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Capacity assessment of Iran's onion and shallot export market

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ABSTRACT

Given the various export limitations facing the Iranian economy, it is essential to assess the export potential of agricultural products such as onions and shallots. This research employs the stochastic frontier gravity model and the fractional probit panel model to analyze the factors affecting the export performance and efficiency of Iranian onions and shallots (tariff code 070310) to 39 selected countries from 2004 to 2023. The results indicate that GDP per capita in importing countries, the ratio of export prices to domestic prices, the real exchange rate, common borders, and trade agreements have a significant positive impact on exports of Iranian onions and shallots. Conversely, trade liberalization, Iran's GDP per capita, and the export costs faced by importing countries negatively affect these exports. The average efficiency of Iranian onion and shallot exports is estimated at 0.79, suggesting an export shortfall of approximately 21%. The markets in Iraq and the UAE present the greatest potential for export growth, with estimated gaps of $6.9 million and $2.04 million, respectively. Furthermore, the findings from the Fractional Probit Panel Model revealed that capital productivity, R&D Expenditures, rail infrastructure, and the globalization index positively influence export efficiency, whereas geographical distance negatively affects export efficiency. Therefore, it is recommended to concentrate on three areas for policy development: lowering export costs, targeting markets with high capacity, and investing in productivity and technology.

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Introduction

Export development is recognized as a crucial driver of economic efficiency by creating new opportunities across sectors (Murdock, 2020; Tkach & Hryniv, 2023; Baqaee & Farhi, 2022; Hu, 2024; Seyoum, 2024). A high level of export efficiency reflects economic stability, sufficient infrastructure, and a country's competitiveness; these factors attract both domestic and foreign investors to export-oriented sectors (Yatim et al., 2024). Countries with successful export strategies frequently enjoy economies of scale, access to global markets, and reduced investment risks; these advantages contribute to enhanced returns on investment (Kormakova et al., 2023).

In 2023, competition among exporting nations in the global onion and shallot market intensified. The Netherlands was the leading exporter, holding a 22.3% share. The country plays a crucial role in the import and re-export of onions and shallots, thanks to its robust food distribution and trade infrastructure. Following the Netherlands, China ranked second with a 12.13% share, while India came in third with 11.98%. Additionally, Mexico and the United States were among the key exporters, with shares of 8.72% and 5.57%, respectively (International Trade Center, 2025).

Iran currently ranks as the ninth-largest exporter of this product, with a 2.01 percent market share (International Trade Center, 2025). This statistic underscores Iran's significant role in the global onion and shallot industry; however, as with other agricultural goods, untapped potential exists (the difference between actual and potential exports) to enhance export levels to Europe, Asia, and Latin America (Aminizadeh & Rafati, 2023; Noroozi et al., 2022; Mohammadi et al., 2020). Although Iran has substantial capabilities in the production and export of onions and shallots, it must focus on strengthening the value chain, optimizing packaging, refining marketing strategies, and identifying targeted markets to boost export performance and solidify its international standing.

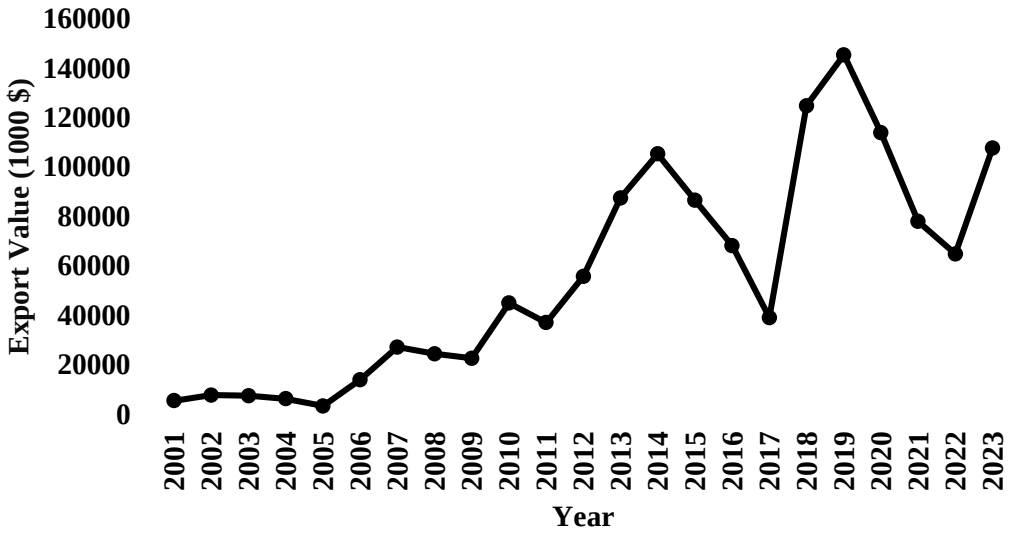

Chart 1. Trend in the value of Iranian onion and shallot exports (International Trade Center, 2025)

Between 2001 and 2023, Iranian onion and shallot exports fluctuated but exhibited an overall upward. In the early years, export values were relatively low, ranging from $3 million to $8 million, but over time they climbed to a peak of about $145 million in 2019. Notable declines occurred in certain years, such as 2017 (≈$39 million) and 2022 (≈$65 million) relative to overall trends and prior years, partly attributable to the COVID-19 pandemic (International Trade Center, 2025). Both domestic and international factors influence variations in Iranian onion and shallot exports. The most significant domestic factor is government intervention to regulate local markets and stabilize prices.

The government occasionally imposes export bans or quotas to prevent price hikes and manage domestic supply fluctuations. Moreover, Other factors include recent droughts, production declines, exchange rate volatility, sanctions-related transfer difficulties, intense competition from India and China, and logistical challenges.

Iran's onion and shallot production has not only met domestic demand but also positioned the country as a net exporter of these commodities. In 2023, Iran exported roughly 206.9 tons of fresh onions and shallots, yielding $107.6 million in revenue. The primary destination for Iran's onion and shallot exports remains the United Arab Emirates (UAE), accounting for 41.24% of total exports in 2023, followed by several neighboring countries. In addition to meeting domestic needs, the Emirates serves as a conduit for re-export to other countries. Iraq ranks second, with a 32.29 percent share, and remains an important market for Iranian onions and shallots, though its share has decreased from previous years. Iraq’s position is attributed to its heavy dependence on agricultural imports and its stable trade relationships with Iran. Pakistan takes third place with an 8.05 percent share, remaining a significant market due to its seasonal requirements and competitive pricing. Next, Kuwait is listed as the fourth largest destination for Iran's onion and shallot exports, with a 5.30 percent share. Finally, Russia also represents a key market, with a 4.48 percent share, highlighting the expansion of Iran's exports to international markets beyond its immediate region.

