5 The Granger Causality Test

We use the Granger causality test based on the ECM to investigate the causal relationships between the variables. Do the Granger causality tests using the VECM framework since the results of the Johansen co-integration test show that CO2 emissions and their determinants are cointegrate. The findings of the research's Granger causality tests are presented in Table 18.

Table 17~~18~~ : The Results of Granger Causality Test

	F- Statistics	*P value*
LnC does not Granger Cause LnPEC	*4.202*	*0.022*
LnPEC does not Granger Cause LnIF	*3.133*	*0 .049*

The Granger Casualty Test was used, and the outcomes are shown in Table 18. The null hypothesis of no causality guides the construction of the F-statistic and probability values. It is clear that two factors of significant concern are causally related, and it is crucial to note that the one-way causality goes through CO2 output to power electricity use. Between LnPEC and LnIF, there is a granger causal link.

5.4.6 Test of Goodness of Fit for ARDL Specification

There are several ways that autocorrelation in the error term could happen, according to Hill et al. (2011). The error term at time t, denoted by e(t), is related to the error term at time t+1, denoted by e(t+1), for example, if it stems from an omitted

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variable with autocorrelation. Time series data are theoretically likely to be correlated since the impact of a change in a dependent variable in the present can extend into the future.

A higher probability of a positive error in the subsequent period results from a positive error in the first period. When there is a positive error in the prior period, there is a greater likelihood that the subsequent period will have a negative error.

The first thing to understand about serial correlation is that it has no effect on the estimates of the regression coefficients. The population error variance will typically be underestimated by the mean squared error (MSE), hence the positive serial correlation will raise the F-statistic when evaluating the overall significance of the regression. On the other hand, a negative serial correlation will reduce the F-statistic because the MSE has a tendency to overestimate the variance of the population error.

The positive serial correlation causes the ordinary least squares standard errors for the regression coefficients to overstate the real standard errors. Also, it results in the regression coefficient's standard errors being as little as possible, giving the generated t-statistics an illusion of statistical significance relative to their actual significance. The OLS standard errors for the regression coefficients understate the real standard errors due to the positive serial correlation. Also, it causes the regression coefficient's standard errors to be minimal, which gives the calculated t-statistics a statistically significant appearance relative to their true importance. There are numerous ways to assess the serial correlation problem.

i) Durbin-Watson Test

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A statistical test called the Durbin-Watson test is used to detect whether a data set contains serial correlation. It compares the alternative positive or negative serial correlation hypothesis to the null hypothesis of no serial correlation. James Durbin and ~~Geoffrey Watson~~Geoffrey Watson, who created the test in 1950, received credit for its naming. The Durbin-Watson Statistic (DW) can be approximated by:

DW= 2(1-r)

Where:

Regression residuals from the current period and the period before it are sampled jointly to calculate r. The test statistic has a range of possible values from 0 to 4. No serial correlation is indicated by a value of 2, a positive serial correlation is shown by a value between 0 and 2, and a negative serial correlation is indicated by a value

between 2 and 4:

Table 1 demonstrates the significant statistical level of the effect of international trade on the carbon emission (CO2) from electricity energy use (1.12). The R-squared value is 0.717, which indicates that the variable in the model accounts for almost 71% of the variation in carbon emissions (CO2) resulting from power consumption changes. Even after accounting for the amount of predictor variables in the model, adjusted R-squared shows that the model can explain around 68% of the variation in CO2 emissions from power usage.

Table 1819 : Durbin Watson Statistics

Variables (Dependent Variables)	*Independent Variables*	*Coef*	*Std. Error*	*t statisitcs*	*P*	*R-square*	*Adjust R-Square*
	c	*-9.773*	*0.362*	*-2.69*	*0.012*	*0.717*	*0.68*
LnC_t	*LnTr*	*2.148*	*1.16*	*1.85*	*0.077*		
	$LnECP_t$	*1.122*	*0.20*	*5.53*	*0.00*		
	$LnIF_t$	*-0.236*	*0.23*	*-0.98*	*0.33*		
Durbin- Watson statistics = 2							

Equation 1's Durbin-Watson statistics value is equal to 2. As a result, there will be no autocorrelation and no correlation between the regression errors.

ii) Brushed –Godfrey Correlation LM test

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When using regression-like models to analyze observed data series, some modeling assumptions must be evaluated for validity using the Breusch-Godfrey test in statistics. Lagged values of the dependent variables may be employed as independent variables in the model's representation for subsequent observations in the regression models to which the test can be applied. In econometric models, structures of this kind are typical.

The assertion that there is no association between the two sets of data or variables under investigation is known as the null hypothesis (commonly abbreviated H0). The idea behind the null hypothesis is that there is no underlying causative relationship and that any experimentally detected difference is just the result of chance. The alternative hypothesis, which asserts that there is a relationship between the two variables, is also developed in addition to the null hypothesis.

The LM test was used to evaluate the joint relevance of the chosen model's lagged residuals and least square estimated residuals. The highest lag of equation ARDL led to the selection of the lag order of 2 for the LM test (4.3.4.3). Table displays the results of the LM test.

Table 1920 : The results of LM Test

F- statistics	*0.129*	*Prob (2,21)*	*0.879*
Obs R- square	*0.328*	*Prob.Chi–Square*	*0.848*

Note: Ho: there is no serial correlation in the residuals up to lag 2.

Table 20 demonstrates that the P-value is more than 0.05 and therefore we cannot rule out the null hypothesis of no serial connection because the F-statistic is not significant. This means that our model's residuals up to lag 2 have no serial correlation.

iii) A correlogram graph

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A correlogram is a graph of correlation statistics used in data analysis. An autocorrelogram is a visualization of the sample autocorrelations r_h vs h (the time lags), for instance, in time series analysis. A cross-correlogram is the name of the output when cross-correlation is plotted. A frequently used method for determining the degree of unpredictability in a data set is the correlogram. Autocorrelations for all time-lag separations should be close to zero if the data were random. One or more of the autocorrelations will be notably non-zero if the data are not random. The correlogram can assist in making a choice regarding serially uncorrelated data visualy.

Table 2021 : Autocorrelation and Partial Auto- Correlation of the Residuals

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Lag	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
AC	*-0.486*	*0.061*	*-0.0047*	*0.016*	*-0.03*	*0.017*	*-0.07*	*0.04*	*0.02*	*-0.01*	*0.049*	*-0.046*
PAC	*-0.486*	*-0.23*	*-0.169*	*-0.108*	*-0.107*	*-0.074*	*-0.152*	*-0.122*	*-0.058*	*-0.053*	*0.026*	*-0.011*

As can be observed from Table 21, there is likely no auto-correlation in the residuals of equation since the values of the auto-correlation coefficients of AC and PAC for the first 12 lags of the residuals from equation are extremely close to 0 or practically zero.

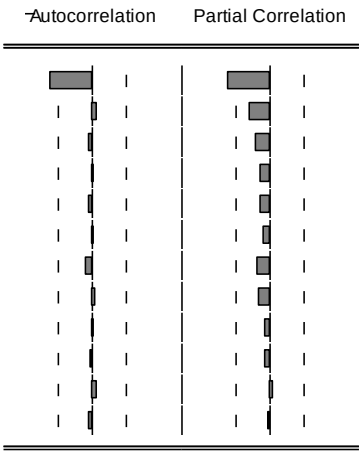

Figure 11 : Correlogram of the Residuals

For a sample size of 27, it is clearly evident from the correlogram (see Figure 11) that the spikes of the auto-correlation value are very well inside the line of +-1.96/29, meaning that the equation does not contain any auto-correlation (eq 1) – ARDL (4.3.4.3).

iv) Q-statistic Test

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Outliers are recognized and rejected using the Q test. According to Robert Dean, Wilfrid Dixon, and others, this test should only be applied a single time in a data collection and presupposes normal distribution. To use a Q test for inaccurate data, arrange the data in ascending value order and perform the desired Q calculation. The Q-null test's hypothesis states that either there is no serial correlation in the residuals or the Q-statistics are not significant at the 5% level if the associated P-value is greater than 0.05. Table 22 displays the outcomes of the Q-statistic tests.

Table 2122 : Q-statistic Testing

lag	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Q stat	*0.119*	*2.956*	*0.316*	*0.741*	*0.751*	*0.866*	*1.357*	*1.477*	*1.478*	*1.478*	*1.483*	*1.91*
Prob	*0.73*	*0.862*	*0.957*	*0.946*	*0.987*	*0.99*	*0.987*	*0.993*	*0.997*	*0.99*	*1*	*1*

The Q-statistic values for the first 12 lags of the residuals of equation were determined (Table 22). It is clear that the relevant probabilities for Q-statistics are greater than 0.05. This indicates that the Q-statistic is not significant at a 5% level of significance; hence the null hypothesis cannot be rejected. The residuals of our model show no serial correlation as a result.

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5.4.7 Test for Heteroscedasticity

It makes the assumption that the error terms are normally distributed and is used to test for heteroskedasticity in a linear regression model. It examines whether a regression's errors' variance depends on the values of the independent variables. Heteroskedasticity is the condition of systematic variations in the residuals' spread or the model's error term. A model's dispersion is dependent on at least one independent variable if there is residual variance present in the model. Homoscedasticity is the presumption that the residual variance will remain constant. On the other hand, heteroscedasticity refers to a variance that is not constant. Thus, homoscedasticity is the presumption that must be true (non-heteroscedasticity). Table shows the results of the test.

Table 2223 : The results of Heteroscedasticity

F-statistic	***1.525***	***Prob.F (3,23)***	***0.234***
Obs* R -squared	***4.481***	***Prob. Chi- Square (3)***	***0.214***
Scaled explained SS	***19.972***	***Prob. Chi- Square (3)***	***0.0002***

According to the F- statistics results of table 23 - do not reject the null hypothesis of homoscedasticity since the Breusch-pagan-Godfrey test indicates that the p-value of the F-statistic test is not significant. As a result, our model is not heteroscedastic.

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5.4.8 Heteroscedastcity Test ~~Histogram and Jarque Beta Test of Residuals~~

We examine the plot of the estimated least square residuals from equation (1) - ARDL to test for heteroscedasticity (4.3.4.3). The residuals of our calculated equation

(2) show no pattern of any kind, indicating that the residuals are homoscedastic (see Figure 12). If the mistakes are they subsequently display greater variety in some organized ways when they are heteroscedastic (Hill et al., 2011, p.303).

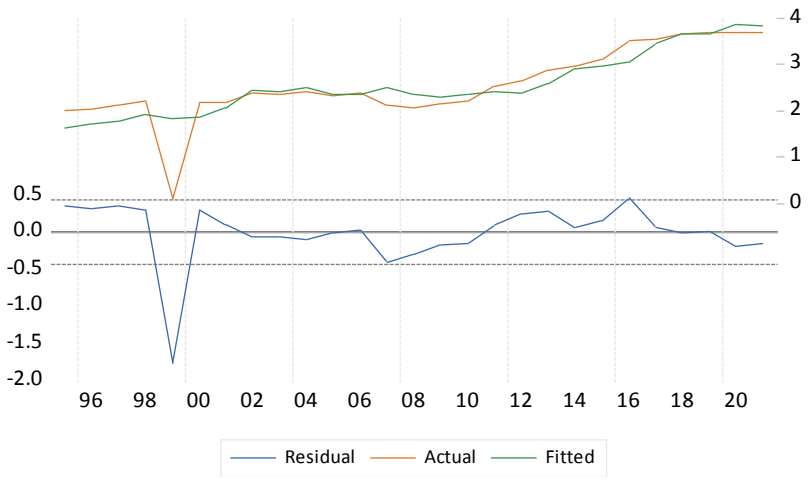


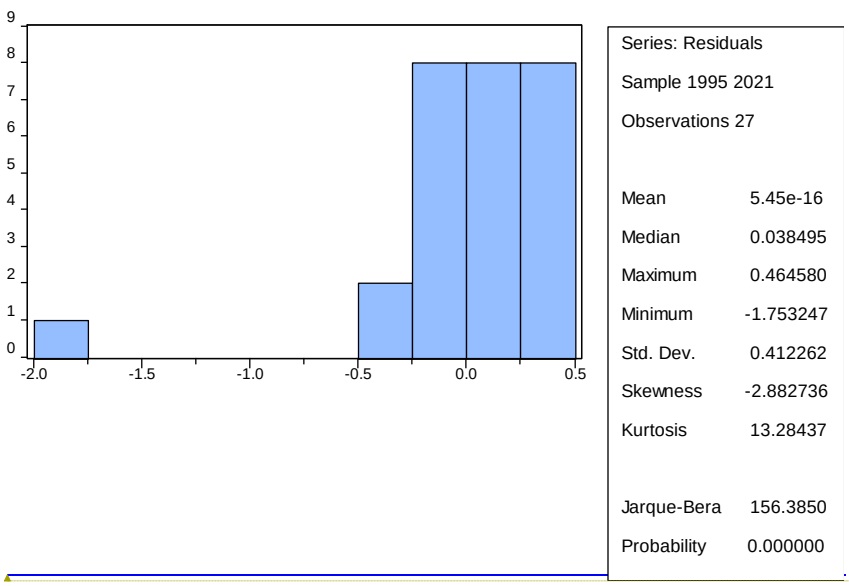
Figure 12 : Plot of Estimated Model Residual

~~An essential presumption for the regression analysis is normality. The normality assumptions of the residuals are crucial for inference techniques, particularly for small samples. If the normality assumption was broken, none of our confidence intervals, Z/t tests, or F tests would be valid.~~

~~Formulate the hypotheses are~~

~~H_0: Data is normal~~

~~H_1: Data is NOT normal~~



~~Figure 13 : Histogram and Result of the Jaarqu-Bera Test for Normality~~

~~The Jarque-Bera is 156.38 and the corresponding p-value 0.00 which is smaller than 0.05, thus the Jarque-Bera statistic is significant, and we can accept the null. Hence, we can conclude that the residuals of our model are not normally distributed~~

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5.4.9 The stability of the model

Verifying the model's stability is the final step in ARDL estimation. The CUSUM and CUSUMQ approaches used in this work are based on the ECM of Eq (11). The plots of the CUSUM and CUSUMSQ statistics are clearly inside the critical boundaries, as can be seen in Figs. 12 and 13, indicating that all coefficients in the ECM model are stable.

