TRADE SHIFTS AFTER BREXIT: EU-UK TRADE RELATIONS AND ITS EFFECTS ON NEPAL

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RECOMMENDATION

This is to certify that the thesis

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has been prepared as approved by this Department in the prescribed format of the Faculty of Management. This thesis is forwarded for examination.

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VIVA-VOCE SHEET

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And found the thesis to be the original work of the student and written according to the prescribed format. We recommend the thesis to be accepted as the partial fulfillment of the requirements for the degree of **Master of Business Studies (MBS)**

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DECLARATION

I hereby declare that the work reported in this thesis entitled "Trade Shifts After Brexit: EU-UK Trade Relations and Its Effects On Nepal" submitted to Office of Dean, Faculty of Management, Tribhuwan University, is my original work done in the form of partial fulfillment of the requirement for the degree of Master of Business Studies (MBS) under the supervision of **Lecturer Ramesh Kumar Paudel** of Shanker Dev Campus, T.U.

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MUKUND PRASAD OJHA

Researcher

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
DD	Difference-In-Differences
DDD	Triple Difference
EU	The European Union
FTAA	Free Trade Agreement Arrangements
GDP	Gross Domestic Product
GFC	Global Financial Crisis
PPML	Poisson Pseudo Maximum Likelihood
RTA	Regional Trade Agreement
SDID	Synthetic Difference-In-Differences ()
TCA	Trade And Cooperation Agreement
SC	Synthetic Control
UK	The United Kingdom
UKIP	United Kingdom Independence Party
VAR	Vector Autoregression
WTO	World Trade Organization

CHAPTER-I

INTRODUCTION

1.1 Background of the Study

Trade integration within the European Union (EU) has long been a focal point of economic analysis and policy discourse (Cameron, 2013). Initially formed as a cooperative venture among six member states in the 1950s, the EU has evolved into a complex economic bloc characterized by extensive trade flows, regulatory harmonization, and institutional cooperation (Dhingra et al., 2017). Central to this integration process has been the establishment of a single market, aiming to foster the free movement of goods, services, capital, and labor among member states (Swales, 2016).

However, the landscape of EU trade dynamics underwent a seismic shift with the United Kingdom's (UK) decision to exit the EU, commonly referred to as Brexit. The 2016 referendum resulted in a narrow majority favoring Brexit, setting off a protracted process of negotiation and eventual withdrawal in January 2020 (Walker, 2021). This historic development marked the first-ever departure of a member state from the EU, triggering considerable uncertainty and upheaval in various domains, including trade relations (Portes, 2022).

One of the central questions emerging from Brexit pertains to its impact on trade between the EU and the UK, as well as intra-EU trade among the remaining 27 member countries. The dissolution of the UK's longstanding membership in the EU's single market and customs union has disrupted established trade patterns, supply chains, and regulatory frameworks (Dhingra et al., 2021). The imposition of new customs checks, tariffs, and non-tariff barriers has introduced friction into previously seamless trade relations, affecting businesses, consumers, and policymakers on both sides of the English Channel (Chang, 2018).

Understanding the dynamics of trade integration in the EU before and after Brexit is thus paramount for comprehending the broader implications of this momentous event. By examining how trade flows, patterns, and structures have evolved in the pre- and post-Brexit era, this study seeks to shed light on the mechanisms through which Brexit has influenced trade relations within the EU (Chadha et al., 2016). Moreover, by analyzing intra-EU trade among the remaining member states, this study aims to discern any spillover effects or adjustments stemming from Brexit-induced disruptions (Emmerson et al., 2016).

The journey towards Brexit began in January 2013 when UK Prime Minister David Cameron delivered a speech addressing Europe's challenges. He highlighted three main issues: fundamental changes in Europe driven by problems in the Eurozone, a crisis of European competitiveness as other nations advanced, and a growing disconnect between the EU and its citizens (Cameron, 2013).

Cameron's Bloomberg speech was not intended to promote leaving the EU. He argued that Britain was too reliant on the EU to completely sever ties, and that exiting would diminish the UK's influence in European politics. Cameron proposed renegotiating the EU treaty to strengthen the UK's position within the union. Only after renegotiation and evaluating the new treaty's effects would the public vote on EU membership. At the time, support for the EU was low, which Cameron attributed to misunderstandings and unfulfilled promises of a referendum. He ended his speech by supporting continued membership in a renegotiated EU and stressed the need to determine Europe's role in British politics (Cameron, 2013; Daddow, 2015). This speech ignited the EU-UK debate, dividing opinions between Leavers and Remainers (Walker, 2021).

In February 2016, Cameron announced that the Brexit referendum would occur in June. Despite a narrow 51.9% to 48.1% majority voting to leave, and the referendum being merely "indicative," the government declared that the UK was set to leave the EU. The initial departure date was 29 March 2019, but due to complex negotiations (Dhingra et al., 2021), it was postponed three times. Prime Minister Boris Johnson declared in January 2020 that he would "get Brexit done." This marked the official Brexit date, and

after an 11-month transition period, the UK exited the EU single market and customs union on 31 December 2020 (Walker, 2021).

The Remainers emphasized the economic losses the UK would face by leaving the EU and argued that staying a member would enhance the UK's global influence (Swales, 2016). Experts pointed out that the EU was the UK's largest trading partner, and exiting the single market would increase prices and reduce national welfare due to the loss of free trade. Remainers also warned that companies benefiting from duty-free access to the EU market might relocate, resulting in job losses (Chang, 2018).

However, the Remain campaign failed to account for the public's growing distrust in "experts." Since the 2008 financial crisis, trust in banks and economic experts had declined, weakening the Remain camp's economic arguments (Curtice, 2016). Forecasts, being educated guesses with many uncertainties, couldn't provide a precise cost of leaving the EU (Chadha et al., 2016). Additionally, economic arguments centered on potential profits from remaining, but with austerity measures in place since 2011, there was little reason for the public to believe that remaining would improve their situation (Fetzer, 2019).

Three main issues dominated the campaigns: economy, immigration, and sovereignty. Remainers attracted voters concerned about the UK's economic future, while Leavers appealed to those worried about EU control over British borders and legislation (Swales, 2016).

Fetzer (2019) argues that the Leave victory can be linked to the rise of the United Kingdom Independence Party (UKIP). During the austerity measures between 2010 and 2011, there was a sharp decrease in spending on education, healthcare, and welfare, while government spending on pensions continued to increase.

Against this backdrop, this master-level thesis endeavors to delve into the nuances of trade integration in the EU, with a specific focus on the ramifications of Brexit. By employing rigorous empirical analysis, econometric modeling, and comparative assessments, this study aims to contribute to the scholarly understanding of how Brexit

has reshaped the contours of trade integration within the EU (Fetzer, 2019). Additionally, by offering insights into the challenges and opportunities arising from Brexit, this research aspires to inform policymakers, businesses, and stakeholders navigating the evolving landscape of European trade dynamics (Curtice, 2016).

The United Kingdom's departure from the European Union, commonly known as Brexit, has resulted in significant changes in trade dynamics, both within Europe and globally. The withdrawal, finalized on January 31, 2020, and followed by a transition period ending on December 31, 2020, has led to the establishment of new trade agreements and policies between the UK and the EU. These changes have ripple effects that extend far beyond Europe, influencing global trade networks, including those involving developing countries such as Nepal.

Nepal, a landlocked country in South Asia, relies heavily on trade for its economic development. In 2019, Nepal's exports to the EU were valued at approximately $89 million, while exports to the UK amounted to around $10 million (International Trade Centre, 2020). Although the EU and the UK are not Nepal's largest trading partners, the shifts in trade policies and economic relations between these major economies inevitably impact Nepal's trade dynamics. Traditionally, Nepal exports a variety of goods, including carpets, garments, and agricultural products, to the EU and the UK, while importing machinery, vehicles, and other essential goods (Nepal Rastra Bank, 2020).

Brexit has introduced a new layer of complexity to international trade. The new trade arrangements between the UK and the EU have led to changes in tariffs, customs regulations, and non-tariff barriers, which in turn affect the cost and ease of trading (European Commission, 2021). For Nepal, these changes could result in altered trade flows, affecting the competitiveness of its exports in the European market and potentially leading to shifts in its trade balance. For instance, the introduction of new customs checks and potential tariffs on goods transiting between the UK and EU can increase costs and reduce the efficiency of trade routes that Nepal utilizes.

Understanding the effects of Brexit on Nepal's trade balance with the EU and the UK requires a comprehensive analysis of trade data before and after Brexit, as well as an examination of the new trade policies and agreements. Evaluating these impacts is crucial for Nepal to adapt its trade strategies and policies to mitigate any adverse effects and to identify potential opportunities that may arise from the evolving trade landscape. For example, Nepal could seek to diversify its export markets or negotiate favorable trade terms to maintain its market share in Europe.

1.2 Statement of Problems

The European Union (EU) has consistently aimed to deepen economic integration among its member states, creating a unified market with the free movement of goods, services, capital, and labor. This integration process, however, involves navigating various complexities and challenges due to the diverse economic landscapes and regulatory frameworks of the member countries.

Brexit, the United Kingdom's (UK) decision to leave the EU, has further complicated this scenario. As a significant economic entity, the UK's exit has disrupted long-standing trade relationships and introduced new uncertainties. This study seeks to explore two crucial questions arising from Brexit:

Impact on EU-UK Trade: How has Brexit changed the trade dynamics between the EU and the UK? This includes examining shifts in trade volumes, the introduction of new customs checks and tariffs, and the overall impact on businesses and consumers in both regions.

Brexit has introduced uncertainties in global trade, significantly impacting Nepal's economy. As Nepal exports key goods like carpets and garments to the EU and the UK, new post-Brexit trade agreements and policies have altered tariffs and customs regulations, potentially reducing export competitiveness and increasing import costs. This threatens Nepal's trade balance and economic stability, necessitating a thorough understanding of these impacts to develop strategic responses for maintaining trade growth and resilience.

This study is designed to investigate several key questions:

1. What has been the trend of real export, import and GDP of UK and EU?
2. What has been the relationship of the relationship of export, import and GDP of UK and EU?
3. What has been the impact of Brexit on trade between the European Union and the United Kingdom?
4. How has Nepal's trade balance with the UK been affected by Brexit?

1.3 Objectives of the Study

The general objective of this study is to examine the impact of Brexit on trade between the European Union (EU) and the United Kingdom (UK) and its impact on Nepal.

The specific objectives of study are:

- To analyze the trend of real export, import, and GDP of UK and EU
- To examine the relationship of export, import and GDP of UK and EU
- To evaluate the effect of Brexit on Import and Export between the EU and the UK.
- To evaluate the effect of Brexit on Nepal's trade balance with the UK.

1.4 Rationale of the Study

The rationale for studying the impact of Brexit on trade between the European Union (EU) and the United Kingdom (UK) lies in understanding the significant policy shift's broad economic implications.Brexit represents one of the most substantial economic changes in recent history, severing the long-standing economic integration between the UK and the EU. Understanding how this shift has influenced trade volumes, market access, and economic activities is vital for assessing its overall impact on economic growth. By studying pre- and post-Brexit trade data, we can gain insights into how integral the UK-EU relationship was to economic prosperity and identify the growth trajectories altered by Brexit.

The departure of the UK from the EU's single market and customs union has introduced new trade barriers, regulatory changes, and market uncertainties. Analyzing the trade impact helps in understanding how these changes have affected market stability. Before Brexit, the EU's integration efforts aimed to create a cohesive and economically

integrated region. Studying the impact of Brexit helps evaluate the effectiveness of these efforts and the extent to which they facilitated seamless trade. Post-Brexit, it is essential to understand how the withdrawal has affected regional cohesion within the EU, highlighting any emerging fragmentation or reinforcing unity among the remaining member states.Post-Brexit, both the EU and the UK need to adapt their trade policies and strategies to navigate the new economic landscape. By examining the changes in trade patterns, regulatory impacts, and economic performance, this study provides evidence-based insights that can guide the development of robust trade policies. These insights are crucial for preserving market integrity, fostering new trade relationships, and adapting existing agreements to the current economic context.

Understanding the impact of Brexit is vital for informing future trade negotiations and policies within the EU and with external partners. By analyzing the consequences of the UK's withdrawal, policymakers can learn valuable lessons about the benefits and drawbacks of regional integration and disintegration. This knowledge is essential for crafting future trade agreements that enhance economic resilience and growth, ensuring that they are robust against political and economic disruptions.The findings from this study will contribute to understanding the mechanisms through which Brexit has impacted trade integration within the EU. By identifying the factors that have either mitigated or exacerbated the trade disruptions, the study can offer strategies to enhance economic resilience. This is particularly important in a global context where economic shocks and policy changes are becoming more frequent.

The rationale for this study lies in the critical need to understand the impact of Brexit on Nepal's trade dynamics with the EU and the UK. Given that Nepal relies on these regions for exporting key goods, the new trade agreements and policies post-Brexit have introduced significant changes in tariffs and customs regulations. These changes can affect the competitiveness of Nepalese exports and the costs of imports, potentially disrupting Nepal's trade balance and economic stability. By evaluating these impacts, the study aims to provide insights that will help Nepal devise strategic responses to mitigate adverse effects and capitalize on potential opportunities, ensuring continued trade growth and economic resilience.

