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ARAŞTIRMA MAKALESİ **RESEARCH ARTICLE**

Türkiye's peach and nectarine exports: An empirical analysis with normalized revealed comparative advantage (NRCA) indexes

Türkiye'nin şeftali ve nektarin ihracatı: Normalleştirilmiş açıklanmış karşılaştırılmalı üstünlük (NRCA) endeksleri ile ampirik bir analiz

Muhammed Fatih AYDEMİR[1]

[1]*Bursa Uludağ University, Vocational School of Social Sciences, Department of Foreign Trade, Bursa, Türkiye.*

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Corresponding author/Sorumlu yazar:
Muhammed Fatih AYDEMİR
mfaydemir@uludag.edu.tr

ABSTRACT

The objective of this study was to examine the competitiveness of Türkiye in peach and nectarine exports through the use of normalized revealed comparative advantage (NRCA) indexes, encompassing cross-product group, cross-country, and cross-period comparisons. For this purpose, calculations were made based on HS-6 coded peach and nectarine, apricot, cherry, sour cherry and plum foreign trade data of Türkiye, Spain, the USA, Chile, Italy and Greece for 2001-2023. The study indicates that Türkiye's comparative advantage in peaches and nectarines increased significantly after 2016. The cross-product group comparison indicates that Türkiye has a competitive advantage in peaches and nectarines relative to other stone fruit exports, including apricots, cherries, and plums. However, especially in recent years, Türkiye has been at a comparative disadvantage in peach and nectarine exports relative to cherries. Regarding cross-country comparison, Türkiye has a comparative advantage over other major peach and nectarine exporters (Italy, Chile, USA and Greece). On the other hand, Türkiye has a comparative disadvantage compared to Spain, the world's largest exporter of peaches and nectarines. In terms of periodic comparison results, Türkiye has increased its competitiveness during the analysis period compared to previous years. To maintain and stabilize competitiveness, more exports are needed to different markets, particularly Canada, Mexico, Switzerland, the United Kingdom, Belgium, Germany and Saudi Arabia.

ÖZET

Bu çalışmanın amacı, Türkiye'nin şeftali ve nektarin ihracatındaki rekabet gücünü normalleştirilmiş açıklanmış karşılaştırmalı üstünlük (NRCA) endeksleri (çapraz ürün grubu, çapraz ülke ve dönemsel karşılaştırmalar) ile analiz etmektir. Bu amaçla, 2001-2023 dönemine ait Türkiye, İspanya, ABD, Şili, İtalya ve Yunanistan'ın HS-6 Kodlu şeftali ve nektarin, kayısı, kiraz, vişne ve erik dış ticareti verileri üzerinden hesaplamalar yapılmıştır. Çalışmaya göre, Türkiye'nin şeftali ve nektarindeki karşılaştırmalı üstünlüğü 2016 yılından sonra önemli derecede artmıştır. Çapraz ürün grubu karşılaştırmasına göre, Türkiye'nin şeftali ve nektarinde diğer sert çekirdekli yaş mevye (kayısı, vişne ve erik) ihracatına karşı rekabet üstünlüğüne sahip olduğu belirlenmiştir. Buna karşın, özellikle son yıllarda kiraza göre Türkiye'nin şeftali ve nektarin ihracatında karşılaştırmalı dezavantaja sahip olduğu tespit edilmiştir. Çapraz ülke karşılaştırması açısından; Türkiye'nin, şeftali ve nektarin ihraç eden diğer başlıca ülkeler (İtalya, Şili, ABD ve Yunanistan) karşısında karşılaştırmalı üstünlüğe sahip olduğu görülmüştür. Buna karşın, dünyanın en çok şeftali ve nektarin ihracatı yapan İspanya'ya göre karşılaştırmalı dezavantaja sahip olduğu anlaşılmıştır. Dönemsel karşılaştırma sonuçları açısından Türkiye analiz dönemi boyunca önceki yıllara göre rekabet gücünü arttırmıştır. Rekabet gücünün korunması ve daha istikrarlı hale getirilebilmesi için başta Kanada, Meksika, İsviçre, Birleşik Krallık, Belçika, Almanya ve Suudi Arabistan olmak üzere farklı pazarlara daha fazla ihracat yapılması gerekmektedir.