According to the CUSUM and CUSUM-square tests, the ARDL model coefficients were also discovered to be stable across the sample period; the test results are shown in figure 12.

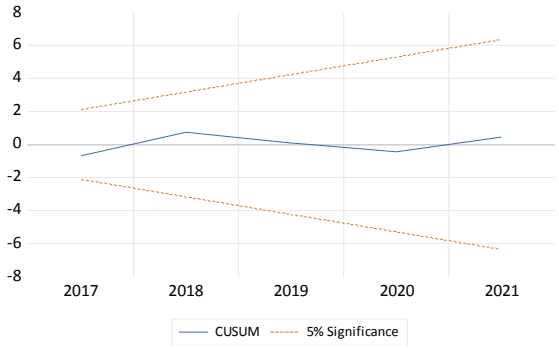

Figure 13 : The Plot of cumulative sum of recursive residual

~~Figure 14 : The Plot of cumulative sum of recursive residual~~

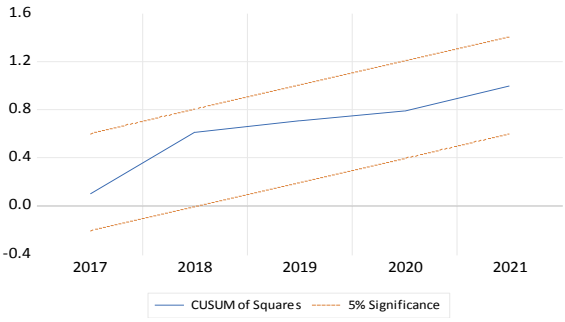

Figure 14 : Plot of cumulative sum of squares of recursive residuals

~~Figure 15 : Plot of cumulative sum of squares of recursive residuals~~

5.5 EIA Method on Trade Policy

The empirical econometric model allows us to statistically assess the environmental effects of trade liberalization in Myanmar. Independent variables (such as real GDP per person, energy use, and the trade openness ratio) were incorporated into the empirical model in order to assess the three main effects of trade liberalization on the environment—scale, composition, and technology. The results of the empirical model do not support our study's attempt to ascertain how trade

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openness policy affects the environment in Myanmar and what regulatory implications result from this.

The assessment of an important project's (or other action) potential impacts on the environment is known as an environmental impact assessment (EIA). EIA is a proactive, inclusive environmental management technique. The immediate goal of EIA, which derives from these tasks, is to inform decision-makers about the potential environmental effects of their choices. As a result, we also apply the method of environmental impact assessment to trade policy.

Economic development, trade openness, and energy use in Myanmar have a substantial negative long-term association with CO2 emissions, according to the results of empirical model estimation (equation 5.4). According to statistics, trade liberalization causes CO2 emissions to increase. A 1% rise in trade openness results in a 3.35% long-term increase and an 8% short-term increase in CO2 emissions. The results of the empirical model estimation point to the feasibility of restoring the environment concurrently with economic growth. The empirical model's findings, however, prevent our study from being able to explain what the regulatory consequences are or how a free trade policy affects Myanmar's environment.

This section of the study looks at how free trade has affected environmental regulations in Myanmar. This research is particularly useful in determining whether Myanmar's environment might benefit from the inclusion of enforceable environmental restrictions in trade openness.

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5.5.1 Myanmar Export Pattern to Major Export Partners

Less developed nations' ability to increase their market share is mostly dependent on international commerce. Today, the majority of academics and decision-makers concur that a poor country's best course of action for development is to benefit from international trade. International markets are therefore essential to increasing the exports of less developed nations. In this regard, the makeup of Myanmar's major marketplaces is researched (Table- 24).

According to the Economic Complexity Index, Burma had the 76th-largest economy in the world in terms of GDP (current US dollars), the 74th-largest in terms of total exports, the 80th-largest in terms of total imports, the 156th-largest in terms of

GDP per capita (current US dollars), and the 102nd-most complex economy (ECI).

The top 12 export commodities are chosen for additional investigation in order to comprehend Myanmar's trade performance. Petroleum Gas ($3.19 billion), Dried Legumes ($1.27 billion), Precious Stones ($1.16 billion), Non-Knit Women's Coats ($904 million), and Rare-Earth Metal Compounds ($803 million) are Burma's top exports. The country exports these goods primarily to China ($6.86 billion), Thailand ($2.82 billion), Germany ($1.17 billion), Japan ($1.1 billion), and the United States ($1.01 billion). Burma was the largest exporter of citrus and melon peels ($27.1M), rare-earth metal compounds ($803M), and precious stones ($1.16B) in 2021.

The table 24 shows that Myanmar's exports are primarily made up of textile and primary sector products. The nature of the export portfolio reveals more intriguing findings. Products including natural gas, vintage stones and clothing, raw minerals, and mineral fuels saw an increase in their percentage of the entire export market. Crude materials and mineral fuels experienced the largest increases ($ 3189 million and $ 1271 ~~million)~~million). This demonstrates how the nation's trade has been concentrated on just a small number of exportable goods while failing to look for competitiveness in new export goods.

And indeed, if we look at the product lines within the same commodity group, it demonstrates that its conventional export is losing competitiveness. For instance, the value of conventional exports like rice declined from US$ 1000 million in 2020 to US$ 701 million in 2021 but corn exports increased from US$ 319 million in 2017 to US$ 633 million in 2021 (Table 24). Petroleum gas remains Myanmar's leading export despite a substantial fall in its export value since 2020 (almost 50%). Dried legume exports increase more than double from 626 million in 2018 to 1271 billion in 2021. The value of textile exports decreased from 2018 to 2021 as a result of COVID-19.

New product lines were developing in the meantime. In 2021, Myanmar's two main exports were refined copper (536 million) and rare-earth metal compounds (802 million). The table shows that the majority of the nation's exports are made up of goods derived from natural resources.

Burma exported $3.19 billion in petroleum gas in 2021. China ($1.63 billion) and Thailand ($1.56 billion) were the top two countries to which Burma exported petroleum gas.

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The production of clothing and textiles is Myanmar's second-largest export contributor. The total manufactured goods exported by Myanmar, up significantly from just 27% in 2011. According to information from the International Labor Organization (ILO), more than 1.1 million people were employed in Myanmar's textile and industry (ISIC 17 & 18) in 2019, up from 0.69 million in 2015. Around 87% of garment workers in Myanmar now are women.

Myanmar, classified as a "least developed country" (LDC) by the World Trade Organization, has duty-free market access to the EU, Japan, and South Korea for its garment exports. Moreover, these nations generally have very lenient "single transformation" (sometimes referred to as cut and sew) rules of origin for acceptable clothing produced in Myanmar. This explains why the EU (56%), Japan, and South Korea (about 30%) are the main destinations for Myanmar's garment exports. Another significant export market for Myanmar is the United States, which will get 7% of its overall garment exports in 2020.

The majority of the country's exports are made up of mining and main agricultural products, with the exception being clothing manufacturing. In addition, certain Asian nations including China, Thailand, the Philippines, and Vietnam have a significant influence on international trade. Myanmar's exports are consequently susceptible to changes in partner trade policies or outside shocks. It is necessary to take the proper steps to diversify export items and destinations.

The majority of Myanmar's exports, according to OECD Comtrade, include petroleum gas, dried legumes, precious metals, other minerals, rice, corn, clothing, and textiles (Table- 24). In particular, India, China, Thailand, Japan, and Vietnam are among Myanmar's top trading partners in the Asia region in 2021. (Table 24).

The main export from Myanmar in 2021, valued at $3189 million, is petroleum gas. China accounts for 51.1% of global petroleum gas exports and is the main consumer. Thailand (49.9% of the total export) is the largest importer.

Dried legumes are Myanmar's second-largest export, with the top three importers being India (48.2%), China (22.4%), and Indonesia (7.85%) of the overall export. The third-largest export good from Myanmar is precious stones. By 2021, 5.7% of all commodities will be exported China (91.7%), Switzerland (1.19%), and Italy (1.62%) received the majority of exports.

The three biggest consumers of Myanmar's exported clothing in 2021 will be South

Korea, Germany, and Poland. Covid-19 has a conflicting effect on Myanmar's exports of clothing. According to UN(United Nation) Comtrade data, Myanmar's clothing exports to the world decreased by 5.7% in 2020 as a result of the pandemic.

The most significant agricultural product and main source of food in Myanmar is rice. In the 1950s, Myanmar was the world's top exporter of rice, and it aimed to foster the nation's sustainable development through export promotion (World Bank 2017). Also, the pressure on Myanmar's rice industry, which had been centered on low-quality export markets, has increased as a result of the demand for the higher-quality rice. Myanmar must therefore concentrate on raising quality in order to take advantage of new market prospects (for example, by creating the premium "Paw San" type of rice) (World Bank 2017).

According to the Ministry of Commerce, Myanmar's corn exports to other countries brought in more than US$ 633 million in 2021. In the 2020–2021 fiscal years, Myanmar exported 2.3 million tonnes of corn to international trading partners. Most of them (58.7%) were transferred to Thailand, with the remainder going to Vietnam (20.4%), Phillipines (17%), and other countries across the world ~~(see~~(see Table- 24). Nowadays, corn is grown in the states of Shan, Kachin, Kayah, and Kayin as well as the areas of Mandalay, Sagaing, and Magway. Winter, summer, and monsoon are the three corn seasons in Myanmar. Every year, the nation produces 2.5 to 3 million tonnes of grain.

Table 2324 : The selected major export of Myanmar form 2017- 2021 ($ million)

2021		2020		2019		2018		2017	
Categories	Value	Categories	Value	Categories	Value	Categories	Value	Categories	Value
Petroleum Gas	3189	Petroleum Gas	3000	Petroleum Gas	6250	Petroleum Gas	6207	Petroleum Gas	5740
Dried Legumes	1271	Rice	1000	Rice	1148	Non-Knit Women's Coats	969	Dried Legumes	924
Precious Stones	1160	Non-Knit Women's Coats	979	Non-Knit Women's Coats	1137	Refined Copper	884	Rice	618
Non-Knit Women's Coats	903	Refined Copper	971	Refined Copper	838	Raw Sugar	659	Non-Knit Women's Coats	611
Rare-Earth Metal Compounds	802	Dried Legumes	922	Dried Legumes	808	Dried Legumes	626	Refined Copper	532
Rice	701	Non-Knit Women's Suits	735	Non-Knit Women's Suits	775	Rice	597	Non-Knit Men's Suits	469
Corn	633	Knit Sweaters	702	Non-Knit Men's Coats	730	Non-Knit Men's Coats	593	Non-Knit Men's Coats	412

Non-Knit Women's Suits	*628*	*Non-Knit Men's Coats*	*640*	*Knit Sweaters*	*669*	*Non-Knit Women's Suits*	*565*	*Raw Sugar*	*407*
Refined Copper	*536*	*Trunks and Cases*	*590*	*Non-Knit Men's Suits*	*502*	*Non-Knit Men's Suits*	*557*	*Ferroalloys*	*347*
Non-Knit Men's Coats	*526*	*Non-Knit Men's Suits*	*512*	*Trunks and Cases*	*495*	*Knit Sweaters*	*483*	*Non-Knit Women's Suits*	*347*
Trunks and Cases	*520*	*Felt or Coated Fabric Garments*	*442*	*Felt or Coated Fabric Garments*	*354*	*Bovine*	*429*	*Corn*	*319*

Source: OECD

Table 2425 : The export partners shares % contribution in Myanmar's total export, 2021

	Categories	% contribution in Total export	Export Destination							
1	Petroleum Gas	15.7	China	Thailand						
			51.10%	48.90%						
2	Dried Legumes	6.24	India	China	Indonesia	Vietnam	Pakistan	United Arab Emirates		Rest of the World
			48.20%	11.40%	7.85%	7.75%	4.56%	2.82%		17.42%
3	Precious Stones	5.7	China	Switzerland	Italy	France	United Kingdom	United States		
			91.70%	1.19%	1.62%	1.35%	0.51%	1.48%		
4	Non-Knit Women's Coats	4.44	Spain	Germany	Poland	Japan	South korea	Nerthlands	Denmark	Rest of the World
			17%	16.90%	13.10%	6.12%	5.36%	5%	4.65%	31. 87%
5	Rare-Earth Metal Compounds	3.94	China							
			100%							
6	Rice	3.45	China	Philippines	Belgium	Bangladesh	Poland	Cote d'Ivoire	Spain	Rest of the World
			48.11%	9.59%	8.35%	6.29%	5.76%	3.95%	3.33%	14.62%
8	Corn	3.45	Thailand	Vietnam	Philippines	China	Bangladesh			
			58.70%	20.40%	17%	2%	1%			

9	*Non-Knit Women's Suits*	*3.09*	*Germany*	*Poland*	*Japan*	*Spain*	*Thailand*	*United Kingdom*	*United States*	*Rest of the World*
			17.84%	*12.81%*	*10.61%*	*9.03%*	*5.62%*	*5.56%*	*5.02%*	*33.53%*
10	*Refined Copper*	*2.63*	*China*	*Thailand*	*Indonesia*	*Malaysia*	*Vietnam*			
			74.80%	*13.60%*	*4.38%*	*4.33%*	*2.89%*			
11	*Non-Kint Men's Coats*	*2.59*	*South Korea*	*Germany*	*Japan*	*Spain*	*Denmark*	*Netherlands*	*Poland*	*Rest of the World*
			15.11%	*11.15%*	*11.06%*	*9.14%*	*6.76%*	*6.12%*	*5.85%*	*34.47%*
12	*Trunks and Cases*	*2.56*	*United States*	*Italy*	*Japan*	*Germany*	*Spain*	*China*	*Canada*	*Rest of the World*
			45.42%	*15.31%*	*5.10%*	*3.79%*	*3.07%*	*2.83%*	*2.25%*	*19.23%*

Source: OECD

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5.5.2 Myanmar's Revealed Advantages Pattern

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Changes in established trade patterns between nations are related to global concerns about environmental sustainability and economic growth. Environmental Impact Studies are necessary for the environmental licensing process to support the environmental agency's comprehension and evaluation, depending on the size and polluting capacity of the enterprise. This study sought to understand the connection between Myanmar's environmental sustainability and trade liberalization. In the context of Myanmar's sustainable development, the author used the RCA index to ascertain the comparative advantage between a country's specialization in imports or exports. The idea of sustainability has raised expectations for social and environmental performance because the majority of Myanmar's exports are based on the exploitation of natural resources, which forces the government to create effective regulations to safeguard natural resources. The RCA phase offers tools to integrate environmental protection into global economic integration at the policy level in Myanmar in a way that is mutually beneficial and sustainable. It also explains potential effects of trade liberalization on the environmental impact of Myanmar.

