

Cross Border Factors, Trade Agreements and Bilateral Exports: Evidence from Major Trading Partners of Pakistan

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Abstract

This study examines the impact of cross-border factors and trade agreements on bilateral exports among major trading partners of Pakistan by using panel data analysis. The research investigates how GDP, population and Distance influence the bilateral export flows. This study also measures the role of trade agreements, which enhance trade volumes by reducing barriers and promoting economic integration. The research evaluates the role of regional trade agreements and free trade agreements in improving market access by reducing trade costs. The finding highlights the significance of quality, infrastructure and regulatory frameworks, which shape export competitiveness. These findings suggest the efficient trade policies, improved relationship and reduced trade restrictions, which contribute significantly to bilateral exports. The results provide valuable understandings for policymakers who are aiming to optimise the trade policies and support economic relations between trading nations to optimise trade policies, enhance potential export and improve economic relations between the trading partners.

Keywords: GDP, Population, Distance, Area, Colonial Regions, Free Trade Agreements, Preferential Trade Agreements.

Introduction

Bilateral trade refers to the exchange of goods and services between two countries on the basis of mutual agreements and trade policies. Partnership between countries can improve their economic potential and promote sustainable development. The bilateral trade allows countries to expand their economies. The nations with a narrow economic base can expand their export portfolio by entering a new market. Bilateral agreements between developing and developed countries enable the exports of raw materials and agricultural products by importing advanced technologies and machinery to reduce reliance on a single sector. Competition created by the bilateral trade also promotes efficiency of the cost by getting cheaper inputs from the trade partners, and the companies also lower their production costs, which reduces the prices for consumers. Bilateral trade plays a significant role in promoting economic growth by increasing exports, creating jobs and attracting foreign investment. It makes countries specialise in the

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production of goods and services in which they have a comparative advantage, which leads to an increase in efficiency and productivity. This contributes to higher economic growth (Temjanovski, 2011). Bilateral trade agreements are also a channel for technology transfer with the new innovations. By importing high-tech products and collaborating with technologically advanced partners, countries can boost their technological progress, like India's trade relations with the United States, partnerships in the information technology and pharmaceutical sectors, promoting innovation and skills development (Chanda, 2017).

Bilateral trade contributes significantly to the job creation, especially in export-dependent industries. Bangladesh's bilateral trade agreements with the EU and USA have been expanding its garment industry, which is employing millions of workers, primarily women (Ahmed & Nathan, 2016). The economic growth through the bilateral trade helps to reduce poverty, the increased exports lead to higher revenues for businesses and governments, which enables the investments in infrastructure, education and healthcare. This cycle of growth and development improves the living standards by reducing inequality. This increases access and also enhances the cultural exchange as the trade introduces consumers to products from other countries. Countries mainly prioritise their closest trade partners most of the time to ensure a degree of economic stability and continuity of trade. This agreement also leads to the creation of new jobs in many sectors, including manufacturing, logistics and services, as trade increases, firms and sectors need to hire more workers to meet their growing demand for their products, resulting in a lower unemployment rate and improved living standards (Lurweg et al, 2010).

Bilateral trade agreements also attract foreign direct investment (FDI) because investors become more confident about the stability due to the trade environment. FDI can bring new capital, technology and improved management skills, which contribute to economic growth and development (Jang, 2011). This agreement can provide market access to new markets by enabling the economies to export their products and services to a large customer area, and increase the volume of trade, also promoting economic growth (Fugazza & McLaren, 2014). Bilateral trade agreements can reduce tariffs by making exports cheaper and more competitive in the global market, which increases trade volumes (Henn & Gnutzmann-Mkrtchyan, 2015). Bilateral trade agreements also reduce trade barriers such as tariffs, quotas and subsidies, which can create obstacles in trade between the countries. By reducing and eliminating these barriers, the countries can increase their trade volumes to improve their economic cooperation (Ramos et al, 2010). It allows countries to get the comparative advantage in the production of certain goods and services, which leads to an increase in efficiency and productivity by specialising in these areas where it has a comparative advantage. Countries can produce more goods and services at a lower cost (Chiang, 2007). These trade agreements create interdependencies, promote collaboration, and reduce the chances of conflicts. Like the trade partnership between China and Africa has not only economic ties, it also facilitates diplomatic engagements, which are leading to infrastructural investments and development across African nations (Brautigam, 2015). While its advantages are too many, it also has some challenges, like trade imbalance, which can lead to economic dependence, mainly for the smaller nations. There are some African countries which is heavily reliant on exports to China, facing problems due to changes in the demand and prices of global markets (Brautigam, 2015).

Gross Domestic Product (GDP) plays a crucial role in the bilateral trade between countries. As a measure of a country's economic performance, GDP provides the size and health of the economy, which directly impacts trade relationships. A higher GDP means a larger economy, signifying the greater market potential for trade with partners. The Countries with substantial GDP have higher purchasing power, which enables them to import more goods and services. Similarly, strong GDP indicates a country's ability to produce and export, which promotes trade relationships (Krugman, 2009). The countries with stable GDP growth are more likely to engage in reliable trade because it provides reliable markets for imports and exports. The

stability in GDP is linked to economic policies and is favourable for trade (Helpman, 1999). GDP shows a country's industrial strengths and competition in sectors which figure its comparative advantage in the bilateral trade. The economies with high GDP contributions from advanced manufacturing and technology sectors can export high-value goods, but those whose GDP is reliant on agriculture might focus on only commodity exports. This specialisation can enable mutually beneficial trade (Balassa, 1965). GDP size and growth also affect a country's bargaining power in trade agreements. The nations with higher GDP have greater control in negotiating trade terms of setting tariffs and influencing international trade regulations (Bhagwati et al, 2004). There is a positive correlation between GDP and trade volumes; the larger economies tend to trade more in terms of exports and imports, which is also reflected by the gravity model of trade. This model refers to trade flows that are proportional to the GDP of trading countries and inversely related to the distance between them (Anderson, 1979). The high GDP also attracts Foreign Direct Investment (FDI), which increases bilateral trade by enhancing production and creating supply chain networks. FDI inflows can inspire more trade activities by promoting mutual trade between nations (Dunning, 2002).

Population plays a significant role in the bilateral trade dynamics. A country's population size directly correlates with its market potential. A larger population size leads to a greater domestic demand for a variety of goods and services, making the country an attractive trade partner. Market size is an essential factor in trade flow, as it influences economies of scale and product specialisation (Krugman, 2009). A large population also refers to a large labour force, which can enhance production capabilities. This labour force enables countries to specialise in specific industries and sectors, leading to comparative advantages in bilateral trade. The resource endowment, including labour, is essential in the trade patterns (Heckscher, 1991). The population from the various demographics, such as income levels and cultural preferences, creates opportunities for the niche markets. This diversity enables countries to trade specialised goods of specific segments to partner nations' populations, which expands the bilateral trade opportunities (Linder, 1961). Urbanised populations tend to have better access to trade infrastructure like ports and logistics networks, which enhances trade efficiency, and there is a link between the population, urbanisation and the trade volume (Citaristi, 2022). Populations with strong diaspora communities promote bilateral trade by reducing cultural barriers, which diaspora networks facilitate through business connections, improving trust between trading partners and encouraging demand for goods in foreign markets (Rauch & Trindade, 2002). Population growth also affects economic growth, which can fuel bilateral trade. A growing population increases the consumption, which provides the capital for trade investments. The countries with large populations and growing economies are more likely to be involved in mutually beneficial trade relationships (Frankel & Romer, 2017).

