

1 **Are Changes in Iran’s Market Share of Saffron Exports Aligned with the**
2 **Global Demand Structure? An Analysis Using the Constant Market Share**
3 **Model**

4 **Reyhaneh Allahverdi¹, Hamed Rafiee¹, Esmaeil Pishbahar^{1*}, Saeed Yazdani¹, Mahdi**
5 **Pendar¹, and Abdolmajid Liaghat²**

6 **ABSTRACT**

7 Saffron, as the world’s most valuable spice, holds strategic importance in non-oil trade and
8 sustainable agricultural development. This study evaluates Iran’s alignment with global demand
9 dynamics in saffron exports using the Constant Market Share model, which decomposes export
10 changes into scale, competitiveness, and second-order effects. Based on ITC export data from 2013
11 to 2022, the analysis focuses on Iran’s major markets—UAE, Spain, China, and Afghanistan. The
12 findings reveal that fluctuations in export volume were largely driven by competitiveness,
13 especially in the volatile Chinese market. Additionally, the negative second-order effect in most
14 years and destinations highlights Iran’s limited responsiveness to structural changes in global
15 demand. These results emphasize the need to revise marketing strategies and enhance Iran’s saffron
16 competitiveness through improved branding, product quality, and packaging.

17 **Keywords:** CMS, Demand Structure, Export, Iran, Market Share, Saffron.

18
19 **INTRODUCTION**

20 In developing countries like Iran, non-oil exports are vital for sustainable growth (Hosseini et
21 al., 2014). Despite agriculture’s strategic export role, Iran’s performance remains unstable due to
22 shifting market shares and external shocks, including sanctions and political tensions (Wang &
23 Liu, 2023; Du et al., 2017; Fetzer & Schwartz, 2021; Carter & Steinbach, 2020). Export stability
24 is further affected by trade agreements, product perishability, and export diversification
25 (Beestermöller et al., 2018; Peterson et al., 2018; Phiri et al., 2021), highlighting the need for
26 dynamic performance analysis (Zhou & Fan., 2023).

27 Saffron accounts for 4.5% of Iran’s agricultural export value (ITC, 2025) and is globally valued
28 for its multifunctional use (Gohari et al., 2013). Although Iran produces 90% of global saffron

¹ Department of Agricultural Economics, Faculty of Agriculture, College of Agriculture and Natural Resources, University of Tehran, Karaj, Islamic Republic of Iran.

² Department of Irrigation & Reclamation Engineering, Faculty of Agriculture, College of Agriculture and Natural Resources, University of Tehran, Karaj, Islamic Republic of Iran.

*Corresponding author; e-mail: esmaeil.pishbahar@ut.ac.ir

29 (UNIDO, 2014; Xinhua News Agency, 2022), its export value share reached only 38% in 2024,
30 compared to Spain's 25% (ITC, 2025), raising concerns about its adaptability to market shifts.

31 This study applies the Constant Market Share (CMS) model to assess whether Iran, as the leading
32 producer, has adjusted its saffron export performance to global demand during 2013–2023. CMS
33 decomposes export value changes into scale, competitive, and interaction effects (Tyszynski, 1951;
34 Leamer & Stern, 1970; Richardson, 1971; Wang et al., 2017; Kong et al., 2025).

35 Iran's saffron exports peaked at \$350 million in 2018 but declined thereafter (Fig.1.a). While
36 volume increased from 137,000 to 217,000 Kgs (Fig.1.b), unit prices dropped from \$1460 to \$1134
37 per kg, reflecting marketing deficiencies. The United Arab Emirates (UAE) and Spain remained
38 key markets (31% and 23%, respectively; Fig.1.c and the highest export volume among the four
39 main destinations; Table 1), while Iran's global share fluctuated between 3% and 13%, peaking in
40 2021 and falling to 7% in 2022 (Table 2). These trends reveal Iran's limited exploitation of its
41 production advantage, threatening its long-term global competitiveness.

