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UNLOCKING PAKISTAN'S DATES PALM FRUIT EXPORT POTENTIAL: A GRAVITY MODEL COMPARISON BETWEEN ASIAN AND NON-ASIAN MARKETS

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Abstract

The current study unveils Pakistan's dates palm fruit sector and explores new export avenues beyond India. Using panel data of 17 trading partners of Pakistan, spanning 1998 to 2021, to uncover key drivers of Pakistan's dates palm fruit exports, the current study applied the Gravity model. Findings underscore the pivotal roles of Pakistan's GDP, partner country GDP and population, distance, and exchange rates in shaping export dynamics. Interestingly, the study highlights untapped opportunities in global markets, showing more substantial export potential for dates palm fruit in Non-Asian regions compared to Asia and neighboring countries. Promising destinations include Germany, Hong Kong, the United Kingdom, and the USA, suggesting a pathway for significant market expansion.

Keywords: Dates palm fruit, Export, Gravity model, Asian vs. Non-Asian countries, Pakistan

INTRODUCTION

The agriculture sector is an indispensable driver of economic growth in Pakistan. It adds almost 22.9 percent to GDP, grabbing 37.4 percent of the labour force, providing a great source of foreign capital, and stimulating growth across different sectors of the economy (GOP, 2024). In recent years, fruit crops have become a key sub-sector of agricultural exports, and among fruit production, dates palm fruit has been the chief exporting item for Pakistan since 2017. Dates fruit production needs hot and less humid zones under any soil, similarly, as compared to other cultivated plants, its cultivation is easy in saline conditions (Lobo et al., 2014). Pakistan has the advantage of having agro-climatic conditions and a contiguous irrigation system; hence, the country produces various tropical and sub-tropical vegetables and fruits, including date palms. During 2017-18, the production of fruit shares added around 10.80 percent to agriculture and 2.04 percent to GDP (GOP, 2019).

The cultivation of dates in Pakistan spans an area of 96,514 hectares, producing 838,251 tons in 2021-22. In the same year, the export of dates amounted to 136.5 million kgs, valued at approximately US$52.24 million (GOP, 2024). According to FAO (2013), Pakistan is the top exporter of dates worldwide. Countries like the USA, India, the UK, Germany, Canada, Malaysia, Indonesia, and Denmark actively import both fresh and dried dates fruits from Pakistan. Pakistan cultivates various major date cultivars across all four provinces of Pakistan.

Globally, Pakistan is the sixth-largest date palm producer and second-largest in the South Asian region (see Table 1) and exported more than 25 percent of total date fruit production in 2019 (GOP, 2020). Dates are among the few fruits cultivated in all provinces of Pakistan over 99 thousand hectares; however, nearly 50 percent of dates fruit production comes from Sindh province alone, trailed by Baluchistan and Punjab province (Bullo, 2017). Pakistan has a vast potential for date export since only the Sindh province produces more than 300 date fruit varieties. Similarly, it offers seasonal employment to around 450,000 workers in a single district like Khairpur, besides permanent employment opportunities to a significant local workforce, particularly the female labour force (Memon, 2017). Therefore, it is a valuable source to enhance the foreign capital inflow and boost the living standard of the local workforce.

Table 1: Top 10 Dates Palm Fruit Producers, 2022

(Values in '000')

Rank	Country	Production (Tons)
1	Egypt	1,733.43
2	Saudi Arabia	1,610.73
3	Algeria	1,247.40
4	Iran	1,033.46
5	Pakistan	732.93

6	Iraq	715.29
7	Sudan	442.66
8	UAE	397.33
9	Oman	376.98
10	Tunisia	369

Source: FAOStat, 2024

The lack of innovation restricts Pakistan from gaining potential revenue from the date palm trade, and there are immense value addition and profit opportunities for Pakistani traders in the international market (Hanif, 2019). Umrani et al. (2024) tried to find the challenges small traders face in the province of Sindh in Pakistan. They emphasized that the local date palm producers cannot find new export markets, and their decisions must be supported by research, etc. India is the major importer of Pakistani dried dates; accounting for nearly 90 percent of Pakistan's total date palm exports in 2018-19. At the same time, Pakistan exports fresh dates to Bangladesh, Canada, France, Indonesia, Malaysia, UAE, and the USA. Still, the export comprises only 10 percent of the total crop production (GOP, 2019).