Distance is an essential factor of bilateral trade, which influences the trade volumes, costs and the ease of conducting business. Geographical distance directly impacts transportation costs, which are the main component of trade expenses. Longer distances increase shipping time and fuel cost, raising the price of goods. According to the gravity model, trade volume declines significantly with the increase in distance due to higher transportation costs (Anderson & Van, 2003). For goods which are perishable or sensitive, longer distances create challenges. The delay of delivery can affect the quality of goods and the ability to meet the demand of markets like agriculture, pharmaceuticals and fashion (Hummels & Schaur, 2013). Distance is correlated with the cultural and institutional differences, including language and business practices. This factor creates additional costs for businesses as they need translators, legal advisors and market researchers (Rauch, 1999). The distance between countries makes it harder to build trust and exchange information about markets and business. The close ones can create better communication and a stronger network, which is crucial for trade relationships (Guiso et al, 2009). Neighbouring countries are more likely to start RTAs to facilitate cross-border

trade and to reduce the barriers in agreements like NAFTA and the European Union (Tinbergen, 1962). Distance also promotes comparative advantage due to the fact that it is more expensive for countries to trade goods with high transportation costs; countries tend to specialise in goods which can be produced and consumed locally or can be traded over short distances (Krugman, 1991).

The study is with panel data from 2000 to 2023 of Pakistan with its 10 trading partners, the United Arab Emirates, the United States, China, the United Kingdom, Germany, the Netherlands, Spain, Italy, Afghanistan and Bangladesh, which is significant in all models for understanding the trade dynamics of Pakistan. By analysing the data for more than two decades, it provides an understanding of the impact of trade agreements and cross-border factors such as GDP, population and geographical distance conditions on trade flows of Pakistan. The scope of this study is to identify key points and challenges to the bilateral trade, showing the effectiveness of existing trade agreements and policies to improve trade competitiveness. The results can guide policymakers in making trade policies evidence-based, regional integration of economic sectors, and enhancing Pakistan's trade relationships with its major trading partners to boost its economic growth.

This study is based on five sections. Section 2 represents a review of the literature. Section 3 explains the model, data and methodology. In section 4, the results and discussions of the study are discussed, and section 5 is about the conclusion and suggested policy implications from the literature of the study.

Review of Literature

The gravity model has emerged as one of the most widely used empirical tools in analysing bilateral trade flows across countries. Table 1 presents a comprehensive summary of key studies that have employed the gravity model to explore the determinants and patterns of bilateral trade.

Table 1: Studies on Bilateral Trade based on Gravity Model

Authors	Time period	Country	Methodology	Main Results
Akram et al. (2024)	1995-2020	Sri Lanka & India	Time Series Data.	The SAFTA and ISFTA agreements impact on bilateral trade between India and Sri Lanka was negative.
Hua & Wu (2024)	2022	China	vertical integration dominated by platform (VIDP) No integration (NI) & vertical integration dominated by ILSP (VIL).	The Effects of integration in cross border E-commerce logistics service supply chains has been positive.
Li et al. (2023)	2002-2013	China & 182 countries	Cross Sectional Data.	The effects of the bilateral relations on exports reduces the negative effects of cultural distance on exports which can promotes exports by reducing trade costs had a positive effect.
Hayat & Ishaq (2023)	2003-2021	Pakistan	Panel Data.	The effects of Pakistan meat, fishery & milk has been positive on the trade agreements.
Benson et al. (2023)	2020-2023	USA, Japan, Korea, India, Thailand, Vietnam, Singapore, Malaysia, Philippines, New	Cross Sectional Method.	Making semi-conductor chipset by own effects positive on Indo-pacific economic framework & its trade agreements.

		Zealand Australia &		
Lu et al. (2023)	2022	Taiwan	Distance from Average Solution (EDAS) & Decision-Making Trial and Evaluation Laboratory (DEMATEL)	This study uses factors affecting the usage for cross border E-commerce (CBEC) platforms construct on (DEMATEL) and (EDAS) methods has positive effects on cross border trade.
Zhang et al. (2023)	2019-2020	China	Technique of order preferences by similarity to ideal solution (TOPSIS) & fuzzy analytic hierarchy process (AHP).	This study say that this has to make balance between E-Commerce Supply Resilience & Supply Vulnerability because that's necessary for management of Supply Chain and has positive effects on cross border exports.
Cooray et al. (2023)	1996-2014	193 UN members	Panel Data.	The effects of corruption on international trade & cross border exports have been negative.
Saeed & Cullinane (2023)	2016	Singapore, Hong Kong & China	Hierarchical clustering technique	The characteristics of China's maritime trading partnership for bilateral show positive effects on bilateral trade.
Allayarov et al (2022)	2000-2016	Kyrgyzstan & 35 countries	Panel Data.	This study shows that Kyrgyzstan's shared border countries (China, Kazakhstan, Uzbekistan, and Tajikistan) and Russia still have potential to trade. Which has positive effects on bilateral trade.
Hao & Han (2022)	2008-2019	China & 33 other Countries	Panel Data.	The Currency swap agreements with China tends to increase in bilateral trade and has positive effects on bilateral trade.
Wu et al. (2022)	2015-2019	New Zealand	Time Series Data.	This study shows that mobile payment platform complementors has positive & sustainable network effects which improves ecosystem by digital payment methods. Overall, this has positive effect on Cross border exports.
Cassia & Magno (2022)	2021	Italy	Partial least square structural equation modelling (PLS SEM)	The effects of CBEC on small & medium sized enterprises (SMEs) in food & beverage industry was positive.
Basboga (2022)	2007-2013	European region	Cross Sectional Data.	The Intensity of Cross-Border Cooperation Across Europe tends to increase trade & exports and has positive effect on cross border exports.
Umair et al. (2022)	2002-2019	Pakistan, USA, UK, Iran, UAE, China, Bangladesh, Malaysia, Algeria, Sri Lanka & Thailand	Panel Data.	The determinants of Pakistan's bilateral trade with its major trading partners with Tinbergen Gravity Model & Heckscher-Ohlin Model has positive effect bilateral trade.
Noureen & Mahmood (2022)	2003-2018	Pakistan & 141 partner countries	Dynamic panel gravity model	The effects of trade cost on components of bilateral export growth of Pakistan have negative for Pakistan's bilateral trade growth.
Douch & Edwards (2022)	1999-2018	United Kingdom & EU	Dynamic gravity model	The bilateral trade effects of announcement of the Brexit were negative.
Kaushal (2022)	2008-2018	167 Countries	Stochastic frontier gravity model	The impact of regional trade agreements on the exports efficiency of India was positive.