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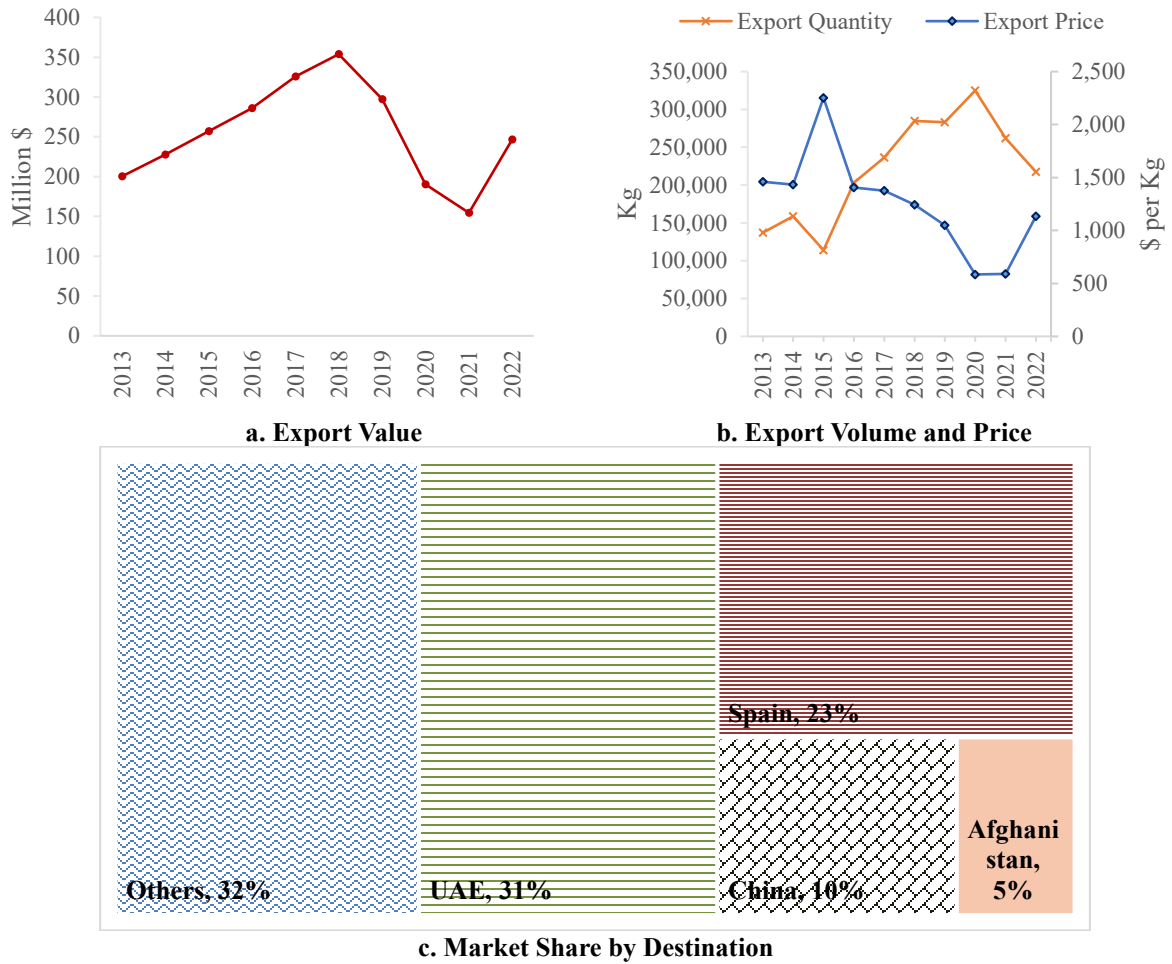


Fig. 1. Iran's Saffron Exports: Value, Volume, Price, and Market Share, 2013–2022. (Source: Author's illustration based on ITC data, 2025).

Table 1. Iran's Saffron Exports to Its Main Destinations of Iran Saffron Exports, 2013–2022 (tons).

Year	UAE	Spain	China	Afghanistan	Others
2013	54.45	40.39	4.74	0.16	37.51
2014	69.85	38.34	9.32	3.04	38.25
2015	43.00	29.00	12.00	5.00	25.00
2016	67.15	52.71	8.61	10.08	64.80
2017	61.66	56.63	7.81	14.55	96.00
2018	79.76	58.06	1.48	19.53	126.11
2019	70.29	56.93	4.18	20.78	130.82
2020	59.80	60.60	40.14	33.78	130.66
2021	67.87	44.93	85.71	7.01	56.41
2022	73.09	46.29	50.85	7.29	39.98

(Source: Author's illustration based on ITC data, 2025).

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Table 2. Iran and Global Saffron Exports, 2013–2022.

Year	Iran's total exports (tons)	World's total exports (tons)	Iran's share of global exports (%)
2013	137	3,483	4%
2014	159	5,282	3%
2015	114	3,638	3%
2016	203	3,254	6%
2017	237	2,784	9%
2018	285	2,652	11%
2019	283	2,548	11%
2020	325	3,169	10%
2021	262	1,942	13%
2022	217	3,111	7%

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(Source: Author's illustration based on ITC data, 2025).

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Previous studies on Iran's saffron exports have explored various dimensions of export performance; however, they have largely neglected the extent to which Iran's export structure aligns with global demand. Mohammadi et al. (2022), using a stochastic frontier gravity model, showed that Iran utilized only 45% of its export capacity in 2017 and identified Spain and the United Arab Emirates as key destination markets. Nevertheless, their analysis focused solely on efficiency measured by comparative advantage indicators, without considering underlying factors such as adaptability to market changes.

Alijani and Hajmoradi (2023) emphasized domestic branding, identifying perceived quality and brand associations as primary sources of differentiation, but the impact of branding on international competitiveness was not examined using trade data. Mohammadzadeh et al. (2023), applying a panel data approach, highlighted the roles of firm size, marketing strategies, and compliance with export standards; however, macro-level trade data were not incorporated. Amirteimoori et al. (2023) demonstrated the predictive power of deep learning in forecasting saffron exports, but their study only provided forecasts without analyzing the fluctuations and their underlying drivers.

Majidian and Dourandish (2024), employing RCA and HHI indices, reported that despite Iran's production dominance, its share of the global saffron market was only 13.6%, recommending a focus on markets such as China, the UAE, and Spain. However, changes in export shares of Iran and destination countries were not examined in a disaggregated manner. Eghbalsefat et al. (2024), using a modified stochastic frontier gravity model, identified unused export potential but did not assess alignment with global demand. Similarly, Riahi Dorcheh and Rahbari (2025), using ANP-SWOT and AHP-SWOT approaches, prioritized strategies such as marketing research and infrastructure development, yet did not integrate macro-level international trade analysis.

91 Furthermore, several studies have employed the CMS model to analyze agricultural trade, notably
92 those by Zadrahal et al. (2023) and Jiequn and Beibei (2023). Nevertheless, these studies have
93 primarily addressed the agricultural sector at an aggregate level and have not adopted the granular,
94 product-specific perspective that characterizes the present research.

95 Despite these contributions, existing research has largely concentrated on comparative
96 advantage, competitiveness indices, or export forecasting, with limited attention to how Iran's
97 saffron export structure adapts to changes in global demand. To address this gap, the present study
98 employs the Constant Market Share (CMS) model to systematically evaluate the alignment of
99 Iran's export performance with global market developments. In doing so, the study aims to provide
100 actionable insights for policymakers and stakeholders, facilitating improved export strategies,
101 enhanced market share, and a stronger position for Iran in the international saffron market.

