J. Arab. Crops Market. 05 (01) 2023. 19-27 DOI: 10.33687/jacm.005.01.4889

Available Online at EScience Press
Journal of Arable Crops and Marketing
ISSN: 2709-8109 (Online), 2709-8095 (Print)
https://esciencepress.net/journals/JACM

Exports of Mangoes from Pakistan: Determinants and Competitiveness

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ABSTRACT

Pakistan, with limited export commodities and markets, grapples with a persistent trade deficit, making its agricultural sector pivotal to the economy. This study delves into the contemporary economic concept of competitiveness, aiming to evaluate and identify determinants influencing the export of mangoes—a significant contributor to the agricultural GDP at 2.48%. Comparative advantage, rather than competitive profit, serves as a more apt term in the realm of trade theory. In this research both time series and panel data was used. The data was collected from secondary sources from multiple sites and main among these were UN-FAO, AMIS, WDI and WITS. Gravity model were used to find the determinants that provided estimation of exports between the Pakistan and other countries. The variables studied in this research were export quantity, export value and export price between Pakistan and its major exporters. Collected data was analyzed through appropriate statistical technique using RCA indices and their extensions. Findings of the study were expected to be helpful in developing some strategies to increase exports of mango from Pakistan. The determinants nominal GDP's for both Pakistan and importing countries, exchange rate and mango area evaluated for mango were significant. This research results showed that Pakistan is quite stable in mango production and much more efforts are needed to ensure and maximize improvements in export of varieties of mango production.

Keywords: Exports of mango, competitiveness, RCA, gravity model.

INTRODUCTION

To allocate resources effectively and increase financial welfare, it is crucial to understand a country's comparative advantage and pattern of specialization. Recognizing the impact of economic changes and characterizing economic welfare benefit from an understanding of comparative advantage. Empirical estimations of comparative advantage can assist in determining the way in which a country's capital and export should be oriented in order to take advantage of global variations in the supply and demand of goods and productive inputs (Cai *et al*., 2008). The long-term benefits of trade under the World Trade Organization (WTO) regime depend on comparative advantage of a country's industries (Quddus and Mustafa, 2011).

Comparative advantages serve as the foundation for competitive advantages, but a variety of other factors can affect a nation's competitiveness (Rahmaddi and Ichihashi 2012).Product, process, operational, and intersectional (chain) upgrading are crucial methods for enhancing competitiveness in global value chains (GVCs). In the economic world, competitiveness is described as a person's capacity to compete in a given situation of company or to the state produce a good or service by utilizing its resources at an appropriate price.

According to (Lafay 1992) comparative advantage and competitiveness diverge in two ways. First, productive capacity compares products within a nation, whereas competitiveness typically entails a cross-country comparison among the competitors of a specific item. Second, although the comparative advantage is

systemic, competitiveness is susceptible to shifts in the macroeconomic environment. As a result, research focused on comparative advantage and competitiveness indices may yield inconsistent findings. Competitiveness is susceptible to shifts in the macroeconomic environment (Hay *et al*. 2011).

Theory of competitive advantage uses a "diamond" model that includes fundamental economic and management aspects at the level of the economic entities as well as supply-side competitiveness elements. Export competitiveness and its lengthy viability are essential components within profitability on international markets for agri-food items as a result of trade liberalization and regional development in agri-food markets (Porter's 1998).

Pakistan is a significant largest exporter of mangoes worldwide (Mehdi *et al*. 2016). Mangoes from Pakistan are renowned for having a delicious flavor. Mangoes of several varieties are cultivated in Pakistan, but every species has its unique features, including form, order, size, color, flavor sweetness, and acidity (Badar *et al*. 2015). While Chaunsa and Sindhri are the varietals that are produced the most frequently, other species including Langra, Anwar Ratole, Dasher, and Neelam are grown less frequently.

Mango is second most popular fruit, in Pakistan after citrus. The provinces of Sindh and Punjab have large mango-growing areas. Multan, Muzaffargarh, Bahwalpur, and Rahim Yar Khan are the most productive districts in Punjab (TRTA, 2010). Mango production was 1636 thousand tons last year (GOP, 2016). Mango yields per hector (10.62 tones) were significantly higher than the global average (7.51 tons). Pakistan has the ability to increase mango output to more than 15 tons per hectare (GOI. 2013).