Export efficiency is defined as the ratio of actual exports to a country's maximum export potential. In bilateral trade, the ideal export capacity between two countries denotes the level of exports achievable under optimal, unrestricted trading conditions (Kalirajan, 1999). Effective trade promotes production growth and improves the allocative efficiency of organizations across different activities, playing a vital role in enhancing market capacity and establishing businesses (European Commission, 2010). Key strategies to increase investment include fostering a supportive business environment, promoting exports, and improving efficiency in target markets globally, as highlighted by Noroozi et al. (2022). Attracting investment focused on exports and refining the range of export products based on comparative advantage improves trade efficiency. When trade operates significantly below its actual capacity and potential, it can greatly impede the attainment of economic growth and related goals. The subsequent sections will independently analyze domestic and international research on export efficiency.

Mohammadi et al. (2020) examined the efficiency of Iranian pistachio exports to specific markets from 2001 to 2016 using a stochastic frontier gravity model. The results showed a decline in efficiency across all markets, especially in Europe, but an improvement in Asian markets from 0.412 to 0.567. Noroozi et al. (2022) examined the export priorities of Iranian tomato paste and the factors influencing them through a stochastic frontier gravity model for the period of 2001 to 2020. Their findings indicated that Iran's average efficiency during this timeframe was 43 percent, suggesting a 60 percent gap in Iranian tomato paste exports relative to their target markets. Aminizadeh & Rafati (2023) analyzed factors impacting agricultural exports and evaluated efficiency from 2001 to 2021 with a stochastic frontier gravity model based on balanced panel data. The findings revealed that between 2015 and 2021, Iran did not attain 100% efficiency in any target market, sustaining an efficiency rate above 50% in four countries: Afghanistan, the United Arab Emirates, Canada, and Iraq. Eghbalsefat et al. (2024) assessed the efficiency of Iranian saffron exports using panel data and an advanced stochastic frontier gravity model. Their results indicated that Iranian saffron exports did not achieve 100% efficiency for any country, with the United Arab Emirates demonstrating the highest export potential and the largest export gap. Fakour et al. (2024) investigated the economic strategies that impact trade in essential agricultural goods between Iran and the member nations of the Eurasian Economic Union using a network and gravity approach. This study evaluated the influence of GDP in both exporting and importing nations, economic similarity, distance, cultural similarity, and the clustering index (as a network variable) on trade volume for key agricultural products using network and gravity models. The findings indicated that a 1% increase in Iran’s GDP

increases agricultural product trade by 1.35%, while a 1% increase in the GDP of exporting nations increases trade volume by 2.35%. Baghban Baghban Haghighi et al. (2024) analyzed the efficiency of Iran's agricultural exports to countries within the Economic Cooperation Organization from 2013 to 2018 using a stochastic frontier gravity model. Their results showed that Kyrgyzstan had the lowest export efficiency at 20.7, while Afghanistan had the highest at 29.8, indicating that, despite increasing exports to ECO countries, Iran faced significant unused capacity of around 70 percent. Fahimifard (2025) examined the effects of Iran's membership in the Shanghai Cooperation Organization on vital indicators of the Iranian agricultural sector using a regional computable general equilibrium model. The findings suggested that lowering trade tariffs between Iran and SCO member states would improve macroeconomic indicators in the Iranian agricultural sector, including exports, capital formation, employment, and, in turn, the sector's added value. The research conducted by Noroozi et al. (2025) is among the most comprehensive in this domain, examining the factors that affect date exports, efficiency, and export capacity using the stochastic frontier gravity model and a fractional probit panel model over the period 2001 to 2023. Results demonstrated that numerous factors positively influence date exports, such as trade advantages, the logarithm of the exchange rate, the difference between Iran's GDP and that of its trade partners, the logarithmic ratio of export prices to domestic prices, and trade agreements with target countries. Conversely, the logarithm of export costs for agricultural products destined for the destination country, along with sanctions, adversely affected date exports. Throughout the reviewed period, the structure of the date export market fluctuated between a tight and loose multilateral monopoly. The analysis of advantage indicators highlighted an export advantage for dates. The findings concerning export efficiency, potential export capacity, and export gap revealed that the United Arab Emirates, Turkey, and India possessed the highest untapped export capacities, totaling $4.8 million, $1.4 million, and $1.1 million, respectively.

Abdullahi et al. (2022) examined the key factors and the effectiveness of China's agricultural exports to 114 importing countries, using stochastic frontier analysis (SFA) and a gravity model, covering the years 2000 to 2019. Their results indicated that China's economic size (GDP), along with that of its importing countries, the Belt and Road Initiative (BRI), the presence of a common border, and the prevalence of the Chinese language, positively impact China's agricultural export flows. They also found that, on average, China has only tapped into 49% of its agricultural export potential. Navarro-Soto et al. (2023) investigated the factors affecting Peru's overall export efficiency using an extended stochastic frontier gravity model (ESFGM) with data from 38 countries spanning 1995-2019. Their findings demonstrated that Peru's export efficiency was moderate, ranging from 0.458 to 0.462, with a consistent trend, suggesting significant export potential with Peru's trade partners. Saxena et al. (2025) applied the stochastic frontier gravity model (SFGM) to understand the factors affecting India's rice exports from 2001 to 2019 across 22 destination countries. The results showed that both India's economic growth (GDP) and the GDP of importing countries positively affect rice exports. Conversely, increased distances and higher import tariffs act as barriers. Furthermore, a depreciation of the Indian rupee positively affects export earnings. A common language facilitates exports, while regional trade agreements have minimal influence. The study highlights a significant export gap between India and its trading partners, emphasizing the need to improve trade facilitation and to focus on logistics and agreements. Bakouan (2025) evaluated the efficiency of total trade within Africa using a stochastic frontier gravity model, analyzing 45 African exporting countries and their 43 African trading partners from 1996 to 2020. The findings from this study indicated that export efficiency was low among African nations, suggesting a substantial untapped export potential.

A thorough examination of the international trade literature reveals that employing *Stochastic Frontier and Gravity Models* (SFGM) to analyze agricultural trade flows effectively gauges export efficiency gaps and identifies macro-determinants such as geographical distance, market size, and trade agreements. However, most prior studies focus on high-value-added commodities and have

three major shortcomings: (1) they neglect undervalued products with high export potential like onions and shallots; (2) they fail to integrate market potential with institutional factors (e.g., capital productivity, transport infrastructure) that cause inefficiency; and (3) they underemphasize the role of innovation and R&D in improving export efficiency. Hence, this research aims to address these gaps by examining Iran's onion and shallot exports from 2004 to 2023, using SFGM and the fractional probit panel model. The primary objectives are: (1) to identify the determinants of exports and assess export efficiency to 39 target countries; (2) to estimate efficiency levels and the gap between actual and potential exports; (3) to rank target markets by development potential; (4) to identify institutional factors affecting efficiency (capital productivity, R&D, rail infrastructure, globalization index); and (5) to propose policies for reducing export costs. According to the theoretical framework and empirical data, the main hypothesis posits a significant disparity between Iran's actual and potential onion and shallot exports, driven by various economic, geographical, and institutional factors that affect export efficiency. Specifically, the sub-hypotheses suggest that the export-to-domestic price ratio, the real exchange rate, common borders, the GDP per capita of importing countries, and trade agreements have a positive and significant effect on exports; conversely, export costs have a negative effect. The study further hypothesizes that Iran's average export efficiency is below 100 percent, indicating a considerable export gap, and that capital productivity, research and development expenditures, railway infrastructure, and the globalization index positively affect export efficiency, whereas geographical distance negatively affects it. By integrating stochastic frontier methods with an analysis of institutional factors, this research moves beyond the existing literature and provides a comprehensive, multidimensional, and policy-focused investigation of the value chain for Iranian onion and shallot exports.