102 This study examines the extent to which positive and negative changes in Iran's export
103 volumes to its main destinations can be attributed to changes in market share versus changes in the
104 size of the target market.

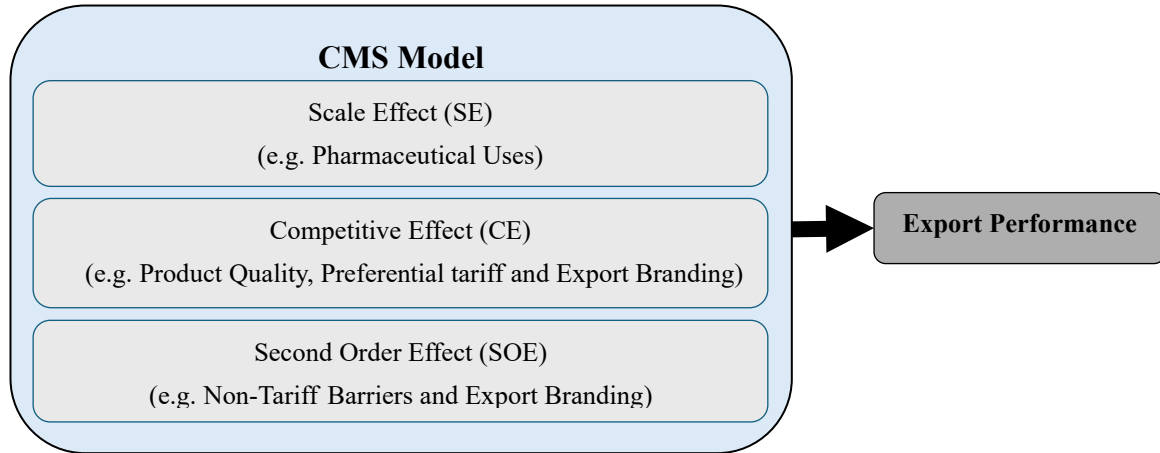
105 106 **METHODOLOGY**

107 **Theoretical Framework**

108 This study proposes a framework (Fig 2) within the CMS model, demonstrating that key
109 attributes of saffron, including product quality, branding, medicinal demand, and non-tariff
110 barriers, may influence changes in export volumes when integrated into the core components of
111 the model: Competitiveness Effect (CE), Scale Effect (SE), and Second-Order Effect (SOE).
112 Product quality and branding could interpret CE, medicinal demand could drive SE, and
113 compliance with market standards could affect SOE.

114 Previous empirical research supports these relationships. Superior product quality (Amanpour
115 et al., 2024) and robust branding strategies (Kashefi et al., 2019; Mohammadi & Reed, 2020;
116 Akbari et al., 2023) have been shown to substantially enhance export competitiveness.
117 Furthermore, export branding strengthens exporters' adaptability to evolving demand patterns
118 (Akbari et al., 2023). Conversely, non-tariff barriers can diminish an exporting country's ability to
119 adjust to market changes (Permeah & Hosseini, 2003; Ardakani et al., 2009). The collective extent
120 and direction of variations in these three CMS effects ultimately determine the export performance
121 of the originating country (Wang et al., 2017). Consequently, strategic marketing initiatives

122 focusing on improving product quality, enhancing branding, and mitigating trade barriers are
123 critical drivers for improved export outcomes (Kashefi et al., 2019). These factors are incorporated
124 exclusively as an interpretative analytical framework for the examination of the Competitive Effect
125 (CE) and the Second-Order Effect (SOE) results, rather than as directly quantifiable inputs within
126 the mathematical model.



127
128 **Fig 2.** Factors Influencing Each Component of Export Changes to Target Markets.

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130 **Constant Market Share (CMS) Model**

131 The CMS model is a widely used analytical tool in international trade that distinguishes
132 between changes in exports due to market growth and those resulting from shifts in
133 competitiveness (Ahmadi-Esfahani, 2006). This study employs the CMS model to assess Iran's
134 saffron export performance by analyzing its exports to selected agricultural markets. Assuming
135 constant market shares in the first year, the model decomposes export changes into economically
136 significant components (Tyszynski, 1951).

137 One of the model's primary advantages is its mathematical foundation, which avoids reliance
138 on econometric estimations and reduces potential modeling errors (Wang et al., 2017). Unlike
139 regression and gravity models, which often focus on limited variables or total trade volumes
140 (Abdul Kamal et al., 2021), CMS provides a detailed structural breakdown of export shifts,
141 emphasizing competitiveness and adaptability. Moreover, although survival analysis explores
142 export duration (Othman et al., 2022), CMS offers a broader analytical framework by
143 distinguishing between market growth, competitiveness, and responsiveness to structural changes.

144 It is essential to differentiate between export fluctuations, simple differences in trade volume
145 and the structural insights provided by CMS, which more accurately reflect changes in
146 competitiveness and market dynamics (Wang et al., 2017).

147 This research adopts the second-level decomposition approach by Wang, based on Jepma
148 (1986), to analyze Iran's saffron exports across key markets in two-year intervals. The
149 decomposition includes three components with distinct economic meanings (Wang et al., 2017):

- 150 1. **Scale Effect (SE):** Captures export changes due solely to global demand growth, assuming
151 CMS.
- 152 2. **Competitiveness Effect (CE):** Reflects changes in market share and indicates whether export
153 performance improved or declined in the target market.
- 154 3. **Second-Order Effect (SOE):** Measures adaptability to shifts in market demand structure
155 (Fagerberg & Sollie, 1987; Ahmadi-Esfahani, 2006). Negative SOE could indicate a persistent
156 misalignment between export composition and shifts in demand. However, negative SOE can
157 also arise when an exporter maintains stable performance in a shrinking market, or when
158 market share gains are concentrated in segments with declining demand.