The RCA index is calculated by dividing the percentage of a product group that is exported by the percentage of that same product group that is traded internationally. An effective tool for determining a country's comparative advantages is the RCA index (Nguyen, 2011). Calculating the conventional RCA index is as follows: In this study, the RCA index was generated for the major product categories of Myanmar's top exports to partner nations. To identify the trends and movements in Myanmar's comparative advantages compared to other partner member nations. The information was obtained from the World Bank (2016).

RCA_{ij} = (x_{ij}/ x_{wj}) / ($\sum x_{ij}$ / $\sum w_{ij}$) (4)

Where x_{ij} = the country i's export of commodity j;

x_{wj} = the world's exports of commodity j

$\sum x_{ij}$ = country i's total exports

$\sum w_{ij}$ = the world's total exports

The RCA index is divided into four groups based on Hinloopen and van Marrewijk's (2001) study (Nguyen, 2011):

- 0 < RCA < 1: Products without comparative advantage.
- 1 < RCA < 2: Products with weak comparative advantage.
- 2 < RCA < 4: Products with medium comparative advantage.
- 4 < RCA: Products with strong comparative advantage.

The table 26 shows the change in RCA indexes for Myanmar's main export goods, including minerals, petroleum, natural gas, textiles, fuel, and raw materials, from 2017 to 2021. The RCA- for petroleum gas, a significant export of Myanmar, is consistently higher than 4, the threshold level signifying the product with the greatest comparative advantage. From 2017 and 2021, the RCA index for petroleum gas was slightly lower, ranging from 20.98 to 7.49. Garment, which is the 9th stage of a major export item, has the highest RCA in 2017 at roughly 196.54. While the export earnings from clothing somewhat increase from 2017 to 2021, the RCA index drops to roughly 31.66 in 2021. ~~Rice and corn, two important agricultural exports, have higher RCA indices.~~ Rice and corn, two important agricultural exports, have RCA indices that are higher than 4, indicating that they are Myanmar's two main exports that have the greatest competitive advantage.

Because to its affordable labor, Special Economic Zone (SEZ) advantages, and tax breaks for foreign investors, Burma was a desirable location for clothing manufacturers and value-added product production facilities prior to the Covid-19 outbreak. Including clothing, sportswear, footwear, purses, and luggage, more than 100 foreign brands are sourced from Burma. China, Hong Kong, and Taiwan are the three countries having the largest foreign ownership percentages in the apparel industry, followed by Japan, Korea, Thailand, and Europe. Much of the industry uses the Cut-Make-Pack (CMP) production system. Customs fees and a 5% business tax are not applied on CMP exports. The apparel sector made approximately 28% of all Burmese exports before Covid-19 and the coup.

Prior to the Covid-19 outbreak, Burma was a desirable place for manufacturing sites for value-added products and garment factories because of the country's Special

Economic Zone (SEZ) advantages, cheap labor costs, and tax breaks for foreign businesses. More than 100 foreign brands, including those for clothing, sporting, footwear, handbags, and luggage, are sourced from Burma. Foreign ownership accounts for two-thirds of the industry, with China, Hong Kong, and Taiwan leading the pack, followed by Japan, Korea, Thailand, and Europe.

The majority of this sector relies on the Cut-Make-Pack (CMP) production system. The 5% business tax and customs charges on CMP exports are both waived. 28 percent of all Burmese exports were made up of the garment industry before Covid-19 and the coup. It was Burma's fastest-growing sector and employed 700,000. The International Labor Organization estimates th at 220,000 garment workers, mostly women, will be let off in 2021. Local partners looked for new business partners in Asia after numerous western brands left the Burma market.

Corn's comparative advantage in Myanmar was unstable and not major export across 2017- 2021 examined. Corn gain its comparative advantage from 2017 (10.01) to 2021 (13.46%).

More than 4 were found in the RCA rice export index. But in recent years, low productivity has presented problems for Burma (with the average paddy yields of only 2.5 tons per hectare). Thailand also poses a serious threat to Myanmar. One of the top industries that the Myanmar National Export Plan prioritizes is rice, which is also exported to Viet Nam and Cambodia (2015). In order to maintain the stability of domestic rice prices over the long term, market integration implies that the government should concentrate on controlling inflationary pressure rather than getting directly involved in the rice marketing sector. Rice export government monopoly has resulted in market segmentation between domestic and foreign markets.

The marketing system would be able to communicate accurate price signals from the global market to the producers, consumers, market participants, and ultimately the government if private rice export were permitted by trade rules. Only then will the rice market in Myanmar no longer be cut off from the world market and receive the proper pricing co-integration that might encourage the efficient market-oriented economy to expand more quickly.

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5.5.3 Consideration of the significance of the identified ~~likely environmental~~likely environmental impacts;

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To maintain economic progress, Myanmar has mainly relied on the exploitation of its natural resources, but this has come at the expense of the environment. In terms of how well the government is doing in upholding its own national environmental policies, Myanmar is ranked 138 out of 180 countries due to its poor environmental governance. Since there was no environment-specific law in place until a few years ago, significant environmental problems are now growing alongside an unstable investment climate.

The environmental degradation brought on by the proliferation of energy extraction projects by foreign firms is the most commonly criticized collateral consequence of liberalization on the livelihoods of the people of Myanmar. Several environmental problems that are crucial to livelihoods are not addressed during the liberalization process. Organizations accuse pipeline development of endangering livelihoods by destroying fishing and farming areas, which are also referred to as restricted access zones. Populations in locations where pipeline projects are pursued becoming jobless is the basic result. Loss of farmland is not the only effect; another is the destruction of woods by resort construction (tourism is another industry growing as a result of FDI reforms) destroys forests, depriving the local population of wood and bamboo, making it impossible to build homes.~~.~~

. One economic sector that has benefited from the various changes implemented is the extraction of fossil fuels, primarily oil and gas. ~~Organizations accuse the development of pipelines for the export of natural gas of endangering livelihoods by destroying areas used for farming and fishing that are also referred to as "limited access zones." Loss of farmland is not the only effect; for instance, the development of tourist resorts (tourism is another industry that is growing as a result of FDI reforms) destroys forests, depriving the local population of wood and bamboo, making it impossible to build homes.~~ According to popular perception, the marketization of agriculture is more advantageous to large-scale agribusiness exploitation than it is to small landowners who depend on subsistence farming. Big exploitation businesses put local farmers in danger with their low production capacity

and don't offer options for landless people to make a living.

Myanmar's second-largest export is apparel and textiles. The following should be the top environmental concerns for Myanmar's garment factories: Even in the best conditions, burning fuel for a boiler releases a significant quantity of CO2, which contributes to climate change. Over extraction or pollution are the two main factors that affect water resources. Everyone should be concerned about reducing solid waste, thus environmental management plans for the factory should take this into account. Certain buyers and producers in the clothing business have been successful in coming up with novel solutions to cut down on packaging waste, particularly by lowering (or eliminating) the amount of plastic needed. In Myanmar, many new factories are being built with energy-efficient technology like screw-type air compressors, skylights, LEDs, and sewing machine motors with variable speed drives (VSDs).

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Table 2526 : RCA Index of Myanmar main export item from 2017- 2021

2021		2020		2019		2018		2017	
Categories	RCA	Categories	RCA	Categories	RCA	Categories	RCA	Categories	RCA
Petroleum Gas	7.49	Petroleum Gas	13.40	Petroleum Gas	15.86	Petroleum Gas	17.51	Petroleum Gas	20.98
Dried Legumes	7.19	Rice	519.64	Rice	7.03	Non-Knit Women's Coats	85.91	Dried Legumes	71.37
Precious Stones	155.69	Non-Knit Women's Coats	53.11	Non-Knit Women's Coats	41.48	Refined Copper	127.39	Rice	25.20
Non-Knit Women's Coats	42.84	Refined Copper	532.61	Refined Copper	112.94	Raw Sugar	24.15	Non-Knit Women's Coats	59.33
Rare-Earth Metal Compounds	304.65	Dried Legumes	75.86	Dried Legumes	63.69	Dried Legumes	58.63	Refined Copper	83.06
Rice	36.45	Non-Knit Women's Suits	12.87	Non-Knit Women's Suits	9.21	Rice	20.58	Non-Knit Men's Suits	31.67
Corn	12.46	Knit Sweaters	13.43	Non-Knit Men's Coats	32.72	Non-Knit Men's Coats	8.59	Non-Knit Men's Coats	6.81
Non-Knit	9.36	Non-Knit Men's	43.88	Knit Sweaters	8.89	Non-Knit Women's	7.61	Raw Sugar	12.10

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Women's Suits		***Coats***			***Suits***						
Refined Copper	***6.02***	***Trunks and Cases***	***105.91***	***Non-Knit Men's Suits***	***199.87***	***Non-Knit Men's Suits***	***305.01***	***Ferroalloys***	***11.64***		
Non-Knit Men's Coats	***31.66***	***Non-Knit Men's Suits***	***35.10***	***Trunks and Cases***	***5.74***	***Knit Sweaters***	***7.93***	***Non-Knit Women's Suits***	***196.54***		
Trunks and Cases	***63.42***	***Felt or Coated Fabric Garments***	***18.18***	***Felt or Coated Fabric Garments***	***25.71***	***Bovine***	***36.64***	***Corn***	***10.01***		

Sources: Author Calculation and Data from OECD

5.5.4 Identification of enhancement or mitigation options

Present-day policies in Myanmar also take the environment into account. In order to allow economic progress, infrastructure development must be supported by appropriate social and environmental safeguards, according to Strategy 3.6 of the Myanmar Sustainable Development Plan (MSDP) (2018–30).

Myanmar's National Environmental Policy (NEP) was established with the following objectives: (1) a clean environment; (2) healthy, functioning ecosystems; (3) mainstreaming of environmental management and conservation. The EIA process is one tool that enables the Republic of the Union of Myanmar to comply with the environmental provisions of the 2008 Constitution, which state that the Union shall protect and conserve the natural environment (Section 45) and that each citizen has a responsibility to help the Union carry out environmental conservation.

The National Environmental Quality (Emission) Guidelines (NEQG), which set forth the rules for preventing pollution from noise, vibrations, gas emissions, and effluent emissions, were published on December 29, 2015. These rules, which are explicitly applicable to all project categories specified in Annex A of the EIA Process, were developed based on the IFC's Environmental, Health and Safety Guidelines.

Also, under the Myanmar Investment Law (2016), investors must get a permit from the Myanmar Investment Commission (MIC) if their ventures include significant investments in capital and have the potential to have a significant negative impact on the environment and the neighborhood (Article 36).

Revenues from natural resources are a crucial source of income for Myanmar because of its exceptionally low tax return when compared to peer nations. Reviewing present procedures in order to find deficiencies and remedy them in accordance with to potential global ~~best practices is~~best practices are necessary maximize the endowment's revenue. The fiscal framework should ensure a smooth and sustainable path of public investment in development. Institutions and procedures supporting these efforts should ensure transparency, accountability, and good governance to minimize revenue leakages. The fiscal regime for natural resources should be revised in particular to maximize the stream of net government revenue~~ues.~~

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6 Impact of FDI on Myanmar's Environment

The existing international literature and its empirical research are either focused in discovering the direct effects of FDI or in comprehending how foreign investors select the locations of their new ventures. This chapter shows the results of empirical model estimation for the short- and long-term effects of urbanization, GDP per capita, and foreign direct investment. The ARDL model, the unit root test, the Johansen co-integration test, the selection of ARDL models, and the Bounds test were all used in this work. The diagnostic and stability tests are presented after the results of the ARDL and ECM model estimation in this section. The first part of the chapter contains a descriptive analysis of the investigation.

