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EXPORT GROWTH UNDER TRADE BARRIERS: A COMPARATIVE SECTORAL ANALYSIS OF DEVELOPING ECONOMIES

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Abstract
The role of tariff liberalization in influencing economic development and sectoral dynamics has been extensively explored in economic literature. Studies have investigated the export-led growth hypothesis for developing economies. This study extends the literature by testing the export growth hypothesis through tariffs (domestic and implemented by partner countries) as a policy variable using a sectoral approach. The study also evaluated the given relationship for the first time in the service sector using restrictions (measured by STRI) as the policy variable at overall and at the sub-services sectoral level. Estimates of the System GMM, using yearly data from 2000 to 2020, showed that tariffs (both types) generally negatively affect exports and hence growth in both sectors. However, domestic tariff was significantly and positively linked to the exports in the food, beverage, and tobacco sector. Domestic tariffs may have encouraged local production growth, leading to greater export potential and overall efficiency in the sector. In the services sector, yearly data of 50 OECD countries was evaluated using System GMM. The results indicated that restrictions in the services sector had a significant negative impact on the services sector exports. The restrictions in the sub-services sectors showed varied associations with services sector exports. It is suggested to implement a sub-services sector-specific approach along with an evaluation of the purpose of restrictions. Overall, the results favored more liberalized trade policies to elevate growth through exports.

Key Words: Export Growth; Trade Barriers; Tariffs, Trade Restrictions; Sectoral Exports
JEL Classification: F10; F13; F41

1. Introduction
Exports, the lifeblood of many economies, play a pivotal role in driving economic growth. It generates jobs, enhances foreign exchange earnings, and stimulates productivity through technological and knowledge transfer. Furthermore, it improves reinvestment potential, optimize resource allocation through specialization, and support long-term growth. Thus, it can stimulate domestic production and innovation through enhanced international demand for goods and services.

In the pursuit of high growth, economies have implemented import substitution and export-led growth policies. The prior policy aimed at reducing dependency on imported goods while the latter one aimed at driving economic growth through exports. The import substitution failed to attain growth objectives in the developing economies. However, export-led growth proved successful in attaining growth objectives, especially in various Asian economies. The significant growth led by exports in the Asian economies inspired the policy fabricators to look for avenues to enhance export-led growth (Ketels & competitiveness, 2010).

The "East Asian Miracle" or high and sustained growth in 23 East Asian economies from 1965 to 1990 gained world attention. They grew comparatively faster than other countries in the region and witnessed a significant decline in income inequality. The remarkable growth

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was largely driven by eight key economies: Japan, the "four tigers" (Hong Kong, South Korea, Singapore, and Taiwan), and three newly industrializing economies (Indonesia, Malaysia, and Thailand) (Tj & Development, 1994).

Several theoretical arguments support export promotion hypothesis for growth. The demand side perspective argued that as the domestic markets are limited in size, sustained economic growth cannot be kept domestically. In contrast, the nature of the export market can spur growth through the expansion of aggregate demand (Siliverstovs & Herzer, 2007). Additionally, exports can increase growth by enhancing productivity. It can also generate positive externalities in domestic-oriented sectors (Feder, 1983). Likewise, exports can play an important role in financing imports, embodying advanced technologies leading to knowledge and technological spillovers (Grossman & Helpman, 1993). Besides, it can center investment in the most efficient sectors of the economy (Kunst *et al.*, 1989) along with achieving economies of scale (Helpman & Krugman, 1987).

Export-led growth strategies are closely linked to the UN's SDGs, predominantly those focused on promoting sustainable economic growth, reducing inequalities, and promoting innovation. However, tariffs can hinder progress on several SDG goals. The World Trade Organization has tried to liberalize trade to accelerate growth. However, exports are still low as countries employ various types of restrictions on exports and imports to safeguard domestic industries. Keeping this in mind our study aims to answer the following questions.

1. How do tariffs influence exports across agriculture and industrial sectors and at sub-sectors in developing economies?
2. What is the impact of services restrictions measured by STRI on exports across sub-services sectors in OECD member economies?

Previous studies have primarily examined the aggregate effects of tariffs and services restriction on exports in the respective sectors. Moreover, there is a limited exploration of detailed sectoral or sub-sectoral impacts for less developed economies. Although, some studies like (Palley, 2011; Ridzuan *et al.*, 2016; Yaghmaian, 1994; Bahmani-Oskooee *et al.*, 2005) highlighted the relationship between trade restrictions and exports using a braoder approach but did not differentiate its effects across specific economic sectors. While some studies such as (Medina-Smith, 2001; Love & Chandra, 2004; Chandra Parida & Sahoo, 2007; Ma, 2009; Akter *et al.*, 2017; Panta *et al.*, 2022) used cross-country approach to study the said association with some studies focusing on a single sector. However, these studies lack a consistent approach across the alternative sectors to have a more detailed overview of the given associations.

While these studies collectively highlight the critical role of trade policies in shaping economic outcomes, they predominantly address tariff effects at aggregate level. This research fills this gap by diving deeper into the sectoral and sub-sectoral dimensions of exports. By analyzing the specific impact of tariffs across diverse sectors and their sub-sectors, this study offers a more efficient understanding of how trade policies influence economic performance, providing actionable insights for targeted policy interventions. We contribute to the body of knowledge by exploring the association across the sectors to gain deeper knowledge of the subject and understand the interplay among the given variables in a better way. This focus on sectoral heterogeneity allows for a richer, more precise exploration of trade-policy impacts, which is crucial for addressing the complexities of modern economic systems.

The study is structured as follows: The next section of this study, section 2 reviews past studies, followed by section 3 which provides research methodology. The research methodology offers a comprehensive approach where a single model is extended by including variables related to the specific sector. It also offers an overview of the econometric

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techniques implemented. Section 4 describes data and variables. It is followed by section 5 where the results are discussed and compared across the sectors to have a profound knowledge and better understanding. It is followed by the section 6 which includes conclusion and some policy recommendations based on the results of the study.