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INTRODUCTION

Peach and nectarine, which are in the stone fruits group, are of significant importance for human health and nutrition due to the vitamins and antioxidants they contain (Gündoğdu, 2024; Serra et al., 2020), as well as for national economies (Okan & Engindeniz, 2016). Peaches and nectarines are typically consumed fresh and can also be utilized as raw materials in the food processing industry (Engindeniz & Çukur, 2003; Vural & Çakan, 2021). Peaches and nectarines can be canned in syrup and processed as fruit juice concentrate and purée (Birinci & Er, 2006). Furthermore, they can be employed in the production of jam and marmalade and certain varieties can be dried and utilized (Şeker et al., 2013; Serra et al., 2020).

In terms of temperate fruit species, peach production is the second most significant after apple production on a global scale. Approximately 1.5 million hectares of cultivated land worldwide are dedicated to the production of peaches and nectarines (Bucur et al., 2023). The ease with which peach and nectarine can be cultivated, coupled with their early fruit set and long harvest period, has contributed to their widespread cultivation (Geçer, 2020). However, there has been a decline in the production of these fruits from temperate to cold climates (Kuden et al., 2018). Nectarines represent approximately one-third of the peach and nectarine species (Bucur et al., 2023). Despite the lower yield of nectarines in comparison to peaches, consumer preference has shifted towards nectarines over time due to their hairless structure (Pakyürek & Yazıcı, 2024). As reported by FAOSTAT (2024a), the leading producers of peaches and nectarines worldwide in 2022 were China (16,800,000 tons), Italy (1,151,490 tons), Türkiye (1,008,185 tons), Greece (894,510 tons) and Spain (870,720 tons). In other words, China is by far the most important producer of peaches and nectarines in the world, while Türkiye is in third place. However, although peach and nectarine production has increased over the years, market saturation has started to occur in some important markets, particularly in the EU (European Union) and the USA (United States of America). The reasons for this are the increased competition from other fruits such as tropical fruits (e.g. bananas and pineapples), increased labor costs and labor shortages, and small-sized supplies instead of large-sized supplies. Additionally, unmet consumer expectations and poor fruit quality have been identified as contributing factors to reduced peach and nectarine consumption (Minas et al., 2018). This has led to declines in peach and nectarine production in major producing countries such as Spain, Italy and the USA (Manganaris et al., 2022). However, demand for peaches and nectarines in other markets is still significant.

While peaches and nectarines are of significant importance for domestic consumption, their exports also provide considerable benefits to the national economy. In this context, the importance of competitiveness in Türkiye's peach and nectarine exports becomes evident. In order to achieve competitiveness in exports, a country must specialise in a particular product or product group and increase its production capacity. In order to achieve a comparative advantage in a particular product group, it is necessary to ensure a consistent increase in exports of that product.

A substantial body of research has been conducted to evaluate Türkiye's comparative advantage in the context of fresh and stone fruits. Some of these studies include fresh fruits and vegetables (Berk et al., 2016), oranges, tangerines, lemons and fresh apricots (Özdemir & Kösekahyaoğlu, 2019), cherries (Çelik et al., 2019), peaches (Bayav & Çetinbaş, 2021), fresh and dried apricots (Süygün, 2021), and stone fruits (Duru et al., 2022). Nevertheless, it was discovered that the “normalized revealed comparative advantage” (NRCA) index was employed in a limited number of studies. These include the Standard International Trade Classification (SITC) Rev.3 single-digit sectors (Mete & Akbulut Yıldız, 2019), pharmacology (Demir, 2020), agricultural products (Aboud & Şahinli, 2021) and various sectors according to technology intensities (Demir et al., 2024). Regarding the fruits, NRCA indexes are employed solely in the context of hazelnuts (Demir, 2022). Nevertheless, an examination of the extant literature reveals that no studies have been employed on the NRCA indexes to assess Türkiye's competitiveness in peach and nectarine exports.

This study employs NRCA indexes to ascertain Türkiye's comparative advantage in the peach and nectarine product group, to evaluate it in comparison with other stone fruits (apricot, cherry, sour cherry, and plum), and to assess it in comparison with the leading peach and nectarine exporting countries and to determine the evolution of Türkiye's comparative advantage in peach and nectarine exports over time. This study differs from previous studies, particularly in terms of its approach to comparing the comparative advantage of peach and nectarine with that of other stone fruits and determining the periodic comparative advantage. In this regard, the findings of this study are anticipated to provide insights that will inform future research in this field and contribute to the development of policies that will facilitate the growth of fruit exports.

