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Original Article

Determinants of Agricultural and Industrial Trade in South Asia: Empirical Evidence from Panel ARDL Approach

Ayesha Khalid*

Hunan University, Changsha, China

Abstract

This study examines the determinants of agricultural and industrial trade in South Asia using balanced panel data from 1990 to 2024. The study focuses on how key macroeconomic and structural factors influence trade performance in the region. Agricultural and industrial trade are considered as dependent variables, while employment in the agriculture and industrial sectors, foreign direct investment (FDI), exchange rate, inflation rate, and trade liberalization are used as explanatory variables. The study applies the Panel Autoregressive Distributed Lag (Panel ARDL) approach to estimate both short-run and long-run relationships among the variables. The findings reveal that employment in both sectors significantly promotes trade expansion, highlighting the role of labor availability and productivity in improving export capacity. FDI inflows also show a positive and significant contribution, suggesting that foreign capital supports technology transfer, production efficiency, and integration into international markets. Trade liberalization positively affects both agricultural and industrial trade by reducing trade barriers and enhancing market access. However, exchange rate depreciation/instability and inflation rate negatively affect trade performance, reflecting reduced competitiveness, higher production costs, and macroeconomic uncertainty. Overall, the study concludes that stable macroeconomic policies and structural reforms are essential for strengthening trade growth in South Asia. The study provides important policy insights for enhancing trade competitiveness and sustainable economic development in the region.

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INTRODUCTION

International trade has been long considered as an engine of growth and structural change in both developed and developing countries. Particularly interest are the agricultural and industrial trade sectors which are regarded as two basic pillars of the global economy that create jobs, generate income, earn foreign exchange and provide economic stability. Yet, the trade success of these sectors is not a foregone conclusion, but is determined by a wide variety of interconnected factors impacting on trade flows, competitiveness and trade integration. These are key for scholarly research and for policy makers who want to design and implement effective policies in trade and development. Agricultural trade is influenced by a number of economic, institutional and policy factors. In early trade theory comparative advantage is seen as a basis for agriculture trade, and countries that specialize in products in which they have an opportunity cost advantage have higher levels of trade (Van Berkum, & Van Meijl, 2000); (Anderson, et al., 1986). On this basis, empirical research generally has shown that key factors, including fertile land, climate conditions, and agricultural inputs, are important determinants of agricultural export performance (Ridley, & Devadoss, 2012). Besides the natural endowments, macroeconomic variables like real exchange rates, producer prices and income levels are important. As an illustration, (Sertoglu, & Dogan, 2016) demonstrate for the case of Turkish agricultural trade that real exchange rate changes, real GDP, and producer price indices have significant effects on the agricultural balance of trade both in the short and long run, indicating that a stable

*Corresponding Author: Ayesha Khalid | Hunan University, Changsha, China
khalidayesha093@gmail.com

macroeconomic environment and exchange rate policy are important factors affecting the agricultural trade result.

Furthermore, in the literature on global agricultural trade, policy and institutional factors are highlighted. (Reimer, & Li, 2010) and others has showed that trade policies, such as tariffs, subsidies, and non-tariff policies can support or obstruct agricultural trade flows, depending on their design. Meta-analysis of the effects of NTMs has resulted in a varied picture, with some arguing that they can be trade-restricting measures and others noting that they can be trade-enabling measures through their role in enhancing product quality and market access (Santeramo, et al., 2018). Institutional quality also proves to be an important determinant; countries with more effective institutions have higher levels of agricultural trade, due to lower transaction costs and more attractive environments for trading (Reimer, & Li, 2010). Compared with agricultural trade, other structural and economic dynamics mediate the determinants of industrial trade. Capital, technology, and skilled labor are generally higher for industrial sectors than for agriculture, so factors like FDI, technological innovation, human capital development, and government expenditure are important determinants of the competitiveness of industrial trade. The panel studies on the industrial growth in South Asia also show that per capita income, trade openness and FDI inflows are important determinants of industrial expansion and that overall economic openness and investment climate are closely associated with industrial trade performance (Ejaz, et al., 2016). In fact, the degree of trade openness, defined as the amount of openness of the economy in engaging in international exchange of goods and services, is found to be an important factor in empirical analysis not only for industrial trade but also for overall economic growth. More generally, open economies have higher shares of trade in GDP, and thus higher levels of industrial growth and agricultural export capabilities. For instance, research on the G-20 economies suggests that a positive relationship between investment in trade openness and economic growth, while a high level of tariff barriers negatively impacts trade growth, suggesting that policies that impact trade barriers have a significant impact on trade overall and by trade sector (Sowrov, 2024).

In addition to the macroeconomic and policy factors, structural transformation theories explain how the productivity gains in agriculture can indirectly affect the industrial trade. Productivity expansion in agriculture makes labor and capital available for industrial use, and thus contributes to structural change and to improving industrial trade competitiveness in the world markets as emphasized by classic development economists like (Nurkse, 2009); (Schultz, 1953); (Ranis, & Fei, 1961). Theories more recently developed include the integration of the agricultural sector into the growth model, and the role of agricultural productivity and comparative advantage in the speed of industrialization based on the elasticity and substitution of agricultural trade (Chu, et al., 2023). Overall, the factors influencing agriculture and industrial trade are numerous and interrelated, and range from natural resources, macroeconomic factors, institutional quality, policy regimes, to structural economic factors. The existing literature indicates that events in both sectors are multi-faceted and result from a variety of local and international conditions that affect the comparative advantages, the amount of trade and the competitive position in the global economy. To design policies which can improve trade performance and promote sustainable economic development and structural transformation in the agricultural and industrial sectors, it is crucial to understand these determinants.

The trade of agricultural and industrial products plays an important role in the global economic growth and is shaped by regional factors. Agriculture and industry are important sources of jobs, export earnings and economic diversification in South Asian region. Their trade performance is, however, affected by economic size, trade policies, regional cooperation and structural conditions. Consequently, key determinants of agricultural and industrial trade in South Asia have become a focus of research to assist in policy design and regional integration. Although agricultural contribution to GDP is decreasing, agricultural trade remains to be a major part of the economy, employing a large percentage of the population of the region (Nanda, 2014). The gravity model factors like GDP of exporter and importer, population and geographical distance are found to be significant determinants of agricultural trade flows. The results indicate that agricultural trade intensity is positively related to exporter GDP and population and the intensity of regional linkages is stronger with trade agreements and export diversification, as mentioned by (Dembatapitiya, 2013). Some bilateral trade linkages such as those between Nepal with Bhutan and Bhutan with

Bangladesh have higher trade intensities, due to the complementary production patterns and the economies of size effects (Dembatapitiya, 2013). Likewise, (Nengroo, et al., 2023), also validate that agricultural trade is improved due to GDP, common language, cultural connections and regional trade agreements while distance and uneven development have a negative impact on agricultural trade. Despite SAFTA's objectives of tariff reductions and support for regional trade, agriculture's development remains hindered by low production complementarities, lack of coordination and poor infrastructure (Ward, et al., 2020). Market concentration also influences agricultural exports because South Asia heavily depends on a few major primary commodities, which decreases resilience to demand shocks and stifles agricultural growth potential. More diversification of exports would help build the competitiveness of the agricultural sector (Dembatapitiya, 2013). Other factors related to competitiveness and structural change also have an impact on industrial trade. Some of the factors that affect urbanization are mentioned by (Ejaz, et al., 2016) and include the determinants of per capita income, trade openness, FDI, governance, government expenditure, labour force size and human capital. Trade openness facilitates access to global markets, whereas the FDI brings technology and capital for the expansion of industries. However, intraregional trade is weak in South Asia, accounting only for 5% of trade, due to institutional issues and poor connectivity. In general, South Asia's trade determinants such as GDP, population, distance, openness, trade agreements, diversification, institutional quality, FDI and human capital influence the ability and potential of South Asia countries to grow and compete in trade.

