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Investigating the factors affecting the export, efficiency, and export capacity of Iranian Dates

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Abstract

This study analyzes the current state of international trade, focusing on trade relations between Iran and other nations, as well as existing and potential capacities for future trade. It also aims to evaluate the impact of key factors on Date exports and their effects. To achieve this, the research investigates the factors influencing Iranian date exports by utilizing panel data and employing a fixed effects model from 2001 to 2023. The findings indicate that several factors positively influence Date exports. These include trade advantages, the logarithm of the exchange rate, the disparity between Iran's GDP and that of its trading partners, the logarithm of the ratio of export prices to domestic prices, and trade agreements with target countries. Conversely, the logarithm of the cost of exporting agricultural products to the target country and the impact of sanctions negatively affect Iranian date exports. During the study period, the structure of Iran's Date export market has varied between a tight and loose oligopoly. The analysis of advantage indicators shows that there is an export advantage for Dates. It is crucial to prioritize the enhancement and development of supply chains for Iran's main export products. The main challenges in the supply chain for these products involve acquiring production inputs, as well as the processes of packaging, sorting, processing, and transportation.

Keywords: Dates, Export Efficiency, Export, Capacity Measurement, Stochastic Frontier Analysis.

Introduction

In the contemporary global landscape, the economies of various nations exhibit a significant degree of interdependence (Zhang *et al.*, 2024). It is becoming increasingly rare to find a country that operates with a completely closed economy (Colloca *et al.*, 2024). Instead, economies around the world are closely interconnected, although the degree of openness varies among different countries (Gyamfi *et al.*, 2023). Through free trade, nations can capitalize on expanded markets resulting from increased transaction volumes (Jia *et al.,* 2022). This phenomenon is recognized as a key advantage of free trade for countries around the globe (De Wit & Altbach, 2021).

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Trade is recognized as a key factor in the economic growth and progress of nations (Rehman *et al.,* 2021; Noroozi *et al.,* 2021). The trade balance, a key aspect of foreign trade, serves as a measure of economic strength (Yusuf & Nasrulddin, 2024). Consequently, by enhancing international engagement within the agricultural sector and boosting efficiency in global markets, opportunities can be created to achieve development objectives (Darko *et al.,* 2020). Export efficiency in bilateral trade refers to the ratio of a country's actual exports to its maximum potential export capacity, assuming there are no barriers or obstacles to its trade relations (Rehman & Noman, 2022).

In contemporary times, production lacks significance without the identification and assurance of a viable market (Mhlanga, 2023). Before initiating the production of any product, it is essential to conduct marketing activities for that product, a concept referred to in marketing (Lahtinen *et al*., 2020).

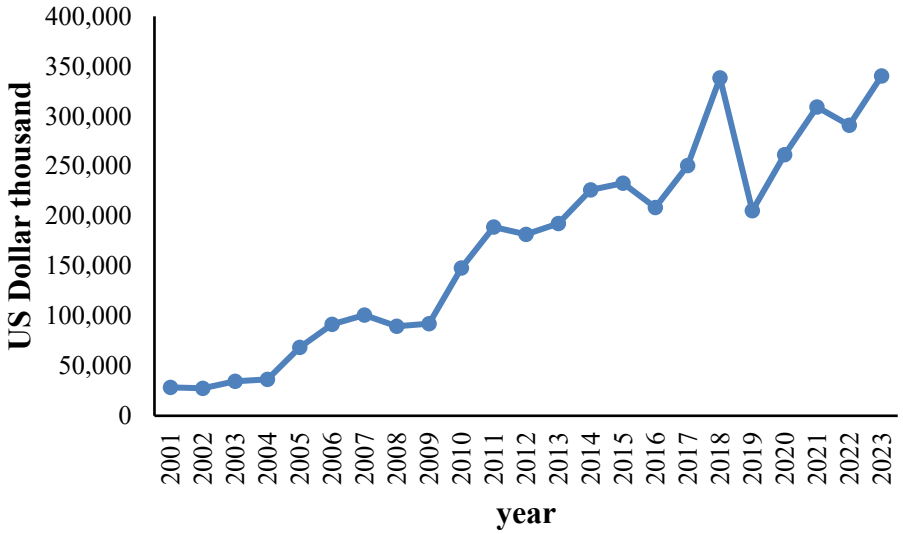

Diagram 1. Trend of export value of Iranian Dates (tariff code 080410) - ITC, 2022.

The analysis of Iran's Date export status shows that in 2023, the export value reached $340.2 million, marking an increase compared to the figures from 2019 and 2020. The primary markets for Iranian date exports (tariff code 080410) in 2023 include India, Pakistan, Türkiye, Afghanistan, the UAE, Kazakhstan and China, with export values of $79.9 million, $66.5 million, $33.9 million, $22.5 million, $22.2 million, $19.9 million, and $12.5 million, respectively.