MATERIALS and METHODS

Material

In this study, data were obtained according to the various types of NRCA indexes. The data period was based on 2001 to 2023. In the case of the periodic NRCA index, the period 2002-2023 was calculated by comparing 2001 with 2002 by the methodology employed in the latter year. Concurrently, an analysis was provided which contrasts and compares the peach and nectarine with other stone fruits. In this context, the Harmonized System (HS)-6 coded product descriptions of peach, nectarine, and other stone fruits are provided in Table 1 for reference.

Table 1. HS-6 Classification of peaches, nectarines and other stone fruits
Çizelge 1. Şeftali ve nektarin ile diğer sert çekirdekli meyvelerin HS-6 sınıflandırması

HS-6 Code	Product Description
080910	Fresh apricots
080920*	Fresh cherries
080921**	Fresh sour cherries "*Prunus cerasus*"
080929**	Fresh cherries (excl. Sour cherries)
080930	Fresh peaches, incl. Nectarines
080940	Fresh plums and sloes

*2011 and before, **2012 and later (Duru et al., 2022)

As illustrated in Table 1, before 2011, both cherries and sour cherries were classified under the same HS-6 code. However, since 2012, these two types of fruit have been assigned different HS-6 codes. This distinction was taken into account in the present study. Furthermore, comparisons were made with Spain, the USA, Chile, Italy, and Greece, as the countries that export the most peaches and nectarines through the NRCA cross-country comparison, to gain insight into the export patterns of these countries. In this context, data on the foreign trade of peaches, nectarines, apricots, cherries, sour cherries, and plums in Türkiye, Spain, the USA, Chile, Italy, and Greece for the period between 2001 and 2023 were obtained from Trade Map (2024) and FAOSTAT (2024b).

Method

The “normalized revealed comparative advantage” (NRCA) index was proposed by Yu et al. (2009) to overcome the asymmetry problem of the “revealed comparative advantage” (RCA) index. The NRCA index is capable of elucidating the extent and comparison of comparative advantage across product groups, countries, and different periods. Consequently, the NRCA index is capable of illustrating the trade trajectory of a given country. In other words, it can identify which types of goods have the potential to be marketable at a given point in time (Demir, 2020). Moreover, this index is a frequently-utilized method for measuring a country's or product group's comparative advantage (Saki et al., 2019). The NRCA index is regarded as an appropriate index for measuring comparative

advantage, as it assesses the extent to which a country's exports diverge from the global export market (Hasan et al., 2024).

The main idea behind the NRCA index is that each country or product is neutral in terms of comparative advantage (Yu et al., 2009). From this perspective, it is not feasible for a single country to achieve a comparative advantage in all product groups. For example, when Türkiye gains a comparative advantage in the peach and nectarine product group, it implies that another country loses its comparative advantage in this product group. The NRCA index is shown in Equation 1 (Yu et al., 2009).

$$NRCA_j^i = \frac{\Delta E_j^i}{E} = \frac{E_j^i}{E} - \left(\frac{E_j \, x \, E^i}{E \, x \, E}\right) \quad \textbf{Eq.(1)}$$

where,

E_j^i : Country i's total export of product group j,

E_j : World exports of product group j,

E^i : Total exports of country i,

E : Total world exports.

The NRCA is comprised of both positive and negative values. The presence of positive values indicates a comparative advantage, whereas negative values indicate a comparative disadvantage. When the value is equal to 0, there is no comparative advantage or disadvantage (Hasan et al., 2024). Furthermore, Yu et al. (2009) derived distinct NRCA indexes to facilitate cross-product group comparison, cross-country comparison, and cross-period comparison. The indexes are provided in the following section.

In order to facilitate a comparison of the cross-product groups of a given country, the disparity between the NRCA values of two distinct product groups can be elucidated through the application of the following calculation, as illustrated in equation 2.

$$\Delta NRCA_{1-2}^i = NRCA_1^i - NRCA_2^i = \frac{E^i}{E}\left[\left(\frac{E_1^i}{E^i} - \frac{E_1}{E}\right) - \left(\frac{E_2^i}{E^i} - \frac{E_2}{E}\right)\right] \quad \textbf{Eq.(2)}$$

where,

$\Delta NRCA_{1-2}^i$: Cross-product group comparison of NRCA scores which compares a country's relative level of specialization in two product groups,

E^i: Total exports of country i,

E: Total world exports,

E_1^i: Country i's exports of product group 1,

E_1: Total world exports of product group 1,

E_2^i: Country i's exports of product group 2,

E_2: Total world exports of product group 2.