2. Literature Review

Joining the world economy requires tremendous government efforts and investment to transform the prevailing government settings. Such prerequisites crowd out other important development priorities making the gains from trade propositions less attractive for less developed countries. Therefore, it needs a comparative analysis to foster development (Rodrik, 2000). Using fixed effects, DeJong *et al.* (2006) observed that agricultural exports play a significant role in economic growth supporting the export-led growth hypothesis. Likewise, Reeberg *et al.* (2021) explored the impact of tariff reduction on China's macroeconomic indicators. It was found that tariff reduction substantially enhanced GDP, exports, and real wages. Industry indicated a rise in benefits with the reduction of tariffs. On the other hand, the overall agriculture exports suggested a rise by 10 percent.

Similarly, Handley *et al.*, (2020) investigated the behavior of export growth with the enhancement of the United States import tariff using the standard gravity model. Using various fixed effects, it was found that those products that are open to policy change have witnessed a decline in exports, particularly from the third quarter of 2018 indicating a 2 percent decline. The policy change had a different impact on exports based on the specific category of the tariff. Furthermore, it had a significant negative impact on employees in different sectors being studied. It was shown that employees in the manufacturing sector were comparatively more exposed to the policy change.

Yeats (1976) also evaluated the impact of specific tariffs on exports of 200 products imported from developed and developing countries into the United States in 1971. It was found that specific tariffs affected the exports from developing countries comparatively more than developed countries. It was noted that the impact was double for developing countries compared to developed countries. Likewise, Tokarick (2007) investigated the impact of tariffs employed domestically and internationally on exports of developing countries. It was discovered that domestic tariffs had a comparatively stronger negative impact on exports. Debaere and Mostashari (2010) also investigated the impact of tariffs on export diversification to the United States using a probit model. Findings suggested that tariffs moderately and significantly influenced export diversification. It suggested that lower tariffs were helpful for the rich countries compared to the poor ones. Furthermore, using Computable General Equilibrium, Beckman *et al.* (2021) found that the elimination of tariffs in the agriculture sector is expected to surge global trade by 11 percent with a rise of $56.6 billion in consumer welfare globally.

Likewise, Furceri *et al.* (2020) used aggregate annual data from 151 countries from 1963 to 2014 using vector autoregressive (VAR) analysis to evaluate the association between tariffs and agriculture growth. It was found that an increase in tariff negatively affected output five years later. However, the theory given by Bairoch supported import restrictions positively affected output in the late nineteenth century. Tena-Junguito (2010) reexamined the theory and found that manufacturing tariffs inversely affect. It seemed to benefit the rich countries. Furthermore, different sectors protected impacted growth differently. Poor countries performed comparatively better by protecting skill-intensive sectors. It rejected the universal view of the long-term positive impact of tariffs on growth in the late nineteenth century. Similarly, Schularick and Solomou (2011) also tested the general view that a rise in tariffs led to a rise in economic growth in the late nineteenth using new data and various advanced

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econometric techniques. The results were contradictory to the general view with a more pronounced of the relevant variables.

Contrary to the above, Kwon (2013) found that tariffs could potentially boost growth by protecting local investments and fostering job creation in certain sectors utilizing the WDI data on 69 LDCs from 1997 to 2007. A lagged dependent variable regression technique was employed. It was found that the association lacks a definite pattern and is amplified upon interaction with other relevant variables. Hoyos (2023) also investigated the association between tariffs and economic growth using the local projections difference-in-differences (LP-DID) approach manufacturing and non-manufacturing countries. A direct association was found for manufacturing countries while an indirect relationship was observed for non-manufacturing countries. The study rejected the universal belief that a liberal trade regime enhances economic growth. Furthermore, Giang (2020) studied the short-run as well as the long-run relationship between tariffs and economic growth in Vietnam between 1999 and 2017 using the ARDL approach. Lagged economic growth was positively associated with current economic growth. Similarly, lagged tariffs and current tariffs were also positively associated with the current economic growth both in the short run and long run.

Intangible activities performed by a party for another are called services (Afzal *et al.*, 2019). The services sector is key for the development of both developed and developing countries (Briggs & Sheehan, 2019). From 1970 to 2021, the share of services in world GDP surged from 53 to 67 percent (WTO report 2023). It is generally observed that the intensity of the services in GDP and employment in the sector increases with per capita income rise in the economy (Hoekman *et al.*, 2008). However, the trade restrictions in the services sector are comparatively larger than in the other sectors (Hoekman, 2006).

The association between services liberalization, economic growth, and services exports has been studied recently, however, they have mainly focused on specific countries. Briggs and Sheehan (2019) pointed out that the association between liberalization of services and economic growth diminishes as the income level of the countries enhances. Other studies (Hapsari & MacLaren, 2012; B. Hoekman *et al.*, 2008; Mattoo *et al.*, 2001) also found a positive association between services liberalization and economic growth. Francois (1990) found that the development of intermediation is essential for economic growth because specialization takes place which helps in outsourcing organizational activities and the expansion of logistics services will take place. Services trade restrictions have a significant negative impact on exports of services (Nordås & Rouzet, 2017). Services restrictions impede bilateral trade in services. Services barriers negatively affect services exports (Lu, 2018).

It is highlighted that the decision of multinational companies is interlinked where fixed export costs help the enterprise earn more through imports from other countries. Furthermore, the liberalization benefits the developing countries more than the developed countries (Irwin, 2019). However, Francois (1990) argued that for the overall growth, the development of intermediation is fundamental because specialization takes place. However, their studies focused on the inter-link between the services sector and the manufacturing sector.

Liberalization helps the inflow of new ideas and technologies that help the economies grow (Hussain, 2004). Liberalization of services has raised the growth of both developing and developed countries (Gulzar, 2011; B. Hoekman & Mattoo, 2000). The services sector has comparatively larger multiplier effects. It makes linkages with other sectors of the economy and is traded as an input there (Park, 1989).