Problem Statement and Research Gap

Agriculture and industrial sector are two major contributors to economic development, job creation and export earnings in South Asia. South Asian countries have a relatively poor level of trade performance despite their large population base, abundant natural resources and developing industrial capacity when compared with other regions like East Asia and Southeast Asia. Agricultural trade accounts for a high percentage of total trade, while industrial trade lacks diversification and has not experienced high levels of technological development or of trade costs. Furthermore, South Asia is having one of the lowest levels of intra-regional trade integration in the world, even after the formation of trade agreements like the South Asian Free Trade Area (SAFTA). These challenges underscore the need to assess and understand the key factors affecting the region's agricultural and industrial trade. There have been a number of studies that have analyzed the determinants of trade flows in South Asia using the gravity model and traditional econometrics approaches. For example, (Dembatapitiya, 2013) pointed out that trade intensity in South Asia depends on some major factors such as GDP, population, and trade agreements. Likewise, (Nengroo, et al., 2023) discovered that the distance and economic size of the countries of SAARC have a significant impact on bilateral agricultural trade between the countries.

For industrial development, (Ejaz, et al., 2016) demonstrated that trade openness, foreign direct investment and government spending are significant factors for the growth of industrial production which leads to the growth of industrial exports. Yet, not all these contributions have been brought together in one comprehensive and comparative analysis examining agricultural and industrial trade determinants in a unified econometric framework. Moreover, South Asian economies have experienced changes in their structural characteristics over the years, which have involved policy reform, the liberalization of trade, the impact of globalization, and technological development. The dynamic changes indicate that the factors that affect agricultural and industrial trade could be different in the short and long run. Current studies have not, however, examined the long-run equilibrium relationships and short-run changes in the trade performance enough. Therefore, deeper investigation is required to find out the nature of the time-varying relationship between macroeconomic factors, the trade openness and agricultural and industrial trade, investment flows and agricultural and industrial trade, exchange rate and agricultural and industrial trade, and institutional quality and agricultural and industrial trade in South Asian countries. If such evidence is not available, policymakers can miss out on creating policies that are effective for enhancing competitiveness, export diversification and regional integration.

The literature on determinants of agricultural and/or industrial trade has been in existence for long time but still the literature on South Asia has some significant gaps, which give an argument to further research. In general, agricultural trade and industrial trade have

been investigated in isolation and not in a combined approach. For instance, (Nengroo, et al., 2023); (Dembatapitiya, 2013) concentrate primarily on trade intensity levels in agriculture, while (Ejaz, et al., 2016) concentrate primarily on factors affecting industrial growth. This separation leaves a significant research gap, given the interdependency of agriculture and industry in South Asia due to their structural transformation processes, labour mobility and supply chain. A comparative investigation is still in its infancy which simultaneously analyzes both sectors. The empirical literature has a major deficit in the extent to which long-run equilibrium relationships between trade and trade determinants are addressed. Most studies are based on static regression methods or on gravity models that predominantly account for cross-sectional trade. In the short run and long run, however, variables that affect trade like GDP growth, exchange rate changes, FDI inflows, inflation and trade openness can affect trade in a different way. Previous research does not account for these effects separately, so it is not possible to draw a complete set of policy implications. Therefore, it is important to consider both short and long-term effects to gain insight into the adjustment of trade and structural change in South Asia.

A methodological gap is one of the most significant gaps. Traditional econometric methods like OLS, fixed effects, random effects, and gravity models are the methods mostly used in the past studies in South Asia. While they are helpful approaches, they do not explicitly consider important econometric problems like the mixed integration order of some variables (I(0) and I(1)), country heterogeneity, and dynamic short-term adjustments. As the variables are integrated of various orders, the Panel Autoregressive Distributed Lag (Panel ARDL) approach is an appropriate method for the analysis of South Asian trade because both short-run and long-run coefficients can be estimated (Pesaran, et al., 1999). Furthermore, the Panel ARDL model can deal with the short-run dynamics that are different across countries and assume a common long-run dynamics model. This is particularly important in the South Asian region, which is characterized by shared regional features, but with varying structures of their economies, trade policies and institutional development. The organization of this paper is: segment two present the literature reviews of previous studies, theoretically backdrop is explained in the segment three. Data and methodologies are given in section four and empirical findings of the techniques are present in the fifth section. The study is concluding with section six comprising conclusion, policy implications and future research direction.

2. LITERATURE REVIEWS

This section of the study is divided in to two subsections; first one is related determinants of agriculture trade and, second one is related to determinants of industrial trade.

Literature Reviews on Determinants of Agriculture Trade

South Asian countries have witnessed the importance of agricultural trade in their economic growth due to employment opportunities, food security, rural development, export earnings, etc. The factors influencing agricultural trade have been examine extensively in the literature, both from a theoretical and empirical perspective, and have been largely dominated by the classical trade theories and empirical models. Comparative advantage, which is determine by the availability of natural endowments like land, climate and labour intensity, has a significant impact on agricultural trade, according to (Anderson, et al., 1986). Likewise, (Ridley, & Devadoss, 2012) stated that agricultural trade is driven by productivity, resource endowment and countries' capacity or capability to supply the international demand. South Asia is highly influenced by climatic conditions and seasonal variation and these aspects assume greater importance as agriculture is largely dependent and its output fluctuations directly influences the export supply capacity. The importance of macroeconomic variables in affecting agricultural trade flows is highlighted through a number of empirical studies. The reasons for considering the most important determinants to be exchange rate fluctuations, inflation and GDP growth is that they affect competitiveness and trade prices. (Sertoglu, & Dogan, 2016), have found that real exchange rate changes have a significant impact on the performance of agricultural trade, which means that a depreciation may improve agricultural export performance by making it possible to sell domestic agricultural products at lower prices in international markets.