Pakistani is a major producer and exporter of mangoes. Pakistan ranks sixth in the globe for cultivation, behind India, China, Thailand, Indonesia, and Mexico, with 1.7 million tonnes of output each year (FAO, 2019). Pakistan exports mangoes to 60 different countries. The main places are the United Arab Emirates (UAE), Saudi Arabia, the United Kingdom, the Netherlands, Iran, Malaysia, and just a few other Middle Eastern and European countries.

Mango is known as the king of fruits due to its excellent taste, sweet taste, and elevated nutrient value (Nawaz and Rukhsana, 2013), making the crop valuable for both achieving food security, particularly in developing countries like Ethiopia where achieving national food security remains a challenge. Goods, procedure, operational, and cross (chain) improvement are key techniques to increase competitiveness in world value chains (GVCs) (Gereffi, 2019).

Poor management techniques and the existence of sick mango trees would cause the garden to be destroyed (Saeed *et al*., 2012). According to (Mohsin *et al*. 2014), pest illnesses and poor management can be major causes of issues. The uneven exporting strategies, conflicting currency depreciation, export tariffs, non-competitiveness of exports, and unstable international market conditions can all be blamed for the changing efficiency of citrus and mango exports (Ghafoor *et al*., 2010).By keeping in view the importance of the research, the current study was designed to analyze the impacts of determinants and overall competitiveness of mango export industry.

REVIEW OF LITERATURE

(Ayyaz, Bonney, and Akmal 2019) analyzed Pakistan's mangoes export competitiveness is measured to that of other major mango production and exports. They calculated numerous RCA indexes for every nation examined using trade data from 2010 to 2016, including in-version (RSCA), (RCA), and (CEP). As a result of the study, Pakistan's mango export competitiveness remained consistent throughout the observation period, with the exception of 2014-2015, when it fell. Mexico, Thailand, and the Philippines all improved their comparative benefits in mango export over the same time period, presenting a severe threat to Pakistan's mango exporters. With the exception of Thailand and the Philippines, an index of comparative export performance (CEP) revealed that Pakistan outperformed the bulk of the top nations for mango production and export. While Pakistan's mango exports had a high comparative advantage, it required to strengthen its operations to handle challenges such as food security, importing nations' quarantine requirements, and sanitary and phytosanitary (SPS) constraints to attain consistency in export competitiveness.

(Kousar *et al*. 2019) analyzed Pakistan's comparative advantage and competitiveness in the cultivation of the top two fruits, namely citrus and mango, using revealed symmetric comparative advantage, revealed comparative advantage, and the relative export

advantage index. Data was collected from the World Bank's World Incorporated Trade Solutions, Pakistan's Trade Development Agencies, the Global Trade Center map, the Food and Agricultural Organization's numbers, and Pakistan's Economic Surveys for the years 2001–2018. Pakistan was found to have demonstrated comparative advantage in cultivating both crops, as evidenced by the fact that revealed symmetric comparative advantage values stayed positive and revealed comparative advantage levels exceeded one. Nonetheless, the Relative Trade Advantage Index log indicates that in situations involving citrus and mango. Competitiveness and competitive advantage were not exported by Pakistan. Therefore, Pakistan's competitive disadvantage was evident in all of the examined years according to the Log Relative Export Advantage Index, which continued to decline for two fruits. For Pakistan to keep its comparative advantage and become more competitive internationally, mango and citrus output should be maintained and improved.

(Rasmikayati, Mukti, and Saefudin 2019) determined that the production of mangoes is well recognized in the Cirebon region. Nevertheless, until recently, the local mango industry was unable to guarantee year-round mango availability or preserve mango quality. The main cause of the problem was the farmers' unpredictable conduct. This implied that the development of mango farmers' agricultural practices ought to be the cornerstone for the industry's expansion in the era of globalization. The purpose of this essay was to investigate the factors that influence the development of agricultural practices by mango growers. An investigation using a simple random sampling technique was carried out in the Greged area of Cirebon regency, with participation from 130 mango growers. An analysis was performed on the data. The study's conclusions showed that the factors that had the greatest effects on mango growers' agribusiness practices (4.8 percent) were technology (9.2%), institutional (8.2%), cultural (7%) and resource (9.2%). This indicated that the development of a viable mango agribusiness model in the Greg district of the Cirebon Regency should focus on optimizing its resources, broadening its purpose of recognition, preserving the mango planting of its landowners, and improving the application of guava agricultural technology.