3. Methodology

This section of the research deals with the theoretical framework used in the study. Following the relevant literature, this discussion suggests that exports are important for the acceleration

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of economic growth i.e. export-led growth. However, higher tariffs might reduce exports by increasing trade barriers, which can also hinder growth. Therefore, it is appealing to study the relationship between exports and tariffs for a better understanding of the issue. We modeled exports as a function of tariffs and other determinants as given below:

$$EXP = f(Tariffs,\ Z) \qquad \text{(A)}$$

Here, *EXP* refers to exports while tariffs is a proxy for trade barriers or restrictions and it embodies both domestic tariffs as well tariffs implanted by partner countries. In equation (A), Z denotes all other relevant variables which may affect exports. We use the log-linear form of equation (A) in our analysis. Nevertheless, trade restriction may affect differently for different sectors of the economy. Therefore, it is important to study the impact of trade restrictions on exports at the sectoral level. A detailed discussion of the methodological framework which will be followed for different sectors and sub-sectors (agriculture, manufacturing and services etc.) is provided in the following sub-sections.

3.1 Model 1: Modeling Tariffs and Exports of Agriculture, Forestry and Fishing Sector

To investigate the impact of domestic tariffs on agriculture, forestry, and fishing sector's exports, we use the following model (1) by extending equation (A):

$$lnA\_EXP_{it} = A_0 + \alpha(TAR_{it}) + \beta ln(EMP_{it}) + \gamma ln(CS_{it}) + \delta ln(ALL_{it}) + \theta ln(DFA_{it}) + \lambda ln(FERT_{it}) + \eta ln(ER_{it}) + \pi(INF_{it}) + \varphi ln(EGI_{it}) + \epsilon_{it} \qquad (3.1)$$

Here, A_EXP is the proxy used to represent exports (outcome variable) of the agriculture sector while our policy variable tariffs are represented by TAR indicating the restrictions faced by the sector. The EMP is used for employment in the sector while CS represents capital stock of the sector. Similarly, ALL, DFA, and FERT are proxies for sector-specific variables representing agriculture land, development funds for agriculture, and fertilizer consumption, respectively. Lastly, ER, INF, and EGI are general variables representing exchange rate, inflation, and government integrity respectively. Whereas α, β, γ, δ, η, θ, λ, φ, and π represent magnitude associations of the attached variables with exports respectively. Equation (3.1) is further customized by including relevant variables for the three sub-sectors of agriculture (agriculture, forestry, and fishing) to understand the relationship between tariffs and exports of sub-sectors of agriculture.

3.2 Model 2: Modeling Tariff and Exports of Industrial Sector

To examine the impact of domestic tariffs on industrial exports, we estimate following model (2):

$$lnI\_EXP_{it} = A_0 + \alpha(TAR_{it}) + \beta \ln(EMP_{it}) + \gamma ln(CS) + \lambda(EIF_{it}) + \pi(ETB_{it}) + \varphi(EDuT_{it}) + \delta ln(ER_{it}) + \eta(INF_{it}) + \theta(EGI_{it}) + \epsilon_{it} \qquad (3.2)$$

Here, I_EXP is exports of the industrial sector, TAR is tariff, EMP is employment and CS is a proxy for capital stock which is represented by investment in machinery and non-transport equipment in the sector. The study also includes sector specific variables such as EIF, ETB, and EDUT which indicate investment freedom, tax burden (the industrial sector is highly taxed), and tertiary education, respectively. All other variables, ER, INF, and EGI are general variables representing exchange rate, inflation, and government integrity and these variables have been defined in the previous section. The equation (3.2) given above is further customized for all other sub-sectors of the industrial sector.

3.2.1 Reporting Counties' Tariffs and Agriculture/Industrial Sectors Exports

Models (01 and 02) are extended with the inclusion of reporting countries' tariffs to investigate their association with exports of the respective sectors.

$$lnA\_EXP_{it} = A_0 + \alpha(TAR\_D_{it}) + \beta ln(EMP_{it}) + \gamma ln(CS_{it}) + \delta ln(ALL_{it}) + \theta ln(DFA_{it}) + \lambda ln(FERT_{it}) + \eta ln(ER_{it}) + \pi(INF_{it}) + \varphi ln(EGI_{it}) + \epsilon_{it} \qquad (3.1a)$$

Here TAR_D is domestic tariffs for agriculture sector.

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$$lnI\_EXP_{it} = A_0 + \alpha(TAR\_P_{it}) + \beta \ln(EMP_{it}) + \gamma ln(CS) + \lambda(EIF_{it}) + \pi(ETB_{it}) + \varphi(EDuT_{it}) + \delta ln(ER_{it}) + \eta(INF_{it}) + \theta(EGI_{it}) + \epsilon_{it} \quad (3.2a)$$

In equation (3.2a) TAR_P is partner countries' tariffs for industrial sector. To assess the impact of the partner countries' tariffs on sectoral growth and exports, simple average tariffs applied by the OECD member countries on exports of the sampled developing countries are included in the analysis. We followed the same criterion.

3.3 Model 3: Services Exports and Service Restrictions

We explore the association between service restrictions and services exports at sectoral and sub-services sectoral levels using the following model.

$$lnS\_EXP_{it} = A_0 + \alpha(STRI_{it}) + \beta(EMP_{it}) + \gamma(EDuT) + \pi\, ln(EBF_{it}) + \varphi ln(FBS_{it}) + +\delta ln(ER_{it})\, \eta + (INF_{it}) + \lambda(EGI_{it}) + \epsilon_{it} \quad (3.3)$$

Here, S_EXP signifies exports of services sector, STRI measures the level of restrictions on country's services sector, focusing on policies that affect trade in services. EMP is employment in the sector while EDu, EBF, and FBS are sector specific variables denoting tertiary education, business freedom, and fixed broadband subscriptions, respectively. Lastly, ER, INF, and EGI are control variables representing exchange rate, inflation, and government integrity.

4. Data Description and Variables

In this part of the study, we give a detailed explanation of the variables, data sources, sampled countries, and sources of data. The following Table 1 shows a detailed explanation of the data included in this study.