Similarly, (Reimer, & Li, 2010) highlighted the role of policy related factors, including tariffs, subsidies and trade restrictions, which may affect competitiveness in the agricultural

sector. The nature of trade policy matters a lot in the South Asian context, where agriculture is often heavily protected and subsidized. Trade policy is important in the South Asian context where agriculture is often heavily protected and subsidized, affecting export competitiveness and import dependence. The gravity model literature has emphasized the role of economic size and geographic proximity to explain bilateral agricultural trade. (Dembatapitiya, 2013) discovered that exporter GDP and population and trade agreements are positively associated with agricultural trade intensity in South Asian economies; on the other hand, distance is negatively associated with trade as it brings transportation and transaction costs. Similarly, (Nengroo, et al., 2023), used the gravity model of the SAARC countries and found that GDP, trade liberalization, common language and regional agreements have significant positive influence on agricultural trade, whereas border conflict and trade barriers have negative influence on agricultural trade potential. The results indicate that South Asia has considerable potential for agricultural trade integration but the situation is constrained by institutional and political factors, which restrict South Asian trade development. Apart from tariffs, non-tariff restrictions and regulations are also significant in agricultural trade. (Santeramo, et al., 2018), showed that, sanitary and phytosanitary standards can either increase the compliance costs of farming and reduce agricultural trade, or improve the product quality and consumer trust and consequently boost the agricultural trade. In South Asia, lack of compliance capacity and poor trade facilitation system can limit agricultural exporters' competitiveness at global markets. Besides, institutions like the SAFTA or regional cooperation agreements have been mentioned as important determinants. (Ward, et al., 2020), however, noted that the success of SAFTA to encourage and foster food and agricultural trade is hampered by lack of implementation, political differences and the existence of persistent non-tariff barriers. In general, natural endowments, macroeconomic stability, trade liberalization policies, institutional effectiveness and regional integration frameworks appear to be the main determinants of agricultural trade in South Asia.

Literature Reviews on Determinants of Industrial Trade

The Industrial Trade is regarded as one of the important factors of economic modernization and structural transformation especially in developing regions including South Asia. Industrial exports create jobs, technological innovation and added-value, and industrial imports enable access to capital goods and intermediate goods, which are essential to industrial development. Industrial trade theories focusing on comparative advantage, economies of scale, and technological competitiveness have been used to explain the determinants of industrial trade. (Krugman, P. (1980) argued that industrial trade is the result of increasing returns to scale and product differentiation, such that countries with a more technologically advanced and/or industrialized economy could export more and become more competitive. Such factors are important in South Asia, where industries are still undergoing industrialization, to explain the performance of trade. Two of the most important variables, which explain the volume of industrial trade in empirical studies, are economic growth and market size. The higher the GDP and per capita income, the greater the amount of industrial output and export supply capacity, which results in improved industrial trade performance.

The study by (Ejaz, et al., 2016) revealed that per capita income and trade openness have significant impact on industrial growth in South Asia, suggesting a strong connection between the level of industrial development and level of export activity. Much the same, (Frankel, & Romer, 2017), contend that openness to trade can itself drive growth, via industrial specialization and increased participation in world market. In South Asia, trade liberalisation policies have led to a greater expansion of industrial exports in textile, pharmaceutical and light manufacturing, however, a lack of diversification and a lack of firm links between the region and global value chains remain a challenge. FDI is another important determinant of industrial trade that is widely recognized. FDI flows bring capital, technology, management skills and market access. The research suggests that FDI could enhance export competitiveness through the boost in industrial productivity and assistance to economies in exporting manufactured goods of good quality. (Ejaz, et al., 2016) reported positive effect of FDI on industrial development of South Asia for instance. Similarly, (Grossman, & Helpman, 1991), pointed out that innovation and technology transfer are critical elements of industrial trade competitiveness, and that FDI and multinationals play a key role in supporting these processes. This is particularly true for

countries in South Asia, where technological differences and low levels of research and development investments limit expansion of industrial trade.

Macroeconomic stability also has a crucial influence on the industrial trade performance. Exchange rate fluctuations impact the competitiveness of exports and inflation leads to higher production costs and lower industrial production. (Rodrik, 2008), argued that industrial development and competitiveness depends on stable macro-economic situations and supportive industrial policies. Further, the lack of infrastructure, logistics inefficiency and weak institutions are also key trade costs that restrict industrial trade growth. According to the gravity model literature, distance, transport costs and trade facilitation efficiency are important determinants of industrial exports and imports (Helpman, et al., 2008). Low level of infrastructure connectivity and customs procedures hinder industrial trade in South Asian economies resulting in high transaction costs. In addition, institutional quality and governance are important factors affecting industrial trade. Investment and industrial exports are more likely to be drawn to countries that benefit from strong public institutions, clear and secure property rights and sound regulations. (North, 1990) emphasized the fact that uncertainty and transaction costs are minimized in the institutional efficiency and thus it improves trade. In South Asia, lack of capacity in institutions are significant obstacles to the industrial trade. In general, the literature suggests that economic growth, trade openness, FDI inflows, exchange rate stability, technological progress, infrastructure development and institutional effectiveness are some of the key determinants of industrial trade in South Asian countries.

3. THEORETICAL BACKGROUND

Theoretically, the study is built on the classical and modern theories of International trade, which outlines the factors affecting the performance of agricultural and industrial trade in South Asian countries. The determinants of trade are tied to the notion that countries trade to achieve maximization of economic welfare, productivity gains and to gain from specialization. Theories of trade offer a fundamental understanding of the trade relationship between SA countries, which products they export and import, and the role of macroeconomic, structural and policy characteristics in determining the nature of the trade relation. Theory of Comparative Advantage, first proposed by (Ricardo, 1895), is one of the major theories that guided this study. This theory is based on the notion that countries need not be efficient in the production of a given good for them to have a comparative advantage in producing it and exporting it to other countries. For instance, for South Asia, comparative advantage is seen in manufacturing and exports of labour intensive products like garments, textiles, and agriculture products like rice, tea, cotton and fruits. Comparative advantage theory holds that there are differences in productivity, efficiency in factors of production and resource endowments, which are responsible for the direction and pattern of trade. So, the level of agricultural productivity, industrial efficiency, exchange rate competitiveness etc. become important to agriculture and industrial trade.

The Heckscher-Ohlin Theory is closely related to comparative advantage, which states that a country exports goods that use its abundant factors of production, and imports goods that use its scarce factors of production. The theory also predicts that these countries will export labour intensive goods of agriculture and light manufacturing and import the capital intensive and technology intensive industrial goods like machinery, advanced equipment and high tech products etc. from other countries, because the labour and agricultural land resources are relatively abundant in these countries. The H-O framework also has to emphasize factor endowment as an important determinant of trade flows, including size of labor force, capital formation, and land resources. This means that shifts in human capital formation, industrial investment, and technologies enable analysis of trade specialization and competitiveness behaviour. In addition, the Theory of Absolute Advantage proposed by Adam Smith adds to the understanding of trade behaviour by focusing on productivity efficiency. This theory states that countries export products in which they can produce more efficiently at a lower opportunity cost than other countries. The South Asian countries such as India and Bangladesh have achieved efficiency in the production of textile and apparel products because of the availability of cheap labour and the development of manufacturing skills. Pakistan, in the same manner, has achieved export capacity in agriculture sector products like rice and fruits, which is due to the favorable climatic

condition and fertile land. So, with productivity, infrastructure and production technology improvements, export competitiveness of the agricultural and industrial sectors is expected to continue to be enhanced. Moreover, this study is based on The New Trade Theory that suggests that in addition to factor endowments, economies of scale, market size and product differentiation also play an important role in driving trade. This theory suggests that industrial trade increases as firms can achieve lower average production costs with increased production and the availability of larger foreign markets. This theory is very applicable to the industrial trade in South Asia because industrial exports rely on scale of production, industrial capacity and access to the world markets. In accordance with New Trade Theory, policies to foster industrialization, FDI and trade openness can help firms to grow their output, boost their efficiency and take part in international value chains to bolster competitiveness.