Purwono et al. (2022)	2007-2017	Indonesia & Countries	37	Panel Data.	The trade liberalization & comparative advantages of Indonesia says that (RTAs) regional trade agreements increase trade of manicured & naturally resourced goods have negative effect on bilateral trade of Indonesia.
De Soyres et al. (2021)	1995-2009	USA & countries	39	Panel Data.	The complex value chain exports volume to exchange rate with the higher foreign value added in exports tends to decrease in the response of export volumes to exchange rate which has negative effects on bilateral.
Jindřichovská & Uğurlu (2021)	2018-2020	China & countries	15 EU	Descriptive statistics	The impacts of trade in Covid-19 between China & EU were a great decline in trade volume. Covid-19 has negative effects on bilateral trade.
Pomfret (2021)	1947-1994 & Post 1995	EU, American & North Asian countries		Historical analysis	The impact of the regional trade agreements facilitate trade by reducing bureaucrat's requirements which has positive effects on bilateral trade agreements.
Ganbaatar et al. (2021)	1996-2019	China & Mogolia		Panel Data.	Bilateral trade between China & Mongolia has effects by various model & tests. This has positive effects on the boosting trade. The tariff imposed by China on Mongolian exports has reduced the trade and has negative effect on bilateral trade.
Yao et al. (2021)	1990-2015	China & countries	188	Panel Data.	The preferential trade agreements on bilateral trade boosts the trade volume between member countries and has positive effects on bilateral trade.
Khan et al. (2021)	1987-2017	China & Bangladesh		Cross-sectional autoregressive distributed lags regression analysis	Effect of the export diversification & composite risk in Carbon emission has been positive on Trade agreements.
Schimmelfennig (2021)	2016	UK, EU nations		Qualitative Analysis.	Brexit has negative effects on Trade agreements.
Fetzer & Schwarz (2021)	2012-2016	USA, Canada, and EU	China, Mexico	Panel Data.	USA & China have politically targeted each other by imposing tariffs on each other's so this has negative effects on trade agreements.
Dou et al. (2021)	1970-2019	China, south Korea & Japan		Panel Data.	The Free trade agreement between China Japan & South Korea has positive effects on trade agreements.
Hang et al. (2021)	2019-2020	Vietnam, EU		Qualitative Method & inductive methods	Vietnam new labor joining in last 6 months has positive effect on Trade agreement.
Bickley et al. (2021)	Jan 2019 - Oct 2020	185 Countries		Time Series Data.	Due to restricted policies & travel restriction covid 19 has negative effect on Trade agreements.
Chin et al. (2021)	1999	China, UK, Japan & Korea		information communication technology (ICT) and	This study suggests Polychronic Knowledge Creation for innovation & sustainable business mode. This has positive effect on cross border exports.
Medeiros et al. (2021)	2018-2020	European Union		Qualitative Analysis. Data	With Covid fencing closing of border effect significantly on cross border trade & economic systems. Covid fencing has negative effects on cross border exports.

Liu et al. (2021)	2021	China	DEMATEL & interpretive structural modelling (ISM)	The effecting factors of (CBECSCR) Cross Border E-Commerce Supply Chain Resilience can improve safe operation & competition which was positive for cross border exports.
Bhagwat et al. (2021)	1980-2014	139 Countries	DEMATEL and ISM methods	The effects of Bilateral investment treaties (BIA) & cross-border mergers & acquisitions (M&A) have positive effects on cross border trade.
Kutlay & Öniş (2021)	2000-2005	Turkey, USA, China & Russia	Qualitative Analysis.	Due to reduction in barriers of trade & efforts for economic growth it has positive effects on Trade agreements.
Weidner & Zylkin (2021)	1995-2000-2005-2010-2015	USA & 167 countries	Three-way fixed effects Poisson Pseudo-Maximum Likelihood (FE-PPML)	Bias has negative effects on Trade agreements but consistency has positive effects tries to fix negative effects.
Adarov & Ghodsi (2021)	2013-2017	Iran, Armenia, Belarus, Kazakhstan, Kyrgyzstan & Russia.	Cross Sectional Data.	The (EAEU) Eurasian Economic Union Iran preferential trade agreement has positive effect on bilateral trade.
Sohail et al. (2021)	2001-2019	South & East Asian countries	Panel Data.	This study shows positive effects on foreign direct investment (FDI) on bilateral trade.
Fernandes & Winters (2021)	2014-2017	United Kingdom	Qualitative Analysis.	The Brexit vote shock on bilateral trade of the UK reduces exports volume & exports prices in UK after this happened. Which has negative effect on the bilateral trade.
Shahriar et al. (2021)	1989-2015	China & 19 countries	Panel Data.	Bangladesh has comparative advantage in field on leather due to their leather abundant resources. So, Bangladesh has positive effect on their bilateral trade.
Qiu & Yu (2020)	2000-2006	China	Theoretical & empirical analysis.	The trade liberalization of Chinese firms has negative effect on bilateral trade.
Baek (2020)	1989-2017	South Korea & 14 partner countries	Nonlinear Autoregressive Distributed Lag (NARDL)	The asymmetric approach of the trade balance in oil prices in Korea with its 14 trading partners can increased or could be decreased with China.
Jun et al. (2020)	2000-2015	Every single country	Time Series Data.	The countries with the Bilateral relatedness are likely to increase. So, it has positive effects on bilateral trade.
Tokas & Deb (2020)	2005-2015	62 OECD members countries	Panel Data.	The factors effecting bilateral trade between India & its trade partners using (CAGE) common language & difference in per capita income effects positively in bilateral trade.
Whitten et al. (2020)	1981-2019	China & 12 countries	Vector Autoregression (VAR) & Vector Error Correction Model (VECM)	The investigation of the association between political relationship and bilateral trade flows has positive effects on bilateral trade.
Laget et al. (2020)	1958-2015	184 countries	Poisson Pseudo Maximum Likelihood (PPML) model	Preferential trade agreements (PTA's) help to increase in Global Value Chains (GVC) and has positive effects on their trade agreements.
Nuruzzaman et al. (2020)	2006-2015	81 Countries	Qualitative Analysis.	Institutional support has positive and more effect than Institutional hazard.

Finley & Esposito (2020)	2016	USA	Qualitative Approach.	This has negative effects on trade agreements.
Yilanci & Gorus (2020)	1981-2016	14 MENA countries	Panel Fourier Toda Yamamoto (PFTY)	Environmental policies have positive effects on Trade agreements.
Enderwick & Buckley (2020)	2019	USA, China, Japan, East Asia & EU	Cross Sectional Data.	After Covid 19 rise in regionalization has positive effect on Trade agreements due to rise in trade.
Chang et al. (2020)	2014-2019	40 countries	Qualitative Analysis.	Potential of Block chain & block supply Govt has positive effect on Trade agreements.
Karackattu (2020)	2018	India & Taiwan	Qualitative Analysis.	The initiative of Taiwan by investing In India has positive effects on Trade agreements.
Stronski & Sokolsky (2020)	1990-2020	Russia, Armenia, Belarus, Kyrgyzstan & Kazakhstan	Qualitative Analysis.	Russia wants to rise of China that's why this has positive effect on trade agreement & Russia wants to promote BRICS.
Allison (2020)	1940-2020	USA, China & Russia	Qualitative Analysis.	This shows us competition between big powers China & Russia vs USA has positive effects on trade agreements.
Chow (2020)	1930-2019	USA & China	Historical Analysis	USA & China's cold war has negative effects on trade agreements
Loong (2020)	1970-2020	USA, China & Southeast Asian Countries	Qualitative Data Analysis.	As the USA leaves from TPP and tried to make Asia free trade region this has positive effect on trade agreements.
Fuchs et al. (2020)	1990-2014	European Unions	Time Series Data.	EU green deal depends on producing goods by themselves instead of importing so, this has negative effects on trade agreements.
Lowe (2020)	2020	United Kingdom, USA and EU Unions	Qualitative Analysis.	After the Brexit UK faced many types of trade barriers this has negative effects on trade agreements.
Burri & Polanco (2020)	2000-2019	USA, EU, Australia, Japan, and the Pacific Alliance.	Panel Data.	The Trade Agreements Provisions on Electronic-Commerce and Data dataset (TAPED) helps to improve and understand digital trade so this has positive effects on Trade agreements.
Brandi et al. (2020)	1984-2016	Australia, Canada, Germany, Japan, UK, USA, Brazil, China, India, Mexico, South Africa & Vietnam.	Panel Data.	Environmental provision Trade agreement tried to reduce dirty exports & increase greener imports this has positive effects on Trade agreements.
Carter & Poast (2020)	1800-2014	Entire world	Time Series Data.	The Border walls affect trade relationship reduction in legal & illegal trade flow with shared border countries leaves negative effects on cross border exports.
Basboga (2020)	2007-2013	European Union	Difference in different methodology	The open & cross-border cooperation in regional growth across Europe for free movements has positive effect on cross border exports.
Naik (2020)	1998-2019	India	Panel Data.	Trade agreements with partners has positive effect on cross border exports.
Pananond et al. (2020)	2008-2017	United States, Europe, China & East Asian economies	integrative topology methodology	The integration between global strategy & Global value Chain (GVC) can lead to optimization of networks which has positive effects on Cross Border exports.