$\Delta NRCA_{1-2}^i > 0$ or ($\Delta NRCA_{1-2}^i < 0$) indicates that the relative specialization level of country i in product group 1 is stronger or (weaker) than the specialization level in product group 2 relative to the world average specialization level in product group 1. Therefore, it indicates that country i has a stronger or (weaker) comparative advantage in product group 1 than in product group 2 (Yu et al., 2009).

In order to facilitate a comparison between countries within a given product group, the difference between the NRCA values of country 1 and country 2 can be calculated as follows (Equation 3):

$$\Delta NRCA_i^{1-2} = NRCA_j^1 - NRCA_j^2 = \frac{E_j}{E}\left[\left(\frac{E_j^1}{E_j} - \frac{E^1}{E}\right) - \left(\frac{E_j^2}{E_j} - \frac{E^2}{E}\right)\right] \quad \textbf{Eq.(3)}$$

where,

$\Delta NRCA_i^{1-2}$: Comparison of two countries in product group j,

Ej: World total exports of product group j,

E: Total world exports,

E_j^1: Country 1's exports of product group j,

E^1: Total exports of country 1,

E_j^2: Country 2's exports of product group j,

E^2: Total exports of country 2.

The condition ($\Delta NRCA_i^{1-2} > 0$ or $\Delta NRCA_i^{1-2} < 0$) indicates that country 1's export performance in product group j is superior to or inferior to that of country 2, respectively. The ratio $\left(\frac{E_j^1}{E_j} - \frac{E^1}{E}\right)$ is more or less favorable than country 2's export performance in product group j, represented by the ratio $\left(\frac{E_j^2}{E_j} - \frac{E^2}{E}\right)$. The relative export performance of country 2 in product group j is therefore stronger or weaker. Therefore, it can be concluded that country 1 has a stronger or (weaker) comparative advantage in product group j than country 2 (Yu et al., 2009).

The properties of NRCA, including total, average value, and distribution, remain constant over time. Nevertheless, it is possible to make comparisons between NRCA values on a periodic basis. The change in NRCA index values between the t + 1 and t periods is illustrated in equation 4:

$$\Delta NRCA_{j,t+1}^i = NRCA_{j,t+1}^i - NRCA_{j,t}^i = \left(\frac{E_{j,t+1}^i}{E_{t+1}} - \frac{E_{j,t}^i}{E_t}\right) - \left(\frac{E_t^i}{E_t}\frac{E_{j,t}}{E_t} - \frac{E_{t+1}^i}{E_{t+1}}\frac{E_{j,t+1}}{E_{t+1}}\right) \quad \textbf{Eq.(4)}$$

where,

$\Delta NRCA_{j,t+1}^i$: The change in the export level of country i in product group j between t+1 and t,

$E_{j,t+1}^i$: World total exports of product group j in period t+1,

E_{t+1}: World total merchandise exports in period t+1,

$E_{j,t}^i$: Country i's exports of product group j in period t,

E_t: World total merchandise exports in period t,

E_t^i: Total merchandise exports of country i in period t,

$E_{j,t}$: Total world exports of product group j in period t,

E_{t+1}^i: Total merchandise exports of country i in period t+1.

$\left(\frac{E_{j,t+1}^i}{E_{t+1}} - \frac{E_{j,t}^i}{E_t}\right)$, which indicates the change in the level of exports of country i in product group j between t+1 and t. The expected exports in product group j if comparative advantage is neutral in period t and t+1, respectively, are represented by by $\frac{E_t^i}{E_t}\frac{E_{j,t}}{E_t}$ and $\frac{E_{t+1}^i}{E_{t+1}}\frac{E_{j,t+1}}{E_{t+1}}$. Therefore, the expression $\left(\frac{E_t^i}{E_t}\frac{E_{j,t}}{E_t} - \frac{E_{t+1}^i}{E_{t+1}}\frac{E_{j,t+1}}{E_{t+1}}\right)$ quantifies the variation in country i's anticipated exports of product group j, in order to maintain the neutral state of comparative advantage between periods t and t+1. Consequently, a period-by-period comparison of comparative advantage permits the assessment of the change in a country's exports of a specific product group in relation to the anticipated shift in exports of that product group in the absence of any comparative advantage. When $\Delta NRCA_{j,t+1}^i > 0$, it can be inferred that country i's comparative advantage in product group j has increased between periods t and t+1. $\Delta NRCA_{j,t+1}^i < 0$ indicates a decline in country i's comparative advantage in product group j between periods t and t+1 (Yu et al., 2009; Demir, 2020).