4. DATA, MODEL CONSTRUCTION & METHODOLOGY

This segment of the paper will discuss the data; construct econometric model and appropriate method of the empirical analysis.

Data Type & Sources

This paper discovers the determinants of agriculture and industrial trade in case of South Asian economies, in accordance with the data that was accessible, a collection of panel data was collected between 1990 and 2024 are employed in the empirical analysis. Table 1 illustrates the thorough description linked to symbols, definition, and their sources.

Table 1

Descriptions Variables

Variables	Descriptions	Measurements Unit	Sources	Expected Sign
Dependent Variables				
AGT:	Agriculture Trade	Billions US$	WITS	
INT:	Industrial Trade	Billions US$	WITS	
Independent Variables				
EMA:	Employment in Agriculture Sector	% of Total Employment	World Bank	+
EMI:	Employment in Industrial Sector	% of Total Employment	World Bank	+
FDI:	Foreign Direct Investment	Inflow, % of GDP	World Bank	+
ER:	Exchange Rate	Local Currency per US$	World Bank	+ or -
INF:	Inflation Rate	Annual Change	World Bank	+ or -
TL:	Trade Liberalization	KOF Index	KOF-SEI	+

Sources: World Integrated Trade Solution, Worldwide Development Indicators KOF-Swiss Economic Institute

Construction of Model

This empirical investigation was undertaken to exploring the determinants of Agriculture and Industrial trade in case of South Asian economies. In research, an empirical model is a model that is grounded in measurable and observed facts as divergent to theory or conjecture. The study formulates the mathematical and econometric model. A mathematical model in research is a formal statement that expresses the relationship between different quantities or variables using mathematical symbols. The mathematical model of the study is given below;

$$AGT = f(EMA, FDI, ER, INF, TL) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$INT = f(EMI, FDI, ER, INF, TL) \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

An econometric model is a mathematical representation used in econometrics to describe the relationship between economic variables. Econometric model, in research, assist to enumerate relationships, evaluate causal influences, and make predictions. The econometric model of this study is given below;

$$AGT_{it} = \beta_0 + \beta_1 EMA_{it} + \beta_2 FDI_{it} + \beta_3 ER_{it} + \beta_4 INF_{it} + \beta_5 TL_{it} + + \epsilon_t \ldots\ldots\ldots (3)$$

$$INT_{it} = \beta_0 + \beta_1 EMI_{it} + \beta_2 FDI_{it} + \beta_3 ER_{it} + \beta_4 INF_{it} + \beta_5 TL_{it} + + \epsilon_t \ldots\ldots\ldots\ldots (4)$$

In the equation, "β_0" is intercept and "β_1,β_2,β_3,β_4, and β_5," are changeable coefficients

of every parameter. In the last, "€" is Error Term.

Empirical Methodological Approaches

Utilizing empirical approaches and procedures is crucial in research since it allows one to measure the relationship between variables rather than relying solely on theoretical assumptions. To recognize the association among the factors, the current study also used a variety of approaches. In first place, study performed the unit root breakdown for the purpose of stationary of the data. Further, the Pesaran Scaled LM & Pesaran CSD analysis were utilized in the paper to conclude whether CSD was present in a panel set of South Asian nations. The study will be capable to utilize PMG-ARDL econometric technique to evaluate the long term panel co - integration connection between the preferred parameters in the model on account of the occurrence of CSD and a mixture of mixed integration order (Zakari, et al., 2021). This PMG-ARDL econometric technique established by (Pesaran et al., 1999), furthermore, even with a small size sample, the estimation of PMG-ARDL is found to be effeciently. In addition, the long run parameters are well-suited with the normal t-distribution and F-tests (Pesaran, et al.,1999). The model of ARDL is classified as an ECM(Error Correction Method) and enables the identification of equally short plus long-term associations. With the exception of the dependent variable being restricted to being I(1), this method is pertinent since it may evaluate potential long period correlations apart-from the order of integration of the variables; whether they are I(1) or jointly included [I(0) plus I(1)]. Conversely, when the series integrated as order of 2 [I(2)], this method is not applicable. Furthermore, by include lag length for equally exogenous plus endogenous variables, this approach removes the issues caused by endogeneity and provides reliable and effective estimators. According to (Pesaran et al. 1999), the long-term link among variables is included in the ARDL (p, q) model, which looks like this:

$$\Delta Y_{1,it} = \alpha_{1i} + \gamma_{1i} Y_{1it-1} + \sum_{l=2}^{k} \gamma_{1i} X_{1it-1} + \sum_{j=1}^{p-1} \delta_{1ij} \Delta Y_{1it-j} + \sum_{j=0}^{q-1} \sum_{l=2}^{k} \delta_{1ij} \Delta_{1it-j} + \varepsilon_{1it} \dots (5)$$

Where, the DV is Y_l and exogenous variables are denoted as Xl, with l=1, 2, 3, 4, 5. ε_{it} is error term or residual, and "Δ" is the operator of 1st difference. In our model, the PMG-ARDL is prepared as follows:

$$\Delta AGT_{it} = \alpha_{1it} + \gamma_{1i} AGT_{it-1} + \gamma_{2i} EMA_{it-1} + \gamma_{3i} FDI_{it-1} + \gamma_{4i} ER_{it-1} + \gamma_{5i} INF_{it-1} + \gamma_{6i} TL_{it-1} + \sum_{j=1}^{p} \delta_{1i} \Delta AGT_{it-j} + \sum_{j=1}^{p} \delta_{2i} \Delta EMA_{it-j} + \sum_{j=1}^{p} \delta_{3i} \Delta FDI_{it-j} + \sum_{j=1}^{p} \delta_{4i} \Delta ER_{it-j} + \sum_{j=1}^{p} \delta_{5i} \Delta INF_{it-j} + \sum_{j=1}^{p} \delta_{6i} \Delta TL_{it-j} + \varepsilon_{1it} \dots (6)$$

$$\Delta INT_{it} = \alpha_{1it} + \gamma_{1i} INT_{it-1} + \gamma_{2i} EMI_{it-1} + \gamma_{3i} FDI_{it-1} + \gamma_{4i} ER_{it-1} + \gamma_{5i} INF_{it-1} + \gamma_{6i} TL_{it-1} + \sum_{j=1}^{p} \delta_{1i} \Delta INT_{it-j} + \sum_{j=1}^{p} \delta_{2i} \Delta EMI_{it-j} + \sum_{j=1}^{p} \delta_{3i} \Delta FDI_{it-j} + \sum_{j=1}^{p} \delta_{4i} \Delta ER_{it-j} + \sum_{j=1}^{p} \delta_{5i} \Delta INF_{it-j} + \sum_{j=1}^{p} \delta_{6i} \Delta TL_{it-j} + \varepsilon_{1it} \dots (7)$$