6.1 Variables Description and Hypothesis

i) Data

Foreign direct investments (FDIs), which are a key tool for transferring technology, capital, and other capabilities, have three different types of effects on the host country: economic, political, and social. The political effects generally focus on the uncertainty of national independence, while the social effects are mostly focused with the potential for societal cultural change and the emergence of foreign elite in the host nation. According to Moosa (2002), economic effects can result in a wide range of outcomes in terms of output, the balance of payments, and market structure. A vast majority of study findings concur that FDI contributes to economic growth by supplying capital, boosting productivity, increasing the likelihood of new job creation, and enhancing competitiveness, (De Mello, 1999: mallampally and Sauvant, 1999; Hermes and Lensink, 2003) however some studies have stated that FDI has no direct impact on economic growth (Carkovic and Levine, 2002: Duham, 2004). In this study, the author chooses three independent variables (FDI, GDP and UR) follow the existing literatures. FDI in Myanmar boosted the income of Myanmar citizens by,

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creating the job opportunities and boosting productivity. The emergence of the special economic zone (SEZs) and the number of industrial zones has grown only gradually over the years. As a result, large number of Myanmar's labour-intensive, export-oriented industries are concentrated in urban area and lead to mass CO2 emission. And then more employment opportunities and increase income for Myanmar citizens which in turn more use of fuel intensive and electric appliances in their daily life. So, the author chose FDI, urbanization and GDP as explanatory variables for CO2 emission.

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The data set for this study is –from the time series data set of Myanmar (1990-2020). The sources of secondary data are World Bank, DICA, and Konema. The following table summarizes the detailed specifications on the variables.

Table 2627 : The description of the Data

Types	*Code*	*Meaning*	*Measurement*	*Expected Sign*
Dependent variables	***C***	***CO2 emissions***	***Per capita CO2 emissions(tons)***	
Explanatory variables	***FDI***	***Foreign Direct Investment***	***% of total GDP***	*+*
	GDP	***GDP per capita***	***current $***	*+*
	Ur	***Urbanization***	***% of total Population***	*+*

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ii) Hypothesis

Researchers have studied how FDI affects the climate. Kaya et al. (2017) used a spatial agglomeration model to analyze the relationship between FDI and pollutant effects. They hypothesized that FDI inflows influenced a variety of environmental pollution and came to the conclusion that location has no bearing on the concentration of pollutants.

H2~~1~~: A positive relationship exists between FDI and CO2 emissions for Myanmar.

6.2 Model Specification

Grossman and Krueger (1995) examined that pollution tends to raise during the first stage of a country's development, and decreases after reaching a certain income level. Empirically, the relationship between economic development and CO2 emissions has been widely studied. It is plausible to establish the long-run relationship between CO2 emissions, energy use, economic growth, and per capita income in a linear quadratic form (Stern, 2003). FDI inflows have also been considered as an additional determinant of environmental quality because of their potential effects on pollution. This study specified a log linear quadratic equation to test the long-run relationship among CO2 emissions, economic growth, foreign direct investment and urbanization of Myanmar. The regression model is given as follows:

$$LnC_t = \alpha_0 + \alpha_1 LnFDI_t + \alpha_2 LnGDP_t + \alpha_3 LnUR_t + \varepsilon \quad (5)$$

Where,

LnC_t = Natural logarithm of CO2 emission

$LnFDI_t$ = Natural logarithm of foreign direct investment

$LnGDP_t$ = Natural logarithm of GDP per capita

$LnUR_t$ = Natural logarithm of urbanization

GDP_t = Gross Domestic Per Capita

$\boldsymbol{\varepsilon}$ = The regression error terms**.**

All variables in equation (9) are in their natural logarithmic form.

Since there is typically high bidirectional causality between FDI and CO2 emissions, 1 is significant and positive in equation (9). Depending on the country under study's economic development stage, the projected sign of 2 is variable. When technical advancements enable wealthier nations to create fewer energy- and pollution-intensive items, the 2 sign is anticipated to be negative for them, but positive for developing nations (Kohler, 2013). The environment is continuously deteriorating due to rapid economic expansion and urbanization, and the issue of global warming brought on by rising carbon emissions has received significant attention**.**

6.3 Descriptive Results ~~and Findings~~

The data used in the study range from 1995 to 2021, a 27 year period. The data sources come from World Bank, Konema and DICA. Table- 19 presents the descriptive statistics focused in the empirical models. GDP per capita ,GDP is measured in current US dollars and denoted as GDP_t; C_t is represent the CO2 emission in metric tons , foreign direct investment is measure % contribution in GDP and urbanization is measure with percentage of total population live in urban . CO2 emissions are used as the proxy for environmental quality, and the GDP per capita and urbanization, FDI are the proxy for the economic growth. Table 28 – shows the descriptive statistics for the variables used in the study.

Table 27~~28~~ : The descriptive analysis of data

Variable	*Mean*	*Medium*	*SD*	*Minimum*	*Maximum*
Ln C $_t$	*2.566*	*2.388*	*0.775*	*0.09*	*3.691*
LnFDI	*1.306*	*1.298*	*0.394*	*0.7962*	*2.056*
LnUr	*3.353*	*3.367*	*3.433*	*3.258*	*3.433*
LnGDP	*6.045*	*6.157*	*1.017*	*4.640*	*7.298*

According to the table -28, the standard variation of CO2 emission, FDI and Ur have small deviation and designated fewer variables through 1995 to 2021. The high standard deviation value of GDP indicated that the variables highly vary during the study period. The Descriptive Statistics in Table 10 exposed that the average CO2 emission for Myanmar was 2.566 with maximum and minimum values of 3.691and 0.09 respectively. This indicates that carbon emissions in metric tons per capita are relatively low and Myanmar economy is the green economy.

Regarding one of independent variables, FDI Regarding the explanatory variables, revealed an average of 1.306. The Minimum and maximum FDI values were 2.056 and 0.7962 respectively.

The real GDP per capita recorded a mean of 6.045 with a maximum and

minimum GDP per capita of 7.298 and 4.640. This shows that the real economic growth of Myanmar is boosting. The gap between the median GDP per capita to the mean implies asymmetrically distributed data. The standard deviation value of 1.107 recorded implies that the dataset is not widely dispersed from the mean.

Better economic condition reveled by the urbanization variables which revealed a median value of 3.353 and 3.367 respectively, showing the asymmetrical distribution of the dataset. Goods economic environment recorded maximum and minimum values of 7.298 and 4.64 capita respectively.

6.4 Estimation Strategy

The FDI-regional attractiveness nexus study's objectives are twofold. In order to identify which regional traits are significantly influencing the FDI agglomeration (i.e., intensity) in Myanmar, this study will first explore the topic of the determinants of FDI. Kaya et al. (2017) used a spatial agglomeration model to analyze the relationship between FDI and pollutant effects. They proposed that FDI inflows affected several types of environmental pollution and came to the conclusion that location has no bearing on the concentration of pollutants.

6.4.1 Unit Root test

Finding out if a time series is stationary or non-stationary is the first step in performing a regression analysis on the data. It is a crucial step since non-stationary time series data might fluctuate over time with either an ascending or descending trend. If non-stationary data are used in the regression, the outcome could be biased estimation.

A unit root test determines whether or not a time series variable is non-stationary. Results from various unit root tests vary (Anwar & Alexander, 2016). This study used three different unit root test specifically i) Augment Dickey- Fuller test ii) ADF- GLS test iii) Phillip-Perron test for the equation (5).

The unit root is tested as the null hypothesis in an augment Dickey- Fuller test (ADF) on a time series sample. Alternatives such as stationary or trend-stationary are

typically available. The time series models used in the ADF exam are more complex. The Phillips-Perron test is used to determine if a time series is integrated or order 1 under the null hypothesis. The test applies a non-parametric correction to the t-test statistic and is unaffected by heteroscedasticity and unexplained autocorrelation in the test equation's disturbance process.

In 1992, Elliott, Rothenberg, and Stock (ERS) improved the augment Dickey-Fuller test and called it the ADF- GLS test. Using an autoregressive model, this test determines if variables are stationary or non-stationary. Data is locally de-trended by the ADF-GLS test.

The table 30 - shows the results of three unit root test for time series data (C_t ,FDI_t , GDP_t , Ur_t) variables used in this study. Based on our sample size (27 observations) conducted three unit root tests to have a robust result on the stationary of variables in the ARDL models. The PPS unit root test is conducted to counterpart the ADF and Dickey-Fuller GLS test, which is motivated by the argument that tests designed on the basis of the null that a series is I(1) have low power of rejecting the null (Ang, 2008).

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Table 2829 : The results of the unit root test

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t- statistics		LnC_t	$LnFDI_t$	$LnUr_t$	$LnGDP_t$
ADF	**level**	**-1.89**	**-3.301**	**-1.013**	**-0.870**
	1st Difference	**-8.154*****	**-4.0.58*****	**-5.32*****	**-2.90*****
Dickey Fuller GLS	**level**	**0.153**	**2.915*****	**0.188**	**-0.591**
	1st Difference	**-8.326*****	**na**	**-6.069*****	**-2.997*****
PPS	**level**	**1.612**	**-3.128*****	**-1.053**	**-0.79**
	1st Difference	**-12.345*****	**na**	**-9.749*****	**-9.749*****

Note: *** denotes the significant at all 5%, 10% and 1% .

For the ADF and GLS tests: The null hypothesis (H_o) states a unit root (non-stationary) which will be rejected if p-value of the time series variables > 5%.

For the PPS: The null hypothesis (H_o) identified non-stationary, which will be reject if t statistics value < test critical value.

No one of the variables is I(2) which is qualified for the ARDL estimation technique and the Bounds Integration .According to the table 10, the results of the ADF, for unit root and stationary all variables are stationary at the first difference. At Augment Dickey (GLSM) and PP test, except FDI_t , other variables are stationary at first difference. GDP_t ,C_t, UR_t have a unit root in GLS test and PPP test which implies that it is not stationary at their levels. Concluded that the variables.

Prior to conducting any regression analysis, it is crucial to ascertain whether a time series is stationary or non-stationary when using time series data. First and foremost, this is due to the nature (characteristic) of time series data. Time series data, for instance, can shift over time with a trend if they are non-stationary (increasing or decreasing). ARDL techniques can be used with time series data if the data are I (0) or I (1), but they cannot be used if the data are I. (2). This is due to the fact that Pesaran et al. (2001)'s estimated F-statistics are invalid for I (2) data.

Consequently, before performing the regression estimation, we need to make sure that none of our variables are I(2) or higher. All information is transformed to natural log values, displaying the time trends of the variables at the levels and in the initial differences (see figure 16). The author omitted the plot of LnC_t in the following figure because the plot for LnC_t already presented in chapter-5.

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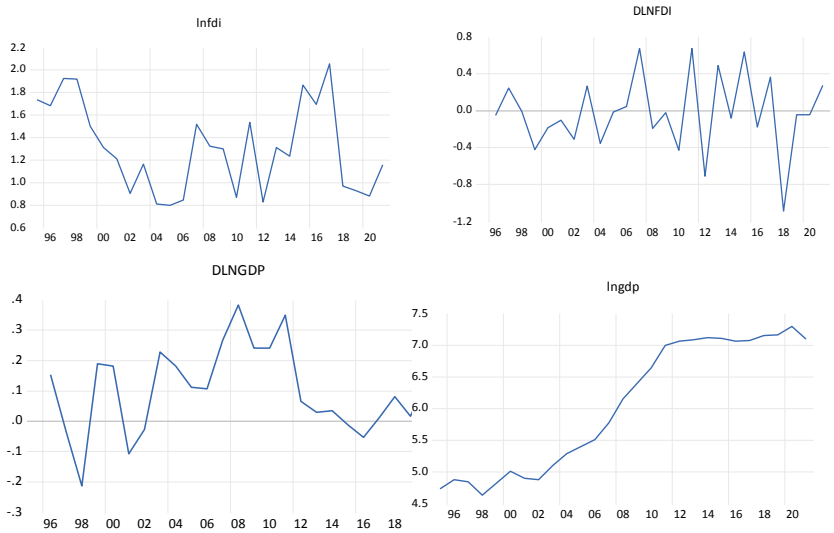

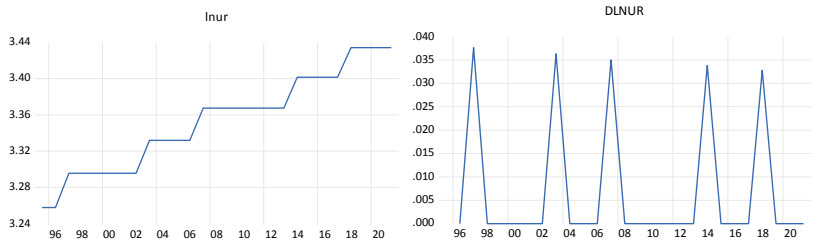

Figure 15 : Plots Real Per Capita GDP, Urbanization and Foreign Direct Investment in the Level and the First Difference.

~~Figure 16 : Plots Real Per Capita GDP, Urbanization and Foreign Direct Investment in the Level and the First Difference.~~

Note: Ln FDI_t –Foreign Direct Investment- % of GDP; DLn FDI_t - the first difference of $lnFDI_t$; Ln Ur_t - Urbanization - % of total population ; DLn GDP_t- GDP per capita - the first difference of LnGDP_t

It is noticeable that except for an extraordinary decrease of FDI in 2018, all the variables (Ur_t, GDP_t) seemed to move with the same increasing trend under the period from 2015 to 2021 (see Figure 15~~6~~). The similarity in upward trends of Ur_t, GDP_t cautions us to be aware of spurious regression among variables. In terms of data on the first difference, it is observable that DLnFDI_t , DLnUr_t, DLnGDP_t fluctuate around a straight line. By adding an intercept term and/or a trend term to the Augmented Dickey-Fuller test equation, the Unit root test can be correctly formed.

Additionally, the model may perform the Johansen co-integration test to check for potential co-integration associations when the variables are integrated at the level or first difference. Table 31 summarizes the ARDL correlation coefficients between FDI and environmental quality.