RESULTS and DISCUSSIONS

This study, which examines Türkiye's comparative advantage in peach and nectarine exports, initially presents the export values and subsequently presents the findings with different NRCA indexes. In order to more clearly express the findings, figures are used, given the relatively low resulting value. In this context, the export data of the world, Türkiye and the leading countries in exports are presented in Table 2.

As illustrated in Table 2, global exports of peaches and nectarines more than doubled from 2001 to 2023. The countries that exported the greatest quantities of peaches and nectarines were Spain, Türkiye, Italy, the USA, Chile and Greece. Türkiye experienced a notable increase in peach and nectarine exports during this period, ranking second in 2023. It was also found that about one fifth of Türkiye's peach and nectarine production is exported. Nevertheless, Türkiye's contribution to global peach and nectarine exports is approaching 9%. In addition to the export values, Table 3 also presents the quantities exported.

Table 2. Global exports of peaches and nectarines and leading countries in terms of export value (in thousands of US dollars)

Çizelge 2. Şeftali ve nektarin dünya ihracatı ve ihracat değeri bakımından öne çıkan ülkeler (bin ABD Doları)

	World	Spain	Türkiye	Italy	The USA	Chile	Greece
2001	974956	264456	6620	277067	128138	71765	66703
2002	1004927	307054	8076	248502	121109	70248	50810
2003	1330290	506641	24293	347040	118621	74606	14502
2004	1143242	345417	11838	309865	111718	86220	58011
2005	1321738	448427	20600	323004	130586	80082	60878
2006	1606626	599947	22877	390437	132260	77998	64504
2007	1735517	629738	15935	437066	150237	81279	70757
2008	2150864	785999	36711	501111	178792	100195	129664
2009	1784130	696169	23906	331729	151411	84585	76198
2010	2141583	836496	28815	395795	170480	89357	108886
2011	2063902	797068	21668	322343	159562	97050	88577
2012	2290022	832935	28050	372204	184100	96329	132319
2013	2480956	1019938	27796	363480	180580	100330	110580
2014	2274294	963814	34952	239014	191452	78042	113561
2015	2225682	902310	38924	231374	153881	98634	80723
2016	2123648	876214	25698	225216	147846	103049	93260
2017	2227126	900873	69783	192821	126931	91762	88026
2018	2234776	938038	87135	194464	134632	113101	98137
2019	2198627	859608	89784	148771	131614	113935	87313
2020	2403935	971151	152146	125189	123421	134537	115871
2021	2581080	1105172	169125	164628	160191	118475	57465
2022	2474815	917340	199419	205491	148632	139964	102093
2023	2326066	949632	202599	127587	145601	142475	100966

As illustrated in Table 3, global exports of peaches and nectarines reached their highest level in 2017 and have since exhibited a general decline. Spain was the foremost exporter of peaches and nectarines, while Türkiye ranked second in terms of export volumes. During this period, the quantity of peaches and nectarines exported by Italy, the USA and Greece exhibited a notable decline, while Chile's exports demonstrated a degree of volatility. Türkiye was the only country whose export volumes increased significantly.

Table 3. Peach and nectarine world and country export quantities (in tons)*
*Çizelge 3. Şeftali ve nektarin dünya ve ülke ihracat miktarları (ton bazında)**