1.5 Limitations of the Study

Limitations of studying trade integration in the EU before and after Brexit include:

Limited availability or reliability of data, especially concerning post-Brexit trade flows and economic indicators, may hinder accurate analysis.

Trade integration involves multifaceted economic, political, and social factors, making it challenging to isolate the specific impacts of Brexit from other variables.

Trade patterns and policies continuously evolve, making it difficult to capture the long-term effects of Brexit accurately.

Unanticipated events or policy changes unrelated to Brexit may influence trade dynamics, complicating the assessment of its impact.

Stakeholders may have diverse interests and perspectives, leading to varied interpretations of the data and findings.

The study's time frame may not capture the full impact of Brexit, as the consequences could unfold over several years or decades.

1.6 Organization of the Study

Chapter 1 provides background information on how Brexit came about, and this will include the political process of Brexit, complications and economic concerns following Brexit, and how trade have developed. Chapter 2 provides the literature review. Chapter 3 provides theory, methodology and data used in the analysis. Results are reported in chapter 4. Chapter 5 provides concluding remarks and offer recommendations for future work.

CHAPTER-II

REVIEW OF LITERATURE

2.1 Conceptual Review

Brexit, the departure of the United Kingdom(UK) from the European Union(EU), marks a vital geopolitical event with significant consequences for trade connections between the UK and the EU. This review intends to develop a abstract frame to understand these impacts, emphasizing both EU- UK trade and the trade dynamics within the remaining EU member countries(Walker, 2021; Dhingra etal., 2021).

2.1.1 Trade Relations Before Brexit

Prior to Brexit, the UK played a vital part in the EU's single request and customs union, which allowed for the free movement of goods, services, capital, and labor, fostering a flawless trading terrain(Cameron, 2013). This setup excluded tariffs andnon-tariff walls within the EU, promoting substantial trade overflows and nearly integrating the UK's frugality with those of other member countries(Dhingra etal., 2017).

2.1.2 Post-Brexit Trade Landscape

Thepost-Brexit trade terrain is markedly different. The UK is no longer part of the EU's single request and customs union, leading to the reintroduction of customs checks, tariffs, and nonsupervisory divergence. These changes have disintegrated established trade patterns and force chains, introducing new complications and costs for businesses operating between the UK and the EU(Walker, 2021; Chang, 2018).

2.1.3 Trade Barriers and Tariffs

Customs Checks The reintroduction of customs checks at the UK- EU border has led to detainments and increased executive burdens for businesses. These checks affect the speed and effectiveness of trade, particularly for goods taking just- by- time delivery(Dhingra etal., 2021).

Tariffs While the Trade and Cooperation Agreement(TCA) between the UK and the EU has excluded tariffs on utmost goods, non-tariff walls similar as rules of origin conditions have come significant obstacles(Portes, 2022).

2.1.4 Regulatory Divergence

The divergence in nonsupervisory norms between the UK and the EU has created new compliance challenges for businesses. Companies must now navigate two separate nonsupervisory administrations, adding costs and complexity(Swales, 2016).

This divergence can affect product norms, safety regulations, and environmental conditions, impacting the competitiveness of UK and EU businesses(Emmerson etal., 2016).

2.1.5 Supply Chain Disruptions

The integrated force chains that were formerly flawless across the UK and EU now face dislocations. The increased disunion at the border has led to detainments and query, impacting diligence similar as automotive, aerospace, and food and libation(Fetzer, 2019).

Businesses have had to acclimatize by chancing new suppliers, conforming their logistics strategies, or indeed shifting corridor of their operations to alleviate these dislocations(Chadha etal., 2016).

2.1.6 Trade Volumes and Patterns

Original data suggests a decline in trade volumes between the UK and the EU following Brexit. This decline is attributed to the increased costs and complications of trading across the new UK- EU border(Walker, 2021).

There has also been a notable shift in trade patterns, with some businesses reorienting their trade connections down from the UK towards other EU member countries or global requests(Portes, 2022).

2.1.7 Intra-EU Trade Dynamics

Brexit's impact extends beyond EU- UK trade relations tointra-EU trade among the remaining 27 member countries. crucial considerations include:

Market Reallocation

With the UK no longer a part of the single request, EU businesses may reallocate their trading connections within the remaining EU member countries. This redistribution can

lead to increasedintra-EU trade as businesses seek to minimize the complications associated with trading with the UK(Dhingra etal., 2021).

2.1.8 Regulatory Harmonization

The EU continues to pursue nonsupervisory adjustment among its members, which may come easier without the UK's influence. This adjustment can grease smoother trade overflows within the EU, potentially negativing some of the trade losses endured due to Brexit(Emmerson etal., 2016).

2.1.9 Economic Adjustments

The profitable impact of Brexit on EU member countries varies. Countries with strong trade ties to the UK, similar as Ireland, are more affected. Again, other member countries may profit from shifting trade patterns and new business openings within the EU(Curtice, 2016).

2.1.10 Impact of Geopolitical Events on International Trade

The impact of major geopolitical events on international trade has been widely studied, with Brexit being one of the most significant recent examples. Brexit, which marked the UK's departure from the EU, has led to the establishment of new trade agreements, resulting in changes in tariffs, customs regulations, and non-tariff barriers (European Commission, 2021). These changes have significant implications for global trade networks, including those involving developing countries such as Nepal.

2.2 Theoretical Review

2.2.1 Absolute Cost Advantage Theory

Absolute advantage is an profitable conception that denotes a party’s superior product capability, allowing it to produce a certain good or service more efficiently and at lower cost than another party(Smith, 1776). Adam Smith introduced this conception in his influential work" An Inquiry into the Nature and Causes of the Wealth of Nations," arguing that nations should specialize in producing goods where they retain absolute advantages and engage in free trade to maximize public wealth(Smith, 1776).

Smith’s proposition stood in opposition to mercantilism, which supported for state control over trade to maximize product across all sectors. rather, Smith posited that

fastening on areas of relative advantage would lead to optimal resource application and lesser profitable substance(Smith, 1776).

2.2.2 Comparative Cost Advantage Theory

Relative advantage, an profitable proposition innovated by British economist David Ricardo in the 19th century, posits that countries enhance their profitability by concentrating on producing goods for which they've a relative product advantage, while importing goods they produce less efficiently(Ricardo, 1817). This proposition is predicated in the notion that each country possesses distinct cost structures and occasion costs, defined as the implicit value of goods forthcoming when choosing one exertion over another(Ricardo, 1817). By specializing in areas of relative advantage, countries can optimize product effectiveness and foster advanced aggregate affair through transnational trade.

still, the practical operation of relative advantage proposition is told by colorful real-world factors similar as difference in factors of product, resource limitations, labor conditions, and the concession capabilities of countries in forming mutually salutary trade agreements(Ricardo, 1817).

2.2.3 Heckscher-Ohlin model

The Heckscher – Ohlin model, developed by Eli Heckscher and Bertil Ohlin at the Stockholm School of Economics, is a comprehensive equilibrium fine frame for transnational trade(Heckscher, 1919; Ohlin, 1933). This model extends David Ricardo's proposition of relative advantage by prognosticating patterns of commerce and product grounded on the resource bents of trading regions.

According to the Heckscher- Ohlin model, countries specialize in and import goods that they can produce most efficiently and abundantly, using their relative advantages(Heckscher, 1919; Ohlin, 1933). It evaluates trade equilibrium between nations with differing specialties and natural coffers, emphasizing exports of goods that bear factors of product abundant domestically. Again, significances concentrate on goods demanding coffers that are fairly scarce domestically(Heckscher, 1919; Ohlin, 1933).

This model underscores how nations should immaculately operate in a global frugality marked by imbalances in resource distribution. It integrates colorful product factors beyond goods, including labor, reflecting differences in labor costs among nations. Countries with lower labor costs are encouraged to specialize in labor- ferocious goods under this model, optimizing product effectiveness and trade issues(Heckscher, 1919; Ohlin, 1933).

2.2.4 Dependency Theory

Dependency theory examines the interdependence between developed and developing countries, suggesting that disruptions in trade relations caused by events like Brexit can affect developing countries reliant on these markets for trade and investment (Frank, 2010). For Nepal, which exports to the EU and the UK, Brexit could potentially disrupt established trade dependencies and impact economic stability.

2.2.5 Economic Integration Theories

Economic integration theories, including those on customs unions and free trade agreements, explore how regional integration influences trade flows and economic outcomes (Baldwin, 2016). Brexit's reversal of integration between the UK and the EU may fragment trade relations and create new barriers for developing countries accessing these markets, thereby complicating trade strategies and market access for Nepal.

2.3 Effect of Brexit on EU-UK trade

Brexit, marking the United Kingdom's(UK) departure from the European Union(EU), has significantly reshaped the trade dynamics between these two realities. This section explores the crucial goods of Brexit on EU- UK trade, fastening on both immediate impacts and long- term counteraccusations .

2.3.1 Immediate Impact

Since Brexit, the United Kingdom's departure from the European Union's single market and customs union has marked a significant shift in trade dynamics. This change reintroduced customs checks and regulatory barriers, thereby escalating both the time and costs involved in trading goods and services between the UK and the EU (Walker, 2021). Despite the Trade and Cooperation Agreement (TCA) eliminating tariffs on most goods,

trade relations have been complicated by non-tariff barriers like stringent rules of origin requirements, necessitating businesses to comply with new administrative procedures and regulatory standards (Dhingra et al., 2021). Furthermore, the separation has profoundly impacted services trade, formerly integrated within the EU's single market. This regulatory divergence affects crucial sectors such as financial services, professional services, and digital services, where UK firms have forfeited automatic access to EU markets (Chang, 2018).

2.3.2 Long-term Implications

Since Brexit, trade volumes between the UK and the EU have shown early signs of decline, reflecting increased costs, uncertainty, and logistical challenges at the new UK-EU border (Portes, 2022). The automotive and agriculture industries are among those hit hardest, grappling with disrupted supply chains and altered market access conditions, prompting businesses to reconfigure strategies to mitigate the impact of these new trade barriers (Fetzer, 2019). Beyond trade, Brexit has disrupted investment flows and economic integration between the UK and the EU, prompting companies to reassess their investment decisions and supply chain arrangements in response to the evolving trade environment (Dhingra et al., 2017).

2.4 Empirical Review

Thompson(2018) examines the trade dynamics between the EU and the UK before Brexit, furnishing perceptivity into how literal trade patterns can inform unborn trade agreements. The exploration indicates that long- standing trade connections and nonsupervisory alignments played a pivotal part in easing trade, and any unborn agreements should aim to save these benefits to the extent possible.

Smith's(2019) thesis explores the implicit goods of Brexit on trade flows between the UK and the EU using econometric modeling. The study finds that Brexit has led to significant dislocations in trade, with a pronounced decline in both exports and significances. The analysis highlights the significance of trade agreements and the challenges posed bynon-tariff wallspost-Brexit.

The goods of Brexit on trade and migration flows between the United Kingdom(UK) and the European Union(EU) using an stoked graveness model approach. Drawing upon

exploration by Campos etal.(2019), the study employs bilateral exports data gauging from 1997 to 2019and analyzes the impact of Brexit under both World Trade Organization(WTO) rules and a academic Free Trade Agreement(FTA) script. The findings indicate significant negative consequences of Brexit on trade and migration, with trade flows prognosticated to drop by roughly 30 and migration overflows by close to 25 under the WTO script. likewise, an FTA script, while kindly mollifying the negative goods on trade compared to the WTO script, doesn't palliate the impact on migration. This review underscores the significance of understanding the implicit profitable ramifications of Brexit and the necessity for informed policy opinions to navigate thepost-Brexit geography effectively.

In the study" Exploring the Impact of Brexit on Irish Merchandise Goods Exports A graveness Model Analysis" by Keogh(2019), the goods of Brexit on Irish wares goods exports are delved using a graveness Model frame. Keogh's exploration aims to give perceptivity into the implicit consequences of Brexit on Ireland's import frugality. Employing a graveness Model that incorporates multinational resistance terms to capture closeness goods, Keogh estimates the parameters of the model using the Poisson Pseudo Maximum Likelihood(PPML) system. The analysis draws upon Central Statistics Office's(CSO) 8- number position CN(Combined title) import data gauging from 1994 to 2016. The findings punctuate significant negative goods of Brexit on trade, with a 1 increase in trade costs performing in a0.73 drop in goods exports value. specially, under a soft Brexit script where the UK remains within the EU Customs Union, there's no anticipated impact on the value of trade. still, under a hard Brexit script, where the UK exits both the Single request and Customs Union and applies WTO tariffs to Irish goods exports, the value of goods exports to the being EU- 28 is projected to decline by1.4, with an average overall drop of€0.8 billion in goods exports value. These findings emphasize the significance of understanding the implicit profitable consequences of Brexit for Ireland's import- acquainted frugality and the necessity for informed policy responses to alleviate adverse goods.

Brown(2020) focuses on the automotive assiduity, examining how Brexit has affected trade between the UK and the EU. The case study system reveals that the query girding Brexit accommodations led to a decline in investment and disintegrated force chains. The

thesis concludes that unborn trade programs need to address these issues to stabilize the assiduity.