(Hagos *et al*. 2020) analyzed that micro mango marketing; one must focus on the factors that determine the extent to which local producers engage in the final market. The study was constructed using cross-sectional data gathered from 150 randomly selected homes sampled in six rural districts. Descriptive statistics and econometric analysis were used to find and study the elements that affect small-holder participation in the output market to what extent. Consequently, it was demonstrated that 10 of the 16 variables under investigation had a significant effect on the quantity of mangoes sold. The Tobit shortened regression model's results showed that money ownership (land allocated Mango and land decentralization is predicted by a number of factors, including financial assets held domestically (number of fruitful mango trees and availability of mango seedlings), social network (support from non-family members in the town and brokers), exposure to facilities (membership in the farmers club), and financial (income from domesticated animals and previous earnings from mango farm animals). There is potential for increased mango commercialization and, consequently, mango access to markets given the robust market demand for mangoes that currently exists.

(Ahmad *et al*. 2021) examined Pakistani fruits and vegetables' export competitiveness from 2001 to 2018. Mangoes, citrus, and dates were revealed to have a comparative advantage in the research. The results of different RCA indexes revealed that potatoes and onions both have comparative advantages and disadvantages. Owing to their comparative advantage, fruits and vegetables in Pakistan have a significant export potential. By utilizing this potential, the nation's trade deficit could be closed, new jobs could be created, exports and foreign exchange earnings could rise, and so on. It was suggested that spending on R&D will increase the export competitiveness of fruits and vegetables by enhancing quality, yield, and postharvest loss control. Infrastructure and the value chain need to be improved in order for Pakistan's fruits and vegetables to compete better on the export market.

Understanding the retention and switching patterns of importing countries is pivotal for exporting nations aiming to sustain consistency and foster growth in their exports. The export of mangoes from Pakistan, in particular, holds considerable influence in this context. (Zahid *et al*. 2023) This influence extends to the broader realm of horticultural products, encompassing fresh fruits and vegetables. Notably, approximately 70 percent

of mango exports worldwide originate from Pakistan, underscoring the nation's significance in this sector. Strategic reliance on importing countries, especially the UAE and other relevant categories, becomes crucial for Pakistan's mango export dynamics. (Ahmed and Jahanzaib 2023) Moreover, the value-based perspective emphasizes the importance of diversifying reliance on various importing nations. The role of regulatory frameworks and policy directions emerges as a critical factor in enhancing both the production and export capacities of Pakistani mangoes, indicating a need for proactive measures to fortify the country's position in the global mango market. (Zahid *et al*. 2023)

MATERIAL AND METHODS

The purpose of this study was to evaluate the competitiveness of mango fruit from Pakistan and to pin point the key factors that influence mango exports. In this study, time series and panel data were both used. In this study, a statistical method was employed to assess the data that had been gathered.

Revealed Comparative Advantage: Comparative advantage would determine the trading pattern, according to Ricardian trade theory. Where a country has a competitive edge, it will likely export such commodities while importing those where it has a disadvantage. Due to the cheap labor and intricate manufacturing cost estimation, Balassa (1965) was the first to introduce the idea of "(RCA)".

The Balassa RCA index (BI) is displayed as follows in Equation:

$$RCAij = (Xij/Xi)/(Xwj/Xw) = \frac{\frac{Xij}{Xwj}}{\frac{Xi}{Xw}} \text{ -------- } 1$$

The variables RCAij and Xij in equation 1 stand for the country's total exports and the exports of a specific item, respectively. Pakistan revealed comparative advantage for commodity j is abbreviated as RCAij. Equation 1 uses the symbols Xwj and Xw to represent the total global exports of a single good, or a "j" good, as well as the overall exports of all products.

A ratio of RCA greater than 1 indicates the presence of revealed comparative advantage, or an area in which the nation is significantly more specialized, whereas a ratio of country's revealed comparative disadvantage, or the field trough which it is less skilled, is shown by RCA 1. Due to the fact that total exports also include the export of each distinct item, this figure suffers from a double reporting issue.

Relative Export Advantage: Relative export advantage (RXA), a different indicator developed by Vollrath (1991), eliminates duplicate counting by deducting the research commodity's entire exports from the worldwide exports. In the second equation, the index in question is shown.

$$RXAij = (Xij/Xir)/\ (Xwj/Xwr) \text{ -------- } 2$$

Where "r" denotes Pakistan's exports of the other goods excluding "j," "wr" stands for the exports of "j" to the rest of across the nation excluding exports from Pakistan "j," and "ws" stands for all exports to the nation excluding Pakistan's overall exports. The outcomes of this index are comparable to those of the original Balassa's index.