	World	Spain	Türkiye	Greece	Chile	Italy	The USA
2001	1230987	275612	23681	142797	85664	408601	152958
2002	1351217	385368	27579	99963	92291	399397	154408
2003	1185239	401838	44305	15370	102003	327668	110090
2004	1187246	239429	20153	98175	114392	407421	113561
2005	1465007	423611	39301	103385	109555	425978	132741
2006	1505554	545188	39123	80845	96899	359947	96855
2007	1492595	520694	18995	82784	97590	372699	117327
2008	1607007	564622	42930	112212	111640	330375	134583
2009	1629568	591262	32279	87451	96035	358751	96696
2010	1714028	589620	41326	117471	91914	359780	115081
2011	1805671	661677	32857	109470	100308	349085	105842
2012	1864888	646841	43540	155345	94768	369320	101013
2013	1871678	758276	34147	112877	88010	295838	105391
2014	2009324	843301	39413	166874	48317	262412	90785
2015	2257146	857690	50490	148045	82765	269204	77768
2016	2110428	819649	50639	168693	93061	228459	83494
2017	2331112	933752	88811	186009	83635	223243	56803
2018	1961538	743403	126814	159741	98766	159692	70575
2019	2072234	828812	105331	163557	100624	157152	72680
2020	1819530	654279	163381	155467	103196	78075	61723
2021	1795435	690901	170422	58966	96456	98252	84162
2022	1758148	539747	204210	126778	111088	140414	62193
2023	1610708	610031	225959	118037	107462	79720	46630

*Trade Map (2024) and ComTradePlus (2025)

Despite China's significant contribution to global peach and nectarine production, the volume and monetary value of exports have remained relatively modest, with the majority of the output consumed domestically. Consequently, China is not included in either table. Nevertheless, a contraction in domestic demand could make China the most important exporter in the world's peach and nectarine market. Table 4 presents the export values and quantities of peaches and nectarines, in addition to the export values per unit of these fruits.

Table 4 illustrates a notable surge in the unit value of global peach and nectarine exports. Despite an increase in the value of peaches exported from Türkiye per unit, this remained relatively low in comparison to the global average for peaches and nectarines. This also suggests that Türkiye is attempting to expand its export market by offering competitive pricing**.**

Table 4. Peach and nectarine export values per unit for the world and countries (in US Dollars/Tons)*
*Çizelge 4. Ülkelerin ve dünyanın birim başına şeftali ve nektarin ihracat değerleri (ABD Doları/ton)**

	World	The USA	Italy	Spain	Chile	Türkiye	Greece
2001	792	838	678	960	838	280	467
2002	744	784	622	797	761	293	508
2003	1122	1077	1059	1261	731	548	944
2004	963	984	761	1443	754	587	591

Table 4 (devamı). Peach and nectarine export values per unit for the world and countries (in US Dollars/Tons)*
*Çizelge 4 (continued). Ülkelerin ve dünyanın birim başına şeftali ve nektarin ihracat değerleri (ABD Doları/ton)**

	World	The USA	Italy	Spain	Chile	Türkiye	Greece
2005	902	984	758	1059	731	524	589
2009	1095	1566	925	1177	881	741	871
2010	1249	1481	1100	1419	972	697	927
2011	1143	1508	923	1205	968	659	809
2012	1228	1823	1008	1288	1016	644	852
2013	1326	1713	1229	1345	1140	814	980
2014	1132	2109	911	1143	1615	887	681
2015	986	1979	859	1052	1192	771	545
2016	1006	1771	986	1069	1107	507	553
2017	955	2235	864	965	1097	786	473
2018	1139	1908	1218	1262	1145	687	614
2019	1061	1811	947	1037	1132	852	534
2020	1321	2000	1603	1484	1304	931	745
2021	1438	1903	1676	1600	1228	992	975
2022	1408	2390	1463	1700	1260	977	805
2023	1444	3122	1600	1557	1326	897	855

*Source: Trade Map (2024) and ComTradePlus (2025)

In 2023, the following countries were identified as the top importers and net importers of peaches (Trade Map, 2024): Germany, the Russian Federation, the (UK) United Kingdom, France, Canada, Mexico, Switzerland, Belgium, Romania and Saudi Arabia. Among these countries, Canada, Mexico, Switzerland, the UK, Belgium, Germany and Saudi Arabia are notable for their high import value per unit of peach and nectarine. Conversely, the majority of Türkiye's peach and nectarine exports are destined for the Russian Federation, Romania, Ukraine, Iraq and Belarus, where the import value per unit is comparatively lower. The values of the NRCA accounts are presented after the information on the foreign trade of peaches and nectarines between Türkiye and other countries. Figure 1 illustrates the NRCA values of Türkiye in the peach and nectarine product group.