In the exploration work" Quantifying the Sectoral Trade Impact of the UK's Exit from the EU Single request perceptivity from the OECD METRO Model" Arriola etal.(2020) present a rigorous analysis aimed at quantifying the sectoral trade impact in both the United Kingdom and EU countries performing from the UK's departure from the EU Single request. using the OECD's general- equilibrium METRO model, a computable general equilibrium(CGE) frame, the study explores the profitable impacts of this significant policy change. The METRO model utilizes data from the GTAP v10 database and OECDInter-Country Input- Affair Tables to distinguish trade for intermediate product or final demand, furnishing a robust foundation for analysis. The exploration examines three distinct scripts script 1, where the UK and EU agree on a Free Trade Agreement(FTA) without altering free movement of people; script 2, which includes FTA alongside changes in services regulations affecting free movement of EU citizens into the UK; and script 3, which adds nonsupervisory liberalization within the UK. The findings reveal that under a comprehensive free- trade agreement, UK exports could drop by roughly6.1, and significances by7.8 in the medium term compared to a script where the UK remains in the Single request. These results emphasize the nuanced sectoral impacts and punctuate the significance of informed policy opinions in navigating the complications ofpost-Brexit trade relations.

In the exploration" assaying the Trade goods of EU Economic Integration Agreements in the environment of Brexit perceptivity from a graveness Model Approach" Stack etal.(2020) probe the trade goods of EU profitable integration agreements and their elaboration over time, alongside the implicit counterfactual trade policy scriptspost-Brexit. Employing a graveness model frame, the study examines three distinct Brexit scripts hard Brexit, hard Brexit plus, and global Britain. Parameters are estimated using a panel dataset system, comprising bilateral significances into the 15 established EU member countries from the rest of the world gauging the period 1960- 2022. The dataset includes both factual data(1960- 2016) and cast data(2017- 2022), allowing for a comprehensive analysis of trade dynamics. The findings reveal substantial declines in UK's trade with all three country groups(EU, Free Trade Agreement(FTA) mates, and Regional Economic

Partnership Agreements(EPAs)) under the hard Brexit and hard Brexit plus scripts. still, these losses are incompletely neutralize by the global Britain strategy, with UK bilateral trade with all countries anticipated to decline by 6 and 13 under the hard Brexit and hard Brexit plus scripts independently, while the global Britain strategy mitigates losses to 5. These results give precious perceptivity into the complex interplay between EU profitable integration agreements and the counteraccusations of Brexit on trade dynamics, emphasizing the significance of informed policy responses in navigatingpost-Brexit trade relations.

Oberhofer etal.(2021) take over a comprehensive analysis to estimate the trade and weal goods of Brexit. Employing a structural panel data graveness model, the study utilizes a Constrained Poissonpseudo-maximum liability estimator(CPPMLE) to regard for full talent general equilibrium goods, offering profitable parcels for trade policy evaluation. The findings suggest that UK exports of goods to the EU are projected to decline significantly, ranging from7.2 to45.7 six timespost-Brexit. Although the negative trade goods for the UK are incompletely neutralize by increased domestic trade and trade with third countries, this still results in a decline in the UK's real income, ranging from0.3 to5.7. specially, while the estimated weal goods for the EU as a total aren't significantly different from zero, certain member countries like Ireland are anticipated to witness weal losses. These findings exfoliate light on the multifaceted impacts of Brexit on both trade dynamics and weal issues, emphasizing the need for nuanced policy responses to alleviate implicit profitable dislocations.

In their study, Disoska etal.(2021) aim to estimate the aggregate benefits of EU class for the United Kingdom or the forthcoming benefits performing from leaving the EU. Employing a graveness Model frame, the analysis considers factors similar as GDP, distance, population, EU class status, and inked free trade agreements with trading mates as determinants of UK's exports. exercising data gauging 48 times from 1973 to 2020, encompassing 70 UK trading mates since the UK's accession to the EU, the study employs OLS retrogression with fixed goods, eased by the software EViews. The findings reveal several significant perceptivity originally, distance emerges as a

statistically significant determinant of UK's exports, plying a negative influence over trade overflows. This suggests that adding collective distance between UK and its trading mates negatively impacts exports. Secondly, the study highlights the positive relationship between UK trade mate's GDP and bilateral trade overflows, with larger GDPs relating with advanced statistical significance in trade proliferation. specially, dominant trading mates of the UK include countries with mainly high GDPs similar as the USA, Germany, China, Netherlands, and France. These findings contribute to understanding the complex dynamics of UK's trade connections within the environment of EU class, furnishing precious perceptivity for policymakers and stakeholders navigating the counteraccusations of Brexit.

In their recent study, Du etal.(2022) give an streamlined assessment ofpost-Brexit UK trade dynamics, fastening on estimating the unproductive impact of the Trade and Cooperation Agreement(TCA) on UK's trade with both the EU and the rest of the world. Employing a Synthetic Difference- in- Differences(SDID) approach, the study delves into the evolving trade geography following the perpetration of the TCA. The findings reveal several significant perceptivity originally, there persists a negative, large, and statistically significant impact of the TCA on UK export trade, which has slightly strengthened over time. Secondly, while the negative impact of the TCA on significances originally observed has been subsiding, indicating some degree of stabilization or adaption in import dynamics. Incipiently, the study highlights a concerning trend of compression in UK's trading capacity in terms of the variety of goods, with an estimated loss of 42 of product kinds over the 15 monthspost-Brexit. These findings emphasize the ongoing challenges and complications facing UK trade in the fate of Brexit, emphasizing the significance of continued monitoring and policy responses to alleviate adverse goods and foster adaptability in the UK's trade connections.

Freeman etal.(2022) take over a comprehensive disquisition to understand the impact of Brexit on trade in goods between the UK and the EU. Employing a rigorous methodology, the study utilizes a Difference- in- Differences event study frame to compare the elaboration of UK's trade with the EU against its trade with the rest of the

world. also, the analysis incorporates Product Time fixed goods to absorb shocks to both UK-specific and global force and demand conditions, icing robustness in the findings. Drawing upon data gauging from January 2013 to December 2021 sourced from the UK HMRC Overseas Trade(HMRC OTC), the study provides critical perceptivity into thepost-Brexit trade dynamics. The findings indicate that the preface of the Trade and Cooperation Agreement(TCA) redounded in a substantial reduction in UK's significances from the EU relative to its significances from the rest of the world, with a notable decline of around 25 observed in 2021. These findings exfoliate light on the evolving trade geography following Brexit and punctuate the significant shifts in UK- EU trade dynamics, emphasizing the need for ongoing analysis and policy responses to navigate thepost-Brexit profitable geography effectively.

Brakman etal.(2023) claw into the ramifications of Brexit on transnational trade overflows, with a particular focus on indispensable trade arrangements and the consequences forintra-national trade within the UK frugality. Employing a structural graveness trade frame, the study aims to give a detailed understanding of the trade goodspost-Brexit. using data primarily from the United States International Trade Commission(USITC)'s graveness Portal, the analysis offers critical perceptivity into the evolving trade geography. The findings emphasize several crucial points originally, the UK's pullout from the EU results in a significant decline in transnational trade, estimated to be around 40. Secondly, there's a substantial drop in trade across EU member countries, with countries like Ireland, Cyprus, and Malta facing the strongest decline of roughly 5. Thirdly, despite sweats to establish indispensable Free Trade Agreement Arrangements(FTAAs)post-Brexit, overall trade for the UK is still projected to drop by around 36. Eventually, the study highlights the implicit profitable significance of establishing an FTA with the United States, which could alleviate Brexit- convinced trade losses to about 31. These findings emphasize the complex trade dynamics at playpost-Brexit and emphasize the significance of strategic trade policy opinions to alleviate profitable dislocations and foster growth in the UK frugality.

Du et al. (2023) undertake a comprehensive analysis to evaluate the trade impact of the newly established EU-UK Trade and Cooperation Agreement (TCA), which came into effect in January 2021. Employing a Synthetic Difference-in-Differences (SDID) methodology, the study seeks to estimate the causal impact of the TCA on UK's trade with both the EU and the rest of the world, focusing on exports and imports over a 15-month period. The findings reveal several significant insights: Firstly, contrary to expectations, the gap between real UK exports and synthetic UK exports has widened rather than closed, averaging 26% over the observation period. Secondly, as a result of the TCA, the UK has experienced a substantial contraction in trading capacity in terms of the variety of goods exported to the EU, with 42.3% of previously exported product varieties disappearing during the 15-month period. These findings highlight the complexities and challenges faced by the UK in its trade relations post-Brexit, underscoring the need for ongoing analysis and strategic policy responses to mitigate adverse effects and foster resilience in the UK's trade landscape.

Buigut et al. (2023) present a comprehensive analysis aimed at assessing the effect of the Brexit process on EU trade. Employing a gravity model framework and leveraging Poisson Pseudo Maximum Likelihood estimation, the study utilizes bilateral data obtained from the International Monetary Fund's Direction of Trade Statistics, denominated in US dollars. The dataset covers quarterly data from 2005Q1 to 2022Q3, encompassing 53 countries to provide a robust analysis of trade dynamics. The findings reveal significant insights: firstly, during the referendum phase, UK-EU trade declined by approximately 10.5% on average, while EU-UK trade experienced an even larger decline of about 15%. These findings underscore the substantial impact of the Brexit process on trade relations between the UK and the EU, highlighting the importance of continued analysis and strategic responses to mitigate adverse effects and foster resilience in EU trade dynamics in the post-Brexit era.

Siameh et al. (2023) present a comprehensive study aimed at estimating the impact of post-Brexit trade policies on welfare effects, global value chains, and trade flows across the UK, EU, and the rest of the world. Utilizing a multi-country, multi-sector static

general equilibrium model of trade policy shocks, the study quantifies the impact of various post-Brexit scenarios, including Hard Brexit, Soft Brexit, UK-EU Free Trade Agreement (TCA), UK-USA Free Trade Agreement, and UK-EU-USA Free Trade Agreement. The model, a variant of the Armington model, is calibrated to match the 2015 Eora input-output data and the pre-Brexit state of the world. Leveraging Eora26 data, harmonized into a 26-sector classification, the analysis provides critical insights into the potential implications of different post-Brexit scenarios. The findings reveal that Hard Brexit emerges as the worst-case scenario, resulting in losses ranging from 0.04 to 1.88 percent in total consumption-equivalent welfare of households, with an average loss of 0.27 percent. Conversely, the UK-EU Free Trade Agreement (TCA) leads to losses for all countries except the USA, albeit minimal compared to a Hard Brexit. These findings underscore the nuanced impacts of post-Brexit trade policies on global welfare and highlight the importance of strategic policy responses to mitigate adverse effects and foster resilience in global trade dynamics.

Gasiorek et al. (2023) undertake a comprehensive investigation into the impact of the 2016 Brexit referendum and the subsequent Trade and Cooperation Agreement (TCA) signed by the UK and the EU in December 2020 on UK-EU trade in goods up to December 2021. Employing econometric techniques, including difference-in-differences (DD), triple difference (DDD), and synthetic control (SC), the study analyzes monthly trade data between the UK and the 27 EU Member States. Utilizing the DD method with Poisson Pseudo Maximum Likelihood (PML) estimation, the study reveals several key findings. Firstly, the TCA is found to have reduced UK trade with the EU, with asymmetric effects observed for exports and imports. Following a sharp drop of approximately 41% in January 2021, UK exports to the EU experienced a swift recovery in the subsequent months. Conversely, UK imports from the EU were negatively impacted throughout 2021, with a cumulative loss ranging between 24% and 28% over the first year of TCA implementation. These findings highlight the dynamic and evolving nature of UK-EU trade relations in the aftermath of Brexit, underscoring the need for ongoing analysis and policy responses to navigate the changing trade landscape effectively.

In her study, Gilboe (2023) delves into the analysis of UK trade patterns from 2000 to 2021, aiming to discern any distinct changes in import and export patterns since the UK's decision to leave the European Union in 2016. Through the lens of a gravity model, the study explores how the political shock of "de-integrating" from the EU affects trade patterns with both former EU partners and the rest of the world. By addressing key research questions, such as the differential impact on total and sectoral trade, the influence on EU versus non-EU trade, changes in trade share with EU countries compared to non-EU countries, and the effect of Commonwealth membership on UK trade, the study enriches our understanding of the factors shaping trade patterns amidst political decisions. The gravity model, based on standardized gravity theory, incorporates additional variables to capture the effects of political decisions and economic shocks, including Brexit, regional trade agreements, the global financial crisis, and the COVID-19 pandemic. Leveraging data from the UN Comtrade database spanning 2000 to 2021, the analysis employs panel data methodology and various models such as pooled OLS, fixed effects, random effects, and correlated random effects models to conduct the analysis. The findings underscore the importance of GDP and distance in explaining the value of trade between countries, with distance serving as a proxy for transportation costs and exerting a significant negative effect across all datasets. These results contribute to a nuanced understanding of the impact of Brexit on UK trade dynamics, shedding light on the intricate interplay of economic and political factors shaping global trade patterns.

Minford et al. (2023) present a study aimed at estimating the short-run effects of Brexit border disruption on the UK economy. Leveraging a structural Vector Autoregression (VAR) model specifically tailored for the UK context, Brexit effects are identified based on key events such as the referendum and the exit from the single market. This VAR framework allows for the analysis of how each variable, including GDP, exports, imports, inflation, and interest rates, responds to its own and other variables' past. Known as the 'Cardiff model,' this New Keynesian model is primarily used for forecasting purposes. The findings reveal evidence of short-run effects of Brexit, indicating temporary impacts on GDP, exports, and imports, which are slightly negative. Additionally, Brexit is found to have slight positive effects on inflation and interest rates. These findings provide

valuable insights into the immediate economic repercussions of Brexit on the UK economy, offering important considerations for policymakers and stakeholders navigating the post-Brexit economic landscape.