Till 2018-19, India was the largest importer of Pakistani date palm fruit. According to Memon (2018), though India is the largest buyer of Pakistani date fruit, date fruit imports from Pakistan account for only 50 percent of India's total date import, allowing Pakistan to export more to India. However, the trade relations between Pakistan and India are always strained. Due to increased political tensions after the Balakot airstrike by India on Pakistan in February 2019, India withdrew the Most Favored Nations status of Pakistan, suspended the bilateral trade, and imposed a 200 percent import duty on the products of Pakistan. In response, Pakistan also suspended trade with India in 2019 (Ashraf, 2019). Besides, several wars between both countries[1] the nuclear weapons race, and occasional clashes on the Line of Control (LOC) troubled the trade contacts between the two countries (Gul et al., 2018). India keeps a minor share of trade with Pakistan and can overlook the trade relations with Pakistan if feels unnecessary (Sami, 2024). Both economies have lost the opportunity for trade to positively impact their relationship (Azam et al., 2024). Table 2 shows India is not among the top 10 buyers of Pakistani date palm fruit in 2022. It indicates to the Pakistani date palm fruit sellers to focus on the other potential markets.

Table 2: Top 10 buyers of Pakistani Dates Palm Fruit (2022)

Rank	Country	Value (000 USD)

1	UAE	28569
2	Germany	2886
3	UK	1936
4	Australia	1150
5	USA	1123
6	Canada	842
7	Sri Lanka	773
8	Denmark	666
9	Bangladesh	505
10	South Africa	448

Source: Trade Map, 2024

Imports of dates by the European Union account for only 10 percent of the global imports in volume but they account for nearly 30 percent in value, it depicts that import receipts for date palms in the European Union are comparatively higher than the world average (Liu, 2003). The European region is an important market for date palm exporters. Pakistan still needs to discover this opportunity to export to EU countries fully. The study's outcome will pave the way for policymakers and exporters to redesign their export policies and get updated information in this area. The remaining study is organized as; Section 2 provides data sources and econometric techniques, Section 3 discusses results, and the last section concludes the study and draws some policies.

DATA AND VARIABLES

The study is based on the panel data of 17 countries: Afghanistan, Australia, Bangladesh, Canada, China, Denmark, Germany, Hong Kong, India, Japan, Malaysia, Nepal, South Africa, Sri Lanka, USA, UK, and UAE. We cover the period from 1998 to 2021. The variable bilateral exports of dates are taken from the Pakistan Bureau of Statistics, and this variable shows the total value of fresh and

dry date exports. The variables GDP, population, and bilateral exchange rates are taken from the World Bank. The dummy variable English language is taken from Google.

METHODOLOGY

For empirical analysis, we use the gravity model. This model is utilized to analyze bilateral trade flows between geographical entities. The model is derived from Newton's gravitational physics function that defines the gravity force. This model explains that the trade flow between two nations is proportional to their economic "mass" such as national income, and negatively associated with the distance between them. The Gravity model equation can be written as:

$$Trade_{ij} = \alpha . \frac{GDP_i . GDP_j}{Distance_{ij}}$$

Where $Trade_{ij}$ is the bilateral trade value between country i and j. GDP_i and GDP_j are the national income levels of both countries. $Distance_{ij}$ represents the bilateral distance between countries and α represents constant of proportionality.

Taking the linear form of the model mentioned above, the concerned estimable equation can be denoted as:

$$Log(Trade_{ij}) = \alpha + \beta_1 log(GDP_i . GDP_j) + \beta_2 log(distance_{ij}) + \mu_{ij}$$

Where α is a constant term, βs are slopes, and μ_{ij} is the error term to capture any shock that can affect the bilateral trade between two countries.