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Table 2930 : The Correlation Matrix for ARDL (3,4,4,4)

Correlation *Probability*	*LnC*	*LnFDI*	*LnUr*	*LnGDP*
LnC	***1.000***			
LnFDI	***-0.129***	***1.000***		
LnUr	***0.767***	***-0.232***	***1.000***	
LnGDP	***0.738***	***-0.15***	***0.925***	***1.000***

According to the table 31 – LnGDP and LnUr has correlation (0.925), there exists no correlation among other independent variables (see Table 31). This means that there has no multi-collineary in the regression model. If variables have multi-collinear each other's, their coefficients may become unstable and difficult to interpret.

6.4.2 Selection of Lags Optimal and Test of Johansen Co-integration

The variables (Ur_t , GDP_t , FDI_t and C_t) are integrated at I(1) and I (0) have a long-run relationship, thus the study can progress to develop the ARDL model. If a collection of series is cointegrated, the ARDL equation demonstrates in equation 9 that an error correcting mechanism exists. According to Engle & Granger, 1987, cited in Baek & Kim, 2013, the error correcting process aids in the variables' ability to move in close proximity to one another over time with a variety of short-run dynamics. The dynamic relationship between the variables was defined by the Error Correction Model's short-run and long-run adjustment parameters. ECM, which enables adjusting long-run equilibrium following a short-term shock, contributes to the speed of adjustment. It is statistically significant and expected that the coefficient of the ECM term will have a negative sign.

The software Eview 12 is used in this study to estimate the chosen ARDL model. With the use of this software, a user can choose a specific lag level or have it automatically choose one between the maximum lags of dependent and independent variables. In this test, the maximum allowed lags—which were determined by

Lag	*Log L*	*LR*	*FPE*	*AIC*	*SC*	*HQ*

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0	*5.3*	*NA*	*1.05*	*-0.113*	*0.083*	*-0.064*
1	*71.645*	*103.83*	*1.36*	*-4.49*	*-3.5*	*-4.242*
2	*79.723*	*9.833*	*3.13*	*-3.802*	*-2.024*	*-3.355*
3	*120.81*	*35.73*	*5.41*	*-5.983*	*-3.416*	*-5.33*
4	*207.59*	*45.275*	*3.36*	*-12.138*	*-8.878*	*-11.294*

Table 2929~~31~~ : Lag Selection Criteria

Lag	*Log L*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	*5.3*	*NA*	*1.05*	*-0.113*	*0.083*	*-0.064*
1	*71.645*	*103.83*	*1.36*	*-4.49*	*-3.5*	*-4.242*
2	*79.723*	*9.833*	*3.13*	*-3.802*	*-2.024*	*-3.355*
3	*120.81*	*35.73*	*5.41*	*-5.983*	*-3.416*	*-5.33*
4	*207.59*	*45.275*	*3.36*	*-12.138*	*-8.878*	*-11.294*

*Indicates la g order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Pesaran and Shin (1999) looked into whether the BIC criterion performed well in most experiments and whether the AIC and BIC were suitable for small-sample performances. After determining the integrating order, the best vector autoregressive lag length is selected using the likelihood ratio (LR), AIC, SBC, SC, and HQ information criterion (VAR). For the sample period of 1995–2021, attention has been paid to five VAR (p), p= 0, 1, 2, 3, and 4 models. The order is inferred by at least four criteria.

The Johansen co-integration test is used after the unit root test to determine whether a long-term link exists between the variables, roughly before the ARDL model. Table 33 displays the Johansen cointegration test results.

Table 3032 : Johansen Cointegration test results

H_0	H_1	*Trace Statistic*	*5% Critical*	*Prob*	H_0	H_1	*Max-Eigen*	*5% Critical*	*Prob*

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			Value				Statistics	Value	
*r=0**	*r>1*	*66.320*	*63.876*	*0.030*	*r=0**	*r>1*	*34.439*	*32.118*	*0.025*
*r<1**	*r=1*	*31.881*	*42.915*	*0.394*	*r<1**	*r=1*	*19.233*	*25.823*	*0.289*
r<2	*r=2*	*12.647*	*25.872*	*0.765*	*r<2*	*r=2*	*10.114*	*19.387*	*0.606*
r<3	*r=3*	*2.532*	*12.517*	*0.926*	*r<3*	*r=3*	*2.517*	*12.517*	*0.926*

Trace statistic and Max-Eigen statistic are both significant at the 5% level for the null hypothesis r=0 (see Table 33). This implies that the null hypothesis r=0 is rejected at the 5% level of significance. Therefore, we can conclude that there is an underlying long-run relationship among the variables C_t, GDP_t, Ur_t, and FDI_t . Both trace statistic and max-eigen statistics show that the p-value of the null hypothesis that the number of co integration equations is, r=0 which is lower than 0.05. This indicates that the null hypothesis r=0 is not rejected at the 5% significance level. Therefore, we can conclude that there is co-integration all variables in the long-run.

6.4.3 The Bounds Tests for Co-integration of ARDL Models

The Bounds Test in the ARDL technique was utilized by Anwar and Alexander (2016), Halicioglu (2009), Hossain (2012), Jalil and Mahmud (2009), and Ozturk and Acaravci (2010) to examine the cointegration among the ARDL model's variables. The long-term association between the variables was examined in conjunction with the F-test. The empirical formulation of the ARDL framework for bound testing can be written as follows:

$$\Delta LnC_t = \beta_o + \sum_{i=1}^{p} \delta_i \Delta LnC_{t-i} + \sum_{i=1}^{p} \emptyset_i \Delta LnFDI_{t-i} + \sum_{i=1}^{p} \omega_i \Delta LnGDP_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta LnUR_{t-i} + \sigma_1 LnC_{t-1} + \sigma_2 LnFDI_{t-1} + \sigma_3 LnGDP_{t-1} + \sigma_4 LnUR_{t-1} + U_t \quad (6)$$

Table 3133: The Bounds Tests for Co-integration

F –Bound Test	*Value*	*Signif*	*I (0)*		*I(1)*
			Lower	*Bound*	*Upper Bound*

F – statistic	***6.366***	***10%***	***2.72***	***3.77***
		5%	***3.23***	***4.35***
		1%	***4.29***	***5.61***

Note: $H_{0:}$ No level relationship

The equation 9 is being forecasted by OLS procedure and F- statistics for the common significance of lagged levels of all variables (C_t , GDP_t , Tr_t and IF_t) have been considered. The computed F-statistics for order of lag four turned out to be 6.366 when the dependent variable is C_t. Pesaren et. al. (2001) provided the critical value , upper bound I(1) (3.77, 4.35, 5.61) and I (0) lower bound (3.72,3.23,4,29) at 10%, 5 % and 1% level of significant respectively. Thus the study rejects the null of no level relationship among variables. So it provides enough sign that there is a strong long-run relationship among the variables of the model.

6.4.4 Error Correction Estimation and ARDL long-run Estimate

After ARDL cointegration methodology Eq. (5) has been predictable to get the long-run estimates. The estimation results are shown in table 34.

Table 3234 : Estimation Results for ARDL (3,4,4,4,)

ARDL Error Correction Regression			***ARDL Long-run***		
Regressor	***Cofficient***	***P- value***	***Regressor***	***Cofficient***	***P- value***
Coint Eq(-1)	***-2.676***	***0.0026******	$LnFDI_t$	***-1.367***	***0.0005******
C	***-73.59***	***0.0027******	$LnGDP_t$	***0.257***	***0.057***
$LnFDI_t$	***-0.966***	***0.034******	$LnUr_t$	***9.173***	***0.008******
$LnGDP_t$	***0.868***	***0.139***	***C***	***-73.590***	***0.031******
$LnUr_t$	***-14.679***	***0.0079******			
R-Square =0.99 , P(F- statistics) =0.00001, Durbin Watson test= 2.125					

Note 2: *** represent 5% level of significance.

The coefficient of coint Eq(-1) is negative and significant which derived from equation 5. The estimated coefficient of ECM (-1) is 2.676. The estimated

coefficient ECM t-1suggest that the deviation from the long-run equilibrium level of CO2 emission in first year is adjusted by 95%% in the following year.

The Error Correction Model

EC=Ln C- (- 1.3678*LnFDI +0.2574*LnGDP + 9.1735*LnUr) (7)

The long-run results are presented with equation (7). The empirical model estimation results of equation (7) on the impact of GDP per capita, foreign direct investment and urbanization on CO2 emissions in the short-run and long-run estimation are described in the following parts.

Table 34 shows that foreign direct investment impact on the carbon emission (CO2) is negative relationship but statistical significant. This means that the flow of FDI rise 1% leads to reduce 1.367% decrease in CO2 emission of Myanmar. This is an interesting finding, as previous scholars have commented on the possible environmental benefits of FDI. Even some recent discoveries in Latin America suggest that FDI could benefit the environment, as demonstrated by Polloni-Silva et al. and Xu et al. Part of the literature defends the idea that FDI brings innovation, green technologies, and higher productivity levels to emerging economies (Bakhsh et al, Zafar et al and Ferraz et al).

Specifically, from the co-integrated equation in Table 16 can be explained that, in the long-term, when urbanization increases by one percent, then it will increase degration of environmental quality by 9.17%. However, statistically LnGDP are not significant or accept the null hypothesis, no significantly effect on LnC in the long term or rejects the null hypothesis.

The R-squared is 0.99 , meaning that approximately 99% of the variability of the carbon emissions (CO2) from Gas Fuels considering the change of urbanization, foreign direct investment and GDP per capita is accounted for by the variables in the model. Considering the effect of GDP on CO2 in eq 5 revealed a positive relationship between GDP per capita and CO2 emission per capita. That is a unit increase in GDP per capita leads to an increase of 0.024 percentage change in carbon emissions.

According to the empirical results show that the FDI and CO2 emission are inversely related if FDI increase 1% lead to 0.96% reduce CO2 emission in short-run and 1.357% reduce in the long-run. In terms of trade and investment, China has been

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Myanmar's biggest international economic partner for the past 15 years. Throughout the past 30 years, China has experienced a highly rapid economic transition with a corresponding increase in poverty. Contributing of the relocation of labor-intensive light manufacturing from China's coastal regions to new locations both inside and outside the country as well as the growth of outside investment in other industries.

Four subsectors, including garment manufacturing, agricultural and agro-processing, construction, and tourism, have the potential to expedite Myanmar's economic transition through foreign direct investment (FDI), particularly from China. Three of the four subsectors—manufacturing of garments, construction, and tourism—reside in secondary industries, and apparel, tourism, and (partially) agro-processing are export-oriented.

Second trade liberalization process is the Foreign Direct Law of 1988. The statute provides protections against the risk of nationalization in order to draw in international capital. Additionally, it guarantees the return of profits and a three-year tax exemption. Due to the investment law 1988, three the Special Economic Zones (SEZ) – Thilawa SEZ near Yangon; Kyauk Phyu SEZ in Rakhine State, western Myanmar; and Dawei SEZ Tanintharyi Region in the southeast of Myanmar. Several SEZs have received or are now receiving significant infrastructural investment, with funding from China, Thailand, and Japan being sought.

The foreign investors major participated in manufacturing sector 82.5% ($ 1751.934 million), Logistics 4.57% ($ 95.47 million) was second and Trading 8.1% ($ 171.808 million) etc. in 2021.The major investor from Japan (32.1%) , Singapore (31.25%) and Thailand (8.96%) invested in Thilawa SEZ in 2021.

For the whole countries Computer Software & Hardware (24.60%), Services Sector (Finance, Banking, Insurance, Non Fin/Business, Outsourcing, R&D, Courier, Tech.), Outsourcing, R&D, Courier, and Tech are top 5 highest foreign investment receiving sector during financial 2020-2021. ~~Computer Software & Hardware (24.60%), Services Sector (Finance, Banking, Insurance, Non Fin/Business, Outsourcing, R&D, Courier, Tech.), Outsourcing, R&D, Courier, and Tech.~~

Singapore surpassed all other investors in the first half of this fiscal year. Mauritius, the United Arab Emirates, the United States, the Netherlands, and Japan came after it. Throughout the first half of this fiscal year, the computer software and

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hardware sector drew the biggest inflows. Jan 31, 2023.

The new foreign investment regulation is extremely clear in its emphasis on environmental preservation. The Ministry of Environmental Protection and Forestry is consulted during the process of an investment application by the MIC give comments and remarks.

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6.4.5 The Granger Causality Test

The Granger's non-causality method is used to address the issues with time series heterogeneity. A modified variant of the Granger causality test is known as the Dumitrescu-Hurlin (DH) test. Tang (2011) examines the cointegration and causation relationship.

The Granger causality test was used to investigate the effect of trade liberalization on CO2 emission or vice versa. Under the null hypothesis of no causation, the F-statistic and Granger causality probability (see table 35) are used to establish the direction of the link.

Granger causality is not present between variables, according to the null hypothesis. Reject the null hypothesis if p 0.05 and use the Granger Causality test instead.

Table 3335 : Pair Wise Granger Causality Test.

	F- Statistics	*P value*
LnGDP does not Granger Cause Lnc	*3.553*	*0.033*
LnC does not Granger Cause LnUr	*3.963*	*0 .023*

The results of Granger Causality test presented in Table- 35. The results proved that there is the one way causal relationship between GDP and CO2 emission and GDP does Granger cause Ur through one way causality runs.

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6.4.6 Test of Goodness of Fit for ARDL Specification

When the regression residuals are correlated with one another, serial correlation—also referred to as autocorrelation—occurs. In other words, it happens

when the regression errors are reliant on one another. This may occur for a number of reasons, such as faulty model design, non-randomly distributed data, and erroneous error term specification. When using time-series data, this is typical. The autocorrelation coefficient can be used to calculate the level of serial correlation. How closely connected a group of data points are to one another is determined by the autocorrelation coefficient.