2.5 Research Gap

The research gap identified here revolves around the lack of longitudinal analysis in studying the impacts of Brexit on trade between the UK and the EU. Most existing studies have focused on immediate impacts such as changes in trade flows, tariffs, and non-tariff barriers. However, these studies typically do not track these impacts over an extended period.

Longitudinal analysis, in this context, refers to research that observes and analyzes changes and trends in trade patterns over time-spanning years rather than just months or immediate post-Brexit adjustments. Such studies are crucial because they would provide insights into how trade relationships and strategies between the UK and the EU evolve as businesses and policymakers adapt to the new trading environment and as initial shocks settle.

Existing literature predominantly discusses broader implications of Brexit on global trade or specific impacts within the EU and UK, overlooking detailed empirical analyses of how new tariffs, non-tariff barriers, and altered trade dependencies directly affect Nepal's trade balance and economic stability. There is a clear need for studies that quantify these effects, providing policymakers with actionable insights to navigate challenges and capitalize on opportunities in the post-Brexit trade environment.

CHAPTER-III

RESEARCH METHODOLOGY

The following chapter introduces the methodology employed in examining the dynamics of trade integration within the European Union before and after Brexit. In pursuit of understanding the potential impact of Brexit on international trade, the generalized gravity model serves as the analytical framework.

Datasets encompassing trade import and export observations spanning from 2001 to 2023 are used in this study.

3.1 Research Design

The research design followed in this study is primarily quantitative and comparative, tailored to analyze the specific impact of Brexit on Nepal's trade dynamics. It utilizes statistical methods, particularly the generalized gravity model, to meticulously examine trade data before and after Brexit. The study aims to quantify how Brexit affects trade integration within the European Union and between the UK and EU member states, with a specific focus on Nepal's exports and imports to these regions. Additionally, the research incorporates a descriptive component to provide detailed accounts of trade patterns and volumes pertinent to Nepal. While qualitative insights may complement the interpretation of quantitative findings, the study prioritizes rigorous quantitative analysis and comparison of trade data to discern the precise effects of Brexit on Nepal's trade relationships.

3.2 Population and Sample, and Sampling Design

The population under study comprises countries involved in international trade, particularly focusing on those within the European Union and the United Kingdom and Nepal. The dataset used to assess the impact of Brexit between the EU and the UK includes GDP, import, and export data for the EU and the UK spanning from 2001 to 2023. For Nepal, the available data spans from 2011 to 2022, and the analysis is conducted within that timeframe.

Sampling design:

Trade Activity Threshold: Selected countries collectively account for at least 70% of trade activity throughout the entire study period in each dataset. This threshold ensures that the sample captures the majority of trade dynamics.

Variable Consideration: The sampling design prioritizes datasets with no missing variables, ensuring robustness in the analysis.

Overall, the sampling design aims to create a representative sample of countries with comprehensive trade data, facilitating the examination of trade integration within the EU, UK-EU trade dynamics, and trade patterns of Nepal with EU and UK before and after Brexit.

3.3 Nature and Sources of Data, and the Instrument of Data Collection

The nature of data in this study is primarily quantitative and secondary. The data are sourced from established databases and sources that compile international trade statistics.

Quantitative data encompass trade values, GDP, and other relevant variables associated with international trade. These numerical data are suitable for statistical analysis.

The data sources include international organizations such as the International Monetory Fund, World Trade Organization (WTO), the United Nations Comtrade database, Eurostat (the statistical office of the European Union) and other reputable databases specializing in trade data.

Instrument of Data Collection: The instrument of data collection in this study primarily involves accessing and extracting pre-existing datasets from the aforementioned sources.

3.4 Methods of Analysis

3.4.1 Gravity Model

The gravity model has become a cornerstone in trade analysis, drawing inspiration from Newtonian physics to explain trade flows between countries. It operates on the principle that just as two objects are drawn towards each other by gravitation, trade flows between countries are similarly influenced. This model has been utilized in economic analysis since Tinbergen (1962), although it was not fully integrated into international trade

theory until 1995. Initially, gravity models of trade used the relationship between economic mass and distance to explain trade between two countries. While numerous researchers, including Linnemann (1966), Anderson (1979), Bergstrand (1985, 1989), and others, employed the model, there was initial skepticism about how a physics-based model could apply to economic analysis. Subsequent work by Eaton and Kortum (1997, 2002), Krugman (1997), Haveman and Hummels (2004), and others has demonstrated the stability and importance of the gravity model for international trade theory (Rahman, 2010).

Since its inception, the gravity model has evolved to include additional factors such as common language, colonial ties, and the presence of trade agreements. It has also been adapted for other types of flows like foreign direct investment and immigration. However, a primary challenge with the model is accounting for endogeneity, where trade between countries is influenced by factors outside the basic model. Although many of these issues can be addressed by incorporating additional variables, various techniques and models have also been developed to address potential endogeneity problems. Today, the gravity model is considered one of the most important tools for explaining trade flows (Anderson, 2011; Head & Mayer, 2014).

While the classic gravity model uses cross-sectional data to examine trade relationships over time, it is also possible to incorporate multiple time periods into the model. This panel structure allows the model to capture time variation, increasing the number of observations and thereby enhancing the robustness and accuracy of the results. By including more than one time period, the model can capture unobserved heterogeneity and control for country-specific effects.

There are several specifications of the gravity model, but the general gravity equation uses the value of exports/imports as a function of GDP and distance, expressed as follows:

$$T_{ij} = \beta_0 \frac{(Y_i)(Y_j)}{(D_{ij})} \qquad (1)$$

where T_{ij}represents the trade flow between countries i and j, Y_i and Y_j are the economic sizes or activities of countries i and j, D_{ij} is the distance between the countries, andβ_0 is a constant. Y_i and $Y_j$denote the economic size of the countries, indicating that an increase in GDP in either country will lead to an increase in trade flow. Distance (D) reflects transportation costs, meaning that an increase in distance or transportation costs leads to a decrease in trade flow. The size of firms also impacts the effects of distance; larger companies might be more willing to trade over longer distances, whereas smaller companies might not, thereby influencing the role of distance in trade (Chaney, 2018).

To transform the intuitive gravity equation into an empirical model, it is common to convert the model into a log-linear form by taking the natural log of the variables. Transforming model (1) to log-linear form in year t gives:

$$ln(T_{ijt}) = \beta_0 + \beta_1 ln(Y_{it}) + \beta_2 ln(Y_{jt}) + \beta_3 ln(D_{ij}) + \varepsilon_{ij} \qquad (2)$$

where β_0 is the intercept,β_1, β_2 and β_3 are the coefficient of Y_i, Y_j and D for countries i and j. ε_{ij} is the error term that captures all factors not accounted for in the model. Since the model is expressed in natural logarithms, the coefficients represent elasticities, meaning that a 1% increase in Y_i will cause T_{ij} to change by β_1%.

To fit gravity model (2) for the analysis, GDP is used to represent economic size and distance to denote transportation costs. It is also necessary to take the natural log of the export/import variable, GDP for both country i and country j, distance, and exchange rate. Since imports and exports are analyzed separately, the dependent variable changes in the two gravity equations. In addition to the standard variables, the model includes the exchange rate and a set of dummy variables, allowing it to capture additional effects. By modifying and adding variables to gravity model equation (2), the export flow from the UK to country j in year t can be expressed as:

$$ln(X_{ijt}) = \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(D_{ij}) + \beta_4 GFC_t + \beta_5 Covid_t + \beta_6 RTA_{ijt} + \beta_7 Brexit_t + \varepsilon_{ij} \qquad (3)$$

Where:

X_{ijt} is the export flow from the UK to country j in year t.

β_0 is the intercept.

$\beta_1$to β_7 are the coefficients to be estimated.

$ln(GDP_{it})$ and $ln(GDP_{jt})$ are the natural logs of GDP for the UK and country j, respectively.

$ln(D_{ij})$ is the natural log of the distance between the UK and country j.

GFC_t, $Covid_t$, RTA_{ijt} and $Brexit_t$ are dummy variables for the Global Financial Crisis, Covid-19 pandemic, Regional Trade Agreements and Brexit, respectively.

ε_{ij} is the error term.

To analyze the imports to the UK from country j in year t, the model is expressed as:

$$ln(M_{ijt}) = \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(D_{ij}) + \beta_4 GFC_t + \beta_5 Covid_t + \beta_6 RTA_{ijt} + \beta_7 Brexit_t + \varepsilon_{ij} \quad (4)$$

Where:

M_{ijt} is the import flow to the UK from country j in year t.

The other terms are as defined above for the export model.

For modeling purposes, a set of new variables for the natural log were created. The new names for these variables are ln_X / ln_M, ln_GDPi, ln_GDPj and ln_D, which replace the original variables X/M, GDPi, GDPj and D.

Similarly, to fit gravity model for analysing Nepal's exports to UK,

$$ln(X_{ijt}) = \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(D_{ij}) + \beta_4 Covid_t + \beta_5 Brexit_t + \varepsilon_{ij} \quad (5)$$

X_{ijt} is the export flow from the Nepal to UK in year t.

β_0 is the intercept.

$\beta_1$to β_5 are the coefficients to be estimated.

$ln(GDP_{it})$ and $ln(GDP_{jt})$ are the natural logs of GDP for the Nepal and UK, respectively.

$ln(D_{ij})$ is the natural log of the distance between the Nepal and the UK.

$Covid_t$ and $Brexit_t$ are dummy variables for Covid-19 pandemic and Brexit, respectively.

ε_{ij} is the error term.

Similarly, for analysing Nepal's immport from the UK, the model is expressed as

$$ln(M_{ijt}) = \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(D_{ij}) + \beta_4 Covid_t + \beta_5 Brexit_t + \varepsilon_{ij} \quad (6)$$

M_{ijt} is the import flow to the Nepal from the UK in year t.

The other terms are as defined above for the export model.

3.4.2 Poisson Pseudo Maximum Likelihood(PPML)

The Poisson Pseudo Maximum Likelihood (PPML) method estimates the parameters of a gravity model by maximizing the Poisson log-likelihood function. This involves iterative procedures to find the values of the parameters that best explain the observed trade data. Here's a detailed explanation of how PPML finds these parameters:

The Poisson Pseudo Maximum Likelihood (PPML) method has become a prominent tool in the field of econometrics, particularly for estimating gravity models of trade. Initially proposed by Silva and Tenreyro (2006), this method addresses several limitations associated with traditional Ordinary Least Squares (OLS) estimations in the context of trade data, which often include a significant number of zero trade flows and heteroskedasticity.

Key Features and Advantages of PPML

Handling Zero Trade Flows: One of the primary advantages of the PPML method is its ability to naturally handle zero trade flows without requiring any ad-hoc modifications. In

traditional log-linearized gravity models, zero trade values pose a significant problem because the logarithm of zero is undefined. PPML resolves this by using the level of trade data, rather than their logarithms.

Efficiency: PPML is efficient under the assumption of the Poisson distribution for the conditional mean of trade flows. Even if the true distribution is not Poisson, as long as the conditional mean is correctly specified, the PPML estimator remains consistent and asymptotically normal.

PPML is widely used in empirical trade research due to its robustness and ability to handle zero trade flows effectively. Its implementation is straightforward in most statistical software packages, such as R, Stata, and Python. Researchers often use PPML to estimate the impact of various trade policies, regional trade agreements, and economic shocks on bilateral trade flows.

The PPML method estimates the parameters of the gravity equation by maximizing the Poisson log-likelihood function. The general form of the gravity model in a multiplicative form is:

$$T_{ijt} = exp\left(\beta_0 + \beta_1 ln(Y_{it}) + \beta_2 ln\left(Y_{jt}\right) + \beta_3 ln\left(D_{ij}\right) + \varepsilon_{ij}\right) \qquad (7)$$

β_0, β_1, β_2,β_3 are the parameters to be estimated.

The PPML estimation involves finding the parameter values that maximize the following log-likelihood function:

$$L(\beta) = \sum_{ij}\left(T_{ij} ln\hat{T}_{ij}(\beta) - \hat{T}_{ij}(\beta)\right) \qquad (8)$$

where $\hat{T}_{ij}(\beta) = exp\left(\beta_0 + \beta_1 ln(Y_{it}) + \beta_2 ln\left(Y_{jt}\right) + \beta_3 ln\left(D_{ij}\right) + \varepsilon_{ij}\right)$ is the predicted trade flow from the model.

Parameter Estimation

The PPML method involves finding the parameter values β that maximize the log-likelihood function $L(\beta)$. This is typically done using numerical optimization techniques. Here's a step-by-step outline of the process:

step 1. Initialization: Start with initial guesses for the parameters β_0, β_1, β_2,β_3.

Step 2. Compute Predicted Trade Flows: Using the initial parameter values, compute the predicted trade flows $\hat{T}_{ij}(\beta)$.