The AIC and SBC are utilized to regulate the lagged parameters to use. Conventional co-integration tests (in case variables I(0) plus I(1) are present) such as that of (Pedroni, 2004, 1999, 1995); (Kao,1999); (Bai & Ng,2001) leftovers inexcusable and the sequential testing of the survival of long phrase association among selected variables remains a valid argument. The third step involves estimating an error correction method (ECM) in order to determine the short-term dynamic affiliation. The following is the definition of the ECM:

$$\Delta Y_{1it} = \alpha_{1i} + \sum_{j=1}^{p-1} \beta_{1ij} \Delta Y_{1it-j} + \sum_{j=0}^{q-1} \sum_{1=2}^{k} \beta_{1ij} \Delta X_{1it-j} + \mu_{1i} ECT_{1it-1} + \varepsilon_{1it} \dots (8)$$

Long term relationship: Where, residual are independent ϵ_it (l={1,2,3,4,5,}) and distributed

normally with a constant variance with a mean of zero and Error Correction Term ECTit-1. The rate of alteration to the level of equilibrium is indicated by the parameter μit. In our study model, the ECM model is set up as follows:

$$\Delta AGT_{it} = a_{it} + \sum_{j=1}^{p-1} \beta_{1ij}\, \Delta AGT_{it-j} + \sum_{i=0}^{p-1} \beta_{2ij}\, \Delta EMA_{it-j} \sum_{i=0}^{p-1} \beta_{3ij}\, \Delta FDI_{it-j}$$

$$+ \sum_{i=0}^{p-1} \beta_{4ij}\, \Delta ER_{it-j} + \sum_{i=0}^{p-1} \beta_{5ij}\, \Delta INF_{it-j} + \sum_{i=0}^{p-1} \beta_{6ij}\, \Delta TL_{it-j} + \mu_{it} ECT_{it-1} + \varepsilon_{it} \ldots (9)$$

$$\Delta INT_{it} = a_{it} + \sum_{j=1}^{p-1} \beta_{1ij}\, \Delta INTT_{it-j} + \sum_{i=0}^{p-1} \beta_{2ij}\, \Delta EMI_{it-j} \sum_{i=0}^{p-1} \beta_{3ij}\, \Delta FDI_{it-j}$$

$$+ \sum_{i=0}^{p-1} \beta_{4ij}\, \Delta ER_{it-j} + \sum_{i=0}^{p-1} \beta_{5ij}\, \Delta INF_{it-j} + \sum_{i=0}^{p-1} \beta_{6ij}\, \Delta TL_{it-j} + \mu_{it} ECT_{it-1} + \varepsilon_{it} \ldots (10)$$

Following the steps of (Pesaran et al.,1999), the ARDL estimators are obtained using the PMG technique to get all parameters. This estimating process, based on the maximum likelihood technique, is believed to be the most reliable as it takes in account the individual features and provides better evaluation of the long term relationship. (Pesaran et al.,1999) notes that the estimators from the resulting PMG, in turn, are asymptotically and normally distributed.

5. EMPIRICAL ANALYSIS AND FINDINGS INTERPRETATIONS

The study begins by conducting the descriptive statistics test that gives a brief information of the basic characteristics of important variables used in the investigation. The outcomes are specified in the table 2 below:

Table 2

Fundamental Characteristics of Variables

Variables	Obs	Mean	Std. Dev.	Min	Max
Agriculture Trade:	280	-0.527870	2.072247	0.634399	-6.907760
Industrial Trade:	280	0.342688	2.813395	6.051536	-6.907760
Employment $_{Agriculture}$:	280	1.632341	0.220695	1.915558	0.854913
Employment $_{Industrial:}$	280	1.203206	0.194995	1.453471	0.440909
FDI Inflow:	280	0.229592	1.197738	2.820395	-6.282200
Exchange Rate:	280	1.726438	0.286589	2.392395	1.010837
Inflation Rate:	280	2.167854	0.907559	4.425641	-1.860990
Trade Liberalization	280	3.616519	0.347744	4.231349	2.771964

The descriptive statistics indicate that the study uses 280 observations. Agricultural trade has a negative mean (-0.528), suggesting relatively lower agricultural trade performance compared to industrial trade, which shows a positive mean (0.343). Industrial trade also has higher variability (Std. Dev. = 2.81) than agricultural trade (2.07), indicating greater fluctuations. Employment levels in agriculture (mean = 1.63) are higher than industrial employment (mean = 1.20), reflecting the labor-intensive nature of agriculture. FDI inflows show moderate variation with both negative and positive values. The exchange rate remains relatively stable. Inflation shows wide dispersion, implying macroeconomic instability. Trade liberalization has a high mean, indicating increasing openness.

Cross – Sectional Dependence Test

To evaluate if there is CS Dependence amongst the parameters in a panel dataset, the present study used the CS dependence test. In panel data analysis, this test is crucial since it can affect the panel estimation's overall effectiveness. The table 3 below portrays the results.

Table 3

Findings of CSD Test

Tests	Agriculture Trade Model			Industrial Trade Model		
	Stat:	d.f	Prob.	Stat:	d.f	Prob.
Breusch-Pagan LM:	551.1603		0.0000	317.0388		0.0000
Pesaran Scaled LM:	69.91023	28	0.0000	38.62444	28	0.0000
Pesaran CD:	14.24274		0.0000	6.733489		0.0000

According to the findings in the above table, the study cannot reject the Alternative (H1) Hypothesis that CSD exists at different levels of significance, such as the 1%, 5%, and 10% levels of significance in the South Asian economies, nor can it accept the Null (H0) Hypothesis is that there is no CSD.

Panel Unit Root Analysis

The current study employs the Augmented Dickey-Fuller (ADF) tests for unit root to verify the stationary nature and stability of the variables in panel data. The table 4 below presents the results.

Table 4

Findings of ADF and PP Unit Root Test

Variables	ADF – Fisher Chi-Square				Integration Order
	At Level		At 1st Difference		
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	
Agriculture Trade:	-3.049318 (0.0317**)	-3.200226 (0.0265**)	-16.97620 (0.0000*)	-16.95434 (0.0000*)	I(0)
Industrial Trade:	-2.798619 (0.1497)	-2.867209 (0.1749)	-17.47844 (0.0000*)	-17.45109 (0.0000*)	I(1)
Employment $_{Agriculture}$:	-2.566311 (0.1013)	-2.708172 (0.2341)	-16.46079 (0.0000*)	-16.43287 (0.0000*)	I(1)
Employment $_{Industrial:}$	-2.741857 (0.1683)	-2.748275 (0.2181)	-16.465501 (0.0000*)	-16.44439 (0.0000*)	I(1)
FDI Inflow:	-5.252951 (0.0000*)	-5.264653 (0.0001*)	-14.66705 (0.0000*)	-14.64169 (0.0000*)	I(0)
Exchange Rate:	-3.618922 (0.0000*)	-3.610797 (0.0000*)	-17.46564 (0.0000*)	-17.43556 (0.0000*)	I(0)
Inflation Rate:	-5.037906 (0.0000*)	-5.327555 (0.0001*)	-12.93281 (0.0000*)	-12.90876 (0.0000*)	I(0)
Trade Liberalization	-3.520645 (0.0081*)	-3.572556 (0.0041*)	-16.97829 (0.0000*)	-16.94795 (0.0000*)	I(0)

The results of panel unit root tests can be found in the table below. As described in the results, below. The stationary variables are level, intercept of Agriculture trade, FDI, exchange rate, inflation rate, and trade liberalization because their probability value is less than 5% (or (0.05) and the data is stationary at this point. These data are combined in the form of I(0). Further, industrial trade, employment in industrial and agriculture sectors are stationary at 1st difference and intercept because at this point the probability value of these variables are less than (0.05) or 5% and the data are stationary at this point. The following is a representation of the results obtained. Null Hypothesis is rejected, Alternative Hypothesis is accepted, and here we can see that panel data does not have unit root (meaning these variables are stationary). The data are stationary both at I(0) and I(1) and for this reason the data are ideal for the Panel ARDL estimator and co-integration.