The chart above shows a remarkable increase in the value of Iranian date exports during the reviewed period, with an impressive rise of over 1095 percent. Analyzing the export status of Iranian dates shows a significant lack of Iran's presence in European markets with processing

industries. Given the high quality of Iranian dates, this is both surprising and concerning. International trade theories can be classified into two main categories: traditional theories and contemporary theories. Traditional economic theories include concepts like mercantilism, absolute and comparative advantage, opportunity cost, and the Heckscher-Ohlin model. Contemporary theories include Linder's theory, new neo-technology theories, and Porter's theory. These approaches provide a modern perspective in contrast to earlier frameworks. These modern trade theories focus on the relationships between nations and bilateral trade, as well as the various factors that influence these interactions. A notable model that has emerged from these contemporary theories is the gravity model. This model functions on a bidirectional basis and clarifies trade volume by incorporating macroeconomic variables relevant to each pair of countries (Kunroo & Ahmad, 2023). Research has been conducted in this field, and some studies will be summarized in Table 1.

Table (1). Summary of studies.

Authors	Objectives	Analytical method	Location	Results
Atif et al. (2019)	A study to examine the factors influencing and the efficiency of chemical exports.	Stochastic Frontier Gravity Model	Pakistan	Preferential trade agreements, common language, and geographical proximity significantly affect.
Noyani et al. (2019)	Analyze the export efficiency of steel products	Stochastic Frontier Gravity Model	China	The findings indicated that China's GDP per capita exerted the most substantial influence on export efficiency.
Abdullahi et al. (2021).	Determinants and Potential of Agri-Food Trade	Stochastic Frontier Gravity Model	Nigeria	Bilateral distance, domestic population, exchange rate, language, and landlocked status adversely affect agri-food exports.
Zhu et al. (2022)	Analyze the export efficiency and potential steel products	Stochastic Frontier Gravity Model	China	China's GDP per capita exerted the most substantial influence on export efficiency.
Abdullahi et al. (2022)	Examine the key determinants and efficiency of China's agricultural exports.	Stochastic Frontier Gravity Model	China	China's GDP and its importing countries, the Belt and Road Initiative, common border, and the Chinese language positively determine China's agricultural export flows.
Nguyen (2022)	Determinants of Vietnam's rice and coffee exports	Stochastic Frontier Gravity Model	Vietnam	A trading partner's GDP has a significantly positive impact on coffee export, while a significantly negative effect on rice export.
Obeidolah and Mostafa Ali (2023).	Evaluation of the trade potential	Stochastic Frontier Gravity Model	Arab Nations	Trade restrictions and barriers resulted in a considerable disparity between the potential and actual trade levels among these countries.
Aminizadeh et al. (2025)	Determining Seafood Export	Stochastic Frontier Gravity Model	Iran	The GDP of Iran and its trading partners had positive effects. Bilateral exchange rate, common border, common religion, distance, and sanctions had negative effects.

Despite the importance of Iranian date exports, there has been no study focusing on their export efficiency and capacity. This research aims to address this gap by examining export efficiency

and potential capacity, as well as market structure, price and quality competition, and comparative advantage.

MATERIALS AND METHODS

This study will examine the structure of the Date export market using the Index: concentration ratios (CR). The concentration ratio index indicates that the production of a product is concentrated in a few countries and can also indicate other types of market structures between perfect competition and perfect monopoly. The index can be defined as equation (1) (See Shibata *et al.,* 2020, and Kazem Pour *et al.*, 2022). The determination of market structure by combining the concentration ratio index is illustrated in Table 2.

Table 2. Types of market structure.

Market	Concentration ratio index (percentage)	Main feature of the market
Perfect competition	$CR_1 \to 0$	None of the exporting countries has monopoly power and does not determine the price in the market.
Monopolistic competition	$CR_1 < 10$	None of the competing exporting countries has a monopoly of more than 10% of the market.
Loose oligopoly	$CR_4 < 40$	4 exporting countries have a maximum monopoly of 40% of the market.
Tight oligopoly	$CR_4 > 60$	4 exporting countries have a minimum monopoly of 60% of the market.
Dominant firm	$CR_1 \geq 50$	More than 50% of the market is monopolized by one exporting country.
Perfect monopoly	$CR_1 \to 100$	One exporting country has a monopoly on the entire market.

Maddala et al., 1995.