The linear form is a fundamental gravity model in which bilateral trade is expected to be a positive function of income and a negative distance function. However, the Gravity model has roots in Tinbergen (1962) and Poyhonen (1963), whose early application with international trade was made by Linnemann (1966). However, Linnemann (1996) credits the standard gravity model to Helpman and Krugman (1985). The establishment of a proportional relationship between trade flows and the size of a country, as described by Helpman and Krugman, does not comprise the role of distance. For several crucial reasons, distance must be included as an explanatory variable. For instance, distance calculates the transport costs and indicates the time consumed during shipment. The transaction cost may also increase with distance. The geographical distance may lead to greater cultural differences that enhance the total cost due to negotiating styles or inhibiting communication.

Trade theories associated with imperfect competition and the Hecksher-Ohlin model validate the inclusion of income as well as distance. Various studies include additional variables such as trade policies and bilateral exchange rates to control geographic, historical, and economic differences (Batra, 2006).

Several studies have applied the Gravity model to analyze trade potentials. Frankel and Wei (1993) have investigated global bilateral trade patterns and found the impact of currency blocs and exchange rate stability on trade. Frankel (1997) used the same model to analyze the host of issues, like the estimates of trading blocs, and the role of currency links, on cross-sectional and panel data. Using

this technique, Kalbasi (2001) has estimated Iran's volume and direction of trade. Further, Kalbasi applied it to a panel on developing and industrial economies and examined the trade flows. Christie (2002) applied the same model to estimate the trade potential for Southeast Europe. Rahman (2003) employed it on Bangladeshi data considering other factors like openness, and exchange rates. Lypko (2022) demonstrated that the distance between countries and their gross domestic products continues to be a critical factor in shaping their trade flows. Khan et al. (2024) studied the impact of Pak-China trade contracts on vegetable exports. Using the gravity model, they found that trade with neighbouring countries benefits Pakistan as it has lower trading costs.

Including other factors that can have a role in dates palm bilateral trade in Pakistan, this study used an augmented gravity model to examine the international trade flow of dates palm fruit and the trade potential for Pakistan with its top trading partners. The applied model is as follows

$$Log(T_{ij}) = \beta_0 + \beta_1 log\,(GDP_i) + \beta_2 log\,(GDP_j) + \beta_3 log\,(Pop_j) + \beta_4 log\,(Dis_{ij}) + \beta_5 log\,(ER_{ij}) + \beta_6 Lan_j + \mu_{ij}$$

Where i and j denote Pakistan and the partner country, respectively, and μ_{ij} is an error term. Tij denotes the value of bilateral trade of dates palm fruit between i and j. GDP_i and GDP_j are the gross domestic product of Pakistan and the trading partner country, respectively. Pop_j is the population of the trading partner country, Dis_{ij} is the distance between Pakistan and the trading partner country. It measures the different modes of transportation and related costs. ER_{ij} is the exchange rate between Pakistan and its buyer of the dates palm fruit.

Lan_{ij} is a dummy variable that measures whether the country follows English as a language. This study includes dummy variables to detect the effect of geographical factors and historical ties between countries on bilateral trade. Lan is equal to 1 when country j follows the English language (official or commercial): English as a common language is likely to reduce transaction cost since it helps facilitate trade negotiations.

RESULTS AND DISCUSSION

The basic assumption of the regression model is the normality of residuals. Violating the assumption may create a problem with the model's fitness, stability, and reliability. The residual normality of the discussed data is seen in Table 3. The results showed that the residuals are normally distributed as skewness (0.651) and kurtosis (0.779). The probability value (0.134) is greater than 5 percent, which leads to not rejecting the null hypothesis.

Table 3: Results of Residual Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	Adj χ^2	Prob > χ^2
Residual	403	0.651	0.779	14.243	0.134

Note: Null hypothesis - the residuals are normally distributed

Variance inflation factor (VIF) is used to analyze the severity of multicollinearity in the estimation. In the presence of Multicollinearity, the coefficients remain consistent but unreliable. Table 4 shows the results of the VIF of applied variables.