Materials and methods

The *stochastic frontier gravity model* is used to analyze factors affecting trade flows and their efficiency (Abdullahi et al., 2022). These techniques are commonly used to evaluate efficiency in Iran's agricultural product export sector. Inspired by Newton's theory of gravity, the gravity model is one of the most widely used econometric frameworks in international trade, showing that trade volume between countries is positively related to their economic size (GDP) and negatively related to geographic distance (Leitão, 2024). In the stochastic frontier model, disturbances are split into stochastic error and technical inefficiency (Leyún Prieto, 2025; Leitão, 2024). This method identifies factors of inefficiency and explains why actual exports of Iranian onions and shallots deviate from the optimal frontier (Ghasemi et al., 2025; Noroozi et al., 2022). Combining these approaches allows for a detailed analysis of Iran’s onion and shallot export market; thus, the panel-gravity model can be used to assess export potential to specific markets. In the studies reviewed (mentioned earlier), the stochastic frontier gravity model considers export value as the dependent variable, including independent variables such as Iran’s GDP, the GDP of destination countries, geographic distance, real exchange rate, consumer price index, trade liberalization, import tariffs, cultural, religious, and historical factors, as well as political influences, common borders or regional agreements, cultivated area or production levels, labor, capital, and production technology. To estimate export efficiency and conduct a more detailed analysis of target markets, the stochastic frontier gravity model proposed by Kalirjan (2008) combines a gravity model with a stochastic frontier model. The gravity model, first introduced by Tinbergen (1962), suggests that trade levels are directly related to the economic size of each country and inversely related to the distance between them. Therefore, the basic form of the gravity model for Iranian onion and shallot exports can be expressed as follows:

$$EXP_{ijt} = \frac{GDP_{it} \times GDP_{jt}}{DIST_{ij}} \quad (1)$$

The linear form of equation (1) for estimation is presented as equation (2):

$$\ln(\mathrm{EXP_{ijt}}) = \mathrm{B_0} + \mathrm{B_1 LnGDP_{it}} + \mathrm{B_2 LnGDP_{jt}} + \mathrm{B_3 LnDIST_{ij}} + \varepsilon_{ijt} \quad (2)$$

Where i, j, and t represent the exporting country, the importing country, and the time (year), respectively. EXP denotes the volume of onion and shallot exports to the chosen countries. DIST indicates the geographical distance between Iran and its trading partners, serving as a measure of transportation costs between these nations, while GDP refers to the gross domestic product, and ε represents the error term.

According to the stochastic frontier model introduced by Aigner et al. (1977), efficient companies operate on the production possibilities frontier, whereas inefficient companies operate below it, resulting in a production shortfall reflecting the gap between actual and optimal output. In essence, trade efficiency refers to the extent to which trade falls short of its potential. Consequently, equation (2) can be reformulated as equation (3) based on the stochastic frontier gravity model:

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

Equation (3) includes the same trade determinants as above, but adds a combined error term consisting of two parts. V_{ijt} is the two-sided error component, assuming $N(\mu \sim \sigma^2)$ which represents the statistical distortion due to measurement error. U_{ijt} is the one-sided error, which is assumed to be $N(0 \sim \sigma^2)$ and stands for the measure of trade performance, representing technical inefficiency and the degree of deviation from the maximum possible trade. This deviation reflects resistance to trade and other inefficiencies. In fact, existing trade resistance leads to inefficient trade performance (Atif et al., 2017). After estimating the gravity model, export efficiency is estimated based on model (4), where $\varphi(0)$ represents the cumulative distribution function of the standard normal distribution.

$$\mu^{t}_{*ij} = \varepsilon^{t}_{ij} - \sigma^2_v/\sigma_u$$

$$\mathrm{E}\left(\exp\left(-\mathrm{U}^{t}_{ij}\middle|\varepsilon^{t}_{ij}\right)\right) = \left[\frac{1-\varphi(\sigma_* - \frac{\mu^{t}_{*ij}}{\sigma_*})}{1-\varphi(\frac{\mu^{t}_{*ij}}{\sigma_*})}\right] \exp\left(-\mu^{t}_{*ij} + \frac{1}{2}\sigma^2_*\right) \quad (4)$$

Based on equation (4), the calculated efficiency lies between 0 and 1. If the efficiency is close to zero, it indicates that the actual export value of Iranian onions and shallots is far from their potential value, and that Iran has acted inefficiently in its target markets for onion and shallot exports. If the efficiency is close to one, it indicates that the actual and maximum levels of onion and shallot exports in the target market coincide. The empirical model for estimating the efficiency of Iranian onion and shallot exports is as follows:

$$ln(EXP_{ijt}) = B_0 + B_1 LnGDPIRper_{it} + B_2 LnGDPTA_{jt} + B_3 LnPTx_{it} + B_4 LnRER_{it} + B_5 LnCost_{ijt} + B_6 LnOpen_{ijt} + B_7 Border_{ij} + B_8 Agreement_{ijt} + (V_{ijt} - U_{ijt}) \quad (5)$$

In this model, LnEXP_{ijt} represents the value of Iran's onion and shallot exports to trading partners. Ln$GDPIRper_{it}$ represents the logarithm of Iran's GDP per capita and Ln$GDPTA_{jt}$ represents the logarithm of GDP per capita of the target countries. The variable LnPTx_{it} is the ratio of the export price to the domestic price of onion and shallot, LnRER_{it} is the logarithm of the real exchange rate, Ln$Cost_{ijt}$ is the logarithm of the cost of trade in agricultural products from Iran to other countries, $Border_{ij}$ represents the common border between Iran and its trading partners, $Agreement_{ijt}$ represents the trade agreement, entered as a dummy variable in the model (for more information on

calculating the real exchange rate, see Afkhami Rad et al., 2023). Finally, the model specified in equation (5) was estimated using the True Fixed-Effect and maximum-likelihood methods.