Relative Import Advantage: According to equations III, IV, and V below, respectively the overall exports from Pakistan, relative import advantage (RMA), and relative trade advantage (RTA), and relative competitiveness indices (RC) were three further indices created by Vollrath (1991):

$$RMAij = (Mij/Mir)/\ (Mwj/Mws) \text{ -------- } 3$$

Comparable to the RXA index, but with imports in place of exports, where M is for imports, I is Pakistan, j is a product, and r is the remaining products. Mwj and Mws represent for all imports from outside Pakistan and all exports from outside Pakistan, respectively. The RTA index distinguishes between RXA and RMA.

$$RTA = RXA - RMA \text{ -------- } 4$$

The RTA is transformed naturally logarithmically to get the relative competitiveness index.

$$RC = In(RXA) - In(RMA) \text{ -------- } 5$$

While negative levels show a comparative disadvantage, positive RTA and RXA figures show a comparative advantage. RTA was favored by Vollrath because it depicts both supply and demand circumstances. However, there are several drawbacks, especially when there are no exports or imports (Havrila and Gunawardana, 2015). Export competitiveness is shown by positive RC values, and export non-competitiveness is indicated by negative RC values.

Additive Revealed Comparative Advantage: The 2006 invention of Hoen and Oosterhaven, the additive disclosed index of comparative advantage (AI), can be stated as:

$$AI = (Xij/Xi) - (Xwj/Xw) \text{ -------- } 6$$

Xs are as previously stated, and the worth of AI range from +1 to -1. In the present study, AI is intended to be

estimated since cross-sector studies are more relevant than cross-country studies. Balassa's index's value spans from (0 to 1) for items when a country has a discernible edge over another, although from one eternity when a comparative disadvantage occurs.

The symmetrical distribution of the NRCA index is one of its distinctive features. The following is how the NRCA index can be expressed:

VII. $NRCAij = (Xij/Xi) - (XiXJ/XwXw)$ -------- 7

Where Xij is the exporting of a product in Pakistan and Xj is the overall global export of a product, Xi symbol is all of Pakistan's exports and Xw the total exports of the entire world.

NRCAij > 0 and NRCAij 0 are indicators of comparative advantage and disadvantage, respectively. A larger NRCA number also indicates conversely, a greater comparative advantage (Hassan and Ahmad, 2018). The International Trade Statistics' online databases contain statistics on important fruit shipments for the years 2001 through 2020 (ITC, 2019).

Gravity Model Estimation:

Since the early 1960s, the gravity model has been used extensively to study trends in global trade, but it wasn't until the end of the 1970s that solid theoretical underpinnings were developed. Numerous investigations led to modifications to the conventional Newtonian gravity equation.

Bergstrand (1985) created the gravity model as a modified jones one of the components of a framework of general equilibrium predicated on the similar Armington theory. A theoretical gravity model including per capita earnings for exporters and importers was developed by Bergstrand in 1989. Using the Heckscher-Ohlin equation, Deardorff (1998) created the gravity model.

Equation 8 shows how the distance between the nations and the conventional gravity model for mangoes includes the income portions of the importer and exporter country.

$$\ln X_{ij} = \beta_0 + \beta_1 Aij + \beta_1 \ln Y_j + \beta_2 Y_i + \beta_3 \ln E_{ij} + \beta_4 P_{ij} + \beta_5 \ln P^e_{ij} + \beta_6 \ln D_{ij} \text{-------- 8}$$

Where Xij stands for export from nation I to nation j; Yi and Yj stand for the exporting and importing nations' nominal GDPs, and Aij stands for mango area correspondingly, which serve as substitutes for income variables; Dij is an erroneous term that refers to the distance between the two countries or the respective economic centers as a stand-in for transportation charges.

In order to analyze the determinants influencing export competitiveness at the level of a particular product, i.e., Mango exports from Pakistan to its main trading partners, the new research used a gravity model within a panel data structure. Given the potential for misspecification in cross-sectional and time-series techniques, panel data formulations of the gravity model are preferable to parameters for cross-sections and time series (Egger and Pfaffermayr 2003; Martnez-Zarzoso and Nowak-Lehmann 2003). A gravity model's cross-sectional specification limits the investigation to a single point and does not take unpredictable effects into consideration. Contrarily, the fixed-country pair effects cannot be studied using the time-series requirements.