Table 4: Results of multicollinearity based on VIF

Variable	VIF
GDPi	1.12
GDPj	2.94
Pop_j	1.82
Dis_{ij}	2.96
ER_{ij}	2.77
Lan_j	2.81
Mean VIF	2.57

As the VIF increases, the regression results are less reliable; generally, a VIF value above 10 indicates a high correlation and that leads to unreliable results, and cause for concern. The table shows that our VIF ranges from 1 to 3.58, indicating a moderate correlation between regressors.

Table 5 shows Ramsey RESET test results. The results are evidence of no misspecification in our regression model.

Table 5: Results of the Ramsey RESET Test

$F(3, 371)$	Prob > F
3.09	0.127

Null Hypothesis: The Model has no omitted variables

Based on the residual normality, VIF, and Ramsey RESET test results, the study's proposed model allows for further empirical analysis.

Table 6 presents the augmented gravity model results. The results show that most of the selected variables are highly significant. The GDP of both countries (seller and buyer) plays a crucial role in trading dates palm fruit. Alessandria and Choi (2007) discuss how differences in GDP per capita influence international trade patterns. They find that higher GDP is associated with higher levels of trade and consumption of imported goods. The countries tend to export goods that are intensive in factors of production where they are relatively abundant, as indicated by their GDP (Hallak and Schott, 2011).

Table 6: Results of the Gravity Model

Variable	Coefficient (SE)
$\text{Log(GDP}_i)$	0.478** (0.193)
$\text{Log(GDP}_j)$	0.352* (0.114)
$\text{Log(Pop}_j)$	0.317* (0.113)
$\text{Log(Dis}_{ij})$	-1.751* (0.425)
$\text{Log(ER}_{ij})$	0.060 (0.199)
Lan_j	0.572 (0.928)

C	0.372
	(6.034)
R^2 = 0.613	N = 380

The population variable is highly significant, a 1% increase in the population of trading partner countries increases the exports of dates palm fruit by 0.3%. Anderson and van Wincoop (2003) show that larger market sizes, indicative of larger populations, lead to increased trade volumes between both countries, the seller and buyer. Population growth affects international trade through its impact on economic growth and technological change. The larger populations can lead to higher levels of trade, driven by increased demand and production capabilities (Docquier and Schiff, 2013).

As expected, the coefficient on distance appears with a negative sign. The value is also high (above 1.7), indicating that the trade of date palm fruit between Pakistan and top buyer countries decreases by over 1.7% for every 1% increase in the distance between them. The results align with Rose (2004) and Head and Thierry (2014), who discuss the gravity model of trade and provide empirical evidence that greater geographical distance between countries reduces trade flows.

The variable exchange rate has insignificant and positive results, and the value of the coefficient is also low. Therefore, we can say that fluctuation in the exchange rate doesn't affect the export of dates. Rose (2000) suggests that some studies find a significant effect, while others find limited or insignificant effects of exchange rate movements on trade.

The language variable is also insignificant, meaning that the trading partners' common language doesn't affect their trade. Our results are in line with Melitz and Toubal (2014), who emphasize that language proficiency alone may not ensure successful trading relationships without considering other factors.

Trade potential is estimated concerning the exports of dates palm fruit from Pakistan to each top trading partner. Results of average trade potential are presented in Table 8. This study defines trade potential from Pakistan to country *j* as the ratio between the predicted exports by the estimated model (P) and actual Pakistan's date palm fruit exports (A), i.e. (P/A) is then used to get the future direction of trade for Pakistan.

A value of P/A higher than one means that Pakistan has yet to be able to export date palm fruit to its full capacity. A ratio of fewer than one means that Pakistan's exports are higher than expected, implying that it has exhausted its current export capacities. The buyers with the potential also can be classified by the absolute difference between the predicted and actual level of trade, such as the value of (P-A); a positive value describes future potentials of trade expansion; on the other hand, a negative

value indicates Pakistan has exceeded its trade potential of dates palm fruit with the particular partner country.