As previously stated, within the theoretical framework, efficiency is defined as the ratio of actual output to potential output. Capital productivity, an essential factor in the production function, directly influences efficiency, consistent with the *stochastic frontier analysis* (SFA) literature (Frýd, 2025). The logarithmic measure of distance to the target country, derived from the gravity model of international trade, reflects transaction costs and geographic obstacles that affect trade efficiency (Bosquet & Boulhol, 2009; Santos Silva & Tenreyro, 2006). The logarithm of the ratio of R&D expenditure to GDP, following the endogenous growth theory (Romer, 1990), assesses the ability to innovate and absorb technology, serving as a dynamic engine for efficiency (Romer, 1990; Goto, 2014; Zon & Yetkiner, 2010). The rail transport variable indicates that transportation infrastructure standards help reduce logistics costs and enhance operational efficiency (Frýd, 2025; Sattayanuwat, 2011). Ultimately, the Globalization Index (KOF), developed by Dreher (2006), encompasses economic, social, and political dimensions through an institutional lens, elucidating the influence of economic openness and knowledge flows on efficiency (Dreher, 2006; Gygli et al., 2019; Norlia & Ariff, 2020). Consequently, recognizing the factors that influence efficiency and the extent of their impact can enhance export efficiency, thereby increasing actual exports. The bounded nature of the efficiency variable (ranging from 0 to 1) distinguishes the model from the dependent variable, which is typically bounded fractionally in the typical panel data approach. From an econometric perspective, the distinction between models with a finite dependent variable lies in the fact that they not only produce a probabilistic outcome but also encompass both corner solution outcomes and continuous outcomes within the interval of zero to one, resulting in the development of logit and fractional probit models (Roostaei Shalmani et al., 2018).

In the estimation of the fractional probit panel model, equation (6) is assumed, where Y_{it} is the dependent variable, X is the vector of variables affecting the dependent variable, β is the vector of parameters, and u_{it} is the error component. The value of the dependent variable is considered as $0 \leq Y_{it} \leq 1$.

$$Y_{it} = \alpha_i + X_{it}\beta + u_{it} \tag{6}$$

It is assumed that $E(Y_{it}|X_{it}c_i) = \Phi(X_{it}\beta + c_i)$. In this relation, E denotes the mathematical expectation, X_{it} is a $K \times 1$ vector for a set of exogenous variables, ci are unobserved effects, and $\Phi(X_{it}\beta + c_i)$ is the cumulative distribution function (which can be the logistic or standard normal distribution) (Papke & Wooldridge, 2008).

$$E\left(log\left(\frac{Y_{it}}{1-Y_{it}}\right)|X_{it}\right) = \Phi(X_{it}\beta + c_i) \tag{7}$$

This property shows that, considering the logistic distribution function, the conditional mean of the dependent variable is in the form of equation (8).

$$E(Y_{it}|X_{it}, u_{it}) = \frac{e^{\Phi(X_{it}\beta + c_i) + u_{it}}}{1 + e^{\Phi(X_{it}\beta + c_i) + u_{it}}} \tag{8}$$

Where:

$$u_{it} = log\left(\frac{Y_{it}}{1-Y_{it}}\right) - E\left(log\left(\frac{Y_{it}}{1-Y_{it}}\right)|X_{it}\right) \tag{9}$$

Therefore, recovering the conditional mean of the dependent variable requires calculating the integral of equation (10).

$$E(Y_{it}|X_{it}) = \int \frac{e^{\Phi X_{it}+z}}{1+e^{\Phi X_{it}+z}} f(z)dz \quad (10)$$

$f(z)$ represents a probability density function of u. This integral can be computed using the density-function estimation method proposed by Papke and Wooldridge (1996). To address this issue, Papke and his associates (Papke & Wooldridge, 2008) developed the zero-to-one fractional panel probit model, which allows estimation of average partial effects for dependent variables with fractional data in the zero-to-one interval. In this framework, it is also possible to assess the dependent variable at the extreme values of zero and one (Kölling, 2012). The linear model, which incorporates summable heterogeneity for time i and time t, is expressed in (11).

$$\begin{aligned} y_{it} &= x_{it}\beta + c_i + u_{it} \quad t=1,\cdots,T \\ & E(u_{it}|x_{i1},\cdots,x_{iT},c_i) = 0 \end{aligned} \quad (11)$$

The empirical model of the factors affecting export efficiency is given by equation (12).

$$eff_{it} = \beta_0 + \beta_1 Cap.Pro_{it} + \beta_2 LnDis_{it} + \beta_3 LnGDPR\&D_{it} + \beta_4 Rail_{it} + \beta_5 Glo.Index_{it} + u_{it} \quad (12)$$

In this regard, eff_{it} represents export efficiency, $Cap.Pro_{it}$ represents capital productivity, $LnDis_{it}$ represents the logarithm of distance to the target country, $LnGDPR\&D_{it}$ represents the logarithm of the ratio of R&D expenditure to GDP, $Rail_{it}$ represents rail transport, and $Glo.Index_{it}$ represents the globalization index.

To achieve the research goals, an analysis was conducted of Iran's exports to its trading partners, which together accounted for over 99 percent of the country's onion and shallot exports (39 countries) from 2004 to 2023. The focus of this study is on fresh or chilled onions and shallots, identified by the tariff code 070310, categorized under the edible vegetables group in the Harmonized System (HS). It is important to note that Stata 14 was used to analyze the patterns. Table 1 displays the data used, the anticipated signs, and the sources from which the data were extracted.

Results and discussion

Table 2 presents the descriptive statistics for the variables analyzed in the research. The statistics indicate that the dependent variable, export efficiency for shallots, has an average of about 0.7877, a standard deviation of 0.0929, and a range of 0.0307 to 0.9897. This suggests that export activities for this product were generally efficient during the period, though a significant disparity exists between the lowest and highest efficiency levels. Regarding the independent variables, Iran's GDP per capita is approximately 4.53 million units, with a notable range of 1.94 to 8.07 million, reflecting economic variation across the nation. The average GDP per capita of the importing nations is $20.78 million, with a standard deviation of $19.94 million, indicating marked differences in the development levels of the trade partners. The average real exchange rate is 21,490 rials, with a standard deviation of 15,440 and a range of 10,601 to 67,542 rials, indicating considerable currency fluctuations over the observed period. The export-to-domestic price ratio averages at 3.14, whereas the average value concerning trade liberalization is 0.95. The typical cost of exporting agricultural products is $237, with a standard deviation of 86.99. Capital productivity averages 4.19, with a range of -7.33 to 24.48, suggesting negative capital growth in some years. The mean distance to target countries is 4,158 km, with a standard deviation of 3396 km and a range of 691-14776 km, highlighting significant variability in distances to export destinations. The ratio of research and development expenditure to GDP averages 2.91 and reaches an extraordinary maximum of 1372.74, suggesting the presence of extreme outliers in this measure.