Furthermore, the intensity and sign of the influence of the explanatory variables can vary depending on the cross-sectional and time-series parameters. The gravity model panel description is founded on the issues with the misspecifications (Egger 2002, Ricchiuti 2002). Egger (2002), Eita (2008), Martinez Zarzoso and Nowak-Lehman (2003), Filippini and Molini (2003), and Mátyás (1997), among several others, suggested that panel data specifications are more suited and helpful than cross-sectional and time-series data in clarifying the export expansion movements and examining the causes driving these export earnings. Panel data was used to solve gravity equations.

Database Sources:

Each trading volume and value figure is derived from the World Integrated Trade Solution (WITS) agricultural trade web database (UNFAO 2012).From the volume and value information, unit prices are calculated. Data for all of these variables' area, production, export value, and quantity was gathered from the Agricultural Marketing Information Service (AMIS). The World Bank provided the import and export figures for the world (WDI).

RESULTS AND DISCUSSION

Pakistan is one of the top exporters and producers of mangoes worldwide (Mehdi *et al*., 2016; UNFAO, 2019). Mangoes from Pakistan renowned for their delectable flavor. Pakistan produces a variety of mangoes with varying physiological traits, including structure, order, size, color, degree of acidity, and

content of sugar, etc. (Badar *et al*., 2015).

Although Chaunsa and Sindhri, two important types, dominate production, additional cultivars like Langra, Anwar Ratole, Dasheri, and Neelam are grown to a lesser extent. The only types that significantly contribute to the commercial value of mango fruits are Chaunsa and Sindhri (GOP, 2019; Mehdi *et al*., 2016).

Table displays a finding of estimations of each RCA index for mangoes. These findings show that mangoes had a comparative advantage from 2001 to 2020. The Balassa index ranged in value from 13 to 28, with a mean worth of 21. Denoting competitiveness, the mean RXA and LNRXA values are 21 and 3, correspondingly, and stayed within the ranges of 13–28 and 2.53–3.34, including both. The RSCA, AI, and NRCA indices have respective mean values of 0.85, 0.001, and 0.000002. Indicators BI, RXA, LNRXA, SI, AI, and NRCA all have coefficients of variation that are 23 percent, 23 percent, 8.25 percent, 2.69 percent, 28 percent, and 30.6 percent, respectively.

By using Balassa's RCA index, Riaz and Jansen (2012) discovered comparative advantage in a variety of mangoes export markets, including Oman, Saudi Arabia, the United Arab Emirates, Bahrain, Qatar, Norway, and others. They recommended that premium mangoes be sold to the high-end Chinese fruit market and that those that complied with SPS standards might be sold in the American market. In order to increase Pakistan's exports of mangoes, Rizwan ul Hassan and Shafiqurrehman (2015) found that the comparative advantage of Pakistani mangoes had decreased between 2004 and 2012. They advised Pakistan to satisfy the quality demands of the global markets.

The three mangoes value chains established by Badar *et al*. (2019) are export mango value chains for customers on global markets, Mangoes that cater to middle-class and upper-class consumers are more modern and of higher quality, whereas traditional mangoes are available for all economic brackets. They proposed that better information flows and chain governance could boost chain operations.

Sandeela (2014) examining all significant components of their supply chains, it was possible to assess the viability and competitiveness of Pakistani exports of mango and kinnow. The study's conclusions showed promise for increasing Pakistani exports of kinnow and mangoes. In addition, he discovered limitations in the Kinnow and mango supply networks that prevented the expansion of their exports. He provided evidence that region of Kinnow had greater growth than the mango region. This might be explained by a more compact planting, which makes it simpler to set up processing facilities. In contrast, the mango plantation spans a distance of around 1,000 kilometers, and the season is perpetually shifting from the south to the north. Furthermore, given that kinnows are less consumable than other species; this disparity in the amount of development may also be explained by less susceptible than mangos.

He recommended educating and training farmers about global standards for product quality and emphasized the revival of trade missions, accompanied by carefully thought-out marketing initiatives. The mango industry has put a lot of work into developing its value chain in recent years. Only 5-7 percent of mango producers have followed best practices for premium quality, thus the adoption rate is relatively low. Value-added goods like mango pulp and its derivatives are in high demand on the global market. But there are just two operational mango pulp mills in Pakistan. As a result, in addition to encouraging the production and export of high-quality mangoes, value-added goods need to be promoted (Ahmad *et al*., 2018).

Indicate RCA values of mango fruit in Pakistan. RCA values indicate that in the beginning years from 2001-2005 there was steady increase in mango production while in 2006 there was a great fall in production value. From 2006 onward to 2017 there remained fluctuations in production value of mango sometimes it was at peak and in next year it fell down.