In this study, the revealed comparative advantage (RCA) and revealed symmetrical comparative advantage (RSCA) indices were utilized to demonstrate Iran's comparative advantage in date exports (See Kazempour Kahriz *et al*., 2023, and Sun *et al.,* 2022). RCA value from zero to one indicates the absence of advantage, while one to infinity indicates the presence of advantage and a move towards trade specialization (Sun *et al.,* 2022). The RSCA range is between positive and negative. A negative value indicates the absence of an advantage in exporting the product, while a positive value indicates the presence of an advantage.

In order to examine the status of trade advantage, Vollrath proposed the RTA index. This index was calculated by, which is calculating the difference between the two indices of relative export advantage (RXA) and relative import advantage (RMA) (See Sun *et al.,* 2022). The export density index is calculated as follows, equation 2 (Noroozi *et al.,* 2023):

$$EDI = \frac{\frac{XR_{ij}}{MR_{nj}}}{\frac{XA_{ij}}{MA_{nj}}} \quad (1)$$

XR, MR, XA, and MA, respectively, represent exports of goods, imports of goods, agricultural exports, and agricultural imports. Additionally, i represents the exporting country, j represents the importing country, and n represents all countries in the world.

After calculating the advantage indices, the TOPSIS algorithm prioritized the export target markets. The TOPSIS algorithm, as a powerful multi-criteria decision-making method, ranks options by comparing them to an ideal solution (See Irfan *et al.,* 2022).

To assess export efficiency and conduct a more thorough market analysis, the stochastic frontier gravity model developed by Kalirjan (2007) is employed. This model integrates two gravity models with a stochastic frontier approach. The foundational gravity model was initially proposed by Tinbergen (1962). In this framework, trade is positively correlated with the size of the economy while exhibiting an inverse relationship with distance.

$$EXP_{ijt} = \frac{GDP_{it} \times GDP_{jt}}{DIST_{ij}} \quad (2)$$

In this context, the variables i, j, and t denote the exporting country, the importing country, and the year, respectively. EXP refers to the export volume of Iranian dates to the chosen countries. DIST signifies the geographical distance between Iran and its trading partners, serving as a measure of transportation costs between nations (for this analysis, transportation costs per ton have been sourced from the World Bank). GDP represents the gross domestic product, while ε indicates the error term.

The stochastic frontier model, introduced by Aigner et al. (1977), suggests that efficient firms operate along the production possibilities frontier. In contrast, inefficient firms fall within a particular frontier level, where their output reduction is linked to the gap between actual output and potential output. Trade efficiency refers to how much trade deviates from its optimal state, and this can be represented by the stochastic frontier gravity model.

$$ln(EXP_{ijt}) = B_0 + B_1 LnGDP_{it} + B_2 LnGDP_{jt} + B_3 LnDist_{ij} + V_{ijt} - U_{ijt} \quad (3)$$

V_{ijt} represents a two-sided error component, modeled as $N(0 \sim \sigma^2)$ to account for statistical disturbances arising from measurement errors. Conversely, U_{ijt} is characterized as a one-sided and positive error, following a distribution of $N(\mu \sim \sigma^2)$, which reflects trade performance metrics. This component signifies technical inefficiency, allowing for the assessment of the extent of deviation from optimal trade levels (Atif *et al.,* 2017). According to the stochastic frontier model, the computed efficiency rate ranges from zero to one. An efficiency rate approaching zero suggests that the export rate significantly deviates from the potential rate. Conversely, an efficiency rate nearing one signifies that the actual export levels align closely

with the maximum possible levels in the target market. The empirical model used for estimating export efficiency and Key variables' impact on Date exports is outlined as follows (equation 4):

$$\ln(\mathrm{EXP_{ijt}}) = \mathrm{B_0} + \mathrm{B_1LnGDP}dif_{\mathrm{ijt}} + \mathrm{B_2LnPXD_{jt}} + \mathrm{B_3LnRER_{it}} + \mathrm{B_4LnCost_{ij}} + \mathrm{B_5RTA_{ijt}} + \mathrm{B_6LnLib_{ij}} + \mathrm{B_7Agreement} + \mathrm{B_8Sanction} + (\mathrm{V_{ijt}} - \mathrm{U_{ijt}}) \quad (4)$$

In this model, $\mathrm{Ln}EXP_{\mathrm{ijt}}$ Denotes the logarithm of Iranian date exports. The variable $ln\mathrm{GDPgdp_{ijt}}$, represents the logarithm of the difference in GDP between Iran and importing countries, which is an indicator of economic growth. The $\mathrm{LnRER_{it}}$ Variable represents the logarithm of the real exchange rate, while $\mathrm{LnCost_{ij}}$ Indicates the logarithm of the transportation costs associated with moving agricultural products from Iran to other countries or vice versa. $\mathrm{RTA_{ijt}}$ refers to the trade advantage index, and $\mathrm{LnPXD_{jt}}$ Represents the price associated with exports or imports. The variable $\mathrm{LnLib_{ij}}$ indicates the Trade liberalization or degree of openness of the economy (ratio of trade volume to GDP), whereas $\mathrm{Agreement_{ij}}$ Pertains to any trade agreements in place. Additionally, Sanction Represents international sanctions, which are incorporated into the model as dummy variables.