Table 1. Introduction of variables and expected sign of explanatory variables on the dependent variable in each model

Model		Variables	Variable type	Expected sign	Data source
Stochastic Frontier Analysis	Dependent	Logarithm of onion and shallot export value	Continuous	-	International Trade Center
	Independent	Logarithm of Iran's GDP per capita	Continuous	Negative	World Bank
		Logarithm of GDP per capita of target countries	Continuous	Positive	World Bank
		Logarithm of the real exchange rate	Continuous	Positive	Research calculations
		Logarithm of the ratio of export price to domestic price	Continuous	Positive	ITC Trade Map
		Trade agreement	Discrete	Positive	WTO, 2024
		Logarithm of trade liberalization	Continuous	Positive / Negative	World Bank & International Trade Center
		Logarithm of the cost of exporting agricultural products to the target country	Continuous	Negative	World Bank
		Common border	Discrete	Positive	Map of Iran and the world
Fractional Probit Panel	Dependent	Export efficiency	Continuous	-	Estimation of the Stochastic Frontier Gravity Model
	Independent	Capital productivity	Continuous	Positive	World Bank
		Logarithm of the distance to the target country	Continuous	Negative	Google Earth
		Logarithm of the ratio of R&D expenditure to GDP	Continuous	Positive	World Bank
		Rail transportation	Continuous	Positive	World Bank
		Globalization Index	Continuous	Positive / Negative	KOF Swiss Economic Institute

Table 2. Descriptive statistics of variables in the export efficiency model of onions and shallots

Variable name	Average	Minimum	Maximum	Standard deviation	Measurement unit
Onion Shallot Export Value	50.99	3.28	138.29	42.56	Million$
Iran's GDP Per Capita	4.53	1.94	8.07	1.92	Million$
GDP Per Capita of Target Countries	20.78	0.16	85.07	19.94	Million$
Real Exchange Rate	21490.23	10601	67541.92	15439.85	Rial
Ratio Of Export Price to Domestic Price	3.14	0.18	18.80	2.36	–
Trade Liberalization	0.95	0.08	5.69	0.90	–
The Cost of Exporting Agricultural Products to the Target Country	237.38	21.21	536.76	86.99	Dollar $
Export Efficiency	0.7877	0.0307	0.9897	0.0929	–
Capital Productivity	4.19	-7.33	24.48	1.67	–
Distance to the Target Country	4157.64	691	14776	3396.18	Kilometer
Ratio of R&D Expenditure to GDP	2.91	0	1372.74	50.19	–
Rail Transportation	17384.69	-1267	198057	33052.76	Kilometer
Globalization Index	67.54	24.11	92.06	14.67	–

Rail transport statistics average 17384, with a range of -1267 to 198057 and a standard deviation of 33053, indicating high volatility in this area. Lastly, the globalization index averages 67.54, with a range of 24.1 to 92.6, indicating diverse levels of international engagement among the target nations.

In Table 3, the stochastic frontier gravity model indicates that all independent variables have VIF

values between 1.02 and 1.37, suggesting no collinearity issues. Likewise, the fractional probit panel model also shows low VIF values. Although the logarithm of the distance to the target country for rail transport shows a moderate correlation, it remains within an acceptable range (since the values are below 5, collinearity is not a concern). Additionally, the Levin-Lin-Chu unit root test (LLC) results for all variables in both models confirm that the data are stationary at the level. Therefore, by confirming the absence of collinearity and validating the stationarity condition, it is feasible to accurately estimate the parameters of both models and draw valid statistical conclusions.

Table 3. Results of the collinearity and stationarity test

Model		Variables	Collinearity test	LLC[1] static test		
			VIF[2]	Statistics	Significance level	Result
Stochastic Frontier Analysis	Dependent	Logarithm of onion and shallot export value	-	7.0996	0.000	I (0)
	Independent	Logarithm of Iran's GDP per capita	1.37	29.8397	0.000	I (0)
		Logarithm of GDP per capita of target countries	1.08	12.3412	0.000	I (0)
		Logarithm of the real exchange rate	1.02	13.5685	0.000	I (0)
		Logarithm of the ratio of export price to domestic price	1.18	7.6614	0.000	I (0)
		Trade agreement	1.24	–	–	–
		Logarithm of trade liberalization	1.35	14.9954	0.000	I (0)
		Logarithm of the cost of exporting agricultural products to the target country	1.08	15.8761	0.000	I (0)
		Common border	1.12	–	–	–
Fractional Probit Panel	Dependent	Export efficiency	–	9.9138	0.000	I (0)
	Independent	Capital productivity	1.09	11.8609	0.000	I (0)
		Logarithm of the distance to the target country	3.70	7.9490	0.000	I (0)
		لR&D به GDP Logarithm of the ratio of R&D expenditure to GDP	1.89	14.5298	0.000	I (0)
		Rail transportation	2.47	10.7213	0.000	I (0)
		Globalization Index	2.07	25.7557	0.000	I (0)

According to Table 4, it is crucial to emphasize that the lambda value (λ=0.5975) demonstrates, at a significant level (Prob.=0.0001), a preference for the random frontier method over ordinary least squares (OLS). This suggests that inefficiencies are present in the export of onions and shallots, and that the model successfully distinguishes between inefficiency errors and random errors. The results indicate that the common border variable (coefficient: 1.006) has the greatest positive impact, as it significantly lowers transportation costs and facilitates land trade for perishable goods. In the literature on gravity models, factors such as proximity (Common Border) and trade agreements are consistently recognized for their role in lowering trade barriers. The coefficient for the export-to-domestic price ratio (2.511) indicates that exports of onions and shallots are highly sensitive to fluctuations in both domestic and foreign prices; specifically, a 1% increase in this ratio is associated with an approximately 2.5% increase in exports. Additionally, the per capita production of importing nations (0.766) and the real exchange rate (0.421) show positive and significant effects: higher average income levels in recipient countries increase demand for agricultural products, and a rising real exchange rate improves the competitiveness of Iranian exports. This is consistent with many

1 Levin, Lin, and Chu
2 Variance Inflation Factor

studies in the gravity model literature, which indicate that the export elasticity with respect to the importing country's GDP typically hovers around 1 and is inversely related to distance.