From 2017 to onward now it is sustained to some extent but this variability in production affects the stock global price of mango fruit from Pakistan. The mean value of production of various factors and CV indicate that production of mango is less stable than citrus. Although Pakistan is ranked among top 10 countries for its production of major fruits like mango, citrus and dates but these fluctuations in production can thrive country.

The studies indicate that instead of having world best mango varieties like Chunsa, Anwar Rathor, Dusehri and langrra still we are facing hurdles in market price. The main reasons include our growers are not familiar with how to preserve fruit to enhance its shelf life, improper harvesting time, no information about ethylene dose (chemical used for mango ripening).

Table 1. RCA Indices for Mango.

Year	RCA	RXA	RMA	RTA	LNRXA	LNRMA	RC	AI	SI	NRCA
2001	24.63	24.67	0.0000	24.67	3.20	0.00	3.20	0.001	0.92	0.003
2002	23.15	23.18	0.0000	23.18	3.14	0.00	3.14	0.001	0.93	0.031
2003	19.94	19.96	0.0000	19.96	2.99	0.00	2.99	0.001	0.92	0.029
2004	26.61	26.65	0.0000	26.65	3.28	0.00	3.28	0.001	0.93	0.035
2005	16.61	16.62	0.0000	16.62	2.81	0.00	2.81	0.000	0.93	0.021
2006	30.58	30.64	0.0000	30.64	3.42	0.00	3.42	0.001	0.88	0.039
2007	17.42	17.43	0.0000	17.43	2.85	0.00	2.85	0.000	0.92	0.020
2008	21.79	21.81	0.0000	21.81	3.08	0.00	3.08	0.001	0.91	0.022
2009	18.25	18.27	0.0000	18.27	2.90	0.00	2.90	0.001	0.91	0.023
2010	18.87	18.89	0.0000	18.89	2.93	0.00	2.93	0.001	0.89	0.023
2011	22.67	22.70	0.0000	22.70	3.12	-8.15	3.12	0.001	0.91	0.029
2012	21.50	21.53	0.0006	21.53	3.06	-7.27	3.06	0.001	0.91	0.026
2013	22.00	22.04	0.0002	22.04	3.09	-8.44	3.09	0.001	0.92	0.028
2014	15.18	15.20	0.0040	15.20	2.72	-5.49	2.72	0.001	0.87	0.018
2015	13.80	13.82	0.0041	13.82	2.62	-5.48	2.62	0.001	0.86	0.018
2016	20.08	20.13	0.0055	20.12	3.00	-5.19	3.00	0.002	0.91	0.026
2017	12.73	12.75	0.0011	12.75	2.54	-6.80	2.54	0.001	0.85	0.015
2018	19.52	19.56	0.0001	19.56	2.97	-9.17	2.973843	0.002	0.91	0.023
2019	23.09	23.17	0.0000	23.17	3.14	0.00	3.14	0.003	0.82	0.028
2020	12.04	12.06	2.7671	9.29	2.49	1.01	2.22	0.001	0.97	0.028

Author's own calculations.

Estimation of results of gravity model:

In order to determine whether this description is appropriate in comparison to cross-sectional and time-series specifications, panel data are used. The variables studied were export of fruits in international unit, export of both fruits (citrus and mango) in standard units, bilateral distance between the main cities of Pakistan and major exporters, contiguity that depicted boundaries that coincide with same countries, major factors that countries share, import of respective countries, exchange rate between main exporters and Pakistan in international currency and import rate in local currency between countries.

Interpretation of Hausman-Taylor estimation:

To examine this correlation, a Hausman specification test is used (Egger 2000). The Hausman test primarily identifies variations in predictions between the fixed effects model as well as the random effects model. Due to its ability to evaluate the Hausman-Taylor model, which combines the fixed and random effects models, is used when considering some factors as time-invariant, such as distance and interdependent (e.g., unit value price attributes and Pakistan's nominal GDP).

In order to make this description more effective than Panel data are utilized using time-series and cross-sectional parameters. The results of the gravity model for the Hausman-Taylor estimation of the model are shown in the table. For the estimation, reliable standard errors are employed.

Hausman Taylor model's coefficient results were reported along with the strength and indication of their statistical significance. This demonstrates that the connection among both the dependent and independent variables is stable. According to Hausman-Taylor calculations, Pakistan's nominal per capita GDP is negligible, whereas the exchange rate has a substantial impact. Despite considerable variance in the level of significance, all factors that are significant statistically have the predicted signals.