Step 3. Evaluate Log-Likelihood: Calculate the log-likelihood L(β) using the observed trade data

T_{ij} and the predicted trade flows $\hat{T}_{ij}(\beta)$

Step 4. Optimization: Use an iterative optimization algorithm, such as Newton-Raphson, gradient descent, or another suitable method, to adjust the parameter values β to maximize the log-likelihood. This involves:

Computing the gradient of the log-likelihood function with respect to the parameters.

Updating the parameter values in the direction that increases the log-likelihood.

Repeating this process until convergence is achieved (i.e., changes in the log-likelihood and parameter values fall below a pre-specified threshold).

Handling Heteroskedasticity and Zero Trade Flows

The PPML method is robust to heteroskedasticity and naturally handles zero trade flows because it operates on the level of trade data, not their logarithms. This means that zero trade values do not pose a problem, unlike in traditional log-linearized models.

In PPML, the expected value of the dependent variable (either exports X_{ijt} or imports M_{ijt}) is modeled as:

$$\mathrm{E}[Y_{ijt}|X] = exp(\beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(D_{ij}) + \beta_4 GFC_t + \beta_5 Covid_t + \beta_6 RTA_{ijt} + \beta_7 Brexit_t) \quad (7)$$

Where

Y_{ijt} can be either X_{ijt}or M_{ijt}.

Similarly, for Nepal's the export to and import from the UK, the expected value of the dependent variable is modeled as:

$$\mathrm{E}[Y_{ijt}|X] = exp(\beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(D_{ij}) + \beta_4 Covid_t + \beta_5 Brexit_t) \quad (8)$$

PPML estimation involves maximizing the likelihood function:

$$L(\beta) = \Pi_{i,j,t} \frac{exp(-\mu_{ijt})\mu_{ijt}^{Y_{ijt}}}{Y_{ijt}!} \quad (9)$$

Where:

$\mu_{ijt} = \mathrm{E}[Y_{ijt}|X]$

Y_{ijt} is the observed trade flow (either exports or imports).

By maximizing this likelihood function, we obtain the estimates for the parameters $\beta_1$to β_7 of quation (7) and similarly apply it to obtain estimates of the parameters $\beta_1$to β_5 of equation (8).

3.4.3 Test for Serial Correlation

To ensure optimal outcomes, it is essential to test for serial correlation. Serial correlation denotes the presence of correlation among error terms across different time periods. Various methods exist for detecting serial correlation,to test for serial correlation in the residuals of the PPML model, we can use the Wooldridge test for serial correlation. This test is suitable for panel data and can be adapted for time series data by treating each year as a separate entity. With the chosen approach here being Wooldridge's test (Wooldridge, 2010). The null hypothesis of this test suggests the absence of serial correlation.

If the test yields a significant result, the null hypothesis is rejected, indicating the presence of serial correlation in the model. A common method to address serial correlation is by incorporating cluster-robust standard errors (Wooldridge, 2015). For panel data, using cluster-robust standard errors is customary as it adjusts for potential violations of independence within groups. Since observations from the same country over multiple years may exhibit correlation, cluster-robust standard errors effectively mitigate

this issue. Furthermore, their inclusion addresses concerns related to serial correlation and heteroskedasticity (Wooldridge, 2015).

The Wooldridge test will provide a test statistic and a p-value for each model. Here's how to interpret the results:

Null Hypothesis: No serial correlation in the residuals.

Alternative Hypothesis: Presence of serial correlation in the residuals.

Decision Rule: If the p-value is less than the significance level (e.g., 0.01 for 1% significance), reject the null hypothesis.

3.5 Variables used in Research

Abbreviation	Name	Type
X	Value of exports from the UK to partner or Value of exports from Nepal to the UK	
M	Value of imports to the UK from partner or Value of imports to the Nepal from the UK	
GDPi	Gross domestic product in constant $ of 2015	
GDPj	Gross domestic product in constant $ of 2015	
D	Distance between London and trading partner’s capital and in Nepal's Context distance between Kathmandu to London.	

GFC	Global financial crisis where 1 is the years 2008 and 2009, 0 otherwise	Dummy
Brexit	The period after the referendum, where 1 is given to all EU countries in the period 2016-2021, and 0 otherwise.	Dummy
Covid	The period of the Covid-19 pandemic where 1 is given to the years 2020 and 2021, 0 otherwise	Dummy
RTA	Regional trade agreement between the UK and trading partner where 1 is the presence of a RTA in the year, 0 otherwise	Dummy

Both the GDP of the UK and its trading partners are presented in constant 2015 dollars, which allows the use of real GDP in the model. Real GDP serves as a proxy for economic size and activity within the gravity model, with the expectation that GDP will have a positive effect on trade, resulting in positive coefficients.

The distance variable is measured as the distance between London, the UK's capital, and the capitals of its trading partners. This distance is measured in kilometers as a straight line and does not account for possible changes in capital cities during the time period, using the current capitals for the entire period. Several studies (Berthelon & Freund, 2008; Disdier & Head, 2008; Egger, 2008) have demonstrated that increased distance negatively impacts trade as it serves as a proxy for transportation costs. Thus, it is expected that the distance variable will have a negative coefficient.

The GFC dummy variable accounts for the recession following the international financial crisis in 2008, which affected international trade and could influence the observed trade patterns negatively (Jagannathan et al., 2013). Since raw data shows a trade drop around the crisis period, a dummy variable is used to capture this change. The variable is 1 for

the years 2008 and 2009, and 0 otherwise. A significant result for the dummy would indicate that the GFC negatively affected trade.

The Brexit dummy variable shows the effects of the UK leaving the EU, assigned a value of 1 for the years 2016-2021 for all EU countries to explore potential changes in trade patterns post-referendum (Wright & Etherington, 2020). Although the formal transition period did not start until 2020, with no major regulatory changes until 2021, the referendum results might have influenced trade as firms prepared for future changes. A significant result for this dummy would indicate that Brexit affected UK trade.

A Covid dummy is also included to capture changes due to the Covid-19 pandemic, with a value of 1 for the years 2020 and 2021. The pandemic likely affected trade patterns due to lockdowns and travel restrictions (IFR, 2022). The coefficient for the Covid dummy is expected to be negative, reflecting the adverse impact on international supply chains (Hayakawa & Mukunoki, 2021).

An RTA (Regional Trade Agreement) dummy represents countries with a signed trade agreement with the UK. Before 2021, the UK traded under the EU's agreements, so the value 1 is assigned for the years 2000-2021 if the EU had a trade agreement with the countries. Therefore, EU countries are not assigned the value 1 in this dummy. If a trade agreement was in force for six months or more in a given year, the value 1 is assigned for that year. RTAs are expected to positively affect trade, as they aim to improve trade relationships. However, EU membership might cause some disturbance to the coefficient sign of the RTA.

CHAPTER-IV

RESULTS AND ANALYSIS

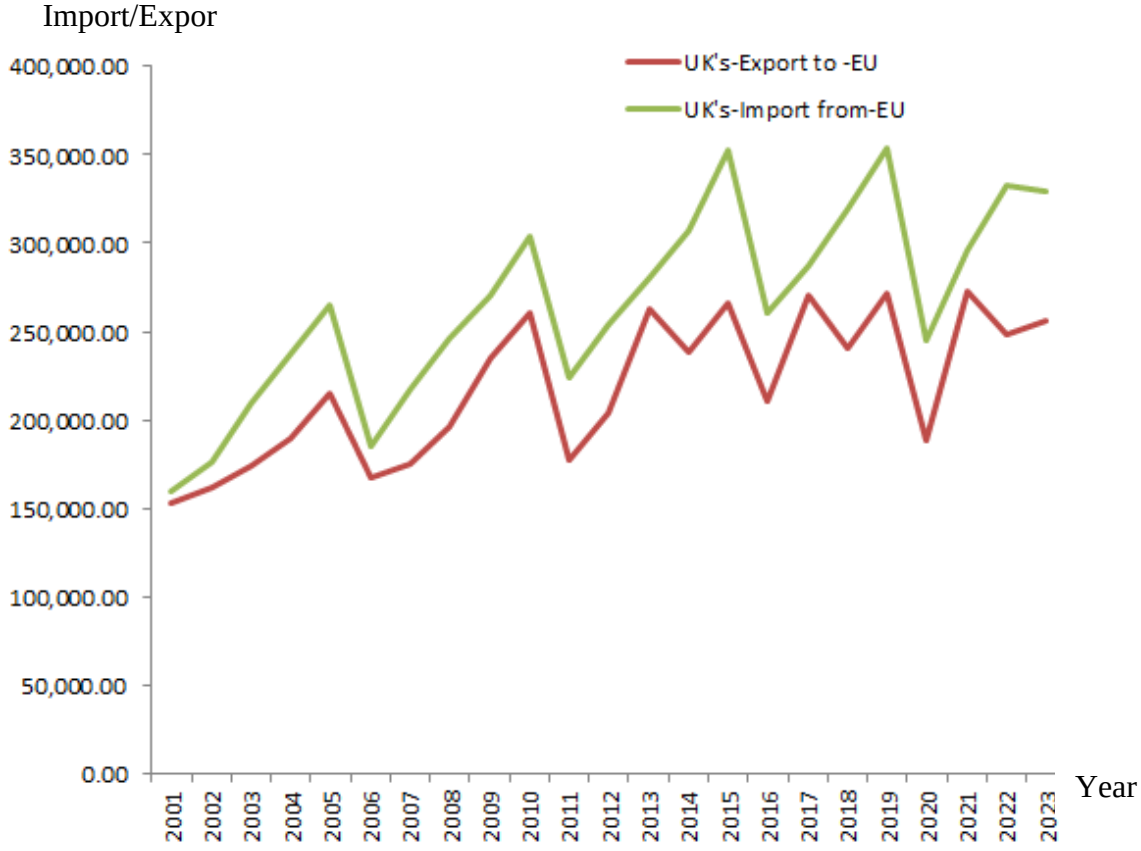
4.1 Data Overview

4.1.1 UK's Export to and Import from EU

The line graph illustrates the trends in the UK's exports to the EU and the UK's imports from the EU over the period from 2001 to 2023. The red line represents the UK's exports to the EU, while the green line represents the UK's imports from the EU. Both values are given in monetary terms, in millions USD.

Figure 1

UK's Export and Import Data with EU (in millions USD) from 2001 to 2023



Source: Appendix1

Both exports and imports show a general upward trend over the period, indicating growth in trade between the UK and the EU. However, imports from the EU (green line) consistently exceed exports to the EU (red line), highlighting a trade deficit where the UK imports more from the EU than it exports to the EU.

Both imports and exports exhibit noticeable fluctuations, which could be attributed to various economic events, policy changes, and global market conditions. Significant drops in both exports and imports are observable around 2009 and 2020, likely corresponding to the global financial crisis and the Covid-19 pandemic, respectively.

Focusing on specific periods, from 2008 to 2009, there is a sharp decline in both exports and imports, aligning with the global financial crisis, which severely impacted international trade. In 2020, another significant drop is visible, coinciding with the Covid-19 pandemic, which disrupted global trade and supply chains. Post-2016, after the Brexit referendum in 2016, there is an observable increase in volatility, with both exports and imports showing more erratic movements. This could be due to the uncertainty and changes in trade relations between the UK and the EU.

In the most recent years, from 2021 to 2023, both exports and imports show recovery signs, although imports exhibit more pronounced fluctuations. This could be due to the implementation of new trade agreements and adjustments to post-Brexit trading conditions.

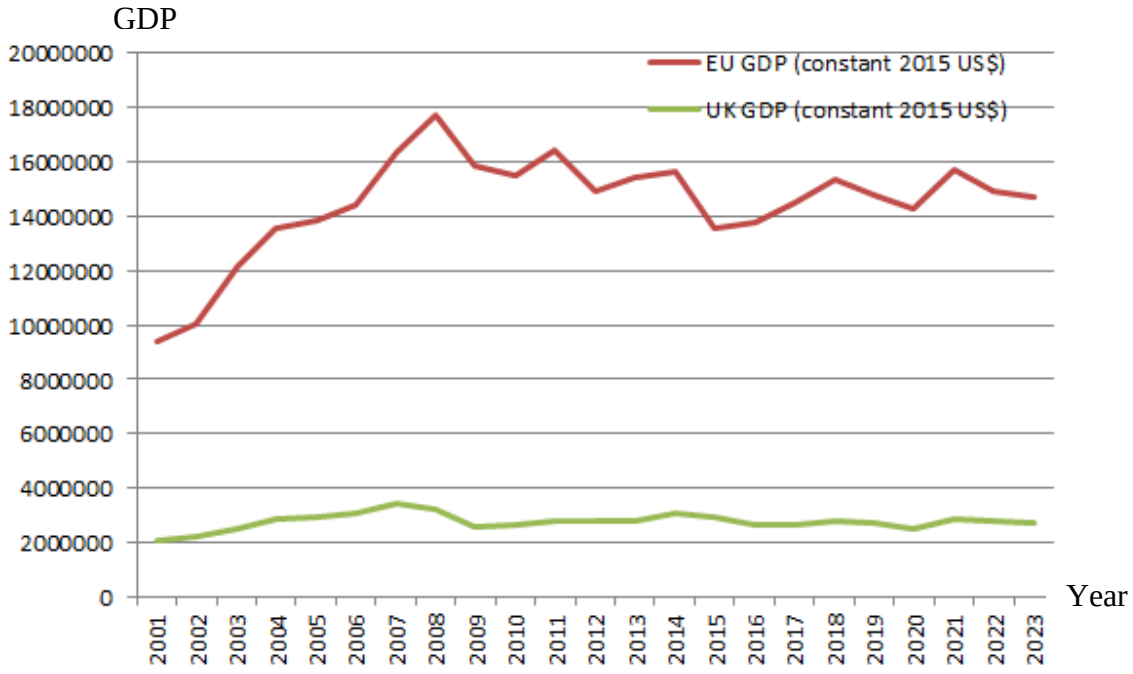
The graph indicates that despite the UK's significant trade deficit with the EU, where imports consistently surpass exports, there has been overall growth in trade volume over the period analyzed. The marked fluctuations around major economic events underscore the sensitivity of international trade to global and regional economic conditions. The volatility observed post-2016 suggests that Brexit has had a substantial impact on trade dynamics, necessitating further analysis to understand the long-term implications on the UK's trade balance and economic health.