Because the efficiency rate ranges from 0 to 1, this model distinguishes itself from the standard panel data method. From an econometric perspective, these variables differ from each other in that they have a probabilistic outcome and include both corner solution outcomes and continuous outcomes within the range of zero and one. As a result, logit and fractional probit models have been proposed (see the studies by Papke and Wooldridge, 2008; Kölling, 2020).

$$Y_{it} = \alpha_i + X_{it}\beta + u_{it} \quad (5)$$

To achieve the research objectives, Iran's date exports to its trading partners, which account for more than 90 percent of total exports (39 countries) from 2001 to 2023, were analyzed. Data for this analysis were obtained from the ITC Trademap website, Iranian Customs, the World Bank, and the Food and Agriculture Organization (FAO).

RESULTS AND DISCUSSION

Table 3 presents the findings aimed at assessing the market structure. The data reveal that throughout the years examined, the Iranian date export market exhibited characteristics ranging from a loose to a tight oligopoly. This market structure signifies the presence of monopoly power held by Iran in its target markets, which has intensified due to the transition to a tight oligopoly in 2023.

Table 3. Examining the structure of Iran's date export market.

Year	CR1	CR4	Market Type
2001	24.21	54.07	Between a tight and a loose oligopoly
2002	21.45	51.53	Between a tight and a loose oligopoly
2003	21.23	49.96	Between a tight and a loose oligopoly
2004	17.48	52.05	Between a tight and a loose oligopoly
2005	15.5	52.54	Between a tight and a loose oligopoly
2006	13.24	46.69	Between a tight and a loose oligopoly
2007	16.10	53.49	Between a tight and a loose oligopoly
2008	19.73	47.95	Between a tight and a loose oligopoly
2009	18.85	44.76	Between a tight and a loose oligopoly
2010	14.26	45.62	Between a tight and a loose oligopoly
2011	16.02	49.51	Between a tight and a loose oligopoly
2012	21.46	50.25	Between a tight and a loose oligopoly
2013	19.19	46.92	Between a tight and a loose oligopoly
2014	17.08	45.52	Between a tight and a loose oligopoly
2015	12.74	47.10	Between a tight and a loose oligopoly
2016	15.44	46.14	Between a tight and a loose oligopoly
2017	17.37	50.95	Between a tight and a loose oligopoly
2018	21.420	56.520	Between a tight and a loose oligopoly
2019	22.060	53.850	Between a tight and a loose oligopoly
2020	19.520	57.310	Between a tight and a loose oligopoly
2021	23.540	60.100	Tight oligopoly
2022	22.590	60.495	Tight oligopoly
2023	22.972	61.915	Tight oligopoly

The findings regarding the advantage indices are shown in Table 4. Over the years analyzed, Iranian date exports consistently exhibited an export advantage. While the RSCA index showed a relatively stable trend, the RCA index displayed volatility and a downward trend. This decline may be attributed to both a reduction in export volume and a decrease in global prices for this product.

Table 4. The results of the calculation of the relative export advantages.

Year	RCA	RSCA	Year	RCA	RSCA
2001	51.1	0.96	2013	51.51	0.96
2002	43.66	0.96	2014	41.89	0.95
2003	36.44	0.95	2015	44.01	0.96
2004	42.79	0.95	2016	28.51	0.93
2005	48.09	0.96	2017	38.40	0.95
2006	52.18	0.96	2018	48.56	0.96
2007	43.99	0.96	2019	29.79	0.94
2008	43.74	0.96	2020	42.07	0.95
2009	32.00	0.94	2021	49.00	0.96
2010	40.98	0.95	2022	45.76	0.96
2011	54.85	0.96	2023	47.12	0.96
2012	45.92	0.96	-	-	-

Table 5 presents that Iranian dates command a higher export price compared to the global market, while simultaneously offering superior quality relative to other competitors. This has consistently resulted in successful quality competition (Until 2015). From 2016 to 2023, Iran's date export prices have consistently been lower than the global average due to the introduction of new varieties and improvements in product quality, packaging, and grading by competing producers. Part of this trend can also be traced to sanctions and restrictions.