Hausman-Taylor model offers a benefit of being able to directly estimate the time-invariant variables, such as distance which cannot be directly calculated in the FE model. Additionally, Pakistan's nominal GDP is probably endogenous since exports have an impact on it as well as unit value prices because there is the stable prices that depends on the international market's surpluses (Exports from Pakistan) and the market.

Table 2. Hausman-Taylor Estimation of Mango.

Quantity (Xij)	Coefficient	Standard Error	z	P>|z|
Pak mango area (Aij)	0.850	0.249	3.41	0.001
Nominal GDP importing country (Yi)	-0.194	0.564	-0.34	0.73
Exchange rate Pak (Eij)	0.940	0.234	4.01	0.000
Nominal GDP Pak (Yi)	0.952	0.298	3.19	0.001
Unit value price (P^eij)	-0.706	0.069	-10.22	0.000
Distance km (Dij)	1.691	0.860	1.96	0.049
Language	0.120	1.262	0.1	0.924
Membership common wealth	-0.349	1.30	-0.27	0.788
_cons	-27.740	20.215	-1.37	0.17

Author's own calculations.

The Hausman-Taylor estimation technique also has the benefit of estimating models while taking the model's endogeneity into account. The Hausman-Taylor model's implications and viewpoints underlie the results because the model incorporates time-invariant variables and possible endogeneity.

Mango is a typical agricultural product, as evidenced by the positive relationship on Yj, the nominal GDP of the nation that imports. The unit price coefficient is 0.70, meaning that a 0.7% decline in Pakistan's mango exports leads from a 1% increase in importer prices. The statistical findings show that a commodity's unit price value is quite important, at 0.000 at 1% level.

CONCLUSIONS

Hausman-Taylor model offers a benefit of being able to directly estimate the time-invariant variables, such as distance which cannot be directly calculated in the FE model. Additionally, Pakistan's nominal GDP is probably endogenous since exports have an impact on it as well as unit value prices because there is the stable prices that depends on the international market's surpluses demand and Pakistan's Exports. The Hausman-Taylor estimation technique also has the benefit of estimating models while taking the model's endogeneity into account. The Hausman-Taylor model's implications and viewpoints underlie the results because the model incorporates time-varying variables and possible endogeneity.

Mango is a typical agricultural product, as evidenced by the positive coefficient on Yj, the nominal GDP in the importing country. The unit price coefficient is 0.70, meaning that a 0.7% decline in Pakistan's mango exports leads from a 1% increase in importer prices. The statistical findings show that a commodity's unit price value is quite important, at 0.000 at 1% level.

At the significance level of 1%, the coefficient on the unit export price is statistically significant and negative as anticipated. With a price elasticity of -0.70 (unitary elasticity), Pakistani shipments of mangoes to a given country fall by around 1% for every 1% increase in the export price of mangoes in that country. The choice of an export market is made by the exporter in direct response to price; meaning is more is sold to countries where a increased cost is realized.

The historical links coefficient has a positive sign, which is appropriate given that marketing and trade ties in former British Empire nations should benefit current business relationships and promote mango exports to countries like Australia and the UK. The signs of the distance variable's coefficient are as expected, and the coefficient is statistically significant at the 5% level of significance using robust standard errors.

REFERENCES

Ahmad, B., M. Anwar, H. Badar, M. Mehdi and F. Tanwir. 2021. Analyzing export competitiveness of major fruits and vegetables of Pakistan: An Application of revealed comparative advantage indices. Pak. J. Agri. Sci. 58:719–730.

Ahmad, B., M. Anwar, H. Badar, M. Mehdi, F. Tanveer 2021. Analyzing Export Competitiveness of Major Fruits and Vegetables of Pakistan: An Application of Revealed Comparative Advantage Indices. 58(2): 719–30.

Ahmed, Z. S. and M. Jahanzaib. 2023. Mango Diplomacy of South Asian Countries. Journal of Asian and African Studies 58(5): 697–707.

Ayyaz, S., L. Bonney and N. Akmal. 2019. A comparative analysis between Pakistan and other mango exporting nations. Int. J. Food. Agri. Econ. 7:341–349.

Ayyaz, S., L. Bonney and N. Akmal. 2019.'International Journal of Food and Agricultural Economics Competitiveness in Mango Trade: A Comparative Analysis between Pakistan and other Mango Exporting Nations. International Journal of Food and Agricultural Economics 7(4): 341–49.