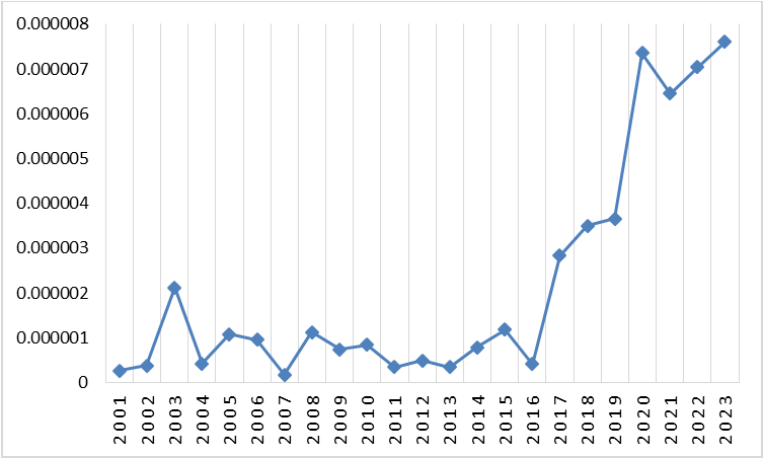

Figure 1. NRCA values for Türkiye's peach and nectarine exports
Şekil 1. Türkiye'nin şeftali ve nektarin ihracatında NRCA değerleri
Source: Author's calculations

As illustrated in Figure 1, the NRCA values of Türkiye's peach and nectarine exports demonstrated a positive trend until 2016, after which there was a notable surge in NRCA values. In this regard, Türkiye has a distinct competitive advantage in peach and nectarine exports, growing significantly. In accordance with the findings of Bayav and Çetinbaş (2021), it was discerned that the comparative advantage in peach and nectarine exhibited a notable increase over the years, exceeding the projected growth observed in the aforementioned study.

Secondly, the analysis concentrated on Türkiye's competitive advantage in the production of peaches and nectarines, as well as other stone fruits, including apricots, cherries, sour cherries, and cherry plums, with the exception of sour cherries. However, the data set revealed that cherries (including sour cherries) were included until 2012 under HS code 080920. Since 2012, data pertaining to cherries with HS code 080929 and sour cherries with HS code 080921 have been subjected to separate analysis. Accordingly, the product group comparison is analysed in two distinct time periods: 2001-2011 and 2012-2023. With regard to this matter, Figure 2 presents the findings for the years 2001-2011.