Chen & Lin (2020)	2000-2012	China, Indonesia, Thailand, Korea, Netherlands & Sweden	Gravity specification	empirical	The effect of increasing Transport system in Cross Border were positive like flights, shipping & high-speed trains.
Mou et al. (2020)	2019	European Union, North & South American regions	Cross Sectional Data.		The effects of Cross Border E-Commerce (CBEC) on the B-Buyers reduced the trade barriers & increase the growth specially in Small & Medium enterprises (SMEs). So, has positive effects on Cross Border exports.
Mendoza & Dupeyron (2020)	1990-2016	USA & Mexico	Qualitative Analysis.		The effects of economic integration & Cross Border governance in between San Diego & Tijuana have led to increase in Foreign Direct Investment (FDI) & trade in these 2 cities. Which has positive effect on Cross Border exports.
Giuffrida (2020)	2018-2019	China	Qualitative Analysis.		The risks of B2C E-Commerce in China are changing in Cross Border regulation, product quality & demand of products has negative effects on cross border trade.
Liu et al. (2020)	2017-2018	UK & Germany	Qualitative Analysis.		This study was about reverse transfer knowledge in Chinese Cross Boarder acquisition has positive effect on the Cross Border Exports.
Kumar et al. (2020)	2000-2017	India	Time Series Data.		Springboard internationalization by emerging market firms focuses on the speed of first cross border acquisition. Which has positive impact on their exports.
Bathelt & Li (2020)	2018-2020	China	Qualitative Analysis.		The building cross border knowledge pipelines can improve & facilitate knowledge generation which has positive effects on cross border exports.
Cui et al. (2020)	2019	Region around the world	Integrated model combining psychological distance theory & commitment trust theory		This study was about consumer trust & relationship management has positive effects on cross border trade.
Qi et al. (2020)	2013-2018	China	Qualitative Analysis.		The effects cross-border e-commerce have been positive on the foreign market entry.
Chang et al. (2020)	2014-2019	64 Countries	Critical methodology	synthesis	Blockchain provides full transaction data, tracking of supply chain, products & reduce costs and time. Which has positive effect on cross border exports.
Goh et al. (2020)	1948-2014	Brazil, Canada, China, France, Germany, Japan, Mexico & UK	Bootstrap Testing Procedure	ARDL	The US's trading partners in exports & imports are cointegrated and dependent variables for a long-term relationship. which has positive effect on US bilateral trade.

Trade agreements play an important role in determining global economic relationships with the different factors influencing with its outcomes. The positive effects often arise from positioning trade policies with the economic strategies like focusing on the high-income markets, latest and new innovations in the key sectors like technology with the skilled labour to meet industrial demands. The environmental considerations and renewable energy adoption are becoming

extremely important to sustainable trade growth and helping to reduce risks associated with the carbon emissions. But the political tensions such as retaliatory tariffs can negatively affect the trade relations. The trade barriers due to different economic policies or from the external disturbances like pandemics and storms create challenges that delay and interrupt the international transactions. However, the advancements in the areas like blockchain technologies and the regional cooperation create the new opportunities for enhancing trade agreements and making global value chains more efficient and resilient. The Trade agreements are very important for encouraging the international economic cooperation, driving growth and enhancing the market access. This significantly boost exports potential, open new markets and create opportunities for sectors like agriculture and manufacturing. The cross-border factors of trade show the complex relationship of factors that significantly influence the international trade dynamics. The effective integration not only improves operational efficiency but also reduce issues of marginalization which leads to reduce costs and better delivery service. The quality of the platforms used in cross-border transactions should be high. The factors such as system quality, service quality and the information quality control the overall users experience and the acceptance of e-commerce platforms. The positive user experience creates trust which is too much necessary for increasing consumer interest in it and it can encourage the consumer to repeat purchases from here. The balancing resilience and vulnerability within supply chains is another important thing in management of these necessary elements to ensure sustainability and avoid the misallocation of resources. The focus on resilience can enhance the overall performance of supply chains. The challenges such as the corruption and political instability shows negatively impacts on trade volumes and creates barriers that can make obstacles in the international business activities. These challenges can be reduced by the attractiveness of the markets and increase operational risks which leads to lower trade efficiency. The knowledge transfer and collaboration among firms can significantly improve the competitiveness in global markets through building networks and sharing experiences can lead to advance solutions that improve the performance and increase the reach of market.

Most of the studies has focus on the developed countries or large trading blocs but with limited attention to the Pakistan and its trade relationships with its major partners. The existing studies are not showing economic and cultural factors which are affecting Pakistan's bilateral exports. Some studies on trade agreements exist but it focuses on how regional trade agreements are influencing bilateral exports of Pakistan. Pakistan's trade agreements with its partners are lacking comprehensive studies about it much of the existing research is on outdated data and used simple econometric models which aren't fulfilling latest trade scenarios. The scope of applying advanced econometric techniques like gravity models is sustainable. This study could address the interaction of Cross Border factors, trade agreements and bilateral export performance mainly focusing on the Pakistan's major trade partners.

Model, Data and Methodology

Model Specification

The section explained the relationship among dependent variable bilateral exports and various independent variables like GDP, Population, Distance, Area, Colonial regions, Free trade agreements and preferential trade agreements. For this purpose, following models are given below:

Model 1: Basic Gravity Model

$$\log EX_{ij_{it}} = \alpha_0 + \beta_1 \log GDP_{i_{it}} + \beta_2 \log GDP_{j_{it}} + \beta_3 \log DIST_{ij_{it}} + \varepsilon_{it} \quad (1)$$

Model 2: Basic Gravity Trade Model with Dummy Variables

$$\log EX_{ij_{it}} = \alpha_0 + \beta_1 \log GDP_{i_{it}} + \beta_2 \log GDP_{j_{it}} + \beta_3 \log DIST_{ij_{it}} + \beta_4 AREA_{i_{it}} + \beta_5 COL_{ij_{it}} + \varepsilon_{it} \quad (2)$$

Model 3: Modified Gravity Trade Model with Trade Agreements

$$\log EX_{ij_{it}} = \alpha_0 + \beta_1 \log GDP_{i_{it}} + \beta_2 \log GDP_{j_{it}} + \beta_3 \log POP_{i_{it}} + \beta_4 \log POP_{j_{it}} + \beta_5 \log DIST_{ij_{it}} + \beta_6 FTA_{it} + \beta_7 PTA_{it} + \varepsilon_{it} \quad (3)$$

Where:

EX_{ij} = Exports between the country i and country j (Current US \$ billion)

GDP_i = Gross Domestic Product of exporter country (Current US \$ billion)

GDP_j = Gross Domestic product of importer countries (Current US \$ billion)

DIST_{ij} = Distance between the country i and country j (kilometre)

AREAi = Dummy variable of the total area of land of country i (1,0)

COL_{ij} = Dummy variable for the colonial regions (1,0)

POP_i = Total population of the country i (Billions)

POP_j = Total population of the country j (Billions)

FTA = Free trade agreements between trading partners (1,0)

PTA = Preferential trade agreements between trading partners (1,0)

Variables Description, Measurements and Data Sources

In this section we explain variables with description and sources from where we get data in Table 2.