159 This comprehensive breakdown offers valuable insights for policymakers seeking to improve
160 agricultural export performance and competitiveness.

161 Mathematically, the CMS model applied in this study is expressed as Equation (1) (Wang et
162 al., 2017):

$$q = \sum_j q_j = \sum_j S_j Q_j \quad (1)$$

163 Where q represents the total exports of the country, q_j denotes the country's exports to destination
164 j , Q_j is the total imports of country j , and S_j indicates the export share of the country in market j .
165 The export share of the country in destination j is calculated using Equation (2):

$$S_j = \frac{q_j}{Q_j} \quad (2)$$

166 Moreover, according to Equation (3), which represents the export function (q), the total export
167 volume is reformulated as a function of two independent variables: the export share (S_j) and the
168 total imports of the destination country from the world (Q_j). This equation forms the foundation
169 for decomposing export changes into the scale effect, competitive effect, and second-order effect,

170 and serves as the analytical basis for empirical studies employing the CMS model (Wang et al.,
171 2017; Li, 2015).

$$q = f(S_j, Q_j) \quad (3)$$

172 By applying a partial differentiation approach, the export function (q) is considered within a
173 defined neighborhood around the point (S_j, Q_j) , such that the point $(S_j + \Delta S_j, Q_j + \Delta Q_j)$ also lies
174 within this neighborhood. Based on this assumption, the change in exports (Δq) from the base
175 period (0) to period t can be decomposed according to Equations (4) to (6) (Wang et al., 2017).

$$\Delta q = q^t - q^0 = f(S_j + \Delta S_j, Q_j + \Delta Q_j) - f(S_j, Q_j) \quad (4)$$

$$\Delta q = \sum_j (S_j + \Delta S_j)(Q_j + \Delta Q_j) - \sum_j S_j Q_j \quad (5)$$

$$\Delta q = \sum_j S_j \Delta Q_j + \sum_j \Delta S_j Q_j + \sum_j \Delta S_j \Delta Q_j = \sum_j SE_j + \sum_j CE_j + \sum_j SOE_j \quad (6)$$

176 Ultimately, Equation (6), which represents the improved form of the CMS model, illustrates
177 that changes in export volume are decomposed into changes in market size and the target country's
178 total imports from the world. Equation (7) is a time-indexed version of Equation (6), incorporating
179 temporal dynamics into the decomposition framework (Wang et al., 2017).

$$\Delta q = \sum_j S_j^0 \Delta Q_j + \sum_j \Delta S_j Q_j^0 + \sum_j \Delta S_j \Delta Q_j = \sum_j SE_j + \sum_j CE_j + \sum_j SOE_j \quad (7)$$

180 Where Δq denotes the change in export volume of the exporting country, S_j^0 represents the initial
181 export share of the exporting country to destination j in the base year ($t = 0$), ΔQ_j is the change in
182 total imports of destination j , ΔS_j is the change in the export market share of the exporting country
183 to destination j , and Q_j^0 denotes the initial imports of destination j in the base year ($t = 0$). The
184 terms $\sum_j S_j^0 \Delta Q_j$, $\sum_j \Delta S_j Q_j^0$, and $\sum_j \Delta S_j \Delta Q_j$ represent the scale effect, the competitiveness effect,
185 and the second-order effect, respectively. The subscript j refers to the target market, and the
186 superscript 0 denotes values corresponding to the initial year of the analysis period.

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188 **Data**

189 This study utilized ITC (2025) data on the quantity, value, and price of Iran's saffron exports
190 (HS code 091020). Countries averaging over 5% of Iran's total saffron exports during the study

191 period were designated as primary destinations, specifically UAE, Spain, China, and Afghanistan,
192 while all remaining importers were grouped under “Others”.

193
194 **RESULTS**

195 **Results of the CMS Model Estimation**

196 Table 3 reports Iran's saffron export volumes, global market share, and the decomposition
197 results from the CMS model between 2013 and 2022. Fig. 3 illustrates the breakdown of export
198 volume changes (Δq) into the SE, CE, and SOE. SE captures variations due to global demand
199 shifts, CE reflects Iran’s relative performance among exporters (Wang et al., 2017), and SOE
200 indicates responsiveness to changing global import patterns, with positive values suggesting
201 adaptive market alignment (Ahmadi-Esfahani, 2006).

202 Over the study period (2013–2022), global saffron exports declined from 3,483 to 3,111 tons,
203 whereas Iran's exports followed a generally upward yet volatile trajectory, ranging between 137
204 and 217 tons, with an average of approximately 200 tons. Despite its status as the leading global
205 producer, Iran’s market share fluctuated considerably (3%–13%), peaking in 2021 before dropping
206 to 7% in 2022. These fluctuations underscore structural and competitive constraints limiting Iran’s
207 sustained market penetration.

208 Annual export variations were substantial, with the highest increase (89 tons) in 2016 and the
209 most pronounced decline (63 tons) in 2021. The CE was positive in certain years (e.g., 2016),
210 indicating relative export advantages, but negative in others (e.g., 2022), reflecting performance
211 shortfalls. The SOE remained consistently negative throughout the period, **could reveal** a persistent
212 misalignment between Iran’s export composition and shifts in global demand. Notably, the 2016
213 surge was CE-driven, whereas the 2021 decline corresponded to weakened global demand.