Long and Short Run Empirical Findings of PMG-ARDL

The PMG-ARDL is an econometric approach which is used to check long-term relationships and short-term dynamics of the predictors, developed by Pesaran et al. (1999). The table 5 below lists their long and short run findings. The study employed PMG-ARDL test since it was established that there is no co-integration relationship, (Zakari et al., 2021) and the results are shown in Table 5. In table 5, agriculture and industrial trade are utilized as dependent variable. According to the findings, the coefficients value of employment in specific sectors shows positively (0.128640) and (0.184380) statistically significant (0.0328) and (0.0219) respectively,

effect on dependent variable. It indicate that, increase in employment will lead to increase in trade of both sectors. this finding is consistent with economic theory and empirical evidence showing that larger and more productive labor forces support higher trade volumes. Higher employment increases production capacity, enabling firms to expand output, meet export orders, and participate more actively in international markets. This is especially relevant in labor-intensive industries like agriculture and some manufacturing subsectors, where greater employment directly translates into increased production and export potential. Empirical studies support this relationship: for example, cross-country evidence from the World Bank shows that higher export levels are associated with significant gains in employment and labor earnings in manufacturing sectors, suggesting that trade expansion stimulates job creation and labor demand. Similarly, sector-specific research indicates that increased agricultural production—facilitated by a larger employed workforce leads to job creation through cultivation, processing, and value-addition activities that feed into trade.

Next, the coefficient value of exchange rate shows negatively (-0.261883) and (-0.232651) statistically significant (0.0021) and (0.0155) respectively, effect on agriculture and industrial trade. It indicate that, increase in exchange rate will lead to decrease in trade of both sectors. This finding are in line with economic theory and empirical evidence that exchange rate volatility can decrease trade quantities. A weaker or volatile exchange rate is likely to increase the foreign currency price of exports and imports of goods, thus reducing export volumes and values, and rising the costs of exports for export firms, reducing export value (Haque, 2012). This adverse effect is backed up by several empirical studies, such as (Cho, et al., 2002), who find that the real exchange rate uncertainty has a strong negative effect on agricultural trade, particularly in the developing world where exporters are more exposed to currency risk. In the same way, empirical studies of total trade have consistently shown that exchange rate volatility and depreciation have negative effects on export volumes of manufactured and industrial products since they increase transaction costs and pricing uncertainty of firms. The findings are in line with the expected negative effect of exchange rate volatility on trade, as it increases the costs and riskiness of trade, which in turn impacts negatively on agricultural and industrial trade performance.

Next, the coefficients value of FDI inflow shows positively (0.231739) and (0.197230) statistically significant (0.0150) and (0.0098) respectively, effect on dependent variable. It indicate that, increase in FDI inflwo will lead to increase in trade of both sectors. This finding is supported by extensive theory and evidence showing that foreign investment facilitates trade expansion. FDI brings capital, technology, and managerial expertise that can enhance productivity and output in both agriculture and industry, making firms more competitive in international markets. In agriculture, FDI often leads to higher production capacity and export orientation, which increases the volume and value of agricultural exports in both the short and long run in many developing economies. At the aggregate level, studies also find that increases in FDI flows are associated with larger trade flows, indicating a complementary relationship between investment and trade. FDI also facilitates integration into global value chains by lowering trade costs and improving access to foreign markets, which is particularly relevant for industrial sectors where multinational firms link local producers into international supply networks.

Table 5

Empirical Findings of PMG-ARDL Technique

PMG-ARDL Technique							
Agriculture Trade				Industrial Trade			
Variables	**Coefficient**	**t-stat**	**Prob.**	**Variables**	**Coefficient**	**t-stat**	**Prob.**
Long Run Results				**Long Run Results**			
EMA:	0.128640	2.145660	0.0328**	EMA:	0.184380	2.138113	0.0219**
ER:	-0.261883	-3.103402	0.0021*	ER:	-0.232651	2.796176	0.0155**
FDI:	0.231739	-2.830623	0.0150**	FDI:	0.197230	3.721471	0.0098*
INF:	-0.191453	-3.445442	0.0001*	INF:	-0.261749	-2.380220	0.0180**
TL	0.261863	3.103492	0.0021*	TL	0.227273	2.127101	0.0343**
Short Run				**Short Run**			
CointEQ(-1):	-0.550811	-2.048106	0.0417**	CointEQ(-1):	-0.492804	-2.424283	0.0160**
EMA:	0.225556	1.824340	0.0692***	EMA:	0.238218	1.922667	0.0570***
ER:	-0.290895	-1.412791	0.1589	ER:	-0.130834	-1.478240	0.1405
FDI:	0.132279	1.494063	0.1363	FDI:	0.130834	1.103268	0.2709
INF:	-0.030973	-1.037530	0.3004	INF:	-0.057176	-1.478240	0.1405
TL	0.173685	1.944603	0.0572***	TL	0.270894	1.285543	0.0997***

Next, the coefficient value of inflation rate shows negatively (-0.191453) and (-0.261749) statistically significant (0.0001) and (0.0180) respectively, effect on agriculture and industrial trade. It indicate that, increase in inflation rate will lead to decrease in trade of both sectors. This also is consistent with economic theory and empirical evidence showing that higher inflation undermines international competitiveness and trade performance. When domestic price levels rise faster than in trading partners, the relative cost of exports increases, reducing their attractiveness abroad and compressing export volumes. High inflation also raises input and production costs for firms in both agriculture and industry, eroding profit margins and discouraging participation in global markets. Theoretical and empirical research supports this link (Gylfason, 1999). finds that high-inflation countries tend to export less than low-inflation counterparts, with export shares significantly lower when inflation is elevated, indicating reduced external competitiveness. Similarly, recent panel studies examining Turkey's exports show that inflation has a negative long-run effect on export volumes, reinforcing the idea that price instability diminishes trade flows.