In contrast, the export-related expenses to the target country, reflected by a coefficient of -0.0930, exert the most significant negative effect. Increased transportation costs, tariffs, and customs procedures significantly impede the export of this perishable agricultural item. Furthermore, Iran's per capita production has a detrimental effect on exports, with a coefficient of -0.573, a result that runs counter to initial assumptions and may be influenced by surging domestic consumption or a pivot in farming practices toward higher-profit crops amid economic growth. Additionally, trade liberalization (the trade-to-GDP ratio) adversely affects exports, as indicated by a coefficient of -0.0272, which is theoretically explicable by intensified competition from other exporters in target markets as trade conditions broaden. While trade agreements produce a positive but lesser influence, with a coefficient of 0.233, this is consistent with previous research suggesting that regional agreements can enhance trade flows by roughly 20 percent. Ultimately, crucial factors influencing Iranian onion and shallot exports include the real exchange rate, the export price relative to the domestic price, the income levels of target countries, reduced export costs, and geographical proximity. The findings of this study align closely with the theoretical constructs of the gravity model and the empirical results from other research (Aminizadeh et al., 2025; Noroozi et al., 2022; Mohammadi et al., 2020; Aminizadeh & Rafati, 2023) in this domain. These results show that the relative price of exports and the costs tied to exporting are the most significant positive and negative determinants, respectively. These discoveries are in agreement with those of Noroozi et al. (2022) and Mohammadi et al. (2020). Moreover, the beneficial impact of the real exchange rate and the negative effects of transportation costs and geographical distance identified in this research align with the findings of Noroozi et al. (2022), Bakouan (2025), and Abdullahi et al. (2022).

Table 4. Results of the estimation of the efficiency model of onion and shallot export

Variable	Coefficient	Standard Deviation	Z-statistic	Probability Statistics
Logarithm of Iran's GDP per capita	-0.573	0.265	-2.16	0.031
Logarithm of GDP per capita of target countries	0.766	0.272	2.81	0.003
Logarithm of real exchange rate	0.421	0.145	2.90	0.001
Logarithm of the export price to domestic price ratio	2.511	0.085	29.48	0.000
Trade agreement	0.233	0.113	2.06	0.040
Logarithm of trade liberalization	-0.272	0.243	-1.12	0.265
Logarithm of the cost of agricultural exports to the target country	-0.930	0.325	-2.86	0.004
Common border	1.006	0.344	2.92	0.004
Constant	6.147	2.829	2.19	0.029
Sigma U	0.2736	0.0351	7.80	0.000
Sigma V	0.4580	0.0208	21.95	0.000
Lambda	0.5975	0.0482	12.37	0.000
Wald chi2 (6)=		1118.05	Prob.=	0.000

Table 5 presents a comparison of export efficiency among the targeted countries. Generally, Azerbaijan, Canada, and Armenia rank as the nations with the highest export efficiency during this period. In contrast, Turkmenistan, Turkey, and Uzbekistan exhibit the lowest levels of efficiency. The average export efficiency is approximately 0.7873, meaning that about 21% of export potential remained unrealized during the study period. The fluctuations in Iran's export efficiency regarding onion and shallot exports can be attributed to economic factors, geopolitical circumstances, and external disruptions, including sanctions and the COVID-19 pandemic, as highlighted by the data in Table 5 and relevant research in random frontier analysis (SFA). The higher efficiency observed in countries such as Azerbaijan, Armenia, and Afghanistan (with scores exceeding 0.80) is primarily attributable to their geographic proximity and reduced trade costs; multiple studies suggest that common land borders and regional trade agreements (notably the ECO) greatly improve export

efficiency. Conversely, Lower efficiency in Turkey and Turkmenistan (below 0.77) may be attributed to 'geopolitical distance', where political tensions, reflected in the United Kingdom's voting patterns, raise trade costs and reduce efficiency. Furthermore, the significant increase in efficiency from 2021 to 2024 (compared to 2016 to 2020) for countries such as Iraq and Pakistan should be considered against the backdrop of systemic disruptions: the Covid-19 pandemic led to substantial disruptions in supply chains and port logistics (crucial elements in efficiency models), while at the same time, the tightening of international sanctions against Iran during this period reduced efficiency through two main pathways: a) heightened costs for financial and insurance transactions, and b) the emergence of political uncertainty, which studies on the Iranian economy indicate has resulted in up to 70% underutilization of export capacities even within neighboring markets. Therefore, the discrepancies in efficiency within the target markets arise not solely from supply and distance considerations, but also from the direct impacts of navigating political and infrastructural challenges amid global instability.

Table 5. Average efficiency of Iranian onion and shallot exports to target countries

Country	Average 2004-2009	Average 2010-2015	Average 2016-2020	Average 2021-2024	Average period
Iraq	0.7130	0.8439	0.8072	0.8268	0.7977
Türkiye	0.6907	0.7043	0.8432	0.7830	0.7553
Pakistan	0.7167	0.7858	0.7658	0.8640	0.7831
Armenia	0.8337	0.8046	0.7811	0.7995	0.8047
Azerbaijan	0.8177	0.8079	0.7816	0.8269	0.8085
Russia	0.7307	0.7642	0.8048	0.8441	0.7859
Uzbekistan	0.8202	0.7581	0.7980	0.6815	0.7637
Germany	0.8070	0.8124	0.8099	0.8004	0.8047
UAE	0.8489	0.8169	0.7742	0.7883	0.8071
Qatar	0.8301	0.8071	0.7456	0.8084	0.7978
Oman	0.7614	0.7075	0.8042	0.8385	0.7780
Turkmenistan	0.5784	0.8110	0.8845	0.6185	0.7232
Afghanistan	0.7368	0.8098	0.8070	0.7379	0.7728
Kazakhstan	0.7688	0.8148	0.7927	0.6839	0.7650
Kuwait	0.8414	0.8116	0.7831	0.7883	0.8062
Tajikistan	0.8315	0.7997	0.8020	0.7120	0.7863
Canada	0.8133	0.8195	0.8219	0.7787	0.8084
Bahrain	0.8389	0.8289	0.7336	0.7126	0.7785
United Kingdom	0.8160	0.8073	0.8132	0.7999	0.8091
Ukraine	0.8105	0.7678	0.7803	0.7824	0.7852
Sweden	0.7970	0.7986	0.8408	0.7763	0.8032
USA	0.8103	0.8276	0.8253	0.7175	0.7952
All countries	0.7824	0.7959	0.8000	0.7713	0.7873

Table 6 presents the actual, potential, and export gaps for Iran vis-à-vis the target countries, based on the average over the period studied. The findings indicate that the export gap, defined as the difference between potential exports (calculated from the efficiency frontier) and actual exports, reveals that Iran's unused export potential in onion and shallot products is notably uneven and concentrated among the target countries. Iraq ranks first in export growth potential, with a $6.9 million gap. This figure demonstrates that, despite Iraq currently being Iran’s largest export market, it still possesses significant untapped export capacity (as indicated by the potential to actual export ratio), with factors like exchange rate fluctuations, variable customs regulations in Iraq, and competition from other suppliers (such as Turkey and Jordan) hindering it from reaching optimal export levels. Following Iraq, the United Arab Emirates emerges as the second market showing the highest unused capacity, with a gap of $2.04 million. Although the UAE serves as a regional trading center with superior logistics and banking capabilities, financial sanctions and currency transfer issues may be contributing to this gap. On the other hand, countries like Germany, Canada, the UK, and Sweden display the smallest export gaps (less than $1,000), suggesting they are almost at their

maximum efficiency level due mainly to significant distance, strict sanitary and phytosanitary regulations, and insufficient structured demand for Iranian onions and shallots in those nations. Notably, Turkmenistan, despite its geographical proximity and relatively low average efficiency (as seen in Table 5), has a considerable export gap of $735,000. This apparent inconsistency can be explained by factors such as border restrictions, discrepancies in packaging standards, and the underdeveloped state of bilateral monetary and banking relations. In general, the export gaps shown in Table 6 indicate that approximately 2127 (≈21) percent of Iran's total onion and shallot export potential, or about $6.26 million, remains unused or underutilized. Addressing non-tariff barriers and enhancing transportation and banking infrastructure in Iraq and the UAE would bring the greatest benefits.