The ordinary least squares standard errors for the regression coefficients overestimate the true standard errors due to the positive serial correlation. Serial correlation influences confidence intervals and hypothesis tests for individual coefficients in addition to having an impact on significance tests. The OLS standard errors for the regression coefficients understate the real standard errors due to the positive serial correlation. The serial correlation problem can be tested in a variety of methods. In this instance, we have a strong conviction that the chosen ARDL model is serial correlation-free. The Durbin-Watson correlogram, Q-statistic, and Lagranger Multiplier tests, as shown below, all back up this view.

i) Durbin –Watson Test

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The Durbin- Watson statistic, which is a test statistic in statistics, is used to find out whether autocorrelation at lag 1 exists in the residuals (prediction errors) from a regression study. Johannes von Nuemann arrived at this ratio's tiny sample distribution (Von Neumann, 1941). By using this statistic to analyze the residuals from least squares regression, Durbin and Watson (1950, 1951) created bound tests to compare the null hypothesis—that the error is serially uncorrelated—with the alternatives, that they exhibit first order autoregressive behavior. According to Hill et al. (2011), there are numerous ways that autocorrelation in the error term might occur. It might originate from an omitted variable that is auto-linked, meaning the error term at time period t, e(t), is correlated with the error term at time period t+1, e(t+1).

Table 34~~36~~ : Durbin- Watson Test

Variables (Dependent	*Independent Variables*	*Coef*	*Std. Error*	*t -statisitcs*	*P*	*R-square*	*Adjust R-Square*

Variables)							
	c	*-29.084*	*15.9091*	*-1.828*	*0.080*	*0.594*	*0.542*
LnC_t	$LnFDI_t$	*0.082*	*0.272*	*0.303*	*0.7646*		
	$LGDP_t$	*0.11*	*0.27*	*0.475*	*0.687*		
	$LnIF_t$	*9.208*	*5.164*	*1.783*	*0.087*		
Durbin- Watson statistics = 2							

. The Durbin-Watson Statistical value for equation 5 is equal to 2, according to the result form table. As a result, there will be no autocorrelation and no correlation between the regression errors.

ii) Brushed –Godfrey Correlation LM test

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Higher order lags and more complex auto-correlation structures can be tested using the LM test (Hill et al., 2011). The LM test was used to evaluate the joint relevance of the chosen model's lagged residuals and least square estimated residuals. . The LM test result is shown in Table 37.

Table 35~~37~~ : The result of LM test

F- statistics	*0.693*	*Prob (2,21)*	*0.5109*
Obs R- square	*1.672*	*Prob.Chi–Square*	*0.433*

Note: Ho: there is no serial correlation in the residuals up to lag 2.

Because the F-statistic is not significant and Table 37 shows that the P-value is greater than 0.05, the null hypothesis that there is no serial connection cannot be ruled out. This indicates that there is no serial correlation in our model's residuals up to lag 2.

iii) A correlogram graph

The residuals from equation (5) are utilized as the dependent variable to test for serial correlation. The results of the partial auto-correlation and auto-correlation for the first 12 lags of the residuals are shown in Table 38. The correlogram can visually assist in making the choice to avoid serial correlation (see Table~~Figure~~ 38). The model is devoid of auto-correlation if the spikes of the auto-correlation coefficients in Figure (38) are substantially inside the two boundary lines, +1.96/T and -1.96/T, where T is the sample size.

Table 3638 : Autocorrelation and Partial Auto-correction of the Residuals

Lag	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
AC	*0.193*	*0.118*	*-0.132*	*-0.057*	*0.059*	*-0.1*	*0.162*	*-0.01*	*-0.02*	*-0.02*	*-0.03*	*-0.022*
PAC	*0193*	*0.084*	*-0.178*	*-0.012*	*-0.011*	*-0.11*	*-0.139*	*-0.06*	*0.03*	*-0.08*	*-0.11*	*-0.12*

Note: AC - Auto correlation

PAC - Partial Auto-correlation

Table 38 demonstrates that there is likely no auto-correlation in the residuals of equation (5) because the values of the auto-correlation coefficients of AC and PAC for the first 12 lags are extremely near to zero or almost zero (eq 5). With a sample size of 29, it is clearly evident from the correlogram (see Figure 16) that the spikes of the auto-correlation value are very well inside the line of +-1.96/29; as a result, there is no auto-correlation in the equation (5) - ARDL (3,4,4,4).

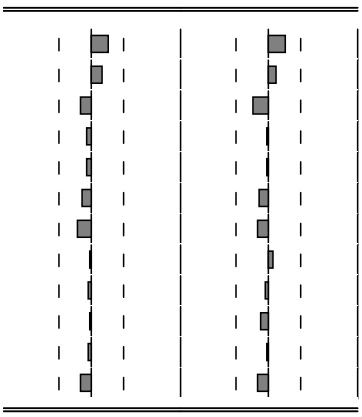

Figure 16 : Correlogram of the Residuals

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~~Figure 17 : Correlogram of the Residuals~~

~~Table 38 demonstrates that there is likely no auto-correlation in the residuals of equation (5.11) because the values of the auto-correlation coefficients of AC and PAC for the first 12 lags are extremely near to zero or almost zero (eq 5). With a sample size of 29, it is clearly evident from the correlogram (see Figure 17) that the spikes of the auto-correlation value are very well inside the line of +-1.96/29; as a result, there is no auto-correlation in the equation (5) - ARDL (3,4,4,4).~~

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6.4.7 Test for Heteroscedasticity

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We examine the plot of the estimated least square residuals from equation (5) - ARDL to test for heteroscedasticity (3,4,4,4,). The residuals of our calculated equation (5) show no pattern of any kind, indicating that the residuals are homoscedastic (see Figure 18). In some systematic ways, the mistakes show more variety if they are heteroscedastic (Hill et al., 2011, p.303).

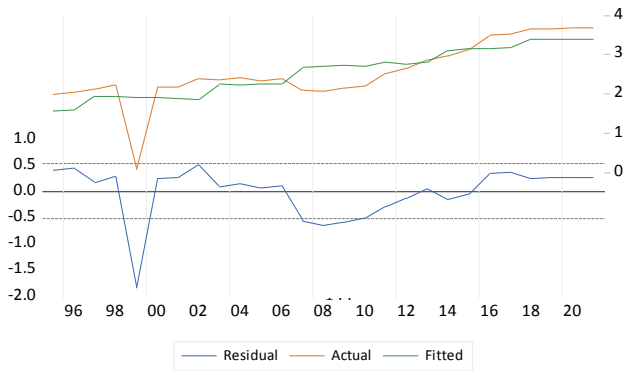

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Figure 17 : Plot of Estimated Model Residual

Figure 18 : Plot of Estimated Model Residual

The plot of the residual is usually used in a simple regression model 23. Therefore, we further checked for the existence of heteroscedasticity using the Breusch-pagan-Godfrey test. The Breusch-Pagan Godfrey test regresses the squared residuals, which are obtained from equation (5), on the independent variables $ln\ C_{t-3}$, $Ln\ Ur_{t-4}$, $Ln\ FDI_{t-4}$ and $Ln\ FDP_{t-4}$ and the intercept. The result of the test is presented in Table 39.

Table 37~~39~~ : Breuch-Pagan –Godfrey Hetroscedasticity Test

F-statistic	*0.606*	*Prob.F (3,23)*	*0.617*
Obs R -squared*	***1.979***	***Prob. Chi- Square (3)***	***0.576***
Scaled explained SS	***5.007***	***Prob. Chi- Square (3)***	***0.171***

Note: Ho: There is no heteroscedasticity

We do not reject the homoscedasticity null since the Breusch-paHgan-Godfrey test demonstrates that the p-value of the F-statistic test is unimportant. As a result, our model is not heteroscedastic.

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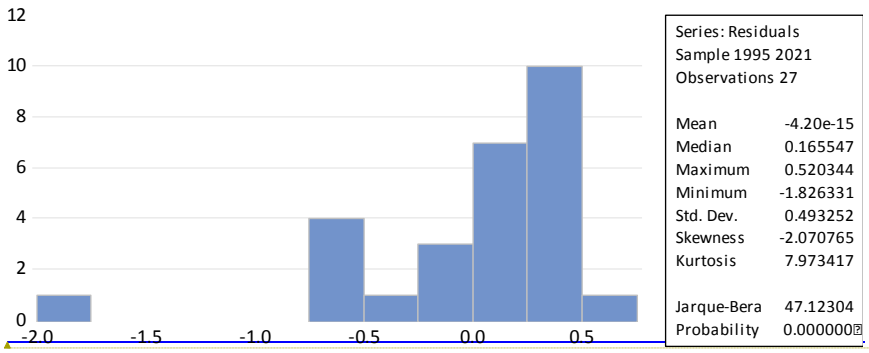
~~6.4.8 Histogram and Jarque-Beta Test of Residuals~~

~~The Jarque-Bera test ARDL was used to determine whether the residuals of equation (5) were normal (3,4,4,4). The Jarque-Bera test's null hypothesis, which stands in opposition to the alternative hypothesis of non-normality, is that there is a normal distribution. Figure 19 depicts the test's outcome.~~



~~Figure 19 : Histogram and Result of the Jarque-Bera Test for Normality~~

~~Because the Jarque-Bera statistic has a p-value of 0.000, which is less than 0.05, and a Jarque-Bera of 47.12, we can reject the null hypothesis because it is significant. As a result, we can conclude that the residuals of our model are not regularly distributed.~~

6.4.9 The stability of the model

Checking for stability is the last stage in ARDL estimate. This study uses ECM eq 5-based~~ CUSUM and~~ CUSUMQ methods. ~~The~~The ~~CUSUM and~~ CUSUMSQ statistics in the next two plotted figures are both well inside the critical boundaries, indicating that all of the ECM model's coefficients are stable.

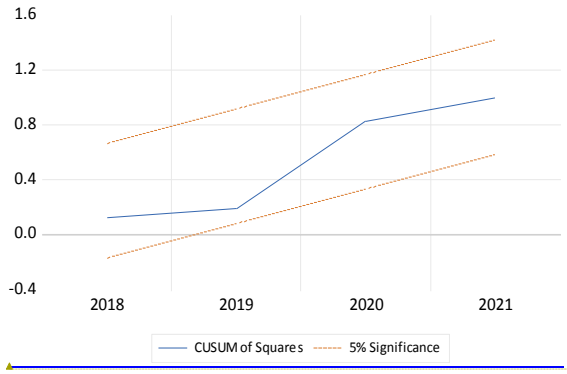


Figure 18: Plot of the cumulative sum of residuals

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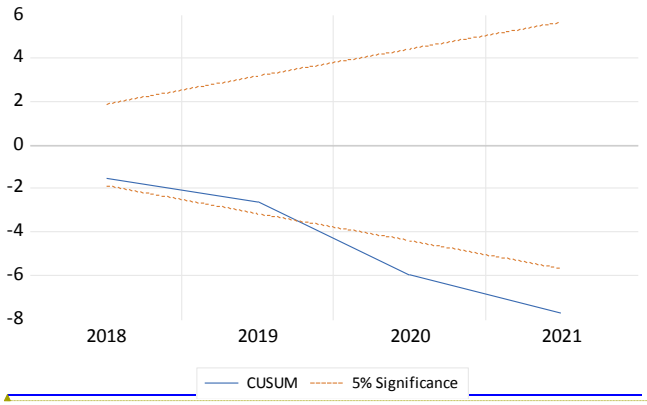

Figure 20 : Plot of cumulative sum of recursive residual

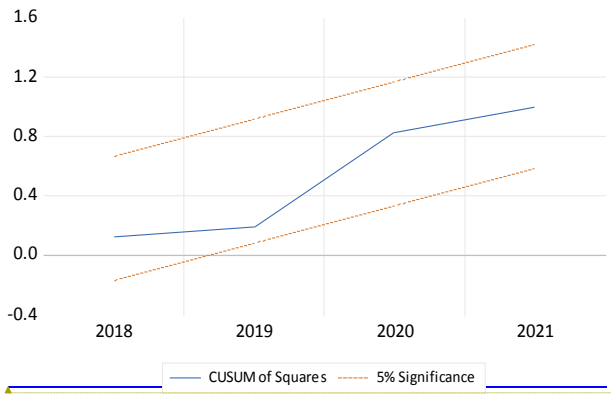

Figure 21 : Plot of cumulative sum square of recursive residual

A CUSMQ from the model is well between the 5% significance level lines, however the plot of CUSM from the model is unfixed inside the 5% significant level. The stability of the model and equation 9 -ARDL is indicated if the cumulative sum of

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residuals is greater than -5% and less than -5%.

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7 Conclusions and Prospects

The concepts of the study were outlined in this chapter. This section contains the empirical findings and their relevance to the study's goals, as well as its implications for policy and suggestions for further research. The final section of this chapter discusses the study's limitations and its policy recommendations for future research.

7.1 Summary of the study

The environmental Kuznets Curve (EKC) hypothesis has been used by several authors to explain the results of their empirical studies on the relationship between environmental quality and per capital income growth. Economic liberalization causes a country's economy to grow faster, which lowers the country's environmental quality. When the country's economic cycle reaches its apex, emphasis is placed on environmental preservation. The EKC hypothesis, which states that there is an inverse U-shape link between environmental quality and income per capita, helps us to picture this situation. Studies by the World Bank on trade and the environment from 1992 by Birdsall, Wheeler, and Lucas et al. and Lucas et al. studied the pursuit of greater trade policies for nations with lower pollution intensity of production..