Table 2: Data Description and Sources

Variables	Description	Sources
EX _{ij}	Bilateral trade flows obtained by adding bilateral exports	UN COMTRADE
GDP _i	GDP used as a proxy for economic size of the exporter country	WDI
GDP _j	GDP used as a proxy for economic size of the importer country	WDI
DIST _{ij}	Distance from the capital to capital used as a proxy for the trade costs	CEPII
AREA ⁱ	Total land area assumes the value of 1 if countries are large size in area otherwise value of 0	CEPII
COL ^{ij}	If the importing country is in colonial region the value is 1 else it is 0	CEPII
POP _i	Total population of Pakistan multiplied by population of partner country	WDI
POP _j	Total population of importer country multiplied by population of partner country	WDI
FTA	1 if free trade agreement is signed between Pakistan and importing country otherwise 0	GOP
PTA	1 if preferential trade agreement is signed between Pakistan and importing country otherwise 0	GOP

Methodology: Panel Least Square (PLS)

Panel Least Squares (PLS) is econometrics technique in panel data analysis which simplifies relationships between the variables of both time and cross-sectional dimensions. The method is used where data is structured in the two-dimensional arrangement with observations repeated across the time for various cross-sectional observations. This methodology combines the both cross sectional and time series data with the strong statistical analysis (Baltagi & Baltagi 2008). The PLS method is selected in this study due to its account unobservable heterogeneity across the cross-sectional data such as data of countries. By including both the fixed and random effects in model PLS can effectively control for fixed over the time factors which can bias the results. It also allows a more detailed analysis by using maximum variations from the cross-

sectional units over the time (Wooldridge, 2002). PLS shows that the individual effects have relation with the dependent variables. This model removes the fixed characters by converting the data through within transformation. which ensures that the effects of missing variables which are constant over time by reducing the risk of the bias. Mathematically the model can be expressed like that.

$$Y_{it} = \beta X_{it} + \alpha_i + \mu_{it} \quad (4)$$

Where the Y_{it} is the dependent variable for the i at the time t . The X_{it} is representation of the independent variables for i at the specific time t . β is the coefficient of the explanatory variables which are to be estimate. α_i is the specific fixed effects of variables which use to get unobserved heterogeneity and is constant over the time for every observation and μ_{it} is error term which is for individuals over the time (Greene, 2012). It also assumes that the unobserved effects do not have relation with the independent variables. This shows the model to maintain the degrees of freedom by making it more efficient rather than the fixed effects and to decide between the fixed and random effects models (Hausman, 1978). The PLS methodology has several assumptions there should be no perfect multicollinearity between the independent variables. Homoscedasticity of the error terms and there should be absence of correlation in the residuals. The model's efficiency is depending seriously on assumption of the no correlation between the specific effects and independent variables (Arellano & Carrasco, 2003). The PLS methodology is applied to explore the relationship between the exports and GDP_{ij}, POP_{ij}, DIST_{ij}, AREA, COL, FTA and PTA over the time period of 2000-2023. This confirms that the most proper specification is used by enhancing the consistency of the findings. The Panel Least Squares methodology is framework for analysing the panel data and to control individuals' heterogeneity using both cross-sectional and the time series variations.

Results and Discussion

Descriptive and Correlation Analysis

The descriptive statistics is a detailed analysis of the variables GDP_i, GDP_j, POP_i, POP_j, DIST and AREA over the time period of 2000-2023 explained in table 3. The mean is the central or average value for every variable. The average value of the GDP_i is 3,045,484 and mean value of GDP_j is 154,926 which is much smaller than the GDP_i. POP_i mean value is 194.7648 and POP_j average value is 161.1545 which shows population of exporting country is more than j countries which could be due to geographical reasons.

Table 3: Descriptive Statistics Analysis of Key Variables (2000-2023)

	GDP _i	GDP _j	POP _i	POP _j	DIST	AREA
Mean	3045484	154926	194.7648	161.1545	5175.004	2.17942
Median	1834811	160269.2	59.37496	161.4323	5354.02	0.43164
Maximum	18036648	271049.9	1371.22	188.9249	12376	9.572378
Minimum	2461.666	40010.42	3.050128	107.6076	424	0.001092
Std. Dev.	4182061	67030.36	384.5908	18.22545	3076.083	3.702133
Skewness	2.109076	0.078859	2.478953	-0.666319	0.770357	1.490123
Kurtosis	6.50308	1.791448	7.471111	3.738986	3.7988	3.236992
JB	200.4291	9.903145	297.1445	15.48015	20.07922	59.58685
Probability	0.000	0.007	0.000	0.000	0.000	0.000

The mean value of DIST is 5,175.004 Representing an average distance which is geographical distances between the regions and AREA's mean value is 2.17942 which is small average. GDP_i has the maximum mean value and the AREA has the minimum mean value.

Median is the middle value in the dataset sample. The median of GDPi is 1,834,811 which is smaller than the mean value showing a distribution where the most values are lower and some of those are higher values. GDPj median is 160,269.2 which is very close to its mean value suggesting that GDPj has close to symmetric distribution with few extreme values. POPi median value is 59.37496 smaller than its mean value indicating most of values are lower figure with few very large values. The median of POPj is 161.4323 which is very close to the mean value representing that variable is more symmetrically distributed than the POPi. The DIST has median of 5,354.02 higher than its mean value showing most of the values are at higher end. The median of AREA is 0.43164 much smaller value than the mean showing most of the observations are of smaller size.

The range in difference between the maximum and minimum values show variability GDPi has Maximum 18,036,648 value which is very high economic value in observations of the dataset and Minimum value of GDPi is 2,461.666 a very low value representing difference between the smallest and the largest observations. GDPj has Maximum value 271,049.9 which is smaller than the GDPi and its Minimum value is 4,001.42 larger than GDPi's minimum value showing that the GDPj values has less spread than values of GDPi. POPi's maximum value is 1,371.22 and its minimum value is 3.05 representing a large population disparity while POPj has maximum value of 188.92 and the minimum value is 107.61 much smaller range compared to the POPi a more consistent population distribution. The DIST's maximum value is 12,376 and its minimum value is 424 shows a huge variability in the distance observations. The AREA has maximum value of 9.572378 and minimum value of 0.001092 Indicating significant variation in the area sizes which could be extremely small to some large observations.

The standard deviation measures the spread of data. The GDPi Std Dev is 4,182,061 which is high standard deviation indicating GDPi dataset has spread in the values which are far from the mean. The GDPj has standard deviation of 67,030.36 which shows lower spread compared to GDPi and more consistent data. The standard deviation of POPi is 384.59 shows high variability and differences in population observations and POPj has standard deviation of 18.22545 much lower standard deviation compared to the POPi suggesting close data cluster in this population. The standard deviation of DIST is 3,076.083 showing substantial variability in the distances. The AREA has standard deviation of 3.702133 representing high value of standard deviation than the mean indicating spread in the area dataset.