The calculation of the previously mentioned indicators (export advantage and export density),

along with the extraction of variables such as price, export value, target market share, and the GDP of the target countries, facilitated the prioritization of export target countries using the TOPSIS method for the year 2023. The findings are detailed in Table 6. Notably, in 2023, Pakistan, India, Peru, Türkiye, Kazakhstan, Afghanistan, and Switzerland emerged as the primary export targets for Iranian dates. This prioritization aligns closely with actual market dynamics. The inclusion of South American nations like Peru, Chile, and Colombia among the top export priorities can be attributed to their significant export density. Essentially, it indicates the extent to which the target country's market relies on Iranian exports or how accessible the market is for Iranian date exports.

Table 5. The results of examining the status of price and quality competition.

Year	Export Price ($ per kg)	Import Price ($ per kg)	Average World Price ($ per kg)	Trade Balance (1000 US dollars)	Type Of Trade	Type Of Competition
2001	0.239	0.099	0.595	28435	Two Way	Price Competition
2002	0.243	1	0.693	27586	Two Way	Price Competition
2003	0.289	-	0.751	34682	One Way	Price Competition
2004	0.385	0.333	0.758	36427	Two Way	Price Competition
2005	0.585	-	0.547	68493	One Way	Quality Competition
2006	0.639	-	0.908	91585	One Way	Price Competition
2007	0.804	-	0.742	100787	One Way	Quality Competition
2008	0.852	-	0.761	89622	One Way	Quality Competition
2009	0.983	-	0.976	92150	One Way	Quality Competition
2010	1.244	-	1.101	148166	One Way	Quality Competition
2011	1.407	-	1.201	188932	One Way	Quality Competition
2012	1.311	-	0.897	181590	One Way	Quality Competition
2013	1.312	1.3	0.988	192403	Two Way	Quality Competition
2014	1.352	-	1.201	226174	One Way	Quality Competition
2015	1.363	-	1.066	232981	One Way	Quality Competition
2016	0.996	-	1.028	208548	One Way	Price Competition
2017	0.988	-	1.233	250492	One Way	Price Competition
2018	1.105	-	1.320	338348	One Way	Price Competition
2019	0.918	-	1.528	205230	One Way	Price Competition
2020	0.876	-	1.343	261579	One Way	Price Competition
2021	0.878	-	1.235	309135	One Way	Price Competition
2022	0.850	-	1.247	291051	One Way	Price Competition
2023	0.903	-	1.179	340278	One Way	Price Competition

Table 6. Prioritizing export target markets.

Rank	Country	Rank	Country	Rank	Country	Rank	Country
1	Pakistan	20	Qatar	39	Malta	58	Poland
2	India	21	Finland	40	China	59	Croatia
3	Peru	22	Belgium	41	Bosnia	60	Turkmenistan
4	Türkiye	23	New Zealand	42	Lithuania	61	Oman
5	Kazakhstan	24	Canada	43	North Macedonia	62	Indonesia
6	Chile	25	Malaysia	44	Czech Republic	63	Romania
7	Afghanistan	26	Japan	45	Venezuela	64	Kyrgyzstan
8	Switzerland	27	France	46	Armenia	65	Mauritania
9	UAE	28	England	47	Albania	66	Lebanon
10	Norway	29	Argentina	48	Georgia	67	Moldova
11	Denmark	30	Italy	49	Brazil	68	Tajikistan
12	Bangladesh	31	Russia	50	Bulgaria	69	Mauritius
13	Singapore	32	Azerbaijan	51	Greece	70	Belarus
14	Sweden	33	South Korea	52	Bahrain	71	Fiji
15	Netherlands	34	Kuwait	53	Sri Lanka	72	South Africa
16	Austria	35	Estonia	54	Ukraine	73	Somalia
17	Australia	36	Spain	55	Syria	74	Philippines
18	Germany	37	Trinidad and Tobago	56	Maldives	75	Vietnam
19	Iraq	38	Uzbekistan	57	Thailand	76	Burkina Faso

The target countries were grouped using the K-means clustering method. As indicated in Table 7, Cluster 4 has been identified as the optimal cluster. In Cluster One, the countries represented are Uzbekistan, Turkmenistan, and Pakistan; Cluster Two includes the UAE and India; Cluster Three comprises Iraq, Armenia, Lebanon, Azerbaijan, Georgia, Germany, Hong Kong, Vietnam, France, Qatar, Oman, the Netherlands, China, Afghanistan, Kazakhstan, Bulgaria, Kuwait, Tajikistan, Canada, Malaysia, Australia, Bahrain, Japan, Ukraine, Sweden, Kyrgyzstan, Italy, Austria, and the United States. Finally, Cluster Four consists of Türkiye, Russia, England, and New Zealand.

Table 7. Choosing the optimal number of clusters of export target markets.