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7.2 Findings for the Research objectives

7.2.1 Research Objective One

For the first goal, CO2 emissions in Myanmar and foreign direct investment (FDI) are inversely connected. The degree of permission granted by Myanmar's government legislation and regulations is a major factor in this circumstance. Examining the effects of trade openness and foreign investment on environmental quality has mostly relied on prior literature and theoretical reviews. List and Co. (1999) assessed how environmental regulations affected foreign corporations' decisions about where to locate new plants and discovered evidence that different environmental regulations in different nations matter. Eskeland and Harrison (1997) asserted that international businesses use greener forms of energy and are much more energy efficient than domestic ones.

The empirical outcome of the ARDL estimation demonstrates that FDI has a detrimental effect on Myanmar's environmental quality (CO2 emission) from 1995 to 2021. The market-oriented reforms improve the climate for FDI influx by making it more hospitable and favorable. The telecommunications industry and labor-intensive manufacturing sectors are where the majority of foreign investment is looking to invest. Agriculture is Myanmar's main export, so modernizing the packaging method and enhancing technology are required to increase the value of exports. Due to political unrest, foreign direct investment has drastically decreased in Myanmar at the moment. Majority of foreign investing in Myanmar are manufacturing such as garment and food wearing, second is construction.

As the military government was replaced by a civilian one in 2010, the real estate sector saw an increase in international investment. A Vietnamese-based real estate developer invested in the Myanmar Plaza building, and several Chinese development companies also bought real estate in Mandalay and Yangon, ushering in a new age for the city of Yangon.

Data on whether FDI is sensitive to restrictions are few, according to the OECD (1997), and foreign capital flows to a variety of industries, some of which are "dirty" and others which are clean. Even though low-cost operations may be a goal of FDI flow abroad, foreign businesses typically prefer consistent environmental regulation to lax environmental policy. They are also more likely to make new investments that protect and improve the environment if competitors are held to the same standards.

The expansion and improvement of economies are significantly influenced by FDI. The volume of FDI flows inside the nation must be kept at or increased. FDI is a significant source of capital input for Myanmar and might unquestionably aid in the process of economic development. The Union of Myanmar Foreign Investment Law (FIL) was enacted on November 30, 1988, with the goals of attracting high-tech foreign direct investment and utilizing the nation's natural resources.

Retail and wholesale activities have been made available to foreign investment under the terms of the nation's 2012 Foreign Investment Law (FIL) , a ~~, a~~ comparatively small number, including the food industry, the plastics industry, some chemical sectors, the mining industry, and the real estate industry. In actuality, the ownership structure of a project involving foreign investment in real estate will be greatly influenced by the project's land rights. And finally, having local partners is typically required for the majority of large-scale mining projects. The FIL restriction has reduced FDI's involvement in Myanmar's heavy sectors, which are major contributors to CO2 emissions. Then, according to government statistics, foreign investment in Myanmar has decreased to an eight-year low, first hurt by the COVID-19 outbreak and then by the political turmoil that escalated following the military takeover in February.

The empirical findings imply that Myanmar is not a "pollution Heaven Hypotheis " and “ Environmental Kuznet Curve” contrary to popular belief.

7.2.2 Research Objective Two

The second research question of this study is to investigate the impact of trade openess environmental quality Myanmar. Myanmar heavily relied on natural

resources to improve its economy and supply energy and living condition for its population. For development and economic transformation of Myanmar, forestry, agriculture, fisheries and mining have played critical roles. NCEA and UNEP (2008), point out that Myanmar place world's lowest environmental management ranks and the highest rate of deforestation among major Southeast Asian countries.

Myanmar, which has abundant and diversified natural resources like timber, oil, and precious stones, was the world's leading exporter of rice up until the early 1940s (Than 1992). After becoming independent, its per capita income surpassed that of Hong Kong, Korea, Malaysia, and Thailand, according to Wong (1997). Since 1962, Myanmar's economy has been distorted as a result of the military government's takeover of power, isolation, and adherence to import substitution and self-reliance programs. It was subsequently listed as one of the least developed nations in Asia in 1987. Despite the 1988 passage of the Foreign Investment Law and the opening of Myanmar's economy, little has changed in terms of the country's economic structure, the average citizen's level of living, or the GDP-contributing export profits.

In the period between 2011 and 2015, the new democratic government carried out a series of changes in all spheres of the economy, including trade, before liberalizing trade policy. Declared an economic policy in 2015, and then in 2016 released a 12-point economic program. The government of the National League for Democracy (NLD) has pledged to create a more enticing and secure business climate. In the major city of Myanmar, urban service provision, traffic congestion, flooding, and green space are some of the key environmental concerns brought on by three distinct phases of urban development plans, trade liberalization, and dominant foreign investment after economic reform.

The goal of the government's export promotion strategy is to increase the export of goods by making efficient use of its human and natural resources. The creation of jobs and the trade liberalization strategy make up the majority of the economic change. Foreign investors wishing to transfer their labor-intensive operations are becoming increasingly interested in Myanmar due to its relatively low labor cost and improving business environment. In one of the nation's economic zones, Hong Kong enterprises engaged in labor-intensive industries like clothing or footwear manufacture (SEZs). They aimed to take advantage of the investment incentives provided by the Myanmar

government as well as additional benefits including strong infrastructure and logistical support.

More than 20 industrial zones have been formed in Yangon as a result of a progressive increase in the number of industrial zones throughout time. This has led to a concentration of the majority of Myanmar's labor-intensive export-oriented enterprises in this region, which has caused substantial pollution issues, including noise pollution, air pollution, and the loss of green space. The main issues include rapid population increase, particularly in the area of migration, an inadequately planned road system, wealth, and weak importation regulations for vehicles. More than 37,000 automobiles were in Yangon in 2014, more than doubling from about 18,000 in 2007. According to this study, the establishment of industrial zones and labor movement were caused by trade openness, which then led to urbanization. Myanmar's energy use decreased progressively from 11 MJ in 2019 to 4 MJ in 2020. ~~These depict Myanmar.~~

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According to research by Raitzer et al. (2015), governments face significant hurdles if they lack a complete and integrated environmental framework, appropriate institutional and legal structures, proficiency and significant financing for managing natural resources (ADB report 2015). In recent years, the Myanmar government has enacted a number of new laws and regulations pertaining to environmental protection.

New Environmental Impact Assessment (EIA) processes were introduced by the Myanmar government in 2016 with the aim of avoiding and justifying adverse environmental and social repercussions. The evaluation processes used by the Myanmar Investment Committee for new projects place special emphasis on rules governing the clearing of timber, changes to the export structure, and environmental standards.

7.3 Research Implication

This study offers evidence for the use of the EKC theory in Myanmar. The EKC model indicated that there was a long-term U-shaped relationship between economic growth and the concentration of CO2 emissions in Myanmar. As a result of trade liberalization in Myanmar, the country's economy and urbanization are likely to grow, which would ultimately cause environmental degradation. The likelihood that Myanmar's environment (as assessed by CO2 emissions) will improve in tandem with its economic development was indicated by this study.

For the empirical exploration, the study used a data series spanning four variables from 1990 to 2021. The data were selected based on the information that was available and were taken from the Central Statistical Organization (CSO) 2020 version and the World Bank and Knoema's publication of global development indicators. Trade openness (Index), FDI (% of GDP), GDP per capita as a proxy for economic growth, power energy consumption (PEC), investment freedom (IF), and urbanization (Ur) were all chosen by the author as explanatory variables.

The author used correlation matrix analysis and descriptive statistics to clarify the nature of the dataset and how the variables interact with one another. The study used the ADF test, ADF-GLS test, and Phillips-Perron test to determine whether the data were stationary. The ECM, ARDL estimation approach for the regression analysis and the Johansen co-integration test were used to check the long-run adjustment between the variables. Regression study results showed a substantial and positive association between environmental quality (CO2 emission) and trade explanatory factors (trade openness, GDP). The relationship between FDI,

trade, and economic growth has been studied by most writers and policymakers (Qi et al., 2019; Boamah et al., 2020; Bhattacharya et al., 2016; Gozgor et al., 2018). 2019; Ayamba et al.

According to a 2013 UNDP research, Myanmar's CO2 emissions are significantly rising as a result of increased energy use in the transportation sector as a result of rapid population growth, urbanization, and industrialization. However unlike many other nations, Myanmar gets the majority of its energy-related CO2 emissions from the agricultural and forestry sectors (United Nations Framework Convention on Climate Change 2013).

In Myanmar, there was discovered to be a negative significant association between FDI and CO2. The findings imply that primary commodities like agricultural, wood, marine, and mining items, including natural gas, make up the majority of Myanmar's exports, while the majority of foreign investment is concentrated in the telecommunications and real estate sectors. The evidence thus showed that FDI had no negative effects on Myanmar's environmental quality. Nonetheless, the increased urbanization and energy consumption of Ur and Tr have a favorable effect on the environment.

Regarding the Granger causality findings, GDP and CO2, GDP and TR, and C to TR all have a unidirectional link. This demonstrates that if one of the variables increases, the other will also increase.

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Urbanization and CO2 emissions had a favorable relationship in this study. According to Cohen's (2006) prediction, the majority of population growth in the developing countries will occur in cities over the course of the next 30 years. Due to the economic shift that fundamentally altered how their economies, communities, and environments functioned, developing nations with transitional economies in Southeast Asia, including Myanmar, have seen increasing urbanization over the past few decades.

Export promotion, a sizable investment in natural resource extraction, the adoption of various high-tech systems, the upgrading of capital-intensive industries,

the expansion of job opportunities, the reduction of energy consumption, and regional development are the main goals of the introduction of foreign capital in Myanmar.

7.4 Policy Recommendation

The analysis's findings also show that trade liberalization has an indirect impact on urbanization and accelerates CO2 emissions in Myanmar over the long and short terms. Burning fuel, flying emissions from coal mining activities, oil and gas extraction, and transportation are the main causes of CO2 emissions in Myanmar (Ministry of Natural Resources, 2016).

The empirical findings indicate that more effort and the appropriate tactics are needed to make the shift from non-RE to RE. Moreover, Myanmar is developing into a market-oriented emergent economy. But during the past few decades, it has been under intense environmental strain. The NLD government made an effort to ensure that policies for economic development and environmental protection were coordinated.

Due to the COVID-19 outbreak and the political upheaval in the last year, foreign direct investment (FDI) in Myanmar has reached an eight-year low. Several of the foreign businesses who invest in Myanmar are wary about making further investments. They are unsure as to whether the political climate and public safety situation in the nation will return to normal. According to the observed EKC for CO2 emission, this is likely due to more sophisticated technical and financial capabilities for good management of livestock and agriculture, as well as better waste treatment plans for urban and industrial water resources. The analysis's findings also demonstrated that industrialization and urbanization—consequences of trade liberalization—have a detrimental effect on Myanmar's environment.

Moreover, there are adequate systematically measure and document regarding with the environmental health and social costs of natural resource extraction. As an alternative of over concentration in the natural resource extraction with more advance differential economy, Myanmar economy can have green economy and healthy environment without scarifying its economic growth. Differentiated FDI inflows in

other sector have larger chance to avoid potential “resource curse” and leads to long-term benefits - job creation and technology transfer.

To ~~To~~ maintain sustainable economic growth without severe consequences for the ecosystem, the skillful, efficient and all- inclusive natural resource and environmental governance is necessary in Myanmar. Myanmar government with the limited institutional capacities and flexible environmental management, it enforces to reduce investments in high emission industries with effective laws and regulations on the local and foreign investors. Moreover, there are adequate systematically measure and document regarding with the environmental health and social costs of natural resource extraction. As an alternative of over concentration in the natural resource extraction with more advance differential economy, Myanmar economy can have green economy and healthy environment without scarifying its economic growth. Differentiated FDI inflows in other sector have larger chance to avoid potential “resource curse” and leads to long-term benefits - job creation and technology transfer.

~~To maintain sustainable economic growth without severe consequences for the ecosystem, the skillful, efficient and all- inclusive natural resource and environmental governance is necessary in Myanmar. Myanmar government with the limited institutional capacities and flexible environmental management, it enforces to reduce investments in high emission industries with effective laws and regulations on the local and foreign investors.~~ Myanmar government requires to target on “green FDI” which focus on the adverse environmental externalities and economic growth.

7.5 Limitation and Recommendation for Future Research

This study is constrained by a number of factors that connect to and help explain environmental quality, such as the lack of data on CO2 emissions from different businesses and the dependability of government statistics. In order to focus exclusively on the reliable and more correlated data in this analysis, the author removed the unreliable data.

Future studies could examine Myanmar's environmental quality, the development of renewable energy sources including solar, wind, and hydropower, as well as its

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economic expansion.