Skewness used to measure the asymmetry in the distribution of data GDPi: 2.109076, POPi: 2.478953 and the AREA: 1.490123 has positive skewness indicating that these variables are right tailed. The POPj: -0.666319 and DIST: -0.770357 has negative skewness indicating left tailed distribution with the most observation of high values and GDPj: 0.078859 is close to asymmetric distribution or normal distribution.

Kurtosis used to measure shape of frequency and peakiness of the distribution the GDPi: 6.50308 and POPi: 7.471111 has high kurtosis representing leptokurtic distributions with high level of peaks. POPj: 3.738986, DIST: 3.7988 and the AREA: 3.236992 has moderate kurtosis representing a mesokurtic which indicating distribution is close to the normal with normal peak and GDPj: 1.791448 showing mesokurtic but lower peak than others.

The p-values of the all variables are highly significant with the probability of 0.0000 except the GDPj whose value is 0.007 all variables are statistically significant and rejecting the null hypothesis with the significance level of 0.10% indicating normal distribution for the all variables.

Table 4: Correlation Analysis of Key Variables (2000-2023)

Correlation	GDPi	GDPj	POPi	POPj	DIST	AREA
GDPi	1.00					
GDPj	0.15	1.00				
POPi	0.34	0.03	1.00			
POPj	0.11	0.96	0.05	1.00		
DIST	0.77	-0.01	-0.03	-0.04	1.00	
AREA	0.78	0.00	0.80	0.00	0.43	1.00

Table 4 is correlation analysis the relationships between six key variables are explained which are GDPi, GDPj, POPi, POPj, DIST and AREA over the time period of 2000-2023. The correlation value between 0-0.39 shows weak correlation, 0.4-0.69 shows moderate correlation and 0.7-1 shows strong correlation between the variables. The values of correlation between variables are ranging from 1 to -1. In which +1 values between variables indicates perfect positive correlation, -1 values show perfect negative correlation and 0 means there's no linear correlation in these variables.

GDPi has correlation of 0.15 with GDPj showing a weak but positive correlation in these two variables. It both has very minimal relationship which shows GDPj doesn't have a significant impact of GDPi. GDPi and POPi correlation value is 0.34 which show positive moderate correlation in these variables. This relationship shows that population size of country i has some affect to its GDP. The value of GDPi's correlation with POPj is 0.11 representing weak and positive correlation in these which suggesting a small relation and impact of POPj on GDPi. The correlation of GDPi with DIST is 0.77 which is strong and positive correlation between these. Which suggesting that greater distance between countries the more impact on GDPi will be. The value of correlation in GDPi and AREA is 0.78 representing strong and positive correlation between these two variables showing that the larger areas are associated with the higher rate of GDPi. GDPi is strongly correlated with DIST and AREA which is indicating that geographical distances and AREA's have significant impact on it.

GDPj correlation with the POPi is 0.03 representing a very small but positive correlation in these which indicating that the POPi has a very small or not a significant impact on GDPj. The correlation of GDPj with POPj is 0.96 which is very strong and positive correlation between them and implying that the GDPj is highly related with the population size of country j. The correlation between GDPj and DIST -0.01 is very weak and negative correlation showing that there's no significant relationship between the GDPj and DIST. The correlation of GDPj with AREA is 0.00 showing that there's no correlation and size of the area does not have any impact on GDPj. GDPj is strongly correlated with the POPj showing population affects most to the GDPj among all these variables.

POPi correlation with POPj is 0.05 a very small and positive correlation representing that these two variables of population measures have small effects on each other. The correlation between POPi and DIST is -0.03 represents very weak and negative correlation showing a little relationship between the population of i and the distance. POPi correlation with AREA value is 0.80 explaining strong with positive correlation representing that larger areas have higher number of population and has strong affects on each other. POPi has strong correlation with the AREA indicating great affect between population of i and larger AREA's.

POPj correlation with DIST is -0.04 indicating weak and negative correlation which is showing there's very small but no significant relationship between the POPj and the distance. The correlation between POPj and AREA is 0.00 which means there's no any correlation between POPj and AREA suggesting that the size of the area and population of j doesn't have any affect on each other. POPj has no any significant correlations with any other variables but have a weak and little correlation with GDPj.

The DIST correlation with the AREA is 0.43 showing moderate and positive correlation in these which indicating that large area has affect on the AREA. DIST has strong correlation with the GDP_i and moderate correlation with the AREA.

AREA is strongly correlated with the GDP_i and POP_i showing its significant impact on the GDP_i and POP_i.

The strongest correlations are between the GDP_j and the POP_j which is 0.96, AREA and POP_i with the value of 0.80 and between the AREA and GDP_i valuing 0.78. The other most of the correlations are weak or which are indicating the limited relationships between the variables.

Bilateral Exports Flows: Basic Gravity Trade Model Framework

Table 5 presents the results of basic gravity model for exports. It examines how variables such as the GDP of the exporting countries and the distance between them affect to the exports.

Table 5: PLS Estimates of Basic Gravity Model for Exporting Countries

Dependent Variable: LOG(EX_{ij})				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.6745	1.2783	6.7862	0.0000
LOG(GDP _i)	3.411630	1.597585	2.135491	0.0343
LOG(GDP _j)	0.317572	0.062910	5.048060	0.0000
LOG(DIST _{ij})	-0.329246	0.121899	-2.700972	0.0077
Diagnostic Statistics				
R-squared	0.28	Mean dependent var		5.70
F-statistic	14.36	S.E. of regression		0.73
Prob(F-statistic)	0.00	Durbin-Watson stat		2.10

GDP_i the GDP of exporting country shows positive effect on exports. It represents that the 1% change in the GDP of exporting country the exports will increase by 3.41% which is highly statistically significant at the 10% level. which shows that the GDP_i has significant impact on exports. The higher rate of GDP shows more production and economic growth. By which country produce extra goods and services more than its domestic needs and export it to other countries (Krugman, 2009). With the growth of GDP, the country's economy becomes more efficient and capable of producing more goods and services which leads to increase in the quantity and quality of the exports. It also leads to new innovations and improvements in the technology. This advancement makes the country's products and services more competitive in the global market and makes the country more attractive to the foreign buyers and investors (Kalaitzi & Chamberlain 2020). The higher GDP refers to higher economic stability and economic growth potential by increase in FDI. It makes the country an attractive place to the foreign investors. FDI brings advanced technologies, managerial expertise and access to the global supply chains which can improve the efficiency and quality of the exportable goods and services and increase the exports. FDI can also establish the new industries and improves the existing ones which expands the products available for export in the global market (Alfaro et al., 2004).

GDP_j the GDP of the importing countries 1% increase in the GDP of the importing country refers to 0.318% increase in exports. The smaller affect compared to GDP_i showing importing countries economic size has less affect on exports and it is highly significant at the 10% level representing a strong influence. As the GDP of the importer countries increase its residents and the businesses generates higher income which improves their purchasing power. This increases their ability to spend and results to higher demand for the imported goods and services. Businesses in these countries also increase their demand for foreign machinery, raw materials and the technology. This growth in aggregate demand directly benefits to the exporting

countries as they get larger markets for their products (Krugman, 2009). The income elasticity of demand for the imports shows that as the income rise in the importing country demand for foreign goods and services grow faster than its income. Many imported goods such as luxury items and technology are income elastic. Trade elasticity refers to how sensitive the demand for imports is to changes in income as incomes in an importing country rise the demand for imported goods and services increases especially for products that are luxury or high value goods like branded clothing, electronics and automobiles. This happens because as income levels increase consumers diversify their consumption and look for higher quality and premium goods which increase the level of exports for exporting countries (Hummels & Klenow, 2005). The rising GDP levels of importer countries brings change in consumer preferences which lead to increase in demand for foreign products citizens experience a rise in disposable income which leads to shifts in consumer preferences toward higher and unique quality foreign products. People of these countries start using imported goods for looking elite by quality or branded products. This change also affects to services like tourism where rich people increasingly seek to get international experiences (Linder, 1961).