Table 1: Data and Variables

Variable	Symbol	Proxy for	Data Source
General Variables (used in all regressions)			
Exports	*EXP*	Exports (Dependent variable)	*WITS*
Tariffs or Services Sector Restrictions Respectively	*TAR & STRI*	Trade Restrictions (focused variable)	*WITS & OECD Statistics*
Employment	*EMP*	Labor	*WDI*
Capital Stock	*CS*	Physical Investment in the Sector	*FAOSTAT &* Penn World Table
Inflation	*INF*	Domestic Price level	*WDI*
Exchange Rate	*ER*	Relative Competitiveness	*WDI*
Government Integrity	*EGI*	Institutional Quality	Economic Freedom Index
Specific Variables (used in agriculture sector)			
Agriculture Land	*ALL*	Natural Resources Available for Agriculture	*WDI*
Fertilizer Consumption	*FERT*	Quantity of Plant Nutrients Used Per Unit of Arable Land	*WDI*
Development Flows	*DFA*	Financial and Technical Support Directed Towards the Sector	*FAOSTAT*
Specific Variables (used in manufacturing sector)			

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Gross Tertiary School Enrollment	*EDT*	Workforce Quality or Human Capital Development	*WDI*
Tax Burden	*ETB*	Fiscal Policy Environment	Economic Freedom Index
Investment Freedom	*EIF*	Regulatory and Institutional Environment	Economic Freedom Index
Specific Variables (used in services sector)			
Gross Tertiary School Enrollment	*EDT*	Workforce Quality or Human Capital Development	*WDI*
Fixed Broadband Subscriptions Per 100 People	*FBS*	Digital Connectivity	*WDI*
Business Freedom	*EBF*	Efficiency of Government Regulations	Economic Freedom Index

4.1a Variables Considered for Agriculture, Forestry and Fishing Sector

The sampled countries are 59 developing countries (excluding LDCs) where binding coverage is less than 35 percent of which few are excluded due to non-availability of data for the dependent variable. For the agriculture sector, 21 years of data for 54 developing countries from 2000 to 2020 was collected from various data sources. Data from WDI has been extracted for variables like; agriculture land (percentage of land area), agriculture employment (percentage of total employment), exchange rate (domestic currency per US$, period average), fertilizer consumption (kgs per hectare of arable land), and inflation (consumer price index). Data for tariff (weighted average) and exports of agriculture forestry and fishing (1000 US$) was extracted from WITS. FAOSTAT was used for variables like; development flows to agriculture (million USD), and capital stock (million USD). The data for government integrity was collected from the economic freedom index. It captures the role of government in building the confidence of investors. The exports were converted into millions first by dividing their respective values by 1000. SA_TAR represents simple average tariffs implemented by the partner countries on imports to the home country from the reporting developing countries.

4.1b Variables Considered for Industrial Sectors

For the industrial sector's analysis, data from 56 least developing countries was compiled for 21 years from various data sites. The variable tariff (in percentage) was collected from the World Integrated Trade Solution (WITS) database and applied to the industrial sector of the respective countries. Data for the exchange rate (domestic currency per unit US$), industrial employment (as a percentage of total employment), inflation (consumer prices), and gross tertiary school enrollment (EduT) were extracted from World Development Indicators (WDI).

Data for CS (Investment at current national prices in machinery and non-transport equipment) was obtained from Penn World Table, version 10.01. ETB, EIF, and EGI are factors of the economic freedom index representing tax burden (overall), investment freedom, and government integrity respectively. The variable CS has been converted by dividing each value by the respective value of the exchange rate to account for currency fluctuations across different countries sampled here. SA_TAR represents simple average tariffs implemented by the partner countries on imports to the home country from the reporting developing countries.

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4.1c Variables Considered for the Services Sector

Data for STRI was collected from the OECD statistics. We use the overall value of the STRI to analyze its association with exports of the services sector. The STRIs are composite evidence-based indices used to collect information across 19 sub-service sectors. It takes values between 0 and 1. Values closer to 0 indicated fewer restrictions, whereas, values closer to 1 indicated higher restrictions. The STRI is a measure used to indicate the level of restrictions a nation applies on trade across the border.

Data for employment (EMP), gross tertiary school enrollment (EDuT), nominal exchange rate (ER), and general inflation (INF_D) were collected from WDI. FBS shows fixed broadband subscriptions per 100 people which indicates the information and communication development of a country. EGI and EBF represent government integrity and business freedom respectively.

4.2 Estimation Techniques

The models were first analyzed for the presence of the multicollinearity problem using the Variance inflation factor. Table A2 in appendix indicates that the models are free of the problem of multicollinearity. We also checked for outliers in the data to have consistent estimators. For estimation, we preferred and reported System GMM over Fixed effects as it accounts for dynamic relationships between variables and deals with endogeneity and lag effect more efficiently, however, study has also conducted estimations with FEM.

In studies, sometimes the variables are affected by unobserved factors that we can't measure directly. These measureless factors can create problems because they might be associated with both the variables we are studying and the outcomes we want to explain. This is called endogeneity. System GMM helps solve this problem by using instruments. These variables are highly correlated to the independent variable. It has zero correlation with the error term. It has no direct correlation with the dependent variable and impacts it through the dependent variable. By using instruments, System GMM can give us more reliable results.

4. Results and Discussion

Here, the findings of the research have been presented and analyzed. First, we evaluated the association between domestic tariffs as well as those employed by the partner countries on the agriculture and industrial exports. It is followed by analyzing the impact of restrictions in the services sector on services sector exports overall and at the services sectoral level.

4.1 Agriculture, Forestry and Fishing Sector's Exports

Model 1 was estimated using the system GMM to evaluate the impact of tariffs on the exports of agriculture, forestry, and fishing sector.[1] As explained earlier, we reported results with System GMM as it is more efficient than fixed effects.

Table 2 shows the estimated results for agriculture sector. Domestic tariffs had a highly significant negative association with agriculture exports. Likewise, it was observed that partner countries' tariffs had a significant negative association with the agriculture exports of the developing countries as shown in Table 2 (Palley, 2011; Ridzuan *et al.*, 2016; Yaghmaian, 1994; Bahmani-Oskooee *et al.*, 2005).