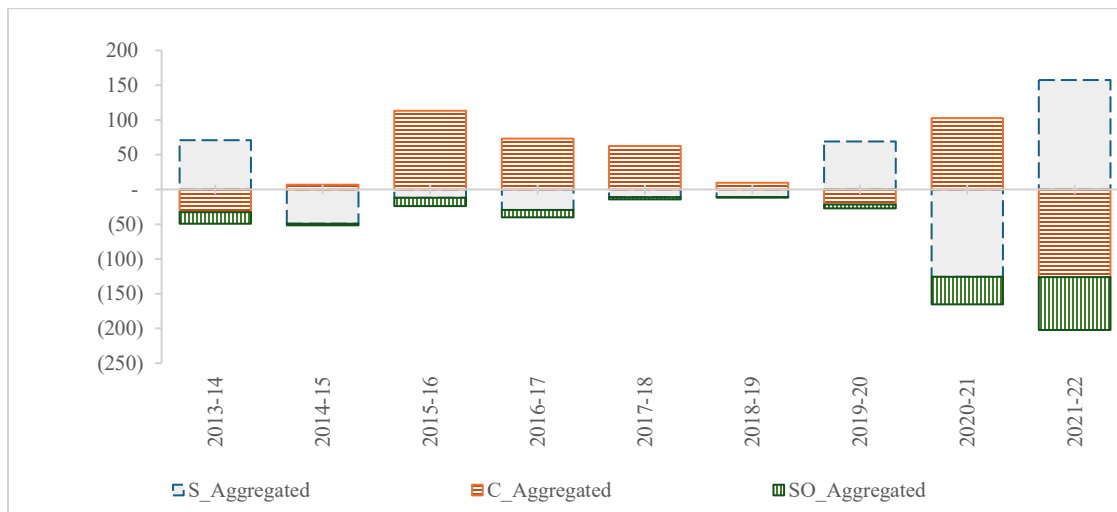
214 Collectively, the CMS decomposition highlights that while Iran occasionally benefited from
215 competitive gains, structural deficiencies, captured by persistently negative SOE and market share
216 instability, pose significant challenges. Strategic alignment with evolving global demand patterns
217 and enhanced adaptability appear essential for improving Iran’s position in the international
218 saffron market.

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222 **Table 3.** Global and Iranian saffron exports and Iran’s share in global saffron exports to major
 223 destinations, along with CMS model results during the period 2013–2022.

Year	World Export	Iran Export	Iran's Market Share	Change in Iran's Export (Δq)	Change in Iran's Export Share (ΔS)	(SE)		(CE)		(SOE)	
	(tons)	(tons)	(%)	(tons)	(%)	(tons)	Share (%)	(tons)	Share (%)	(tons)	Share (%)
2013	3,483	137	4	–	–	–	–	–	–	–	–
2014	5,282	159	3	22	-0.9	70.89	58.95	-32.55	-27.07	-16.81	-13.98
2015	3,638	114	3	-45	0.1	-49.42	-84.85	6.73	11.56	-2.09	-3.60
2016	3,254	203	6	89	3.1	-12.03	-8.76	113.35	82.53	-11.96	-8.71
2017	2,784	237	9	33	2.3	-29.37	-25.95	73.24	64.71	-10.58	-9.35
2018	2,652	285	11	48	2.2	-11.22	-14.64	62.47	81.50	-2.96	-3.86
2019	2,548	283	11	-2	0.4	-11.17	-52.78	9.62	45.44	-0.38	-1.78
2020	3,169	325	10	42	-0.9	68.97	71.87	-21.70	-22.61	-5.29	-5.51
2021	1,942	262	13	-63	3.2	-125.83	-46.96	102.45	38.24	-39.67	-14.80
2022	3,111	217	7	-44	-6.5	157.67	43.82	-126.17	-35.07	-75.95	-21.11

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226 **Fig 3.** Decomposition of Δq into its three components for Iran’s saffron exports during the period
 227 2013–2022.

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229 **Comparative Analysis of Target Markets**

230 A cross-market comparison of Iran’s saffron exports between 2013 and 2022 reveals distinct
 231 patterns in growth dynamics, competitive positioning, and adaptability, as reflected in the CMS
 232 model’s SE, CE, and SOE components (Table 4; Fig. 4). While some destinations have benefited
 233 from competitiveness gains, others have relied predominantly on market expansion, resulting in
 234 uneven resilience to shifts in global demand.

235 The **United Arab Emirates** stands out as a market where both scale and competitiveness
 236 effects have played significant roles. Export volumes increased from 54 to 73 tons, and Iran’s
 237 market share surged from 41% in 2015 to 91% in 2019 (Table 4; Fig. 4). This trajectory was driven

238 largely by a strong CE rebound after 2015 and adaptive capacity reflected in peak SOE values in
239 2016. The UAE experience illustrates how targeted marketing and sustained quality improvement
240 can translate into durable market presence.

241 In contrast, **Spain** presents a case of market dominance under contracting demand. While
242 exports rose modestly from 40 to 46 tons, Spain's overall imports fell sharply, magnifying the
243 value of Iran's 93% market share in 2022. Yet this dominance is fragile: CE experienced severe
244 negative shocks in 2015, 2017, and especially 2021 ($-57.41\%^3$). SOE contributions were sporadic,
245 signaling limited adaptability. Maintaining this position will require aggressive branding strategies
246 and protection against demand-side volatility in Europe.

247 The **Chinese** market offers a story of rapid expansion followed by vulnerability. Exports
248 jumped from 5 to 51 tons, closely tracking the rise in China's import demand. Market share peaked
249 at 84% in 2021, driven by SE. However, the subsequent drop in 2022 (-35 tons) was rooted in a
250 steep CE decline, highlighting the limits of a growth model dependent on scale without entrenched
251 competitive advantages.