Table 6. Capacity assessment of onion and shallot exports to trading partners (thousands of dollars)

Country	Actual exports	Potential exports	Gap	Country	Actual exports	Potential exports	Gap
Iraq	27487.20	34458.07	6970.87	Turkmenistan	3674.43	5080.79	735.16
Türkiye	448.76	594.15	145.39	Afghanistan	1895.71	2453.04	417.03
Pakistan	835.33	1066.70	231.37	Kazakhstan	110.38	144.29	26.75
Armenia	759.71	944.09	184.38	Kuwait	1788.43	2218.35	451.29
Azerbaijan	1177.00	1455.78	278.78	Tajikistan	38.57	49.05	5.14
Russia	600.71	764.36	163.65	Canada	1.00	1.24	0.21
Uzbekistan	11.86	15.53	3.67	Bahrain	72.10	92.61	12.52
Germany	0.95	1.18	0.23	United Kingdom	1.10	1.36	0.26
UAE	8570.67	10619.09	2048.42	Ukraine	32.19	41.00	4.03
Qatar	923.67	1157.77	219.31	Sweden	1.05	1.31	0.24
Oman	597.00	767.35	122.64	USA	4.33	5.45	1.00

The factors influencing the export efficiency of onions and shallots were analyzed using the fractional probit panel model. The parent statistic (11.58) indicates that the regression is overall significant at the 0.95 confidence level. As illustrated in Table 7, capital productivity, the logarithm of the ratio of research and development expenditure to GDP, rail transportation (measured by the number of rail lines in kilometers as an indication of the quality of domestic logistics), and the globalization index positively impact export efficiency. Additionally, the logarithm of the distance to the destination country adversely affects export efficiency. Based on the earlier analysis of onion and shallot exports, over 80 percent of exports are directed to neighboring countries, which supports the negative sign associated with this variable. Among the model variables, capital productivity and the logarithm of the distance to the target country exert the greatest influence on the export efficiency of onions and shallots. By evaluating the final impact of the model's variables, one can measure and interpret the relationship between each variable and export efficiency. For instance, a 1% rise in capital productivity will result in a 0.01% increase in the export efficiency of onion and shallot products.

Conclusion

Identifying trade determinants and assessing export potential is crucial for emerging economies. This study employs a stochastic frontier gravity model to explore the factors influencing Iranian onion and shallot exports (tariff code 070310) and evaluate export efficiency. The research results indicate that the main determinants of onion and shallot exports are the export price ratio relative to domestic price, transportation costs of agricultural products to target export nations, the real exchange rate, the presence of a common border with destination countries, and trade agreements. Additionally, the findings reveal a significant export gap of approximately 21 percent, suggesting potential for export development in target markets, particularly Iraq and the UAE. A crucial point is the identification of a 21 percent export gap, indicating that current exports of onions and shallots have reached roughly

79 percent of capacity and have substantial growth potential. The Iraqi and UAE markets present the largest opportunities for expanding exports of this product, with respective export gaps of $6.9 million and $2.04 million. When interpreting these numbers, it is essential to recognize that Iraq's export gap is nearly three times larger than that of the UAE, and addressing the export challenges in this market—largely driven by fluctuations in Iraq's exchange rate, frequent alterations in customs regulations, and growing competition from Turkey and Jordan—could result in immediate and significant benefits.

Table 7. Factors affecting the export efficiency of onions and shallots

Variable	Coefficient	Z-statistic	Probability	Marginal effect	Z-statistic	Probability
Capital productivity	0.0353	2.93	0.003	0.0102	2.89	0.004
Logarithm of distance to the target country	-0.2118	-2.28	0.023	-0.0612	-2.26	0.024
Logarithm of R&D expenditure to GDP	0.0117	0.93	0.354	0.0034	0.93	0.354
Rail transportation	1.10×10^{-6}	2.14	0.033	3.19×10^{-7}	2.12	0.034
Globalization index	0.0030	2.23	0.025	0.0008	2.21	0.027
Constant	1.1462	4.86	0.000	–	–	–
Wald chi2(5)		11.58		Prob.		0.0411

Considering current onion and shallot export capacities, enhancing product quality, boosting productivity, and adopting modern technologies can elevate the export value of these goods (Tori et al., 2023). Nevertheless, in light of Iran's current economic situation, which is hindered by foreign-exchange limitations and sanctions affecting banking and insurance, merely improving quality may not suffice; it should also include reducing transaction costs. Agricultural sector policies should highlight actionable strategies to minimize agricultural production losses, particularly in the distribution sector (Arowosegbe et al., 2024). Regarding onions and shallots, post-harvest losses in Iran can reach 25-30%, significantly affecting potential export value. Promoting greenhouse farming for onions and shallots, due to its superior water-use efficiency and improved production patterns, can help make the production and export of items like onions, shallots, and garlic more sustainable (Rahman et al., 2024). It is important to point out that in recent years, the water crisis in the provinces of Khuzestan, Fars, and Khorasan Razavi—central areas for onion production—has escalated to a critical level, and without reforming cultivation methods to adopt low-water practices, sustainable exports will encounter serious challenges in the medium term.

To enhance export efficiency and boost volumes, policymakers should reduce export barriers and costs—especially transportation costs. This can be achieved by streamlining customs procedures, improving transportation infrastructure (particularly rail networks), and offering financial assistance to exporters. Additionally, empirical evidence indicates that financial support provided under sanctions, primarily through the Export Guarantee Fund and clearing systems (notably with Iraq, where Iran's frozen foreign exchange assets are located in Iraqi banks), can prove more beneficial than providing rial credits. Furthermore, focusing on high-capacity markets such as Iraq and the UAE by launching marketing initiatives and actively participating in international trade fairs can help tap into the identified potential. However, it is important to recognize that competition in the UAE market is fierce, with countries like India, Pakistan, and Egypt, which have lower production costs, vying for market share. Iran's competitive edge primarily lies in the quality and freshness of its products during specific seasons (such as winter and early spring). Therefore, it is recommended to establish a seasonal export strategy that leverages price opportunity windows.