[1] The results of the Hausman test (B1) given in Table A1 in Appendix were significant (P-value < 0.05%) favoring fixed effects, while, the Breusch and Pagan LM (B2) supported the random effects model. The study chose fixed effects and the models were estimated with FEM but did not report here. However, we have reported results with SGMM in this section as it deals with endogeneity and heteroskedasticity which is usually present in panel data. In addition, Table 2A in appendix shows that the model is free of the problem of multicollinearity.

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Reeberg *et al.* (2021) investigated the impact of tariff on different macroeconomic variables of China and it was found that tariff reduction substantially enhanced GDP as well as exports of China. Moreover, the overall agriculture exports suggested a rise by 10 percent because of reduction in tariffs.

Table 2: Tariffs and Agriculture sector's Exports

Domestic Tariff and Agriculture, Forestry and Fishing Exports		**Partner Countries' Tariffs and Agriculture, Forestry and Fishing Exports**	
Variables	**Coeff.**	**Variables**	**Coeff.**
L1_EXP	0.749 (0.000)***	L1_EXP	0.741 (0.000)***
L2_EXP	0.06 (0.000)***	L2_EXP	0.055 (0.000)***
Tariffs_D	-0.02 (0.000)**	Tariffs_P	-0.004 (0.000)***
ln_EMP	0.027 (0.545)	ln_EMP	0.011 (0.754)***
ln_CS	0.095 (0.001)***	ln_CS	0.09 (0.000)***
ln_ALL	0.065 (0.000)***	ln_ALL	0.076 (0.000)***
ln_FERT	0.109 (0.000)***	ln_FERT	0.096 (0.000)***
ln_DFA	0.084 (0.000)***	ln_DFA	0.09 (0.000)***
ln_ER	-0.111 (0.000)***	ln_ER	-0.087 (0.000)***
Inflation	-0.012 (0.000)***	Inflation	-0.011 (0.000)***
EGI	0.003 (0.003)***	EGI	0.002 (0.005)***
Constant	-0.221 (0.200)	Constant	0.021 (0.877)

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

Table 2 also shows that labor and capital positively influence exports growth as suggested by classical growth models (Mankiw *et al.*, 1992; Briggs & Sheehan, 2019). On the other hand, sector specific variables such as agriculture land, development funds for agriculture, and fertilizer consumption has positive significant association with exports of agriculture sector. Lastly, inflation and exchange rates inversely change agriculture exports while government integrity encourages exports.

To summarize, our findings of agriculture sector suggests that higher restrictions such as tariff lead to lower export volumes of agriculture sector, highlighting the detrimental effects of restrictive trade policies (Javed & Khan, 2024).

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Handley *et al.*, (2020) investigated the relationship between export growth and tariff for the United States and it was found that the policy change had a different impact on the exports based on the specific category of the tariffs for the products. Therefore, to study the association deeper, we further divided the sector and analyzed the association specific to that sub-sector. For this purpose, we split the agriculture sector into agriculture & mining, forestry & logging, and fishing sub-sectors. The results are presented in Table 3, Table 4 and Table 5, respectively.

Table 3 shows impact of tariffs on the exports of agriculture and mining sub-sector. Domestic tariffs as well as partner countries' tariffs showed negative and highly significant association with exports of the agriculture and mining sub-sector.

Table 3: Tariffs and Exports of Agriculture and Mining Sub-sectors

Domestic Tariff and Agriculture, Forestry and Fishing Exports		**Partner Countries' Tariffs and Agriculture, Forestry and Fishing Exports**	
Variables	**Coeff.**	**Variables**	**Coeff.**
L1_EXP	0.661 (0.000)***	L1_EXP	0.642 (0.000)***
L2_EXP	0.158 (0.000)***	L2_EXP	0.174 (0.000)***
Tariffs_D	-0.01 (0.001)***	Tariffs_P	-0.002 (0.000)***
ln_EMP	0.149 (0.016)***	ln_EMP	0.103 (0.000)***
ln_CS	0.139 (0.004)***	ln_CS	0.101 (0.000)***
ln_ALL	0.083 (0.088)***	ln_ALL	0.088 (0.000)***
ln_FERT	0.194 (0.000)***	ln_FERT	0.203 (0.000)***
ln_DFA	0.038 (0.022)***	ln_DFA	0.064 (0.000)***
ln_ER	-0.179 (0.000)***	ln_ER	-0.099 (0.012)***
Inflation	-0.012 (0.000)***	Inflation	-0.01 (0.000)***
Constant	0.047 (0.900)	Constant	0.091 (0.678)

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

Our findings of negative impact of tariff for agriculture sector are consistent with Beckman *et al.* (2021). The study found that the elimination of tariffs in the agriculture sector is expected to surge global trade by 11 percent with a rise of $56.6 billion in consumer welfare globally.

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Likewise, Furceri *et al.* (2020) found that an increase in tariff negatively affected agriculture output.

The association of employment and capital stock (specific to the sector) was also highly significant and consistent but positive. Inflation and exchange rates also showed highly significant and consistent negative relationship with exports of the agriculture and mining sector.

Table 4 presents the estimation results for the sub-sector forestry and logging. There is negatively significant impact of tariffs on the exports of forestry and logging sub-sector. These findings suggest that exports are discouraged by trade restrictions and if policy makers are interested in trade and development of developing countries then trade restriction and barriers should be relaxed. Otherwise, it would not be possible to maximize gains from exports (Javed & Khan, 2024).