252 Finally, **Afghanistan** reflects an extreme case of scale-driven growth without competitiveness
253 retention. While exports grew from 0.16 to 7.29 tons, market share collapsed from 100% to 24%
254 over the decade. Persistent negative CE values, particularly in 2018 and 2022, underline a
255 structural inability to defend market position despite demand growth.

256 Viewed collectively, these market trajectories reveal that Iran's saffron export strategy remains
257 uneven. The UAE shows that competitiveness-led growth is achievable, while Spain and China
258 demonstrate the risks of over-reliance on market size or existing dominance without reinforcing
259 brand equity. Afghanistan's case warns of the consequences when scale growth is unaccompanied
260 by competitiveness gains. The evidence points to an urgent need for market-specific branding,
261 quality assurance, and adaptive policy interventions to align export structure with shifting global
262 demand.

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³ To facilitate interpretation of the results, these shares have been recalculated and normalized to sum to 100, taking into account the absolute changes in export volumes.

264 **Table 4.** Global and Iranian saffron exports and Iran's share in global saffron exports to major
265 destinations, along with CMS model results (2013–2022).

Year	World Export (Q _j)	Iran Export (q _j)	Iran's Market Share (S _j)	Change in Iran's Export (Δq)	Change in Iran's Export Share (ΔS _j)	SE		CE		SOE	
	(tons)	(tons)	(%)	(tons)	(%)	(tons)	Share (%)	(tons)	Share (%)	(tons)	Share (%)
Export to UAE											
2013	82	54	66	-	-	-	-	-	-	-	-
2014	105	70	67	15	0.58	14.79	96.07	0.48	3.09	0.13	0.84
2015	105	43	41	-27	-25.72	0.20	0.74	-26.97	-98.98	-0.08	-0.28
2016	109	67	62	24	20.63	1.64	6.77	21.69	89.81	0.83	3.42
2017	113	62	55	-5	-6.79	2.16	22.02	-7.41	-75.55	-0.24	-2.43
2018	142	80	56	18	1.53	15.93	87.99	1.73	9.55	0.45	2.47
2019	77	70	91	-9	35.02	-36.44	-33.50	49.64	45.64	-22.68	-20.85
2020	78	60	77	-10	-14.61	0.91	7.41	-11.25	-91.40	-0.15	-1.19
2021	115	68	59	8	-17.65	28.37	58.29	-13.77	-28.29	-6.53	-13.42
2022	104	73	70	5	11.26	-6.49	-31.39	12.95	62.62	-1.24	-5.99
Export to Spain											
2013	83	40	49	-	-	-	-	-	-	-	-
2014	48	38	80	-2	31.20	-17.03	-31.63	25.90	48.09	-10.92	-20.28
2015	53	29	55	-9	-25.15	3.99	23.05	-12.07	-69.69	-1.26	-7.26
2016	90	53	59	24	3.85	20.25	85.38	2.04	8.61	1.42	6.01
2017	113	57	50	4	-8.29	13.25	58.66	-7.46	-33.03	-1.88	-8.30
2018	114	58	51	1	0.62	0.72	50.28	0.70	49.10	0.01	0.62
2019	111	57	51	-1	0.42	-1.59	-76.36	0.48	23.01	-0.01	-0.63
2020	63	61	96	4	44.86	-24.60	-25.66	49.77	51.91	-21.50	-22.43
2021	76	45	59	-16	-37.07	12.50	30.74	-23.35	-57.41	-4.82	-11.85
2022	50	46	93	1	33.45	-15.37	-31.06	25.42	51.37	-8.70	-17.57
Export to China											
2013	24	5	20	-	-	-	-	-	-	-	-
2014	21	9	44	5	24.63	-0.59	-8.18	5.91	81.62	-0.74	-10.20
2015	27	12	44	3	0.07	2.66	99.28	0.01	0.56	0.00	0.16
2016	15	9	57	-3	-12.92	-5.33	-51.42	3.49	33.64	-1.55	-14.95
2017	10	8	78	-1	-20.73	-2.87	-40.89	3.11	44.33	-1.40	-14.78
2018	5	1	30	-6	-48.59	-3.90	-34.89	-4.86	-43.41	2.43	21.70
2019	7	4	58	3	28.68	0.64	23.78	1.43	53.11	0.62	23.11
2020	64	40	63	36	4.39	33.15	92.17	0.32	0.88	2.50	6.95
2021	102	86	84	46	21.44	23.69	52.00	13.75	30.19	8.12	17.82
2022	83	51	61	-35	-22.65	-16.10	-36.97	-23.11	-53.07	4.34	9.97
Export to Afghanistan											
2013	0.16	0.16	100	-	-	-	-	-	-	-	-
2014	6.04	3.04	50	3	-49.69	5.88	66.21	-0.08	-0.90	-2.92	-32.90
2015	10	5	50	2	-0.31	1.99	98.47	-0.02	-0.92	-0.01	-0.61
2016	20.08	10.08	50	5	0.19	5.04	99.23	0.02	0.38	0.02	0.39
2017	15	14.55	97	4	46.80	-2.55	-17.80	9.40	65.61	-2.38	-16.59
2018	38.53	19.53	51	5	-46.31	22.82	56.12	-6.95	-17.08	-10.9	-26.79
2019	37.78	20.78	55	1	4.32	-0.38	-18.28	1.66	80.17	-0.03	-1.56
2020	65.78	33.08	51	13	-3.65	15.40	86.51	-1.38	-7.75	-1.02	-5.74
2021	17	7.01	41	-27	-10.11	-25.0	-68.39	-6.65	-18.15	4.93	13.46
2022	30	7.29	24	0.28	-16.95	5.36	51.32	-2.88	-27.58	-2.20	-21.09
Export to Others											
2013	3,293	38	1.1	-	-	-	-	-	-	-	-
2014	5,102	38	0.7	1	-0.39	20.60	50.91	-12.82	-31.69	-7.04	-17.40
2015	3,443	25	0.7	-13	-0.02	-12.4	-88.68	-1.20	-8.54	0.39	2.78
2016	3,020	65	2.1	40	1.42	-3.07	-5.30	48.88	84.34	-6.01	-10.36
2017	2,534	96	3.8	31	1.64	-10.4	-15.33	49.61	72.93	-7.98	-11.74
2018	2,353	126	5.4	30	1.57	-6.86	-13.85	39.82	80.40	-2.85	-5.75
2019	2,315	131	5.7	5	0.29	-2.01	-22.46	6.84	76.32	-0.11	-1.22
2020	2,898	131	4.5	-0.16	-1.14	32.94	49.88	-26.45	-40.04	-6.66	-10.08
2021	1,632	56	3.5	-74	-1.05	-57.1	-56.58	-30.48	-30.22	13.32	13.20
2022	2,844	40	1.1	-16	-2.05	41.90	41.80	-33.47	-33.39	-24.9	-24.80