The Distance between exporting and importing countries. $DIST_{ij}$ explains that the 1% increase in distance corresponds with a 0.329% decrease in exports. This shows distance is negatively associated with trade due to transportation costs and other factors. These results are highly statistically significant at the 10% level indicating that distance plays significant role in the exports. The greater distances results in higher transportation costs which includes shipping, fuel and insurance. These types of costs make exported goods less competitive in the distance markets. The distance between trading partners rise the costs of shipping goods due to higher fuel consumption, port charges and the custom fees. These costs can make goods from distant exporters more expensive compared to local suppliers. Longer distances also need different types of transportation like combining road, sea and the air which become expensive logistics. These factors collectively reduce the profitability and attractiveness of exporting to the distant markets (Anderson, et al 2003). Long distances also lead to extended or more shipment time which can affect to the perishable goods, increase inventory cost and reduce the market responsiveness. This reduces the ability of exporters to compete in the distant markets. Longer distances also mean longer delivery times which can be a critical disadvantage especially for the time sensitive goods like perishable foods and electronics having a short product cycle. Delays in the delivery can affect supply chains and reduce firm ability to respond to the market demand which making their products less attractive to buyers. It also raises inventory holding cost for the both exporters and importers and time related barriers also leads to decrease the competitiveness of exporters in the distant markets compared to those market which are located closer (Hummels, 2001). Distant countries more likely have significant differences in culture, language and in the institutions which reduce the trade volume. Distant countries also have different business strategies and cultural norms which can create misunderstandings and expectations between the trading partners. These differences can increase the cost of communication and relationship as the exporters need to hire translator, cultural advisor or local intermediaries to know the market. The lack of shared cultural results in lower trust and reduce ease of business by making it harder to establish a sustainable trade relationship. These factors also work as hidden barriers by reducing the trade and economic benefits (Guiso, et al 2009).

Bilateral Exports Flows: Basic Gravity Trade Model with Dummy Variables

Table 6 presents the Basic Gravity Trade Model with dummy variables with analysis of bilateral export flows $LOG(EX_{ij})$ between the exporting and importing countries. Dummy variables $AREA_{ij}$ and COL_{ij} are included in this trade related effects.

Table 6: PLS Estimates of Basic Gravity Model with Dummies for Exporting Countries

Dependent Variable: LOG(EX _{ij})				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.726602	1.181696	2.307364	0.0224
LOG(GDP _i)	0.608538	0.073369	8.294230	0.0000
LOG(GDP _j)	0.167641	0.094025	1.782941	0.0766
LOG(DIST _{ij})	-0.831133	0.122019	-6.811513	0.0000
AREAD _i	-0.290958	0.171138	-1.700142	0.0911
COLD _{ij}	1.311957	0.127388	10.29887	0.0000

Table 7: Diagnostic Statistics

R-squared	0.58	Mean dependent var	4.25
F-statistic	43.22	S.E. of regression	0.54
Prob(F-statistic)	0.00	Durbin-Watson stat	1.92

In this model GDP_i is representing that the 1% increase in the GDP of the exporting country is linked with a 0.61% increase in exports which is less effect than the which was shown in previous table 5 basic gravity trade model for exporting. This indicates that a larger economy of the exporting country positively affects to export flows and it is highly significant at the 10% level showing a strong relationship between the exporting country GDP and the trade.

GDP_j is showing that by 1% increase in the GDP of the importing countries is associated with the 0.17% increase in exports this confirming that the importing countries economic size has positive but small impact on exports. This effect is also less than the effect was shown in Table 5 basic gravity trade model. This value is also statistically significant at the 10% level indicating weak but positive relationship between the importing countries GDP and trade.

DIST_{ij} explaining by the 1% increase in distance between importing and exporting countries is associated with 0.83% decrease in exports which is more effect than our previous model. This negative relationship is aligned with the gravity model where greater distances reduce trade. These results are highly statistically significant at the 10% level confirming the negative impact of distance on the trade.

AREAD_{ij} is area size of the trading region examining that the 1% increase in area size is related with the 0.29% decrease in exports. In the larger areas there might be logistical and infrastructural challenges that can reduce trade efficiency. These results are significant at the 10% level indicating weak and negative relationship between the AREA and exports. The larger areas can lead to the higher transportation costs due to coverage of greater distances. This can make exports less competitive to the global market. Managing exports across a larger area can be logistical challenge such as delays in the shipping and difficulties supply chains which can negatively impact to export efficiency larger area led to market fragmentation where the different regions have different levels of infrastructure and the economic development. This makes harder to achieve economies of scale and reduce the overall competitiveness of the exports (Mehak & Abbas, 2021). Managing resources efficiently across the larger geographic area can be challenging which leads to potential inefficiencies and the higher costs. This can negatively impact on the exports (Kalaitzi & Chamberlain, 2020). In the larger areas there might be various ranges of economic activities which can make weak focus of the export orient industries and can lead to overall lower export volume (Forte & Carvalho, 2024).

COL_{ij} is the dummy for colonial regions representing the 1% change in colonial region is associated with the 131.19% increase in exports these results are highly statistically significant at the 10% level confirming the positive and strong relationship between colonial regions and export flows. Colonial ties provided colonies the access to larger markets and established the trade relationships which can be increase and positive for exports (Kallab & Terra, 2020).

Colonies provided urban countries access with the abundant and diverse raw materials which were unavailable and scarce in their home countries which is increasing exports of colonial regions for example colonies supplied rubber, tea, spices and minerals which were in high demand in the global markets (Kriger, 2022). Colonies sometimes became manufacturing hubs exports finished goods for specific goods which boosting exports (Findlay & O'Rourke, 2021).

Bilateral Exports Flows: Modified Gravity Trade Model with Trade Agreements

Table 7 presents the modified gravity trade model which includes variables representing the trade agreements like Free Trade Agreements (FTA's) and Preferential Trade Agreements (PTA's). The dependent variable is the natural logarithm of bilateral export flows $\text{LOG}(\text{EX}_{ij})$ with explanatory variables GDP, population, distance and trade agreement dummies.