Table4: Tariffs and Exports of Forestry and Logging Sub-sector

Domestic Tariff and Agriculture, Forestry and Fishing Exports		**Partner Countries' Tariffs and Agriculture, Forestry and Fishing Exports**	
Variables	**Coeff.**	**Variables**	**Coeff.**
L1_EXP	0.487 (0.000)***	L1_EXP	0.531 (0.000)***
L2_EXP	0.204 (0.000)***	L2_EXP	0.252 (0.000)***
Tariffs_D	-0.022 (0.000)***	Tariffs_P	-0.003 (0.000)***
ln_EMP	0.077 (0.022)***	ln_EMP	0.094 (0.056)*
ln_CS	0.416 (0.000)***	ln_CS	0.307 (0.000)***
ln_ER	-0.107 (0.007)***	ln_ER	-0.143 (0.001)***
Inflation	-0.017 (0.000)***	Inflation	-0.012 (0.000)***
Constant	-0.398 (0.003)***	Constant	-0.36 (0.012)**

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

The variables employment and capital stock showed positive relationship suggesting that more labor and capital produces more output in forestry and logging sub-sector (Solow, 1956). The rest of the variables have a consistent association with sectoral exports.

The estimation results for fishing sub-sector are reported in Table 5**.** The findings suggest that higher restrictions lead to lower export volumes of fishing, highlighting the detrimental effects of restrictive trade policies.

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Table 5: Tariffs and Exports of Fishing Sub-sector

Domestic Tariff and Agriculture, Forestry and Fishing Exports		**Partner Countries' Tariffs and Agriculture, Forestry and Fishing Exports**	
Variables	**Coeff.**	Variables	**Coeff.**
L1_EXP	0.538 (0.000)***	L1_EXP	0.546 (0.000)***
L2_EXP	0.21 (0.000)***	L2_EXP	0.223 (0.000)***
Tariffs_D	-0.009 (0.001)***	Tariffs_P	-0.007 (0.000)***
ln_EMP	0.066 (0.334)	ln_EMP	0.049 (0.461)
ln_CS	0.31 (0.000)***	ln_CS	0.26 (0.000)***
ln_ER	-0.305 (0.000)***	ln_ER	-0.137 (0.022)**
Inflation	-0.001 (0.777)	Inflation	-0.002 (0.624)
Constant	0.813 (0.002)***	Constant	0.503 (0.021)**

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

Overall, the results of agriculture sector show that removal of trade berries such as tariffs positively affect the agriculture sector's exports. Moreover, fertilizer consumption, development funds, employment, investment in transport equipment, net capital stock, agricultural land, and government integrity has significant positive association with agriculture exports while exchange rate and inflation negatively affect the agriculture sector's exports.

4.2 Industrial Exports

Model 2 was selected to assess the impact of domestic tariffs on exports of the industrial sector and results are reported in Table 6. Similar to the previous results of the agriculture sector are reported. The tariff (both domestic and those implemented by partner economies) carried a highly significant negative association with industrial exports as shown in Table 6. This finding is consistent with Tena-Junguito (2010) and Handley *et al.*, (2020). On the basis of these findings, our study submits that tariff act as anti-exports and anti-trade instrument in developing countries. And therefore, tariffs can hinder progress on several SDG goals in developing countries.

Table 6: Tariffs and Industrial Exports

Domestic Tariff and Agriculture, Forestry and Fishing	**Partner Countries' Tariffs and Agriculture, Forestry and Fishing**

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Exports		**Exports**	
Variables	**Coeff.**	Variables	**Coeff.**
L1_EXP	0.702 (0.000)***	L1_ln_EXPM	0.72 (0.000)***
L2_EXP	0.181 (0.000)***	L2_ln_EXPM	0.178 (0.000)***
Tariff_D	-0.018 (0.000)***	Tariff_P	0.002 (0.687)
Employment	0.026 (0.000)***	Employment	0.017 (0.000)***
ln_CS	0.081 (0.000)***	ln_CS	0.077 (0.000)***
EIF	-0.002 (0.012)***	EIF	-0.003 (0.000)***
ETB	0.008 (0.000)***	ETB	0.009 (0.000)***
ln_EDT	0.351 (0.000)***	ln_EDT	0.234 (0.000)***
Inflation	-0.01 (0.000)***	Inflation	-0.01 (0.000)***
ln_ER	-0.028 (0.000)***	ln_ER	-0.018 (0.004)***
EGI	0.005 (0.000)***	EGI	0.003 (0.003)***
Constant	0.3 (0.004)***	Constant	-0.12 (0.363)

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

Nonetheless, industrial employment (EMP), investment in machinery (MEQC), tax burden (ETB), gross tertiary school enrollment (EDuT), and government integrity showed a significant positive association with industrial exports. Exchange rate, inflation, and investment freedom had a significant negative association with industrial exports. The investment showed a significant negative association with industrial exports which may indicate the reallocation of resources from export-oriented industries and shift towards domestic industries which provides higher returns.

Using a similar approach, we subdivided the industrial sector into three sub-sectors i.e. basic metal industries, the manufacture of wood, and the manufacture of food, beverages, and tobacco industries. The estimation results of these sub-sectors are provided in Table 7, Table 8 and Table 9, respectively. Table 7 shows the estimation results for metal industries.

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Table 7: Tariffs and Basic Metal Industries

Domestic Tariff and Agriculture, Forestry and Fishing Exports		**Partner Countries' Tariffs and Agriculture, Forestry and Fishing Exports**	
Variables	**Coeff.**	Variables	**Coeff.**
L1_EXP	0.61 (0.000)***	L1_EXP	0.592 (0.000)***
L2_EXP	0.031 (0.139)	L2_EXP	0.049 (0.013)**
TAR_D	-0.027 (0.006)***	TAR_P	-0.034 (0.049)**
Employment	0.026 (0.146)	Employment	0.035 (0.008)***
ln_CS	0.373 (0.000)***	ln_CS	0.396 (0.000)***
Inflation	-0.02 (0.001)***	Inflation	-0.02 (0.000)***
ln_ER	0.074 (0.023)**	ln_ER	0.064 (0.041)***
EIF	0.005 (0.025)**	EIF	0.006 (0.002)***
EGI	0.002 (0.659)	EGI	0.001 (0.720)
Constant	0.607 (0.176)	Constant	.209 (0.405)

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

Table 7 shows negative relationship between tariff and exports of metal industries. It suggests that tariff acts as a barrier for metallic exports. The trade among nations faces barriers in the form of tariff and non-tariff restrictions to protect domestic industry, losses of jobs, trade deficit and so on. However, higher tariff discourages exports which in turn reduces consumer welfare as discussed earlier (Beckman *et al.*, 2021). Therefore, removal of trade berries such as tariffs will positively affect global trade and welfare.