266
267



268 **Fig 4.** Decomposition of Δq into its three components across Iran's saffron export target markets
 269 during the period 2013–2022.
 270

271

272

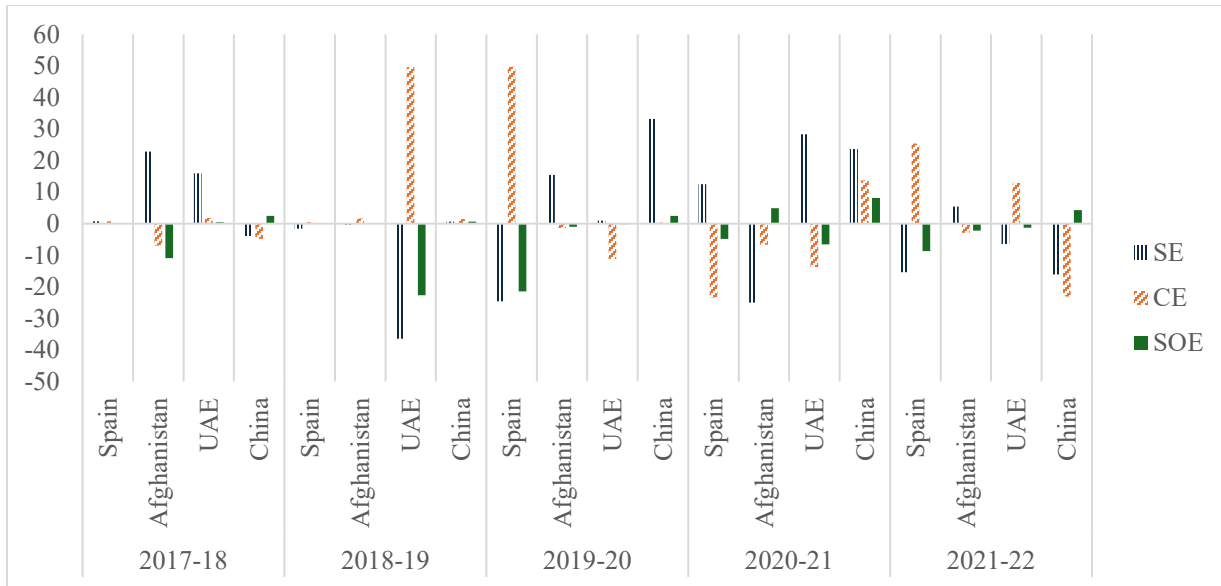
273 **DISCUSSION**

274 Fig. 5 illustrates the relative magnitude of three fundamental drivers—scale effect,
275 competitiveness effect, and second-order effect—in shaping the fluctuations of Iran’s saffron
276 exports to major destination markets over the period 2017–2022 (To avoid a lack of clarity in
277 presentation and given the particular importance of these recent years compared to earlier periods),
278 presented in biennial intervals. The evidence suggests a notable shift in Iran’s competitive position
279 during the latter part of the study period, with the Spanish market emerging as the most favorable
280 destination, as indicated by the pronounced dominance of positive competitiveness effects
281 compared with other markets.

282
283 **Causal Analysis**

284 The relatively weak CE in the Chinese market, as reported in Table 4, can be attributed
285 primarily to deficiencies in Iran’s branding strategies and the comparatively limited market appeal
286 of bulk saffron when juxtaposed with Spain’s value-added, packaged products. This observation
287 is in line with the findings of Kashfi et al. (2019), who underscore the strategic importance of
288 marketing in strengthening export performance. It also provides empirical validation for the
289 theoretical framework underpinning this study, which highlights product quality and branding as
290 central determinants of international competitiveness. By contrast, the enhanced CE in the Spanish
291 market likely reflects Iran’s recent concerted efforts—both at policy and industry levels—to
292 elevate packaging standards and consolidate the global brand identity of its saffron exports.

293



294

295 **Fig 5.** Decomposition of Δq into its three components in the target markets of Iran's saffron exports
 296 during the period 2017–2022.

297

298 CONCLUSIONS

299 This study demonstrates that Iran was able to expand both the volume and market share of its
 300 saffron exports, even in years when imports declined in key destinations such as Spain. In major
 301 markets like Spain and the UAE, export growth generally coincided with rising import demand,
 302 reflecting Iran's capacity to respond to favorable market dynamics. However, this pattern was less
 303 evident at the global level (Table 4; Figs. 3 and 4). A market-specific analysis reveals certain years
 304 of synchrony between Iran's export trends and import patterns in target destinations (Fig. 4), yet
 305 no single year exhibited strong alignment with global demand (Fig. 2), indicating a structural
 306 mismatch between Iran's overall export composition and international market trends.