Row	Number of clusters	Calinski/ Harabasz Clusters pseudo-F	Row	Number of clusters	Calinski/ Harabasz Clusters pseudo-F
1	3	1709.7	5	7	1635.96
2	4*	2373.8	6	8	1474.6
3	5	2079.68	7	9	1293.15
4	6	1849.44	8	10	1208.95

The influences on Iranian date exports were analyzed utilizing a fixed-effects panel model. The outcomes of the model estimation are presented in Table 8. The F statistic, which stands at 88.44 (prob.=0.0000), signifies the overall relevance of the regression analysis. The coefficient of determination and the adjusted coefficient of determination, with values of 0.8479 and 0.8383, respectively, demonstrate the model's substantial explanatory capability. Furthermore, the model was assessed against classical assumptions, revealing no violations. To avoid spurious regression estimation, the residuals of the model disturbance were evaluated using the Levin-Lin-Chu (LLC) test, confirming the stationarity of this variable. The results indicate that

several factors positively influence Iranian date exports. These include the logarithm of the real exchange rate, trade agreements, the logarithm of the ratio of export prices to domestic prices, the disparity (gap) between Iran's GDP and that of its trading partners, the logarithm of trade liberalization, and trade advantages. This aligns with the findings of Atief et al. (2019). In contrast, the logarithm of transportation costs for agricultural products going to the target country, along with the impact of sanctions, has a negative effect on these exports. This aligns with the findings of Noroozi et al. (2022) and Atief et al. (2019).To further elucidate the variables, it can be stated that a one percent increase in the logarithm of the export price to domestic price ratio, ceteris paribus, would result in a 2.07 percent increase in Iranian date exports. The variables related to agreements and the logarithm of trade liberalization were found to be insignificant.

Table 8. The results of estimating the pattern of factors affecting the export.

Variable	Coefficient	Elasticity	Standard error	T-Statistic	Probability
LnRER	0.6229	0.6229	0.0656	9.49	0.000
Sanction	-0.0983	-	0.0265	-3.70	0.000
Agreement	0.1399	-	0.0490	2.85	0.000
LnPXD	2.0773	2.0773	0.0469	44.27	0.000
LnCost	-0.6811	-0.6811	0.1536	-4.43	0.000
LnGDPdif	5.88×e^-14	-	1.30×e^-14	4.54	0.000
LnLib	0.9956	0.9956	0.2317	4.30	0.000
RTA	1.0175	-	0.4683	2.17	0.030
Cons.	1.7834	-	0.6251	-2.85	0.004
F(45,714)		88.44	R^2		0.8479
Prob.		0.0000	R^2 adj		0.8383

Table 9 provides the results from the stochastic frontier model. The findings from the stochastic frontier gravity model indicate that the lambda index (λ) is significant, supporting the use of the stochastic frontier method for assessing efficiency.

Table 9. The results of estimating the Stochastic Frontier Gravity Model.

Variable	Coefficient	Standard error	t-Statistic
LnRER	0.6053	0.0915	6.71
Sanction	-0.0907	0.0217	-4.18
Agreement	0.2097	0.2025	1.04
LnPXD	2.0415	0.0496	41.12
LnCost	-0.0014	0.0002	-5.61
LnGDPdif	3.68×e^-14	1.04×e^-14	3.53
LnLib	0.2283	0.5569	0.41
RTA	0.9734	0.4715	2.06
Cons.	0.0057	0.7204	0.01
σ_u	0.2476	0.0722	3.43
σ_v	0.1035	0.0055	18.81
λ	2.3922	0.0657	36.41

The data shown in Table 10 reveals that the overall average efficiency of the total export target countries during the analyzed period is 0.8735. According to the Stochastic Frontier Gravity Model (SFGM), Azerbaijan, Afghanistan, and Bulgaria demonstrate the highest levels of efficiency. In contrast, Oman has the lowest efficiency among the target countries.

Table 11 presents the actual export figures, potential export capabilities, and the export gap for the target countries. Notably, the countries with the greatest potential for increasing exports, or the largest export gaps, are the UAE, Türkiye, India, and Pakistan, in that order. In contrast, the countries with the least potential for export growth are Hong Kong, Bahrain, Austria, and Japan.

Table 10. Comparison of the average efficiency of target countries.