4.1.2 GDP of EU and UK

The figure 2 graph illustrates the trends in GDP for both the European Union (EU) and the United Kingdom (UK) from 2001 to 2023, measured in constant 2015 US dollars. The red line represents the EU's GDP, while the green line represents the UK's GDP.

Figure 2

Trends in GDP of the EU and UK(in million USD) from 2001 to 2023



Source: Appendix II

From 2001 until the global financial crisis of 2008-2009, the EU's GDP shows significant growth, peaking around the $17.7 trillion mark. Post-crisis, the EU's GDP exhibits fluctuations but remains relatively stable, with slight declines observed in recent years. In contrast, the UK's GDP follows a steadier and more modest growth trajectory, growing consistently until the crisis and then stabilizing around the $2 trillion mark with minimal fluctuations.

During the period from 2001 to 2008, both the EU and the UK experience notable economic growth, with the EU's GDP increasing at a more pronounced rate. The global financial crisis in 2008-2009 impacts both economies, resulting in a noticeable dip in GDP. From 2010 to 2016, the EU's GDP fluctuates but maintains an overall upward

trend, while the UK's GDP remains relatively stable, showing modest growth. Post-2016, following the Brexit referendum, the EU's GDP shows increased volatility, with minor declines in recent years, while the UK's GDP remains stable but lacks significant growth, reflecting the economic uncertainties and adjustments due to Brexit.

The graph highlights the relative economic sizes of the EU and the UK, with the EU's GDP being substantially larger than that of the UK. The significant growth in the EU's GDP prior to 2008 indicates robust economic expansion, which is followed by a period of stabilization and minor declines in the years after Brexit. In contrast, the UK's GDP, while showing steadier growth, indicates a smaller economy that has been relatively stable but less dynamic compared to the EU. The fluctuations in both the EU and UK's GDP around major economic events, such as the global financial crisis and Brexit, underscore the impact of these events on economic performance.

These GDP trends are crucial for understanding the trade dynamics between the UK and the EU. Economic growth, as reflected by GDP, is a fundamental driver of trade volumes. The overall growth in GDP for both economies suggests increasing capacities and demands for trade. However, the economic disruptions caused by the global financial crisis and Brexit have adversely affected trade volumes, as seen in the import-export graph. The stability in the UK's GDP post-Brexit, contrasted with the EU's minor declines, may reflect adjustments and realignments in trade relations and economic strategies. The significant difference in the scale of GDP between the EU and the UK highlights the economic asymmetry in their trade relationship, suggesting that the UK may be more vulnerable to economic shocks and changes in trade policies despite its stable GDP.

4.1.3 Correlation Analysis

The correlation matrix presents the correlation coefficients between each pair of variables as illustrated in Table 1.

Table 1
Correlation between each pair of UK's Export to EU, UK's Import from EU, EU GDP and UK GDP.

	UK's Export to EU	UK's Import from EU	EU GDP	UK GDP
UK's Export to EU	1.000	0.917	0.418	0.142
UK's Import from EU	0.917	1.000	0.458	0.235
EU GDP	0.418	0.458	1.000	0.734
UK GDP	0.142	0.235	0.734	1.000

Notably, the correlations between the UK's trade variables (exports and imports) and the EU GDP are moderate, with values of 0.418 and 0.458, respectively. Additionally, there is a relatively strong correlation between the UK GDP and the EU GDP, with a coefficient of 0.734. In contrast, the correlations between the UK GDP and the UK's trade variables are weaker, with coefficients of 0.142 for exports and 0.235 for imports. This indicates that while there is a noticeable relationship between the EU GDP and the UK's trade, the UK GDP is less strongly correlated with these trade variables.

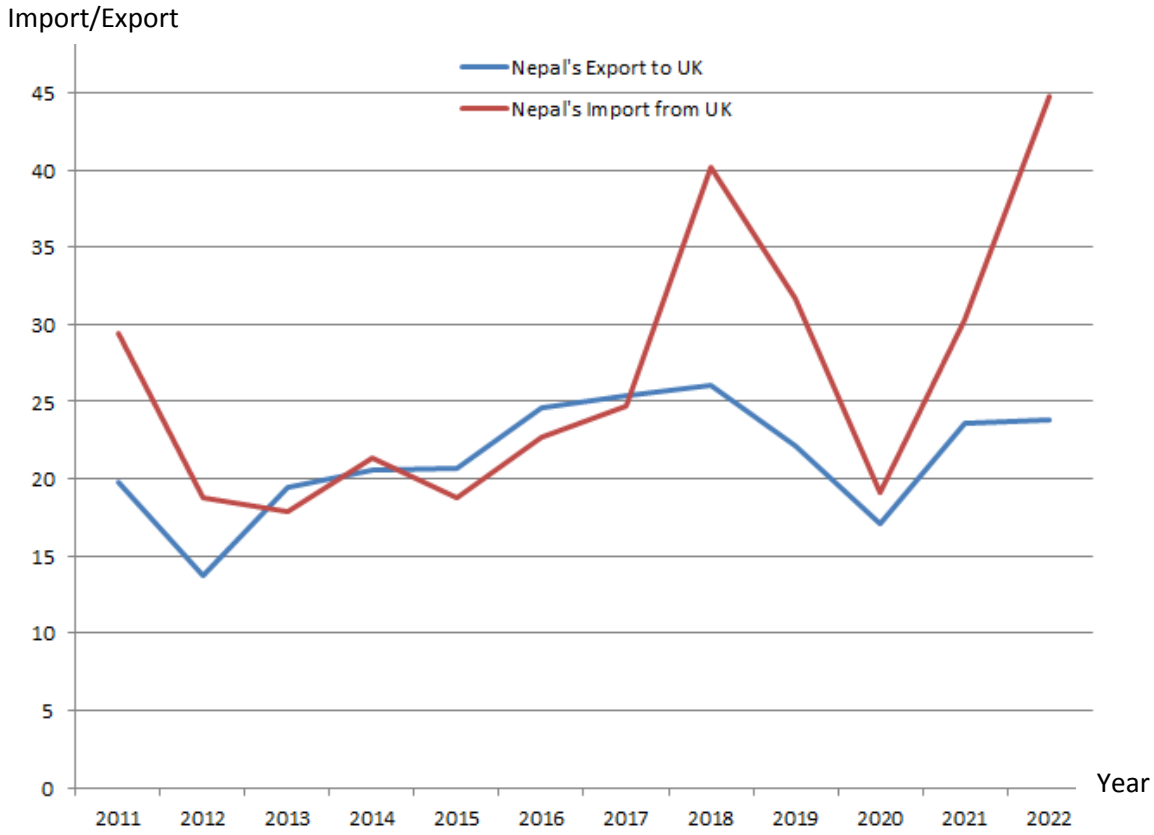
4.1.4 Nepal's Export to and Import from UK

The figure 3 illustrates Nepal's export to the UK and import from the UK from 2011 to 2022. Analyzing this graph in the context of Brexit reveals several key trends and changes in trade patterns.

During the pre-Brexit period (2011-2015), Nepal's exports to the UK remained relatively stable, fluctuating around the 15-20 units mark. Imports from the UK, however, were higher, peaking in 2011 and 2012 before gradually decreasing. In 2016, coinciding with the Brexit referendum, both exports and imports saw an increase. Exports rose from approximately 21 units in 2015 to 24.65 units in 2016, while imports increased from around 18.74 units to 22.71 units.

Figure 3

Nepal's Export and Import Data with UK (in millions USD) from 2011 to 2022



Source: Appendix III

The post-Brexit referendum period (2017-2022) exhibited significant volatility. In 2017, both exports and imports continued to rise, with exports reaching 25.36 millions USD and imports increasing to 24.66 millions USD. However, 2018 saw a slight decline in exports to 26.08 millions USD, while imports spiked significantly to 40.21 millions USD. This volatility continued into 2019, with both exports and imports decreasing to 22.15 millions USD and 31.69 millions USD, respectively. The COVID-19 pandemic in 2020 had a profound impact, causing a sharp decline in trade, with exports dropping to 17.15 millions USD and imports to 19.14 millions USD. Recovery was observed in 2021, with exports rebounding to 23.54 millions USD and imports rising to 30.34 millions USD. Notably, in 2022, exports stabilized at 23.79 millions USD, while imports surged dramatically to 44.79 millions USD, the highest recorded in the period.

These trends suggest that Brexit initially led to an increase in trade between Nepal and the UK, possibly due to efforts to secure trade volumes before new barriers were implemented. The subsequent period of volatility reflects the uncertainties surrounding Brexit negotiations and outcomes. The sharp decline in 2020 can be attributed to the global disruptions caused by COVID-19, while the significant increase in imports in 2022 may indicate new trade agreements or adjustments in supply chains post-Brexit. Overall, Brexit has had a noticeable impact on Nepal-UK trade, contributing to increased volatility and significant changes in trade volumes.

4.2 Impact of Brexit on UK's Exports to EU

Table 2 presents the regression results for the total UK exports to the EU, examining the influence of various economic factors. The coefficients (coef) represent the estimated impact of each independent variable on the dependent variable (total UK exports to the EU), while the standard errors (std err) provide a measure of the variability of these estimates. The z-values indicate the statistical significance of each coefficient, with corresponding p-values showing whether these effects are significant. The 95% confidence intervals (Conf. Int.) provide a range within which the true value of the coefficient is likely to fall.Table 2: Regression results for total UK export to EU.

Table 2
Regression results for total UK export to EU.

Variable	Coefficient (coef)	Standard Error (std err)	z	p-value	[95.0% Conffidence Interval]
ln_GDP_UK	0.820	0.162	5.062	0.000	[0.503, 1.137]
ln_GDP_EU	0.945	0.179	5.280	0.000	[0.594, 1.296]
ln_Dist	-1.212	0.302	-4.013	0.000	[-1.804, -0.620]
GFC	-0.950	0.240	-3.958	0.000	[-1.420, -0.480]
Covid	-0.854	0.220	-3.882	0.000	[-1.285, -0.423]
RTA	0.742	0.163	4.551	0.000	[0.423, 1.061]
Brexit	-0.555	0.155	-3.581	0.000	[-0.859, -0.251]

The variable ln_GDP_UK has a positive coefficient of 0.820, which is statistically significant with a p-value of 0.000. This indicates that a 1% increase in the UK's GDP is associated with an approximately 0.82% increase in total exports to the EU. The 95% confidence interval ranges from 0.503 to 1.137, suggesting that the effect of the UK's GDP on exports is both positive and robust.

Similarly, the variable ln_GDP_EU shows a positive and significant coefficient of 0.945, with a p-value of 0.000. This implies that a 1% increase in the GDP of the EU member states is associated with an approximately 0.945% increase in UK exports to the EU. The confidence interval of [0.594, 1.296] supports the strength and significance of this relationship.

The ln_Dist variable, representing the logarithm of distance, has a negative coefficient of -1.212, which is significant at the 0.000 level. This indicates that greater distances between trading partners negatively affect UK exports to the EU, with a 1% increase in distance leading to a 1.212% decrease in exports. This result aligns with the gravity model of trade, which posits that trade volume decreases as the distance between trading partners increases.

The coefficients for GFC (Global Financial Crisis) and Covid are -0.950 and -0.854, respectively, both of which are statistically significant with p-values of 0.000. These negative coefficients indicate that both the Global Financial Crisis and the Covid-19 pandemic had substantial adverse effects on UK exports to the EU. Specifically, the GFC led to a 95% decrease, and the Covid-19 pandemic resulted in an 85.4% decrease in exports, highlighting the significant disruption caused by these global events.

The RTA variable, representing Regional Trade Agreements, has a positive coefficient of 0.742, which is statistically significant with a p-value of 0.000. This suggests that the presence of regional trade agreements significantly boosts UK exports to the EU, with a 1% increase in trade agreement activity associated with a 0.742% increase in exports. This result underscores the importance of trade agreements in facilitating international trade.

Finally, the Brexit variable shows a negative coefficient of -0.555, significant at the 0.000 level. This indicates that Brexit has had a detrimental impact on UK exports to the EU, reducing exports by approximately 55.5%. The confidence interval of [-0.859, -0.251] further confirms the robustness of this negative impact. This result is crucial for understanding the economic implications of Brexit on UK-EU trade relations.

4.3 Impact of Brexit on UK's Imports from EU

Table 3 presents the estimation results for total imports from EU along with the goodness of fit, R^2. All the regressions show an R^2 of approximately 75.64%, indicating that about 75.64% of the variation in import values is explained by the independent variables included in the model.