Next, the coefficients value of trade liberalization shows positively (0.261863) and (0.227273) statistically significant (0.0021) and (0.0343) respectively, effect on dependent variable. It indicate that, increase in trade liberalization will lead to increase in trade of both sectors. It implies that finding is aligns with extensive theoretical and empirical literature showing that reducing trade barriers expands market access and enhances export performance. Trade liberalization – through the removal or reduction of tariffs, quotas, and other restrictions – lowers trade costs and encourages domestic producers to participate more actively in global markets, thereby increasing both export and import flows. Empirical studies in developing countries demonstrate that greater openness and liberal trade policies are associated with higher agricultural export volumes, improved diversification, and efficiency gains in agriculture, as firms respond to competitive pressures and international demand. Similarly, broader evidence on trade liberalization confirms that lowered barriers stimulate industrial exports and imports by integrating domestic industries into global supply chains, improving productivity, and attracting foreign markets.

Co-integration Tests

In research, a cointegrating relationship points to a statistical link among two or further time series variables that stick together over the long haul. To figure out if such a relationship exists, the paper utilize the Pedroni Residual Cointegration Test and the Kao Residual Co-integration Test. The (Pedroni. 2004) test helps to decide whether a long-term balance exists among multiple time series. Researchers often use this test when looking at panel data. The (Kao, 1999) test serves a similar purpose. It checks for a cointegrating association among two or more time series in panel data settings. The outcomes of these tests are specified in the table 6 below;

Table 6

Empirical Findings of Co-integrations Test

Pedroni Residual Cointegration Test				
	Agriculture Trade		Industrial Trade	
	Stat:	W. Stat:	Stat:	W. Stat:
Panel v-Stat:	-1.077688(0.8594)	-0.811693(0.7915)	-1.627651(0.9482)	-1.071440(0.8580)
Panel rho-Stat:	0.427038(0.6653)	0.501027(0.6916)	0.572238(0.7164)	0.675340(0.7503)
Panel PP-Stat:	-1.272984(0.1015)	-1.586373(0.2563)	-1.068454(0.1427)	-1.002808(0.1580)
Panel ADF-Stat:	0.084700(0.7532)	-0.187524(0.4256)	0.163472(0.5649)	0.151902(0.5604)
	Stat:	Prob.	Stat:	Prob.
Group rho-Stat:	1.490279	0.9319	1.761782	0.9609
Group PP-Stat:	-1.704334	0.0442	-0.573327	0.2832
Group ADF-Stat:	0.266880	0.6052	0.897077	0.8152
Kao Residual Cointegration Test				
	t-Stat:	Prob.	t-Stat:	Prob.
ADF:	-0.726071	0.2339	-0.387527	0.3492

When the p-value of the test statistic is less than the significance level (5% or 0.05), researchers can reject the H0 of no co – integrating affiliation, This indicates evidence of a co - integrating affiliation. If p-value exceeds the selected level of significance, however, the H0 is not rejected. This suggests that there is no cointegration present. The results from the Pedroni panel co-integration test do not support the notion that there is no co-integration in the study as 8 of the 11 tests are significant to reject the null hypothesis. Further the study also provide the Kao cointegration test, which was introduced by Kao(1999) and demonstrates that, at a 1% significant level, the null hypothesis that there is no co-integration is unable to accepted.

Diagnostic Analysis

Diagnostic tests are the necessary checks for determining the outcomes of econometric and statistical methods. The current study also utilized different tests and tools to identify and diagnose the problem of Multicollinearity, Heteroscedasticity, Autocorrelation or Serial Correlation and Specification Errors. Their findings are given table 9 below.

Table 9

Pair – Wise Correlation Matrix

	AGT	INT	EMA	EMI	ER	INF	FDI	TL
AGT	1.000000							
INT	0.560686	1.000000						
EMA	0.209353	0.184830	1.000000					
EMI	-0.273147	-0.294138	-0.578326	1.000000				
ER	0.185797	0.131598	0.409354	0.123994	1.000000			
INF	-0.106650	-0.249069	-0.029222	0.216339	0.217894	1.000000		
FDI	-0.278178	-0.435777	-0.153714	0.157068	0.017790	0.125325	1.000000	
TL	-0.142123	-0.352300	0.188845	-0.067854	0.205185	0.130425	0.703307	1.000000

The first research step reveals multicollinearity to the dataset. Multicollinearity: A multiple linear regression situation where two or more predictor variables are correlated (either positively or negatively) with one another. It is important to evaluate the correlation between the explanatory variables and the dependent variables. High degree of similarity and correlations is indicated by large numbers. As in the table above, the values of correlations are below 0.9 of all parameters with each other which indicate that there is absence of multicollinearity in the panel data set. The study also attests to the problem of autocorrelation, Heteroskedasticity and specifications errors. Their results are shown in table 10 below;

Table 10

Empirical Findings of Diagnostic Tests

Tests	Agriculture Trade Model			Industrial Trade Model			Conclusion
	F-stat:			F-stat:			No Serial Correlation and Heteroskedasticity
Serial Correlation LM Test	0.251788 (0.7776)			0.345769 (0.7080)			
Breusch Pagan-Godfrey Test	1.305982 (0.2208)			1.503552 (0.1245)			
Ramsey RESET Test	**Values**	**d.f**	**Prob.**	**Values**	**d.f**	**Prob.**	The Model is free from Specification Errors & Model is Well Specified
t-statistic:	0.30425	271	0.7612	0.769511	271	0.4423	
F-statistic:	0.09256	(1,271)	0.7612	0.592147	(1,271)	0.4423	
Likelihood Ratio:	0.09528	1	0.7576	0.608962	1	0.4352	

The findings of different tools and techniques are given in the table above for the diagnostic test evaluation. The findings indicate that, in case of Autocorrelation and Heteroskedasticity the findings are (F-Stat: = 0.251788; Prob. = 0.7776) and (F-Stat: = 0.345769; Prob. = 0.7080) for autocorrelation, and (F-Stat: = 1.305982; Prob. = 0.2208) and (F-Stat: = 0.1.503552; Prob. = 0.1245) for Heteroskedasticity. These values show that in both cases, the study is unable to reject null (H0) hypothesis and accept alternative (H1) and confirm that Heteroskedasticity and autocorrelation are absent from the model and residuals are equal and homoskedastic. Further, the Ramsey RESET Test findings state that, The Estimated model is well specified and free from specifications errors.

6. CONCLUSION & POLICY IMPLICATIONS

This research investigates the major determinants of agricultural and industrial trade in South Asia over the period 1990–2024, employing a Panel ARDL framework. The purpose of the study is to identify how sectoral employment, foreign investment, and macroeconomic stability influence trade performance in both agriculture and industry. The results indicate that employment in agriculture and industrial sectors has a strong positive impact on trade, implying that increased labor participation enhances production capacity, improves supply potential, and strengthens export performance. Similarly, FDI contributes positively to both agricultural and industrial trade, reflecting the importance of foreign capital in improving infrastructure, introducing advanced technology, and expanding production efficiency. Trade liberalization also shows a positive relationship with trade, indicating that reduced tariffs and fewer restrictions increase trade flows and improve competitiveness in global markets. In contrast, the exchange rate has a negative impact on trade, suggesting that exchange rate depreciation or volatility increases import costs of intermediate goods and creates uncertainty for exporters. Inflation also negatively affects trade by increasing domestic production costs and weakening international competitiveness. The overall findings highlight that South Asian economies require improved macroeconomic stability, investment-friendly policies, and trade openness to enhance both agricultural and industrial trade performance.