Country	2001-2005	2006-2010	2011-2015	2016-2023	Average
Iraq	0.8730	0.9227	0.9506	0.9454	0.9230
Türkiye	0.9397	0.9345	0.7996	0.9514	0.9064
Pakistan	0.9760	0.9728	0.9489	0.8990	0.9492
Armenia	0.8588	0.9531	0.9555	0.9445	0.928
Lebanon	0.9741	0.7717	0.8073	0.9045	0.8645
Azerbaijan	0.9615	0.9324	0.9818	0.9682	0.961
Russia	0.9398	0.9623	0.9345	0.9777	0.9536
Uzbekistan	0.9585	0.9448	0.8922	0.9443	0.935
Georgia	0.9664	0.9494	0.9292	0.9872	0.9581
Germany	0.9370	0.8753	0.8300	0.9788	0.9053
Hong Kong	0.9554	0.9322	0.9283	0.7522	0.8921
Vietnam	0.7778	0.7566	0.7359	0.7154	0.7465
France	0.7856	0.7644	0.7435	0.7229	0.7541
UAE	0.8300	0.8081	0.7866	0.7653	0.7976
Qatar	0.9643	0.9419	0.9197	0.8978	0.931
Oman	0.5862	0.5684	0.5509	0.5337	0.5599
Netherlands	0.7077	0.6877	0.6680	0.6487	0.6781
Turkmenistan	0.9130	0.9100	0.9070	0.9040	0.9086
China	0.9584	0.9370	0.9159	0.8950	0.9266
India	0.9371	0.9378	0.9452	0.9806	0.9502
Afghanistan	0.9545	0.9465	0.9820	0.9581	0.9603
Kazakhstan	0.9563	0.9767	0.9528	0.9292	0.9538
Bulgaria	0.9624	0.9396	0.9755	0.9663	0.961
Kuwait	0.8050	0.7835	0.76235	0.7414	0.7731
Tajikistan	0.9757	0.9550	0.9345	0.9142	0.9449
Canada	0.8280	0.8061	0.7846	0.7634	0.7956
Malaysia	0.7885	0.7666	0.7450	0.7238	0.756
Australia	0.8299	0.8080	0.7864	0.7651	0.7974
Bahrain	0.9641	0.9403	0.9169	0.8937	0.9288
Japan	0.9442	0.9207	0.8975	0.8746	0.9093
England	0.8798	0.8572	0.8349	0.8129	0.8463
New Zealand	0.9801	0.9571	0.9343	0.9117	0.9459
Ukraine	0.9595	0.9376	0.9159	0.8945	0.9269
Sweden	0.9106	0.8875	0.8648	0.8424	0.8764
Kyrgyzstan	0.9816	0.9621	0.9427	0.9235	0.9525
Italy	0.8354	0.8128	0.7904	0.7685	0.8018
USA	0.8115	0.7892	0.7672	0.7456	0.7784
Austria	0.8904	0.8677	0.8452	0.8231	0.8567
average	0.8740	0.8740	0.8735	0.8726	0.8735

Table 11. Measuring Iran's date export capacity (1000 US dollars).

Country	Actual export	Potential exports	Gap	Country	Actual export	Potential exports	Gap
Iraq	6712.67	7272.88	560.21	Afghanistan	10496.48	10929.89	433.41
Türkiye	14342.14	15823.63	1481.49	Kazakhstan	10567.1	11078.77	511.67
Pakistan	20814.9	21928	1113.09	Bulgaria	779.24	810.86	31.62
Armenia	694.05	747.89	53.84	Kuwait	287.43	371.78	84.35
Lebanon	592.38	685.26	92.88	Tajikistan	723	765.14	42.14
Azerbaijan	5427.71	5647.87	220.15	Canada	3219.52	4046.81	827.29
Russia	9348.33	9802.98	454.64	Malaysia	5367.95	7100.11	1732.16
Uzbekistan	910.76	974.11	63.34	Australia	2657.67	3333	675.33
Georgia	293.9	306.75	12.85	Bahrain	16.33	17.59	1.25
Germany	2563.24	2831.29	268.05	Japan	210.1	231.06	20.96
Hong Kong	7.67	8.59	0.93	England	3028.86	3579.04	550.18
Vietnam	20.19	27.05	6.86	New Zealand	970.1	1025.63	55.53
France	229.81	304.74	74.93	Ukraine	2108.62	2274.86	166.24
UAE	18981.9	23800.12	4818.21	Sweden	1434.14	1636.43	202.29
Qatar	238.76	256.46	17.7	Kyrgyzstan	879.48	923.32	43.84
Netherlands	1093.43	1612.55	519.12	Italy	87.43	109.04	21.61
Turkmenistan	907.19	998.5	91.31	USA	147.05	188.91	41.86
China	1413.14	1525.05	111.91	Austria	115.38	134.69	19.31
India	21469.67	22594.34	1124.67	-	-	-	-

Investigation of variable influencing on export efficiency, table (12), (based on the Fractional Probit Panel Model) reveals that the logarithm of trade liberalization in the agricultural sector (LnLIBagr), the number of R&D researchers per capita (R&D researchers) (per million individuals), and the logarithm of rail transportation (LnRail) (measured in kilometers of rail lines) exert a positive influence on export efficiency. It is in line with Noroozi et al. (2022). Conversely, the logarithm of the distance to the destination country (LnDistance) negatively impacts the export efficiency of Iranian dates. This is consistent with Noroozi et al. (2022). Specifically, a one percent increase in trade liberalization, ceteris paribus, is associated with an approximate 0.02 percent rise in the export efficiency of Iranian dates. As same as, for each variable, the following interpretation can be drawn. The Wald statistic (88.38) indicates the significance of the model.