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Appendix

A-1 Data Used for ARDL Model Estimations

Year	lnc	lnfdi	lnpec	lnur	lntr	lnif	lngdp
1995	2.00148	1.737158159	3.78419	3.258096538	3.688879	3.218876	4.734443
1996	2.054124	1.684523807	3.663562	3.258096538	3.806662	3.401197	4.887337
1997	2.140066	1.927660597	3.713572	3.295836866	3.806662	3.401197	4.852811
1998	2.230014	1.919349262	3.806662	3.295836866	3.828641	3.401197	4.640537
1999	0.09531	1.500678588	3.73767	3.295836866	3.828641	3.401197	4.830711
2000	2.174752	1.313704045	3.663562	3.295836866	3.871201	3.401197	5.013298
2001	2.186051	1.208597951	3.713572	3.295836866	3.828641	2.302585	4.906755
2002	2.397895	0.901422233	4.046029	3.295836866	3.828641	2.302585	4.879007
2003	2.360854	1.166103513	4.054043	3.33220451	3.806662	2.302585	5.107762
2004	2.415914	0.811261693	4.169297	3.33220451	3.78419	2.302585	5.290285
2005	2.341806	0.796831255	4.172385	3.33220451	3.713572	2.302585	5.402227
2006	2.388763	0.843711061	4.220977	3.33220451	3.688879	2.302585	5.508173
2007	2.116256	1.5158645	4.320949	3.36729583	3.713572	2.302585	5.77393
2008	2.066863	1.322789333	4.224934	3.36729583	3.688879	2.302585	6.157614
2009	2.151762	1.298309811	4.291007	3.36729583	3.637586	2.302585	6.398429
2010	2.219203	0.868863683	4.381276	3.36729583	3.610918	2.302585	6.640137
2011	2.533697	1.538177032	4.388381	3.36729583	3.637586	2.302585	6.990993
2012	2.653242	0.827321871	4.315486	3.36729583	3.663562	2.302585	7.057295
2013	2.873565	1.314307533	4.48108	3.36729583	3.663562	2.302585	7.086654
2014	2.97553	1.234875319	4.493792	3.401197382	3.850148	2.70805	7.121818
2015	3.126761	1.868354092	4.544889	3.401197382	3.850148	2.70805	7.11037
2016	3.511545	1.693238016	4.59875	3.401197382	3.89182	2.995732	7.057812
2017	3.549617	2.056461867	4.822778	3.401197382	3.970292	2.995732	7.069194
2018	3.663562	0.968279357	5.039417	3.433987204	3.988984	3.401197	7.150623
2019	3.681351	0.926800677	5.04992	3.433987204	3.988984	3.401197	7.16642
2020	3.688879	0.882217643	5.222354	3.433987204	3.988984	3.401197	7.298107
2021	3.691376	1.155280229	5.372032	3.433987204	3.903991	3.433987	7.098293

A-2 Descriptive Analysis and Empirical Analysis for Eq- 9 and 11

	LNC	LNPEC	LNTR	LNIF
Mean	2.566305	4.307132	3.797418	2.785319
Median	2.388763	4.291007	3.806662	2.708050
Maximum	3.691376	5.372032	3.988984	3.433987
Minimum	0.095310	3.663562	3.610918	2.302585
Std. Dev.	0.775032	0.484751	0.115475	0.510396
Skewness	-0.705462	0.523054	0.118617	0.229516
Kurtosis	5.064461	2.536364	1.990881	1.220263
Jarque-Bera	7.034293	1.472962	1.208925	3.800447
Probability	0.029684	0.478796	0.546368	0.149535
Sum	69.29024	116.2926	102.5303	75.20361
Sum Sq. Dev.	15.61752	6.109580	0.346695	6.773096
Observations	27	27	27	27

Null Hypothesis: D(LNC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.154289	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-8.326367
Test critical values:	1% level	-2.660720
	5% level	-1.955020
	10% level	-1.609070

*MacKinnon (1996)

Null Hypothesis: D(LNC) has a unit root
Exogenous: Constant
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-12.34556	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNTR has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.862513	0.0081
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

Null Hypothesis: D(LNTR) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.478502	0.0017
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.002634
HAC corrected variance (Bartlett kernel)	0.002933

Null Hypothesis: D(LNIF) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.842037	0.0007
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNIF) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-4.739551
Test critical values:	1% level	-2.660720
	5% level	-1.955020
	10% level	-1.609070

*MacKinnon (1996)

Null Hypothesis: D(LNIF) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.842047	0.0007
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNPEC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-4.328437
Test critical values:	1% level	-2.660720
	5% level	-1.955020
	10% level	-1.609070

*MacKinnon (1996)

Null Hypothesis: D(LNPEC) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.154369	0.0003
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.853692	74.17165	47.85613	0.0000
At most 1	0.481199	26.12061	29.79707	0.1251
At most 2	0.308942	9.714715	15.49471	0.3033
At most 3	0.018877	0.476430	3.841465	0.4900

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.853692	48.05105	27.58434	0.0000
At most 1	0.481199	16.40589	21.13162	0.2020
At most 2	0.308942	9.238284	14.26460	0.2669
At most 3	0.018877	0.476430	3.841465	0.4900

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Null Hypothesis: D(LNUR) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.320872	0.0003
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNC)
Selected Model: ARDL(4, 3, 4, 3)
Case 3: Unrestricted Constant and No Trend
Date: 03/02/23 Time: 23:35
Sample: 1995 2021
Included observations: 23

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-66.84071	17.58348	-3.801337	0.0126
LNC(-1)*	-4.842913	1.207279	-4.011427	0.0102
LNPEC(-1)	4.877079	0.992352	4.914665	0.0044
LNTR(-1)	16.23593	4.465688	3.635705	0.0150
LNIF(-1)	-1.135537	0.354153	-3.206344	0.0238
D(LNC(-1))	3.658691	1.370453	2.669695	0.0444
D(LNC(-2))	3.147258	1.044974	3.011805	0.0297
D(LNC(-3))	1.153211	0.396132	2.911177	0.0334
D(LNPEC)	0.540209	1.216960	0.443900	0.6757
D(LNPEC(-1))	-7.064422	2.835893	-2.491075	0.0551
D(LNPEC(-2))	-4.724955	1.640860	-2.879561	0.0346
D(LNTR)	8.007659	1.464672	5.467205	0.0028
D(LNTR(-1))	-9.319176	3.874657	-2.405162	0.0612
D(LNTR(-2))	-4.411588	3.301823	-1.336107	0.2391
D(LNTR(-3))	-7.252489	2.957463	-2.452267	0.0578
D(LNIF)	0.433725	1.311565	0.330693	0.7543
D(LNIF(-1))	4.094350	1.450943	2.821854	0.0370
D(LNIF(-2))	1.055419	0.666922	1.582521	0.1744

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPEC	1.007055	0.078631	12.80734	0.0001
LNTR	3.352512	0.416850	8.042492	0.0005
LNIF	-0.234474	0.100084	-2.342765	0.0662

EC = LNC - (1.0071*LNPEC + 3.3525*LNTR -0.2345*LNIF)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.853692	74.17165	47.85613	0.0000
At most 1	0.481199	26.12061	29.79707	0.1251
At most 2	0.308942	9.714715	15.49471	0.3033
At most 3	0.018877	0.476430	3.841465	0.4900

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.853692	48.05105	27.58434	0.0000
At most 1	0.481199	16.40589	21.13162	0.2020
At most 2	0.308942	9.238284	14.26460	0.2669
At most 3	0.018877	0.476430	3.841465	0.4900

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNC)
Selected Model: ARDL(4, 3, 4, 3)
Case 3: Unrestricted Constant and No Trend
Date: 03/02/23 Time: 23:35
Sample: 1995 2021
Included observations: 23

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-66.84071	17.58348	-3.801337	0.0126
LNC(-1)*	-4.842913	1.207279	-4.011427	0.0102
LNPEC(-1)	4.877079	0.992352	4.914665	0.0044
LNTR(-1)	16.23593	4.465688	3.635705	0.0150
LNIF(-1)	-1.135537	0.354153	-3.206344	0.0238
D(LNC(-1))	3.658691	1.370453	2.669695	0.0444
D(LNC(-2))	3.147258	1.044974	3.011805	0.0297
D(LNC(-3))	1.153211	0.396132	2.911177	0.0334
D(LNPEC)	0.540209	1.216960	0.443900	0.6757
D(LNPEC(-1))	-7.064422	2.835893	-2.491075	0.0551
D(LNPEC(-2))	-4.724955	1.640860	-2.879561	0.0346
D(LNTR)	8.007659	1.464672	5.467205	0.0028
D(LNTR(-1))	-9.319176	3.874657	-2.405162	0.0612
D(LNTR(-2))	-4.411588	3.301823	-1.336107	0.2391
D(LNTR(-3))	-7.252489	2.957463	-2.452267	0.0578
D(LNIF)	0.433725	1.311565	0.330693	0.7543
D(LNIF(-1))	4.094350	1.450943	2.821854	0.0370
D(LNIF(-2))	1.055419	0.666922	1.582521	0.1744

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPEC	1.007055	0.078631	12.80734	0.0001
LNTR	3.352512	0.416850	8.042492	0.0005
LNIF	-0.234474	0.100084	-2.342765	0.0662

EC = LNC - (1.0071*LNPEC + 3.3525*LNTR -0.2345*LNIF)

ARDL Error Correction Regression
Dependent Variable: D(LNC)
Selected Model: ARDL(4, 3, 4, 3)
Case 3: Unrestricted Constant and No Trend
Date: 03/03/23 Time: 00:20
Sample: 1995 2021
Included observations: 23

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-66.84071	8.702229	-7.680873	0.0006
D(LNC(-1))	3.658691	0.617248	5.927422	0.0019
D(LNC(-2))	3.147258	0.474507	6.632691	0.0012
D(LNC(-3))	1.153211	0.249398	4.623986	0.0057
D(LNPEC)	0.540209	0.710023	0.760833	0.4811
D(LNPEC(-1))	-7.064422	1.180772	-5.982884	0.0019
D(LNPEC(-2))	-4.724955	0.723384	-6.531738	0.0013
D(LNTR)	8.007659	0.941073	8.509069	0.0004
D(LNTR(-1))	-9.319176	1.503246	-6.199369	0.0016
D(LNTR(-2))	-4.411588	1.421377	-3.103742	0.0267
D(LNTR(-3))	-7.252489	0.928504	-7.810942	0.0006
D(LNIF)	0.433725	0.648159	0.669164	0.5330
D(LNIF(-1))	4.094350	0.528404	7.748525	0.0006
D(LNIF(-2))	1.055419	0.423465	2.492337	0.0550
CointEq(-1)*	-4.842913	0.631356	-7.670648	0.0006

R-squared	0.972792	Mean dependent var	0.063537
Adjusted R-squared	0.925179	S.D. dependent var	0.649882
S.E. of regression	0.177765	Akaike info criterion	-0.368410
Sum squared resid	0.252804	Schwarz criterion	0.372130
Log likelihood	19.23671	Hannan-Quinn criter.	-0.182166
F-statistic	20.43101	Durbin-Watson stat	2.353866
Prob(F-statistic)	0.000101		

	LNC	LNFDI	LNGDP	LNUR
Mean	2.566305	1.306746	6.045594	3.353031
Median	2.388763	1.298310	6.157614	3.367296
Maximum	3.691376	2.056462	7.298107	3.433987
Minimum	0.095310	0.796831	4.640537	3.258097
Std. Dev.	0.775032	0.394843	1.017045	0.054175
Skewness	-0.705462	0.315863	-0.082611	-0.069098
Kurtosis	5.064461	1.883208	1.253488	1.952358
Jarque-Bera	7.034293	1.852090	3.462303	1.256232
Probability	0.029684	0.396117	0.177080	0.533596
Sum	69.29024	35.28214	163.2310	90.53184
Sum Sq. Dev.	15.61752	4.053435	26.89391	0.076307
Observations	27	27	27	27

Null Hypothesis: D(LNUR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-6.069697
Test critical values:	1% level	-2.660720
	5% level	-1.955020
	10% level	-1.609070

Null Hypothesis: D(LNUR) has a unit root
Exogenous: Constant
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.749096	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Pairwise Granger Causality Tests
Date: 03/03/23 Time: 01:31
Sample: 1995 2021
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
LNPEC does not Granger Cause LNC	23	1.08971	0.3992
LNC does not Granger Cause LNPEC		4.02065	0.0224
LNTR does not Granger Cause LNC	23	0.63848	0.6436
LNC does not Granger Cause LNTR		0.36164	0.8318
LNIF does not Granger Cause LNC	23	0.24154	0.9100
LNC does not Granger Cause LNIF		23.7233	4.E-06
LNTR does not Granger Cause LNPEC	23	1.23596	0.3403
LNPEC does not Granger Cause LNTR		0.43960	0.7780
LNIF does not Granger Cause LNPEC	23	2.48460	0.0914
LNPEC does not Granger Cause LNIF		3.13346	0.0490
LNIF does not Granger Cause LNTR	23	0.08379	0.9861
LNTR does not Granger Cause LNIF		0.83865	0.5232

Date: 03/03/23 Time: 08:50
Sample (adjusted): 1997 2021
Included observations: 25 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: LNC LNFDI LNGDP LNUR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.747808	66.32039	63.87610	0.0307
At most 1	0.536687	31.88124	42.91525	0.3949
At most 2	0.332755	12.64743	25.87211	0.7652
At most 3	0.096337	2.532479	12.51798	0.9268

Null Hypothesis: D(LNFDI) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.058466	0.0050
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

Null Hypothesis: LNFDI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-2.915939
Test critical values:	1% level	-2.656915
	5% level	-1.954414
	10% level	-1.609329

*MacKinnon (1996)

Null Hypothesis: LNFDI has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.128692	0.0367
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

Null Hypothesis: D(LNUR) has a unit root
Exogenous: Constant
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.749096	0.0000
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.900399	0.0595
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic		-2.997611
Test critical values:	1% level	-2.660720
	5% level	-1.955020
	10% level	-1.609070

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Date: 03/03/23 Time: 08:50
Sample (adjusted): 1997 2021
Included observations: 25 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: LNC LNFDI LNGDP LNUR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.747808	66.32039	63.87610	0.0307
At most 1	0.536687	31.88124	42.91525	0.3949
At most 2	0.332755	12.64743	25.87211	0.7652
At most 3	0.096337	2.532479	12.51798	0.9268

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.747808	66.32039	63.87610	0.0307
At most 1	0.536687	31.88124	42.91525	0.3949
At most 2	0.332755	12.64743	25.87211	0.7652
At most 3	0.096337	2.532479	12.51798	0.9268

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.747808	34.43915	32.11832	0.0255
At most 1	0.536687	19.23381	25.82321	0.2898
At most 2	0.332755	10.11495	19.38704	0.6065
At most 3	0.096337	2.532479	12.51798	0.9268

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