The results in Table 7 show that Pakistan's export of dates palm fruit has exceeded neighbouring countries like Afghanistan, Bangladesh, India, and China. Exports to other regional countries like Malaysia, Nepal, Hong Kong, and Sri Lanka have also been exceeded.

Pakistan's trade potential coefficient is maximum with Germany, Hong Kong, the United Kingdom, Australia, Canada, Japan, UAE and the USA. The results indicate that Pakistan can potentially increase its exports of date palm fruit with these countries. Also, Pakistan and Germany have had strong and diverse ties since 1951. Trade between Germany and Pakistan is a freely exchangeable currency in the Trade Agreement contracted in 1957. Within the European Union, Germany is Pakistan's largest trading partner. Similarly, Pakistan and the USA signed a Trade and Investment Framework Agreement in 2003, that offers a forum for debate on bilateral trade issues. Improvement in bilateral trade and economic relations between these countries will bring prosperity and development. Pakistani exporters need to meet quality standards to penetrate the markets of Europe, the USA, and Australia.

Trade between Pakistan and mentioned countries holds significant potential for mutual economic benefit. Pakistan, with its strategic geographical location, offers these economies access to South Asian markets and beyond. Furthermore, enhanced trade relations can foster technology transfer, investment inflows, and cultural exchange, contributing to socio-economic development in both regions.

Table 8: Average Trade Potential of Pakistan's Dates Palm Fruit to Top Buyers

Country	Average (P-A)	Average (P/A)
Afghanistan	-1.942	0.480
Australia	1.261	1.284
Bangladesh	-2.612	0.800
Canada	0.544	1.196
China	-2.940	0.343
Denmark	0.542	1.263
Germany	0.542	1.047
Hong Kong	-0.917	0.876

India	1.687	-0.080
Japan	1.671	1.354
Malaysia	-1.170	0.728
Nepal	-1.529	-0.331
South Africa	-0.145	1.018
Sri Lanka	-0.186	0.045
USA	0.523	1.296
UK	0.334	1.282
UAE	2.567	1.561

CONCLUSION AND POLICY IMPLICATION

Using the gravity model, this study estimated Pakistan's trade potential for date palm fruit. The panel data from 1998 to 2021 for 17 top buyers of the world has been analyzed through OLS. The gravity model fits the data, exposes the income and geographic distance elasticities, and estimates other characteristics. Our results show that Pakistan's global trade potential for dates palm fruit is higher in the Non-Asian region than in Asian and neighbouring countries. Based on our findings, The United Kingdom, USA, UAE, Germany, Australia, Canada, and Japan are countries where Pakistan is not exporting its dates palm fruit. They are not producers of this fruit or negligibly produce it. Hence, the export of dates palm fruit can be expanded. Considering the fact and a favourable exchange rate with these countries, it is a good opportunity for Pakistan to enhance its palm fruit export to these countries. India already has strategies and policies to improve its production and export of date palms to these countries. The exchange rate with India is also comparatively lower than non-Asian countries, so this is time to diversify the export market for Pakistani dates palm fruit. The study draws a few policy implications to enhance the export of date fruits in Pakistan; for example, policymakers should focus on exploring the latest marketing strategies to implement. There is a need to focus on drafting those policies that help preserve the date fruit, such as implementing suitable processing techniques, mechanized dryers, packaging, cold storage houses, and modern logistic services. These policy implications lead to preserving the dates for a longer period, increasing profitability for growers, and helping minimize postharvest losses of date palm fruit on farmers' earnings and living conditions.

International users are concerned about food-borne risks; hence, the fundamental requirement is adopting a Quality Management System. Date palm manufacturers should implement an effective management system such as Good Manufacturing Practices, British Retail Consortium, ISO 22000,

and HACCP for products and processes to ensure the hygienic and consistent quality of date fruit in Pakistan. Traditional manufacturing methods need to be updated after industrialization 4.0. Policymakers should emphasize the introduction of traceability of orders and automated operations throughout the supply chain of date manufacturing.

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