Table 12. Factors affecting the export efficiency of dates.

Variable	Coefficient	Z-statistic	Probability	Marginal effect	Z-statistic	Probability
LnLIBagr	0.0938	1.40	0.162	0.0199	1.38	0.166
LnDistance	-0.3413	-4.80	0.000	-0.725	-4.36	0.000
R&D researchers	8.1e10^-8	1.68	0.093	1.74e10^-8	1.70	0.089
LnRail	0.0492	4.34	0.000	0.0104	4.02	0.000
Cons.	0.0467	0.17	0.886	-	-	-
Wald chi2(5)		88.38		Prob.		0.0000

CONCLUSIONS

This study has sought to explore and analyze the key factors that theoretically influence Iranian date exports, recognizing the significance of agricultural exports. In addition, the study also examined the export efficiency of dates and their potential competitiveness.

The market structure, price and quality competition status, and comparative advantage of Date exports were also analyzed. Finally, based on the results, the following conclusions and suggestions are presented. The results of the study of the structure of the Iranian date export market indicated the existence of monopoly power and a tight oligopoly structure. A review of data on Iranian Date exports indicates a strong advantage in export performance. The results showed that Iran's exports have increased in recent years due to lower prices compared to other Date exporters. However, Iranian date exports have not been successful in the quality competition. Based on data from 2023, Pakistan, India, Peru, Türkiye, Kazakhstan, Afghanistan, and Switzerland have been identified as priority markets for Iranian date exports. The results of the gravity model indicate that the logarithm of the real exchange rate, trade agreements, the logarithm of the ratio of export prices to domestic prices, the difference between Iran's GDP and that of its trading partners, the logarithm of trade liberalization, and the trade advantage index all have a positive impact on Iranian date exports. Conversely, the logarithm of transportation costs for agricultural products to the target country and sanctions have a negative impact on these exports.

The adverse impact of distance and transportation expenses on trade, coupled with elevated advantage and price indices, alongside the perishability of certain products and the limited timeframe for their movement and transportation, suggests that enhancing agricultural trade with neighboring countries and regions in close geographical proximity may result in improved conditions and a more favorable trade balance.

It is crucial to enhance the development of supply chains for Iran's key export products. The most significant challenges encountered in the supply chain for these products involve the provision of inputs for production, processing, and transportation. Specifically, in the date sector, industry stakeholders identify the financing of sorting and packaging facilities as a critical obstacle within the supply chain, attributed to the substantial profit margins associated with this sector.

This research analyzed the competition in terms of price and quality among Iranian date export products. Considering the presence of quality competition in the Date market, both the private and public sectors need to engage in appropriate planning tailored to their respective roles and objectives to sustain this competitive landscape. Furthermore, for products that are gaining traction in global markets through price competition, the government must implement necessary strategies aimed at enhancing quality. This transition from price competition to quality

competition should be incorporated into governmental initiatives, particularly through investments in the development of transformation and processing industries.

In light of the adverse effects of sanctions on the trade of Iranian agricultural products, including the loss of access to markets with higher prices and greater capacity, as well as the redirection of target markets towards nations with lower GDP, it is recommended that, considering the current circumstances and the alterations in the country's trade framework, more comprehensive studies be undertaken. These studies should account for the conditions of these nations to ensure a sustained and effective presence in these markets, particularly in neighboring Asian and Eurasian countries.

The significant volatility in agricultural product exports, coupled with the availability of surplus production in global markets, has resulted in missed opportunities and market losses for certain countries. Therefore, the government should consider importing goods rather than imposing multiple export bans to stabilize the domestic market. In light of the necessity to sustain current markets and the intense competition in entering new ones, the government should implement a re-export strategy that preserves existing markets and trade capacities. By improving regional, trans-regional, and international relations and investing in necessary infrastructure, Iran can establish itself as a central hub for agricultural products. For future studies, it is suggested that target export markets be examined in terms of tastes and preferences. It is possible to increase Iranian exports in target markets by adopting effective marketing strategies and understanding consumer tastes and preferences.

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