Badar, H., A. Ariyawardana and R. Collins. 2015. Capturing consumer preferences for value chain improvements in the mango industry of Pakistan. Int. Food Agribus. Manag. Rev. 18:131-148.

Cai, J. and P.S. Leung. 2008. Towards a more general measure of revealed comparative advantage variation. App. Econ. Lett. 15:723-726

FAO. 2019. Food and Agricultural, Statistics, Italy. Available online with updates at www.fao.org/faostat/en/

Gereffi, G., 2019. Economic upgrading in global value chains. In Handbook on global value chains. Edward Elgar Publishing.

GOI. Government of India, Post- harvest Profile of Mango. Government of India. Ministry of agriculture (department of agriculture and cooperation) Directorate of marketing and inspection branch head office Nagpur. 2013

GOP. 2017. Economic survey of Pakistan (2016-17). Economic advisor's wing, finance division, Islamabad Pakistan.

Hagos, A., R. Dibaba, A. Bekele and D. Alemu. 2020. Determinants of Market Participation among Smallholder Mango Producers in Assosa Zone of Benishangul Gumuz Region in Ethiopia. Int. J. Fruit Sci. 20:323–349.

Hagos, A., R. Dibaba, A. Bekele and D. Alemu. 2020. Determinants of Market Participation among Smallholder Mango Producers in Assosa Zone of Benishangul Gumuz Region in Ethiopia. International Journal of Fruit Science, 20(3): 323–49.

Hay *et al*. 2011 Lateef, H., T. Guang-ji, M. Us. Riaz, M. N. Ishaq, M. Abdullah, and Z. Ahmad. 2018. Agricultural exports competitiveness of Pakistan in global market. J. Northe. Agric. Univ. Eng. Ed. 25:77–87. J. Bus. Mgt. 11:29–34.

Kousar, R. T. Sadaf, M. S. A. Makhdum, M. A. Iqbal, R. Ullah. 2019. Competitiveness of Pakistan's Selected Fruits in the World Market'. Sarhad Journal of Agriculture 35(4): 1175–84.

Lafay, G. (1992), "The measurement of revealed comparative advantages", in Dagenais, M.G. and Plunet, P.A. (Eds), International Trade Modelling, Chapman & Hall, London, pp. 209-236.

Mehdi, M., B. Ahmad, A. Yaseen, A. Adeel and N. Sayyed. 2016. A comparative study of traditional versus best practices mango value chain. Pak. J. Agric. Sci. 53:733- 742.

Mohsin, M., F.Jamal, F. Ajmal. 2014 Impact of Mango Orchard Diseases on Growers Economic Life in Ahmedpur East, Bahawalpur, Pakistan. Academic Research International. v. 5, p. 196-204.

Nawaz, A. and K. Rukhsana, 2013. Changing revealed comparative advantage of textile and clothing setors of Pakistan: Pre and Post Quota analysis. Pakistan Journal of Commerce and Social Sciences, 7(3): 520-544.

Rahmaddi, R. and M. Ichihashi, 2012. How do export structure and competitiveness evolve since trade liberalization? An overview and assessment of Indonesian manufacturing export performance. International Journal of Trade, Economics and Finance, 3(4): 272-280.

Rasmikayati, E., G. W. Mukti, and B. R. Saefudin. 2019. The Determinant Factors of the Dynamics of Agribusiness Behavior of the Mango Farmers in Greged Sub District, Cirebon District. IOP Conference Series: Earth and Environmental Science 334(1).

Rasmikayati, E., G.W. Mukti and B.R. Saefudin. 2019. The Determinant Factors of the Dynamics of Agribusiness Behavior of the Mango Farmers in Greged Sub District, Cirebon District. IOP Conf. Ser. Earth Environ. Sci. 334.

Saeed, S.; Masood, A., Khan, S.M. Diseased plants as a source of dissemination of mango sudden death disease in healthy mango plants. Pakistan Journal of Phytopathol. v. 24, p. 21-25, 2012

TRTA. TRTA Pakistan. Trade; A route to prosperity. Available at http://trtapakistan.org/sector-products/horticulture/mangoes.2010

Zahid, M., M. S. Sharif, R. Ahmed and T. Abbas. 2023. Direction and Destination Pattern of Mango Export from Pakistan, A Markov Chain Approach. Review of Education, Administration & Law, 6(1): 75–82.