307 CE emerged as the principal driver of Iran's export growth to the UAE and at the global level,
 308 whereas in Spain, China, and Afghanistan, SE played a more dominant role (Fig. 4). This suggests
 309 that, in most major markets, Iran's export expansion has been primarily fueled by market growth
 310 rather than competitiveness gains, with the UAE being a notable exception. These findings
 311 reinforce earlier research (Kashefi et al., 2019) emphasizing the central role of marketing
 312 strategies, particularly improvements in product quality—in enhancing export performance.

313 The results further highlight the strategic importance of product quality (Amanpour et al.,
 314 2024; Mohammadi & Reed, 2020) and branding in sustaining competitive advantage. The sharp
 315 decline in Iran's saffron exports to China in 2022, coupled with a reduction in CE, likely reflects

316 branding deficiencies and intensifying competition from Spanish-packaged saffron (Kashefi et al.,
317 2019; Mohammadi & Reed, 2020; Akbari et al., 2023).

318 Despite the UAE and Spain remaining Iran's dominant export destinations, increasing
319 competition and the country's limited progress in obtaining international certifications have
320 constrained its ability to capture the growing European demand for organic saffron (Kashefi et al.,
321 2019; Mohammadi & Reed, 2020; Akbari et al., 2023). Volatility in exports to most destinations
322 (Fig. 4) appears to be shaped by political dynamics, trade barriers, logistical challenges, and policy
323 inconsistencies. Taken together, and in line with the study's theoretical framework, these findings
324 reaffirm that sustained improvements in product quality and the adoption of robust branding
325 strategies are critical to strengthening Iran's competitive position in the global saffron market.

326 **Recommendations:** Based on these findings, several policy recommendations are proposed to
327 enhance Iran's saffron export performance:

- 328 1. **Market Access Facilitation:** Implement measures to facilitate exports, such as establishing or
329 strengthening preferential tariffs and reducing non-tariff barriers with countries demonstrating
330 potential demand for Iranian saffron.
- 331 2. **Brand Development and Protection:** Support producers and trade unions in brand registration
332 in target markets (e.g., European Union, India, Japan, Spain), particularly through legal
333 instruments like Geographical Indications (GI).
- 334 3. **Traceability and Marketing Investment:** Advocate for a traceability system to prevent the
335 export of unbranded bulk saffron, which inadvertently strengthens re-exporter brands. Allocate
336 financial resources for export marketing efforts, especially facilitating Iranian exporters'
337 participation in major global trade fairs (SIAL, ANUGA, Gulfood, EXPO, e.g.) to foster
338 connectivity and enhance awareness of Iran's national brand.
- 339 4. **Technological Upgrades:** Support Small and Medium-Sized Enterprises (SMEs) in upgrading
340 facilities with modern packaging technologies to preserve Saffron's aroma, flavor, and
341 medicinal properties, thereby enhancing competitive strength.
- 342 5. **International Standard Compliance:** Prioritize facilitating compliance and monitoring with
343 international standards (e.g., ISO, HACCP, organic, and health certifications) for saffron
344 destined for highly regulated markets like the European Union.

- 345 6. **Intellectual Property and Brand Support:** Consistent with the results of Shahabadi et al.
346 (2023), provide support to producers and trade unions in protecting intellectual property,
347 including brand registration and the promotion of a national brand in target markets.
- 348 7. **Incentives to Reduce Unbranded Bulk Exports:** In line with the findings of Mano Raj (2021),
349 introduce export incentives for small-scale shipments to reduce unbranded bulk exports, thereby
350 preventing the inadvertent strengthening of third-country brands, such as those of Spain, in
351 products like saffron.
- 352 8. **Export Marketing and Global Event Participation:** Similar to the results reported by Quaye
353 (2017), facilitate marketing initiatives that enhance Iranian exporters' participation in major
354 international events, such as EXPO, and strengthen global networking opportunities. These
355 efforts should be coordinated by the Iran Trade Promotion Organization and relevant chambers
356 of commerce.
- 357 9. **SME Facilitation and Technological Upgrades:** According to Calheiros-Lobo et al. (2023),
358 support Small and Medium-Sized Enterprises (SMEs) in processing and exporting to new
359 application markets (e.g., dietary supplements, cosmetics, pharmaceuticals). Equip these
360 enterprises with modern packaging technologies capable of preserving saffron's key attributes,
361 including aroma, flavor, and medicinal properties, to enhance competitive advantage.
- 362 10. **International Standards and Quality Assurance:** Based on the results of Yang et al. (2022),
363 facilitate access to international certifications and standards (e.g., ISO, HACCP, organic) for
364 export products targeting highly regulated markets such as the European Union. Establishment
365 of laboratories for residue and contaminant testing should also be prioritized by the relevant
366 organizations.
- 367 **Research Limitations and Future Agenda:** Due to data unavailability, global exports to
368 Afghanistan were assumed equal to the sum of imports from Iran and the world in certain years
369 (2013 and 2017), leading to a reported 100% market share for Iran in those instances. Similar
370 assumptions were made for UAE (2013–2019), Spain (2017–2019), and China (2019, 2020, 2022).
371 Future research should explore other agricultural commodities using an integrated approach
372 combining the gravity model with the CMS model. Such analyses can provide a deeper
373 understanding of export structures and uncover causal relationships between key factors affecting
374 the CMS model's three components. CMS model can illustrate that in cases where the size of the
375 target market has not changed and only Iran's market share has declined, the reduction may be

376 attributable to weaknesses in exporters' marketing strategies, as well as to a decrease in overall
377 exports driven by macroeconomic factors.

378

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