The analysis of factors influencing export efficiency indicates that enhancing capital productivity and boosting R&D efforts, along with reducing reliance on distant markets (by prioritizing neighboring countries under the current circumstances), can lead to sustained improvements in export outcomes. In the current economic climate, the return on R&D investment in Iranian agriculture is

lower than the regional average, largely due to exchange rate volatility and inflation risks. Consequently, it is recommended that these investments be primarily supported through collaborations between universities, agricultural research centers, and the export-focused private sector, rather than depending solely on government funding. In general, by implementing integrated strategies that target both cost reduction and obstacle minimization while carefully selecting target markets, unused export capacity for onions and shallots can be effectively utilized. Based on the research results, three main focal points are suggested for enhancing onion and shallot exports: first, lowering costs and logistical challenges related to exports by streamlining customs procedures (including establishing green customs at the Mehran and Shalamcheh borders specifically for perishable agricultural goods), improving transportation infrastructure (particularly finalizing the East-West rail corridor and linking it to the Iraqi rail network), and offering low-cost financial support to exporters (with a preference for barter systems for essential goods); second, strategically concentrating on high-potential markets such as Iraq and the United Arab Emirates, which exhibit the largest export deficits, with the distinction that in Iraq, the focus is on maintaining market share through competitive pricing and building long-term business relationships, while in the UAE, the emphasis is on quality differentiation and standardized packaging; and third, committing to long-term investments aimed at boosting capital productivity and fostering R&D-based initiatives to enhance international competitiveness. The simultaneous execution of these strategies within a unified action plan can more effectively activate the overlooked export potential identified in the study (surpassing 21 percent) and boost Iran's presence in global markets.

Given the variety of onion and shallot products, it is advisable for exporters and policymakers to broaden their export offerings to align with the geographical characteristics of target markets and local production capabilities, while reducing reliance on neighboring countries. This approach can facilitate exports to more lucrative markets with better pricing and a diverse range of partners. It is crucial to note that, at present, over 90 percent of the value of Iranian onion and shallot exports is directed towards five neighboring nations (Iraq, Afghanistan, Pakistan, Turkey, and Persian Gulf states), significantly elevating the risk of market dependency. Considering the perishable nature of onions and shallots, along with the detrimental influence of transportation costs on the export worth of these products and the adverse effects of distance on their export efficiency, it is suggested to focus on exporting fresh onions to nearby markets by investing in suitable packaging systems and equipment with effective ventilation and temperature management. For more remote markets such as Europe (Germany, Netherlands, France) and North America (Canada and, to a lesser extent, the United States, given the sanctions), taking into account the negative effects of transportation costs and distance on export value and efficiency, as well as the high perishability of these products, it is advisable to develop exports of higher-value products like dried onions, onion powder, caramelized onions, pickled onions, and frozen items that offer prolonged shelf life. To penetrate the European and American markets, as well as specific markets (such as the Persian Gulf countries, where there is strong demand for organic goods), the cultivation of organic onions and specific varieties (like red onions, white onions, and salad types) should be pursued, along with obtaining international certifications such as Global G.A.P., ISO 22000, and the European Union Organic Certificate. This expansion of export products not only mitigates the risk of relying on a limited number of products and markets (since neighboring countries account for more than 90 percent of the value of these exports) but also enhances Iran's position within global value chains for these products. In this context, obtaining a geographical indication for Iranian onions and shallots can help distinguish the product in distant markets and achieve higher profit margins.

Research Limitations

Although data existed for sanctions and COVID-19 dummies, including them led to severe multicollinearity, resulting in unstable estimates. These variables were therefore excluded and are

recommended for future research using alternative methods. Therefore, it is recommended that the variables of sanctions and COVID-19, considered as limitations of the current study, be analyzed separately in future research using different methods (such as sub-period analysis or regime change models).

Author Contributions

Hossein Noroozi: Conceptualization; Methodology; Data curation; Investigation; Validation; Resources; Supervision; Project administration; Funding acquisition; Writing – review & editing.

Mahsa Pour Hossein: Formal analysis; Writing – original draft.

All authors have read and approved the final manuscript.

Data Availability Statement

The data that support the findings of this study are publicly available from the International Trade Center (ITC) website. Additionally, the estimation results derived from the analysis are available from the corresponding author upon reasonable request.

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Ethical considerations

This study was conducted using secondary data obtained from publicly available sources. No human or animal subjects were involved in this research. Therefore, ethical approval was not required.

Conflict of interest

The authors declare no relevant financial or non-financial conflicts of interest. They did not receive any funding for this study and have no ties to organizations or entities with a financial stake in the topics or materials discussed in this manuscript.

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سنجش ظرفیت‌های بازار صادرات پیاز و موسیر ایران

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کلیدواژه‌ها:
الگوی جاذبه مرزی تصادفی،
بازارهای هدف،
شکاف صادراتی،
کارایی صادراتی،
محصولات کشاورزی.

چکیده

در اقتصاد ایران که با محدودیت‌های صادراتی زیادی مواجه است، شناسایی ظرفیت‌های صادراتی محصولات کشاورزی مانند پیاز و موسیر از اهمیت ویژه‌ای برخوردار است. این مطالعه با به‌کارگیری الگوی جاذبه مرزی تصادفی و الگوی پانل پروبیت کسری به بررسی و تحلیل عوامل مؤثر بر صادرات و کارایی صادراتی پیاز و موسیر ایران با کد تعرفه ۰۷۰۳۱۰ به ۳۹ کشور هدف در دوره ۲۰۲۳-۲۰۰۴ می‌پردازد. نتایج بیانگر آن است که متغیرهای تولیدناخالص داخلی سرانه کشورهای هدف، نسبت قیمت صادراتی به قیمت داخلی، نرخ ارز حقیقی، مرز مشترک و موافقتنامه‌های تجاری اثر مثبت و معنی‌دار بر صادرات پیاز و موسیر ایران دارند، در حالی‌که متغیرهای آزادسازی تجاری، تولید ناخالص داخلی سرانه ایران، هزینه صادرات به کشور هدف اثر منفی بر صادرات پیاز و موسیر دارند. میانگین کارایی صادراتی پیاز و موسیر ایران تقریبا ۰/۷۹ برآورد شده که نشان‌دهنده وجود شکاف صادراتی حدود ۲۱ درصدی است. بازارهای عراق و امارات به‌ترتیب با شکاف صادراتی ۶/۹ و ۲/۰۴ میلیون دلاری، بیشترین ظرفیت را برای توسعه صادرات دارا می‌باشند. نتایج الگوی پانل پروبیت کسری نشان داد متغیرهای بهره‌وری سرمایه، مخارج تحقیق و توسعه، زیرساخت‌های ریلی و شاخص جهانی شدن اثر مثبت و فاصله جغرافیایی اثر منفی بر کارایی صادراتی داشته‌اند. از این‌رو، سیاست‌گذاری در سه محور کاهش هزینه‌های صادراتی، تمرکز بر بازارهای با ظرفیت بالا و سرمایه‌گذاری در بهره‌وری و فناوری پیشنهاد می‌شود.

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