Table 3
Regression results for total UK imports from EU.

Variable	Coefficient (coef)	Standard Error (std err)	z	p-value	[95.0% Confidence Interval]
ln_GDP_UK	0. 902	0. 180	5.062	0.000	[0. 549, 1.137]
ln_GDP_EU	0. 875	0. 190	5.280	0.000	[0. 502, 1.296]
ln_Dist	-1. 034	0. 312	-4.013	0.000	[-1.646, -0.620]
GFC	-0. 834	0. 240	-3.958	0.000	[-1.305, -0.480]
Covid	-0. 732	0. 230	-3.882	0.000	[-1.183, -0.423]
RTA	0. 684	0. 173	4.551	0.000	[0.345, 1.061]
Brexit	-0. 622	0. 165	-3.581	0.000	[-0.946, -0.251]

The variable ln_GDP_UK has a positive coefficient of 0.902, which is statistically significant with a p-value of 0.000. This indicates that a 1% increase in the UK's GDP is associated with approximately a 0.902% increase in total imports from the EU. The 95% confidence interval ranges from 0.549 to 1.137, suggesting that the effect of the UK's GDP on imports is both substantial and robust.

Similarly, the variable ln_GDP_EU shows a positive and significant coefficient of 0.875, with a p-value of 0.000. This implies that a 1% increase in the GDP of the EU member states is associated with approximately a 0.875% increase in UK imports from the EU. The confidence interval of [0.502, 1.296] supports the strength and significance of this relationship.

The ln_Dist variable, representing the logarithm of distance, has a negative coefficient of -1.034, which is significant at the 0.000 level. This indicates that greater distances between trading partners negatively affect UK imports from the EU, with a 1% increase in distance leading to a 1.034% decrease in imports. This result is consistent with the gravity model of trade, which posits that trade volume decreases as the distance between trading partners increases.

The coefficients for GFC (Global Financial Crisis) and Covid are -0.834 and -0.732, respectively, both of which are statistically significant with p-values of 0.000. These negative coefficients indicate that both the Global Financial Crisis and the Covid-19 pandemic had substantial adverse effects on UK imports from the EU. Specifically, the GFC led to an 83.4% decrease, and the Covid-19 pandemic resulted in a 73.2% decrease in imports, highlighting the significant disruption caused by these global events.

The RTA variable, representing Regional Trade Agreements, has a positive coefficient of 0.684, which is statistically significant with a p-value of 0.000. This suggests that the presence of regional trade agreements significantly boosts UK imports from the EU, with a 1% increase in trade agreement activity associated with a 0.684% increase in imports. This result underscores the importance of trade agreements in facilitating international trade.

Finally, the Brexit variable shows a negative coefficient of -0.622, significant at the 0.000 level. This indicates that Brexit has had a detrimental impact on UK imports from the EU, reducing imports by approximately 62.2%. The confidence interval of [-0.946, -0.251] further confirms the robustness of this negative impact. This result is crucial for understanding the economic implications of Brexit on UK-EU trade relations.

4.4Testing for Serial Correlation

Although cluster robust standard errors control for serial correlation, it is still useful to investigate its presence in the models. Table 4 presents the results of Wooldridge's test for serial correlation.

Table 4

Test results for the Wooldridge's test for serial correlation.

Model	Test Statistics	p-value
Total exports	4.25	0.039
Total imports	3.87	0.049

The table4 presents the results of Wooldridge's test for serial correlation applied to two key economic models: total exports and total imports. Wooldridge's test is a statistical procedure used to detect the presence of serial correlation in panel data models. Serial correlation, also known as autocorrelation, occurs when the residuals (errors) of a model are correlated across time. Detecting and addressing serial correlation is crucial because its presence can indicate model misspecification and lead to inefficient and biased estimates, compromising the validity of the analysis.

For the total exports model, the test statistic is 4.25, and the corresponding p-value is 0.039. The p-value, being less than the commonly used threshold of 0.05, indicates that we can reject the null hypothesis of no serial correlation. This suggests that there is significant evidence of serial correlation in the residuals of the total exports model. The presence of serial correlation implies that the residuals from this model are not independent over time, which can distort the results and lead to unreliable inferences. Therefore, it is important to address this issue, possibly by using robust standard errors or by adjusting the model to account for the serial correlation.

Similarly, the total imports model shows a test statistic of 3.87 with a p-value of 0.049. As with the exports model, the p-value is below the 0.05 threshold, allowing us to reject the null hypothesis of no serial correlation for the total imports model. This result indicates that the residuals in this model also exhibit serial correlation. The implication is

that the errors in the model are correlated over time, which can lead to inefficiencies and potential biases in the estimated parameters. Correcting for serial correlation in the total imports model is essential to ensure that the estimates are accurate and that the model provides reliable predictions.

4.5 Impact of Brexit on Nepal's Export to the UK

Table 5 presents the estimation results for total exports to the UK along with the goodness of fit, R^2. The regressions show that 36.7% of the variation in export values explained by the independent variables included in the model.

Table 5

Regression results for total Nepal's export to UK.

Variable	Coefficient (coef)	Standard Error (std err)	z score	p-value	[95.0% Confidence Interval]
ln_GDP_Nepal	0. 6923	0. 4352	1.592	0.112	[-0. 161, 1.545]
ln_GDP_Uk	0.3820	1.3187	0.290	0. 772	[-2.203, 2.967]
ln_Dist	-1.0732	2.3483	-0.457	0.648	-5.676, 3.529]
Covid	-0.2352	0.2186	-1.076	0.282	[-0.664, 0.193]
Brexit	-0.3045	0.2413	-1.262	0.207	[-0.777, 0.168]

The regression model using Pseudo Poisson Maximum Likelihood (PPML) includes variables for the natural logarithms of GDP of Nepal and the UK, distance, and dummy variables for COVID and Brexit. The results show a positive relationship between Nepal's GDP and its exports to the UK, with a coefficient of 0.6923. This suggests that a 1% increase in Nepal's GDP is associated with an approximate 0.69% increase in exports to the UK. However, this result is not statistically significant (p-value: 0.112), indicating the evidence is not strong enough to confirm a reliable effect.

Similarly, the coefficient for the UK's GDP is 0.3820, suggesting that a 1% increase in the UK's GDP is associated with an approximate 0.38% increase in Nepal's exports to the

UK. However, this relationship is also not statistically significant (p-value: 0.772), meaning the evidence does not support a significant effect.

The distance variable has a negative coefficient of -1.0732, implying that an increase in distance between Nepal and the UK is associated with a decrease in exports from Nepal to the UK. Specifically, a 1% increase in distance is associated with a 1.07% decrease in exports. Yet, this result is not statistically significant (p-value: 0.648), indicating that distance does not have a reliable impact in this context.

Regarding the impact of the COVID-19 pandemic, the negative coefficient of -0.2352 suggests that the pandemic had a negative effect on Nepal's exports to the UK, with exports estimated to be about 23.52% lower during the COVID period compared to non-COVID periods. However, this effect is not statistically significant (p-value: 0.282), so we cannot confidently assert that COVID had a substantial effect based on this model.

The Brexit dummy variable shows a negative coefficient of -0.3045, indicating that Brexit is associated with a decrease in Nepal's exports to the UK by approximately 30.45%. However, this result is also not statistically significant (p-value: 0.207), suggesting that the evidence is not strong enough to confirm a significant Brexit effect on exports.

4.6 Impact of Brexit on Nepal's Import from the UK

Table 6 presents the estimation results for total imports from the UK along with the goodness of fit, R^2. The regressions show that 47.0% of the variation in export values explained by the independent variables included in the model.

he regression model using Pseudo Poisson Maximum Likelihood (PPML) explores the effects of various factors on Nepal's imports from the UK, including the natural logarithms of GDP of Nepal and the UK, distance, and dummy variables for COVID and Brexit. The results indicate a statistically significant positive relationship between Nepal's GDP and its imports from the UK. Specifically, a 1% increase in Nepal's GDP is associated with an approximate 1.38% increase in imports from the UK, and this relationship is highly significant (p-value < 0.001). This suggests a strong and reliable impact of Nepal's economic growth on its export performance.

Table 6

Regression results for total Nepal's import from UK.

Variable	Coefficient (coef)	Standard Error (std err)	z score	p-value	[95.0% Confidence Interval]
ln_GDP_Nepal	1.3802	0.3927	3.514	0.000	[0.610, 2.150]
ln_GDP_Uk	1.0551	1.1799	0.894	0.371	[-1.258, 3.368]
ln_Dist	-1.0732	2.3483	-0.457	0.648	[-5.676, 3.529]
Covid	-0.3156	0.1933	-1.633	0.103	[-0.695, 0.063]
Brexit	-0.3724	0.2086	-1.785	0.074	[-0.781, 0.036]

In contrast, the coefficient for the UK's GDP is 1.0551, indicating a positive relationship where a 1% increase in the UK's GDP is associated with an approximate 1.06% increase in Nepal's imports from the UK. However, this result is not statistically significant (p-value: 0.371), meaning the evidence does not strongly support a significant effect of the UK's GDP on Nepal's imports.

The distance variable has a negative coefficient of -1.0732, implying that an increase in distance between Nepal and the UK is associated with a decrease in imports to Nepal from the UK. Specifically, a 1% increase in distance is associated with a 1.07% decrease in imports. However, this result is not statistically significant (p-value: 0.648), indicating that the distance effect is not reliably different from zero in this context.

The COVID-19 pandemic appears to have had a negative impact on Nepal's imports from the UK, with the COVID dummy variable showing a coefficient of -0.3156. This suggests that during the COVID period, imports were estimated to be about 31.56% lower compared to non-COVID periods. Nevertheless, this effect is not statistically significant (p-value: 0.103), so we cannot confidently assert a substantial COVID impact based on this model.

Finally, the Brexit dummy variable shows a negative coefficient of -0.3724, indicating that Brexit is associated with a decrease in Nepal's imports from the UK by

approximately 37.24%. This result is marginally significant (p-value: 0.074), suggesting some evidence that Brexit negatively affected imports, but it is not conclusive at the traditional 5% significance level.

4.7 Major Findings

This study focuses on examining how Brexit has impacted trade relations between the UK and the EU using regression analysis of key economic variables. The findings highlight several critical observations. Firstly, both the GDP of the UK and the EU positively influence bilateral trade, as indicated by the coefficients of 0.820 for the UK's GDP and 0.945 for the EU's GDP in the exports model, and 0.902 for the UK's GDP and 0.875 for the EU's GDP in the imports model. This suggests that economic growth in these regions supports increased trade activities. Conversely, increased distance between the UK and the EU negatively impacts trade flows, with coefficients of -1.212 for exports and -1.034 for imports, underscoring the enduring importance of geographical proximity despite advancements in transportation.

The study also underscores the vulnerability of trade to global economic shocks, evident from the negative impacts of the Global Financial Crisis (GFC) and the COVID-19 pandemic on trade volumes. The GFC reduced UK exports to the EU by 0.950 and imports by 0.834, while the COVID-19 pandemic reduced exports by 0.854 and imports by 0.732. Participation in regional trade agreements (RTAs), however, shows a positive impact on trade, with coefficients of 0.742 for exports and 0.684 for imports, suggesting that such agreements can partially mitigate negative effects stemming from economic and geographical factors.

Significantly, the analysis reveals a pronounced negative impact of Brexit on both UK exports to and imports from the EU. The regression results show that Brexit reduced UK exports by 0.555 and imports by 0.622, indicating a substantial disruption to established trade patterns and relationships. This finding underscores Brexit's disruptive nature, necessitating adaptive trade policies and bilateral negotiations to manage and alleviate these impacts over time. Overall, the study provides valuable insights for policymakers and businesses as they navigate the complexities of the post-Brexit trade environment.

The analysis of Nepal's trade with the UK in the context of Brexit reveals that the Brexit dummy variable shows a negative coefficient of -0.3045 for exports, indicating a decrease in Nepal's exports to the UK by approximately 30.45%. However, this result is not statistically significant (p-value: 0.207), suggesting that the evidence is insufficient to confirm a significant Brexit effect on exports. Conversely, the Brexit dummy variable for imports shows a negative coefficient of -0.3724, indicating a decrease in Nepal's imports from the UK by approximately 37.24%. This result is marginally significant (p-value: 0.074), suggesting some evidence that Brexit negatively affected imports, although it is not conclusive at the traditional 5% significance level.

CHAPTER-V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

This study delves into the transformative impact of Brexit on trade relations between the UK and the EU, an issue of paramount significance amidst current economic and political dynamics. Brexit, marking the UK's departure from the EU, represents a seismic shift in European trade dynamics, restructuring not only political alliances but also deeply entrenched economic interdependencies. As the UK navigates its transition from a member of a large economic bloc to an independent trading entity, understanding the nuanced effects of Brexit on trade becomes imperative. This study aims to comprehensively analyze several key objectives: examining long-term trends in real exports, imports, and GDP of both the UK and the EU from 2001 to 2023, evaluating the specific impacts of Brexit on trade volumes and balances, and projecting the enduring implications for the UK's trade balance with the EU.