Policy Implications

Governments should promote rural employment through agricultural modernization, skill development, and mechanization support. Policies that enhance farm productivity, improve access to credit, and strengthen agricultural value chains can raise output and export capacity. Employment growth in agriculture can improve trade performance and rural income stability. Industrial employment should be strengthened through investment in manufacturing zones, vocational training, and industrial innovation programs. Expanding employment increases industrial output and export potential. Policies encouraging small and medium enterprises (SMEs), improving labor productivity, and ensuring stable industrial energy supply will enhance industrial trade growth. South Asian economies should adopt investor-friendly policies such as improving political stability, reducing bureaucratic hurdles, and ensuring legal protection for foreign investors. Encouraging FDI in export-oriented agriculture and industrial sectors can enhance technology transfer, infrastructure development, and global market integration, ultimately increasing trade performance. Authorities should ensure exchange rate stability by improving foreign reserves management and reducing excessive currency volatility. Stable exchange rates lower uncertainty in trade contracts and reduce the cost of imported inputs. Effective exchange rate

policies can enhance export competitiveness and improve long-term trade performance in both sectors.

Competing Interests

The authors did not declare any competing interest.

References

Anderson, K., Hayami, Y., & Honma, M. (1986). The growth of agricultural protection. https://www.cabidigitallibrary.org/doi/full/10.5555/19871848801

Cho, G., Sheldon, I. M., & McCorriston, S. (2002). Exchange rate uncertainty and agricultural trade. *American Journal of Agricultural Economics, 84*(4), 931-942. https://doi.org/10.1111/1467-8276.00044

Chu, A. C., Peretto, P., & Xu, R. (2023). Export-led takeoff in a Schumpeterian economy. *Journal of International Economics, 145*, 103798. https://doi.org/10.1016/j.jinteco.2023.103798

Dembatapitiya, P. (2013). An analysis of determinants of agriculture trade intensities of South Asia. *Sri Lankan Journal of Agricultural Economics*, 59-81. https://ageconsearch.umn.edu/record/205986/?v=pdf

Ejaz, Z., Ullah, M. A., & Khan, M. U. (2016). Determinants of industrial growth in south Asia: Evidence from panel data analysis. In *Papers and Proceedings* (Vol. 1, pp. 97-110).

Frankel, J. A., & Romer, D. (2017). Does trade cause growth?. In *Global trade* (pp. 255-276). Routledge.

Grossman, G. M., & Helpman, E. (1991). Trade, knowledge spillovers, and growth. *European economic review, 35*(2-3), 517-526. https://doi.org/10.1016/0014-2921(91)90153-A

Gylfason, T. (1999). Exports, inflation and growth. *World Development, 27*(6), 1031-1057. https://doi.org/10.1016/S0305-750X(99)00045-5

Haque, A. K. (2012). *The effects of exchange rate and commodity price volatilities on trade volumes of major agricultural commodities* (Doctoral dissertation, University of Guelph).

HELPMAN, E., MELITZ, M., & RUBINSTEIN, Y. (2008). Vol. CXXIII May 2008 Issue 2. *Technology, 441*.

Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of econometrics, 90*(1), 1-44. https://doi.org/10.1016/S0304-4076(98)00023-2

Krugman, P. (1980). Scale economies, product differentiation, and the pattern of trade. *American economic review, 70*(5), 950-959. https://www.aeaweb.org/aer/top20/70.5.950-959.pdf

Nanda, N. (2014). Agricultural trade in South Asia: how important are the trade barriers?. *Journal of International Agricultural Trade and Development, 10*(1), 95.

Nengroo, T. A., Bhat, J. A., & Equbal, M. S. (2023). Revolutionising Indian Agriculture Exports: Unpacking the Transformative Impact of South Asian Free Trade Agreement. *Foreign Trade Review*, 00157325251348007.

North, D. C. (1990). Institutions, institutional change and economic performance. *Cambridge Univ Pr*.

Nurkse, R. (2009). *Ragnar Nurkse: Trade and Development* (Vol. 1). Anthem Press.

Pedroni, P. (1995). Panel cointegration. *Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis, Indiana University*. https://web.williams.edu/Economics/pedroni/pc-revc.pdf

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and statistics, 61*(S1), 653-670. https://doi.org/10.1111/1468-0084.0610s1653

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric theory, 20*(3), 597-625. https://doi.org/10.1017/S0266466604203073

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American statistical Association, 94*(446), 621-634.

Ranis, G., & Fei, J. C. (1961). A theory of economic development. *The American economic review*, 533-565. https://www.jstor.org/stable/1812785

Reimer, J. J., & Li, M. (2010). Trade costs and the gains from trade in crop agriculture. *American Journal of Agricultural Economics, 92*(4), 1024-1039. https://doi.org/10.1093/ajae/aaq046

Ricardo, D. (1895). *The first six chapters of the principles of political economy and taxation of David Ricardo, 1817*. Macmillan and Company.

Ridley, W., & Devadoss, S. (2012). Analysis of the Brazil-USA cotton dispute. *Journal of International Trade Law and Policy, 11*(2), 148-162. https://doi.org/10.1108/14770021211239668

Rodrik, D. (2008). The real exchange rate and economic growth. *Brookings papers on economic activity, 2008*(2), 365-412. https://muse.jhu.edu/article/261232

Santeramo, F. G., Lamonaca, E., Contò, F., Nardone, G., & Stasi, A. (2018). Drivers of grain price volatility: a cursory critical review. *Agricultural Economics/Zemědělská Ekonomika, 64*(8). https://doi.org/10.17221/55/2017-AGRICECON

Schultz, A. H. (1953). The relative thickness of the long bones and the vertebrae in primates. *American Journal of Physical Anthropology, 11*(3), 277-312. https://doi.org/10.1002/ajpa.1330110308

Sertoglu, K., & Dogan, N. (2016). Agricultural trade and its determinants: Evidence from bounds testing approach for Turkey. *International Journal of Economics and Financial Issues, 6*(2), 450-455. https://dergipark.org.tr/en/pub/ijefi/article/352461

Sowrov, S. M. (2024). Trade openness, tariffs and economic growth: An empirical study from countries of G-20. *arXiv preprint arXiv:2405.08052*. https://doi.org/10.48550/arXiv.2405.08052

Van Berkum, S., & Van Meijl, H. (2000). The application of trade and growth theories to agriculture: a survey. *Australian Journal of Agricultural and Resource Economics, 44*(4), 505-542. https://doi.org/10.1111/1467-8489.00123

Ward, M., Herr, H., & Pédussel Wu, J. (2020). *South Asian free trade area and food trade: implications for regional food security* (No. 148/2020). Working Paper. https://hdl.handle.net/10419/224943

Zakari, A., Adedoyin, F. F., & Bekun, F. V. (2021). RETRACTED ARTICLE: The effect of energy consumption on the environment in the OECD countries: economic policy uncertainty perspectives. *Environmental Science and Pollution Research, 28*(37), 52295-52305. https://doi.org/10.1007/s11356-021-14463-8