The estimation results for wood industries are provided in Table 8. Table 8 shows that domestic tariff has insignificant negative association with exports of wood industries. While partner countries tariff showed insignificant positive association. The insignificance may be the result of high elasticity demand and supply, larger number of substitutes, more globalized supply chain etc.

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Table 8: Tariffs and Manufacturing of Wood, Wood Products and Furniture

Domestic Tariff and Agriculture, Forestry and Fishing Exports		**Partner Countries' Tariffs and Agriculture, Forestry and Fishing Exports**	
Variables	**Coeff.**	Variables	**Coeff.**
L1_EXP	0.652 (0.000)***	L1_EXP	0.665 (0.000)***
L2_EXP	0.237 (0.000)***	L2_EXP	0.245 (0.000)***
TAR_D	-0.001 (0.615)	TAR_P	**0.002** (0.769)
Employment	0.003 (0.068)*	Employment	0.004 (0.025)**
ln_CS	0.084 (0.000)***	ln_CS	0.065 (0.000)***
Inflation	-0.007 (0.000)***	Inflation	-0.006 (0.000)***
ln_ER	0.019 (0.014)**	ln_ER	0.015 (0.028)**
ln_EDT	-0.03 (0.312)	ln_EDT	-0.039 (0.184)
EIF	-0.008 (0.000)***	EIF	-0.006 (0.000)***
EGI	0.002 (0.059)*	EGI	0.002 (0.078)*
ETB	0.013 (0.000)***	ETB	0.011 (0.000)***
Constant	-0.108 (0.29)	Constant	-0.092 (0.471)

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

Table 9 reports estimation results for food, beverages and tobacco industries. Table 9 shows that higher tariff results in higher food exports. Protection can some time lead economy of scales lowering overall cost of production. With increased production efficiency, these firms can start exporting competitively. Additionally, government policies generally support these industries through subsidies, tax incentives, or export promotion programs which offset the negative impact of higher tariffs. However, it needs a more specific approach to assess the said association.

Table 9: Tariffs and Manufacturing of Food, Beverages and Tobacco

Domestic Tariff and Agriculture, Forestry and Fishing	**Partner Countries' Tariffs and Agriculture, Forestry and Fishing**

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Exports		Exports	
Variables	**Coeff.**	**Variables**	**Coeff.**
L1_EXP	0.717 (0.000)***	L1_EXP	0.719 (0.000)***
L2_EXP	0.104 (0.000)***	L2_EXP	0.128 (0.000)***
TAR_D	**0.002** (0.001)***	TAR_P	-0.003 (0.000)***
EMP	0.007 (0.000)***	EMP	0.006 (0.000)***
ln_CS	0.119 (0.000)***	ln_CS	0.106 (0.000)***
INF	-0.004 (0.000)***	INF	-0.003 (0.002)***
ln_ER	0.016 (0.001)***	ln_ER	0.017 (0.000)***
ln_EDT	0.042 (0.280)	ln_EDT	0.02 (0.641)
EIF	-0.003 (0.000)***	EIF	-0.002 (0.001)***
EGI	0.0005 (0.503)	EGI	0.0003 (0.686)
ETB	0.01 (0.000)***	ETB	0.009 (0.000)***
Constant	0.546 (0.000)***	Constant	0.534 (0.000)***

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

The results for industrial sub-sectors showed that tariffs significantly impede exports in basic metal industries, and the manufacture of food, beverages, and tobacco industries. While it impacted exports insignificantly in the manufacture of wood and wood products sub-sector. Furthermore, investment freedom and inflation showed significant association with exports across all the sectors. Conversely to the agriculture sector, the exchange rate here significantly and positively impacted exports overall and across the sub-sectors (Javed & Khan, 2024)). Similar to the agriculture sector, capital stock, government integrity, and educating the individual had a significant positive impact on exports of the industrial sector (overall and at the sub-industrial sectoral level).

4.3 Services Restrictions and Services Exports

Here, we follow a similar approach compared to the previous sectors. We use the Services Trade Restrictiveness Index (STRI) to represent barriers in the sector as we do not have tariff data for the services sector. Barriers to service trade are applied in the form of limited mobility of individuals, barriers to foreign ownership, and policies that support local over

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foreign producers and consumers, and general restrictions on competition. According to (Deardorff & Stern, 2005) services trade restrictions carry the same impact as tariffs in another sector. Therefore, they can be counted as tariffs equivalent.[2]

The results in Table 10 indicated a highly significant negative association between the policy variable (STRI) and the services sector exports. It is evident that STRI coefficient reinforces the adverse effects of regulatory barriers on services trade flows (Javed & Khan, 2024).

Table 10: Services Sector Restrictions and Services Sector Exports

Domestic Tariff and Agriculture, Forestry and Fishing Exports		Partner Countries' Tariffs and Agriculture, Forestry and Fishing Exports	
Variables	**Coeff.**	Variables	**Coeff.**
L1_ln_EXP	0.981 (0.000)***	L1_ln_EXP	0.862 (0.000)***
STRI	-0.876 (0.000)***	---	---
ln_ER	-0.006 (0.031)***	ln_ER	-0.022 (0.006)***
INF	0.001 (0.392)	INF	0.005 (0.008)***
EMP	-0.01 (0.000)***	EMP	-0.003 (0.177)
FBS	-0.006 (0.000)***	FBS	-0.002 (0.235)***
ln_EDT	0.11 (0.000)***	ln_EDT	0.205 (0.000)***
EGI	0.003 (0.000)***	EGI	0.004 (0.000)***
EBF	0.003 (0.000)***	EBF	0.005 (0.000)***
Constant	0.657 (0.008)***	Logistics customs brockerage	1.24 (0.000)***
		Legal	0.482 (0.000)***
		Telecom	0.77 (0.000)***
		Construction	-1.736 (0.000)***
		Rail freight transport	0.113 (0.000)***

[2] We do not have a consistent measure for the earlier sampled countries to represent restrictions in the services sector. Therefore, we choose a different sample of countries.