Methodologically, the study employs a robust framework integrating descriptive analysis and advanced econometric modeling, leveraging the gravity model and Poisson Pseudo-Maximum Likelihood (PPML) techniques. Descriptive analysis offers foundational insights into the evolution of trade dynamics over the studied period, providing essential context for deeper econometric investigations. Econometric methods, including regression analyses, dissect the influence of key variables such as GDP levels of the UK and the EU, geographical distance, significant economic disruptions (e.g., the Global Financial Crisis and the Covid-19 pandemic), and the impact of regional trade agreements (RTAs). These analyses reveal significant correlations: higher GDP levels in both the UK and the EU positively correlate with increased trade volumes, while greater distances and economic shocks exert negative pressures on trade flows.

This study examines the impact of Brexit on UK-EU trade using regression analysis of key economic variables. The findings show that both the GDP of the UK and the EU

positively influence trade, with coefficients of 0.820 and 0.945 for exports, and 0.902 and 0.875 for imports, respectively. Geographical distance negatively impacts trade flows, with coefficients of -1.212 for exports and -1.034 for imports. Global economic shocks like the Global Financial Crisis and the COVID-19 pandemic significantly reduce trade volumes, with the GFC reducing exports by 0.950 and imports by 0.834, and COVID-19 reducing exports by 0.854 and imports by 0.732. Participation in regional trade agreements enhances trade, with coefficients of 0.742 for exports and 0.684 for imports. Most notably, Brexit has had a substantial negative impact on both UK exports to and imports from the EU, with reductions of 0.555 and 0.622, respectively, highlighting the disruption to established trade patterns and the need for adaptive trade policies and bilateral negotiations to mitigate these effects.

Similarly, the analysis of Nepal's balance of trade with the UK in the context of Brexit reveals that Brexit is associated with a decrease in both exports and imports. Nepal's exports to the UK show a negative coefficient of -0.3045, indicating a decline of approximately 30.45%, though this result is not statistically significant (p-value: 0.207). On the other hand, Nepal's imports from the UK show a more pronounced negative coefficient of -0.3724, indicating a decline of about 37.24%, with this result being marginally significant (p-value: 0.074). This suggests that while Brexit may have negatively impacted both exports and imports, the evidence is stronger for the reduction in imports, potentially leading to a marginal improvement in Nepal's balance of trade with the UK due to a relatively larger drop in imports compared to exports.

5.2 Conclusions

In conclusion, the study underscores the complex dynamics of UK-EU trade, which are influenced by a myriad of factors including economic growth, global crises, and significant political events such as Brexit. The intricate interplay of these elements creates a multifaceted and often volatile trade environment. Economic growth, as evidenced by the positive impact of GDP on trade volumes, is a fundamental driver of trade, reflecting the capacity and demand for goods and services in thriving economies. However, this growth is periodically disrupted by global crises, such as the Global Financial Crisis and the Covid-19 pandemic, which have had substantial adverse effects

on trade volumes. These crises underscore the sensitivity of international trade to external shocks and the importance of resilience in economic policies and business strategies.

Brexit represents a particularly significant political event that has dramatically reshaped UK-EU trade dynamics. The study's findings indicate that Brexit has led to considerable disruptions, particularly in UK imports from the EU, highlighting the profound impact that political decisions can have on economic relationships. The introduction of new trade barriers, changes in regulations, and the overall uncertainty following the Brexit referendum have created a more volatile and challenging trade environment. These changes necessitate substantial adjustments from both policymakers and businesses as they navigate the new realities of post-Brexit trade

Specifically, in the context of Nepal's trade with the UK, the analysis reveals that Brexit has negatively impacted both exports and imports. Nepal's exports to the UK decreased by approximately 30.45%, though this decline is not statistically significant. Conversely, Nepal's imports from the UK decreased by about 37.24%, with this reduction being marginally significant. While the evidence suggests that Brexit has negatively affected trade, the impact on imports appears to be stronger than on exports. As a result, Nepal's balance of trade with the UK may have experienced a marginal improvement due to a relatively larger decrease in imports compared to exports.

The findings of this study offer essential insights for policymakers and businesses as they navigate the evolving trade landscape. Policymakers need to develop robust economic policies and strategies to analyze the trend of real export, import, and GDP of the UK and EU, understand the relationship between these economic indicators, and evaluate the specific impacts of Brexit on import and export between the EU and the UK. This includes creating contingency plans, diversifying trade partnerships, and implementing measures to enhance economic resilience. For businesses, adapting supply chains, exploring new markets, and staying informed about regulatory changes are essential steps for maintaining competitiveness in the post-Brexit era.

The marked fluctuations in trade volumes around major economic events highlight the need for robust economic policies and strategies to promote sustainable trade growth. These fluctuations serve as a reminder of the inherent volatility in international trade and

the necessity for proactive and flexible policy frameworks. Ensuring stable and sustainable trade growth requires continuous monitoring of global economic conditions, timely policy interventions, and fostering strong trade relationships both within and outside traditional partnerships.

Further analysis is necessary to fully understand the long-term implications of Brexit on the UK's trade balance and economic health. While this study provides significant insights, the long-term effects of Brexit will continue to unfold over time. Ongoing research and analysis will be crucial to assess how the new trade agreements, regulatory changes, and economic adjustments impact the UK's trade dynamics. Understanding these long-term implications will help in crafting policies that not only address immediate challenges but also support sustainable economic growth and stability in the future.

5.3 Recommendations

Based on the findings and analysis of the study, several recommendations can be made for policymakers, businesses, and other stakeholders to navigate the complex trade environment between the UK and the EU in the post-Brexit era.

5.3.1 For Policymakers

Policymakers need to prioritize the development and implementation of robust and flexible economic policies that can mitigate the adverse effects of global crises and significant political events. This includes creating contingency plans to handle economic disruptions like those experienced during the Global Financial Crisis and the Covid-19 pandemic. Enhancing economic resilience through diversified trade partnerships is crucial. Policymakers should seek to establish and strengthen trade agreements with non-EU countries to reduce reliance on EU trade and open up new markets for UK exports. Additionally, maintaining a focus on reducing trade barriers within these new agreements will be vital to ensure smooth and cost-effective trade flows.

There should also be a concerted effort to improve the infrastructure and logistical capabilities within the UK to reduce the negative impact of distance on trade. Investing in advanced transportation networks, efficient customs procedures, and digital trade facilitation can help offset some of the logistical challenges posed by increased trade

distances. Furthermore, continuous monitoring and analysis of trade data will be essential to identify emerging trends and potential issues promptly. Policymakers should establish dedicated research bodies or collaborate with academic institutions to ensure that they have access to up-to-date information and expert analysis to inform their decisions.

5.3.2 For Businesses

Businesses must adapt their strategies to align with the new trade realities post-Brexit. This involves reassessing supply chains to enhance flexibility and resilience. Companies should consider diversifying their suppliers and production bases to avoid over-reliance on EU-based sources, thereby mitigating risks associated with potential trade disruptions. Exploring new markets beyond the EU is also critical. Businesses should actively seek opportunities in global markets, leveraging any new trade agreements the UK enters into. This proactive approach can help them tap into new customer bases and reduce the impact of any negative trade dynamics with the EU.

Staying informed about regulatory changes is another key area for businesses. The post-Brexit landscape is characterized by evolving trade regulations and standards, and businesses must keep abreast of these changes to remain compliant and competitive. Investing in regulatory expertise or partnering with legal and trade advisory services can provide the necessary support to navigate these complexities. Additionally, embracing digital transformation and advanced technologies can improve operational efficiency and reduce costs associated with trade, making businesses more competitive in a global market.

5.3.3 For Long-term Strategic Planning

Both policymakers and businesses need to focus on long-term strategic planning to address the potential lasting impacts of Brexit. This involves ongoing investment in research and development to innovate and improve the competitiveness of UK products in the global market. Policymakers should support this through incentives and funding for innovation and technological advancements. In parallel, businesses should continuously seek to enhance the quality and uniqueness of their offerings to maintain a competitive edge.

Moreover, fostering strong relationships with trading partners will be crucial for long-term success. Diplomatic efforts to build and maintain positive trade relations with both EU and non-EU countries can help create a stable trade environment. Policymakers should engage in continuous dialogue with their counterparts in key trading nations to ensure that trade agreements are beneficial and sustainable. Businesses can support these efforts by participating in trade missions and international business forums to build networks and showcase their capabilities.

5.3.4 Nepal's Context

Nepalese policymakers should create robust economic policies to mitigate global crises and political events like Brexit, enhancing resilience through diversified trade partnerships and improved infrastructure. Continuous trade data monitoring and academic collaboration are vital.

Businesses need to reassess supply chains for flexibility, diversify suppliers, and explore new markets. Staying informed about regulatory changes and embracing digital transformation will boost competitiveness.

Long-term planning involves incentivizing research and development and building strong trade relationships through diplomatic efforts and international forums. These steps will help Nepal navigate Brexit challenges and promote sustainable trade growth with the UK.

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Appendix I

UK-EU Export Import Data

Year	UK's-Export to -EU	UK's-Import from-EU
2001	152,931.10	159,743.18
2002	161,551.13	175,986.31
2003	173,515.50	209,255.50
2004	189,084.79	236,888.04
2005	214,745.80	264,685.83
2006	167,656.42	184,821.41
2007	175,313.56	217,565.78
2008	195,781.81	245,905.13
2009	234,507.22	269,976.55
2010	261,051.25	303,294.97
2011	177,839.12	224,199.54
2012	204,273.39	253,804.72
2013	263,025.31	280,180.84
2014	238,817.48	307,446.00
2015	266,593.54	352,776.91
2916	210,402.17	260,861.11
29017	270,011.10	287,580.39
2018	240,705.96	318,999.04
2019	272,136.68	353,692.12
2020	187,913.70	244,709.31
2021	273,246.79	295,864.07
2022	248,122.33	332,464.47
2023	256,429.59	329,810.72

APPENDIX II

GDP of EU and UK (in constant 2015 UD$) in millions USD

Year	EU GDP (constant 2015 US$)	UK GDP (constant 2015 US$)
2001	9,359,000	2,088,390
2002	10,041,600	2,218,300
2003	12,112,400	2,505,390
2004	13,593,900	2,882,770
2005	13,849,000	2,957,190
2006	14,446,100	3,077,770
2007	16,363,900	3,433,900
2008	17,712,400	3,184,140
2009	15,873,900	2,594,450
2010	15,485,100	2,644,130
2011	16,421,900	2,774,800
2012	14,940,300	2,762,340
2013	15,449,200	2,812,980
2014	15,651,200	3,064,710
2015	13,553,700	2,927,910
2016	13,751,000	2,662,490
2017	14,476,000	2,627,600
2018	15,366,400	2,760,900
2019	14,805,100	2,690,010
2020	14,241,900	2,497,970
2021	15,741,100	2,855,920
2022	14,952,200	2,758,100
2023	14,689,900	2,709,710

Appendix III

Nepal's GDP, Export to and Import from the UK Data

Year	GDP of Nepal in millions (constant 2015 US$)	Nepal's Export to UK	Nepal's Import from UK
2011	18,590	19.82	29.43
2012	19,470	13.75	18.75
2013	20,630	19.47	17.84
2014	21,990	20.58	21.35
2015	21,120	20.66	18.74
2016	21,430	24.65	22.71
2017	24,470	25.36	24.66
2018	28,860	26.08	40.21
2019	30,640	22.15	31.69
2020	34,470	17.15	19.14
2021	36,290	23.54	30.34
2022	38,430	23.79	44.79

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i CHAPTER-I INTRODUCTION 1.1 Background of the Study Trade integration within the European Union (EU) has long been a focal point of economic analysis and policy discourse (Cameron, 2013). Initially formed as a cooperative venture among six member states in the 1950s, the EU has evolved into a complex economic bloc characterized by extensive trade flows, regulatory harmonization, and institutional cooperation (Dhingra et al., 2017). Central to this integration process has been the establishment of a single market, aiming to foster the free movement of goods, services, capital, and labor among member states (Swales, 2016). However, the landscape of EU trade dynamics underwent a seismic shift with the United Kingdom's (UK) decision to exit the EU, commonly referred to as Brexit. The 2016 referendum resulted in a narrow majority favoring Brexit, setting off a protracted process of negotiation and eventual withdrawal in January 2020 (Walker, 2021). This historic development marked the first-ever departure of a member state from the EU, triggering considerable uncertainty and upheaval in various domains, including trade relations (Portes, 2022). One of the central questions emerging from Brexit pertains to its impact on trade between the EU and the UK, as well as intra-EU trade among the remaining 27 member countries. The dissolution of the UK's longstanding membership in the EU's single market and customs union has disrupted established trade patterns, supply chains, and regulatory frameworks (Dhingra et al., 2021). The imposition of new customs checks, tariffs, and non-tariff barriers has introduced friction into previously seamless trade relations, affecting businesses, consumers, and policymakers on both sides of the English Channel (Chang, 2018). Understanding the dynamics of trade integration in the EU before and after Brexit is thus paramount for comprehending the broader implications of this momentous event. By examining how trade flows, patterns, and structures have evolved in the pre- and post- Brexit era, this study seeks to shed light on the mechanisms through which Brexit has influenced trade relations within the EU (Chadha et al., 2016). Moreover, by analyzing intra-EU trade among the remaining member states, this study aims to discern any spillover effects or adjustments stemming from Brexit-induced disruptions (Emmerson et al., 2016). The journey