Table 7: PLS Estimates of Modified Gravity Model for Exporting Countries with Trade Agreements

Dependent Variable: $\text{LOG}(\text{EX}_{ij})$				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.239455	0.213697	1.120535	0.2642
$\text{LOG}(\text{GDP}_i)$	3.965423	1.653225	2.398598	0.0177
$\text{LOG}(\text{GDP}_j)$	0.297043	0.065070	4.564976	0.0000
$\text{LOG}(\text{POP}_i)$	0.278502	0.143514	1.940599	0.0541
$\text{LOG}(\text{POP}_j)$	-0.650677	0.145620	-4.468335	0.0000
$\text{LOG}(\text{DIST}_{ij})$	-0.319052	0.190779	-1.672362	0.0975
FTA	-1.185223	0.521787	-2.271469	0.0271
PTA	0.263032	0.147958	1.777752	0.0811
Diagnostic Statistics				
R-squared	0.49	Mean dependent var		6.02
F-statistic	9.01	S.E. of regression		0.73
Prob(F-statistic)	0.00	Durbin-Watson stat		1.86

In this model, the GDP_i is showing that the 1% increase in the GDP of the exporting country is related with a 3.97% increase in exports indicating strong and positive relationship which is statistically significant at 10% level between the size of the exporting economy and trade flow. GDP_j is representing a 1% increase in the GDP of the importing country tends to 0.30% increase in the exports. This is smaller effect compared to GDP_i suggesting that the importing countries economic size has less influence on the trade. This is highly statistically significant at the 10% level indicating a strong and positive relationship between the GDP of importing countries and exports.

The POP_i is population of exporting country indicating a 1% increase in the population of the exporting country results in the 0.28% increase in the exports. This shows that the larger population tends to higher trade volumes which is statistically significant at the 10% level indicating weak but positive relationship between the population of exporting country and exports. High population increase the labor supply larger population also mean as larger labor force which can boost the production capacity and exports volume. A larger population can create culture of the innovation and investment which leads to development of the new products and services to be exported (Kopecky, 2023). It also increases economies of scale with the larger population size firms can achieve economies of scale by reducing the production costs and making exports more competitive in global market. The larger population can lead to the more diverse range of skills which enhance the quality and variety of exportable goods and services (Karimi & Saadat 2021). Population also increases the production capacity with larger

workforce confirms high production capabilities which allowing the country to meet its both domestic and international demands effectively (Garnier, 2021).

POP_j is the population of importing country examining the 1% increase in the importing countries population is associated with a 0.65% decrease in exports. This negative relationship also shows there might be competition between the domestic production and imports in the large markets but these results are highly significant at the 10% level and is confirming the negative impact of population on exports. High population in importer countries increase in the domestic demands the larger population can lead to reduce the need for imports as the consumers prefer locally produced goods and increased domestic consumption can lead to the market fullness by reducing the incentive of the firms to export (Kinugasa et al, 2018). It also creates Self Sufficiency in Production by scale economies the large population in the importing countries may lead to higher domestic production capacities due to economies of scale as the population grows high the country may develop its own industries to meet the domestic demand by reducing its reliance on the imports (Krugman & Obstfeld, 2000). The growing population often put pressures on the governments to implement the import substitution policies to protect its domestic industries and employment which can lead to tariffs or restrictions on imports to discouraging the exports from other countries (Rodrik, 2000).

DIST_{ij} is showing the 1% increase in distance is indicating 0.32% decrease in the exports. This follows to the traditional gravity model where the greater distances increase the trade costs and reduces the trade flow and it is statistically significant at the 10% level suggesting negative and weak relationship between distance and the exports.

The FTA is Free Trade Agreement Dummy variable representing that the presence of free trade agreement is associated with the 118.52% decrease in the exports level and this is statistically significant at the 10% level which is confirming the negative association of FTA's and exports. FTAs may lead to the trade diversion where the countries prefer imports from partner nations within the agreement over cheaper and the high-quality products from the non member countries this can harm exports from countries which are out of the FTA which reduce market opportunities for the excluded nations (Viner, 2014). Free trade agreements often increase competition with the partner countries markets. If the domestic exporters cannot compete on the price, quality and efficiency their export shares may be decline the sectors with high production costs or less competitive industries may lose from the more efficient producers within the FTA region (Kose et al, 2005). FTAs countries may create export dependencies on the specific partner nations which tends to vulnerability if the demand in those markets declines over reliance on one market can discourage to the diversification (Freund & Ornelas 2010).

The PTA is Preferential Trade Agreement Dummy variable indicating that the presence of a preferential trade agreement is affecting with 26.30% increase in the exports. PTAs promotes the bilateral trade by reducing the barriers and improving access between partner countries. This is statistically significant at 10% level and presenting a weak but positive relationship. PTAs often involves the reduction and elimination of tariffs by making exports cheaper and more competitive to the markets of partner countries and it promotes economic integration between the member countries which leads to increase trade and investment flows (Falvey & Foster-McGregor, 2022). PTAs also provide exporters a greater access to the partner markets which can lead to increase in export volume by fostering cooperation and matching standards. PTAs can enhance the competitiveness of the exporters in the global market (Shaista, 2015). PTAs provide exporters access of the larger markets by removing discriminatory practices and harmonizing regulations this leads to an increase in the demand for exported goods (Baier et al., 2007).

Conclusion and Policy Recommendation

The study used data from 2000 to 2023 data from Pakistan and its 10 trading partner countries. This use panel least square technique on bilateral exports flows basic gravity trade model

framework, bilateral exports flow basic gravity trade model with dummy variables and bilateral exports flows modified gravity trade model with trade agreements. The results from model are analysis of key factors of bilateral export flows gravity trade model. In the basic gravity model GDP of both exporting GDP_i and importing GDP_j countries are showing positive and significant effects on bilateral exports. This represents the importance of economic size has impact on the trade flows. The larger economies most of the times involve with the higher levels GDP countries for the international trade and on the other side distance $DIST_{ij}$ has negative and significant effect on bilateral exports which confirms that the greater geographic distances work as trade barriers.

In model the introduction of dummy variables in the gravity model it represents the positive and significant effect of colonial region $COLD_{ij}$ on the bilateral exports showing that the exporter and importer countries with in the same colony are more likely to trade with each other it can be due to shared similar practices and larger areas $AREAD_i$ has negative but significant impact on bilateral exports indicating that larger areas may cause limits in trade.

In model modified gravity model with the trade agreements is explained which is examining the role of free trade agreements FTA is significantly negative which could be due to difficulties in these agreements which reduces the trade. The preferential trade agreements (PTA) have positive but less effect on the bilateral exports which is indicating improvements in the trade flows. The population of exporting country POP_i has positive impact on the trade suggesting that the larger domestic population can increase the higher exports and the importing countries population POP_j shows negative relationship with the bilateral exports which could be due to many factors which are limiting and decreasing exports.

The all of these results are showing that the economic size, geographic distance, colonial region, larger areas, population and trade agreements all play significant roles in determining the bilateral export flows these results shows the importance of international trade and the trade policies.

Policy Recommendations

Based on these results the policy recommendations to optimize Pakistan's bilateral trade performance.

- There's positive affect of GDP on bilateral trade so Pakistan should focus on its economic growth to promote its partnerships with the higher GDP trading partners by investing in to industries with large exports and reduce its dependency from the imported products.
- Pakistan would to increase its market access through the making favourable terms with other economies to improve its market access by reducing tariffs and non-tariff barriers.
- The negative impact of geographic distance shows the importance of trade logistics and reducing transportation costs. Pakistan should enhance its roads, rails and port to facilitate the cross-border trade and take different initiatives like the China-Pakistan Economic Corridor (CPEC) which is connecting with regional markets and facilitate to the trade flows.
- The results of trade agreements indicate need of improved agreements policies and implementation. To maximize benefits of agreements Pakistan should conduct FTAs to see its barriers or complex rules and costs. Pakistan needs to prioritize its preferential trade agreements that align with the Pakistan's exports potential.
- Pakistan's population size support to exports large trading partner populations may reduce demand and target specific demographic in high population countries where demand for the Pakistani goods can grow and promote textiles and agricultural products in targeted markets.

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