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		Courier	-0.457 (0.000)***
		Distribution	-1.947 (0.000)***
		Insurance	1.389 (0.000)***
		Constant	2.381 (0.000)***

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

Employment in the services sector, increase in fixed broadband subscriptions, and exchange rate were having highly significant negative impacts on services sector exports. Business freedom, government integrity, education, and inflation showed a positive association with services exports however the association was insignificant in the case of inflation.

Here, we evaluated the impact of restrictions in the sub-services sector on services sector exports. The purpose of the sub-services division was to gain a more detailed understanding of the services sector. There are 22 sub-service sectors. Because of the multicollinearity problem in the STRI variable, a few sub-services sectors were excluded. The sampled countries and periods were the same as earlier. Results in Table 10 showed that restrictions in logistics, Telom, insurance, legal, and rail freight transport services change services exports positively and significantly. Services restrictions in courier, distribution, and construction services showed a significant negative relationship with services exports.

5. Conclusion

This study has evaluated the impact of tariffs (domestic as well as partner countries') on exports in the agriculture and industrial sectors overall and at the sub-sectoral level. Similarly, the impact of restrictions (measured by STRI) in the services sector was evaluated on overall services exports and at the sub-services sectoral level. The system GMM technique was implemented to assess the associations between the given policy and outcome variables.

While tariffs generally act as trade barriers, our results indicate sector-specific dynamics where they may enhance exports. In the food, beverage, and tobacco sector, domestic tariffs may have encouraged local production growth, leading to greater export potential. Similarly, partner countries' tariffs in the wood and furniture sector might have redirected demand towards the home country's exports, benefiting domestic producers.

The results were generally in line with economic theory and favored more open economies both from domestic and partner countries' perspectives. Similarly, in the services sector, the overall restrictions measured by the Services restrictiveness index (STRI) had a highly significant and negative impact on services sector exports. However, at the sectoral level, the relationship varied showing both positive and negative relationships among the policy variables and outcome variables. Based on the estimated results, it was concluded that to enhance export-led growth the government generally needs a more rationalized tariffs policy. However, the government must keep industry structure and global trade relationships in mind while fostering tariff policies. Reporting countries imposing lower tariff rates can also play an important in enhancing export-led growth. Furthermore, fewer restrictions in the services sector can also play a pivotal role in enhancing the growth of the services sector.

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5.1 Research Implications

The findings of this study have several important implications. First, tariffs generally constrain economic growth through exports. Secondly, domestic tariffs mostly act as a tax on exports. This makes domestically produced goods expensive in the international market. Thus, it lowers the diversification and expansions of the exports affecting the growth of the respective sector. Partner countries' tariffs can also hinder the pace of economic growth of an economy. It can increase the price of the goods in the foreign economy which can potentially erode the development of the domestic economy. The partner countries' hike in tariffs raises the cost of the exported goods. This makes the products less competitive in the international market. This can potentially lower the volume of exports and eventually growth. Thirdly, services sector restrictions typically hurt service growth through the channel of exports. In this study service restrictions in a few sub-service sectors have a positive impact on services sector growth. Therefore, a specific approach is advised to enhance services sector growth and exports. It is advised to study the given association in more detail using a country-specific approach. The imposed restrictions might enhance the quality and reliability of the services sector to comply with international standards. It might result in stable and predictable trade relations with other nations.

5.2 Recommendations

In light of our comprehensive analysis, we propose the following recommendations to address challenges and pave the way for economic progress. The recommendations aim to mitigate the adverse effects of the trade barriers and foster ways to enhance economic growth and exports.

- Policy fabricators are encouraged to commonly rationalize tariffs policy to foster economic growth led by exports of the respective sector.
- It is advised to lower tariffs implemented by the partner countries on exports of the respective countries through bilateral and multilateral trade agreements to enhance economic growth.
- Tariff reimbursement is recommended for export-oriented industries to make the products competitive in the international market and mitigate the negative impact of costs imposed by tariffs.
- In the services sector, it is recommended to tailor less restrictive policies and study the sector using sub-services specific and country-specific approaches.

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Appendix

Table A2: Model Specification Tests

Hausman test A		Breusch and Pagan B	
Chi-square test value	63.326	chibar2(01)	7598.4
P-value	0.0000	Prob>chibar2	0.000

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Hausman test C		**Breusch and Pagan D**	
Chi-square test value	61.63	chibar2(01)	7623.9
P-value	0.000	Prob>chibar2	0.000
Hausman test E		**Breusch and Pagan F**	
Chi-square test value	30.16	chibar2(01)	7355.2
P-value	0.000	Prob>chibar2	0.0000

Table A3: Multicollinearity Tests

AGRICULTURE SECTOR			**INDUSTRIAL SECTOR**			**SERVICES SECTOR**		
Variables	VIF	1/VIF	Variables	VIF	1/VIF	Variables	VIF	1/VIF
ln CS	3.371	0.297	ETB	1.468	0.681	EMP	3.462	0.289
ln DFA	2.517	0.397	EIF	1.383	0.723	FBS	2.813	0.356
ln ER	2.368	0.422	EGI	1.268	0.788	EBF	2.441	0.41
ln EMP	1.435	0.697	Tariff	1.198	0.835	STRI	1.795	0.557
ln FERT	1.429	0.7	SA TAR	1.15	0.87	ln ER	1.571	0.636
ln ALL	1.252	0.799	ln EMP	1.147	0.872	EDT	1.492	0.67
SATAR	1.092	0.915	ln ER	1.137	0.879	INF	1.338	0.747
TAR	1.072	0.933	EDT	1.116	0.896	Mean VIF	2.355	.
INF	1.062	0.941	ln_CS	1.112	0.899			
Mean VIF	1.94	.	INF	1.064	0.94			
			Mean VIF	1.204	.			