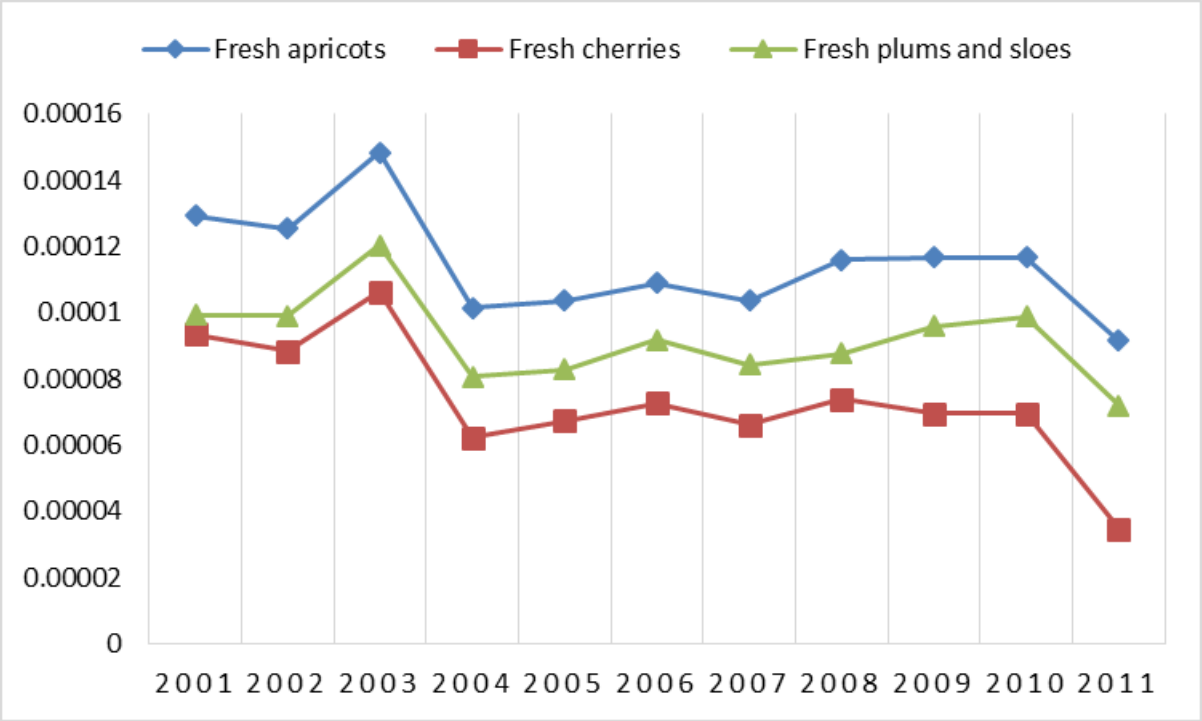

Figure 2. Türkiye's cross-product NRCA values (2001-2011)

Şekil 2. NRCA çapraz ürün grubu değerleri (2001-2011)

Source: Author's calculations

As illustrated in Figure 2, the cross-product group results revealed a positive and decreasing NRCA value trend over the 2001-2011 period. This indicates that Türkiye's relative specialisation level in peach and nectarine is more pronounced than that observed in the second product group (apricot, cherry including cherry and plum) in comparison to the global average specialisation level in peach and nectarine. In other words, Türkiye exhibits a stronger comparative advantage in the peach and nectarine product group than in the second product group (apricot, cherry including sour cherry and plum). Nevertheless, the comparative advantage of the peach and nectarine product group vis-à-vis other product groups exhibited a decline over the period in question. Figure 3 presents the findings for the period between 2012 and 2023.

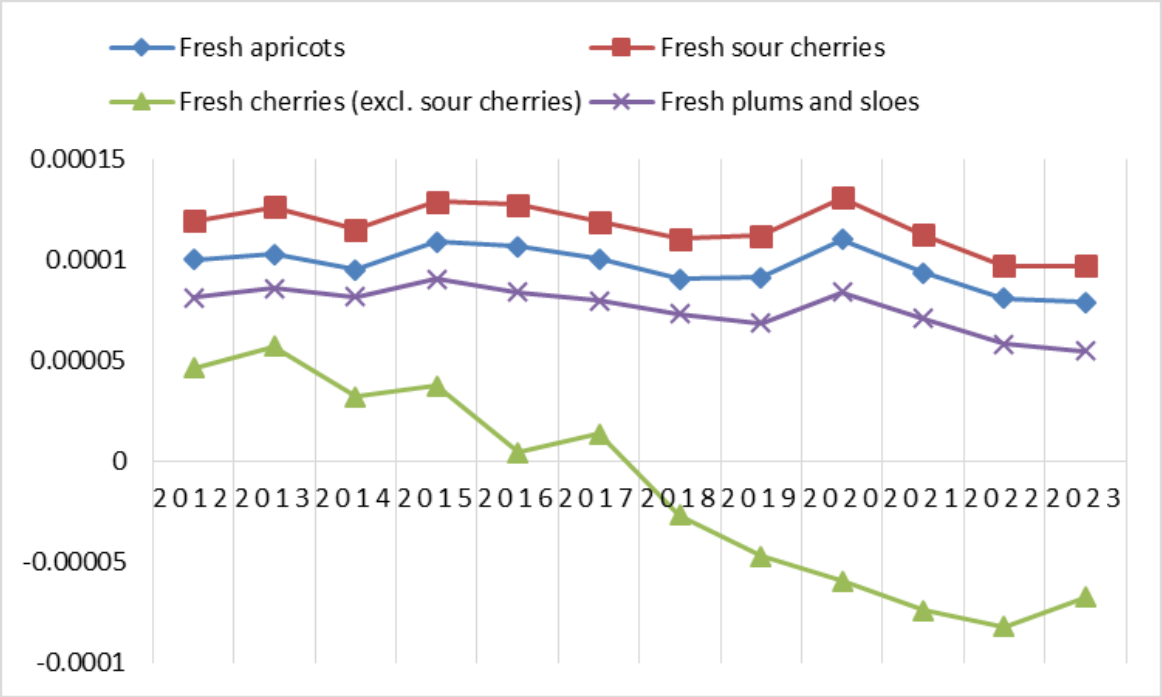

Figure 3. Türkiye's cross-product NRCA values (2012-2023)
Şekil 3. Türkiye'nin çapraz ürün grubu NRCA değerleri (2012-2023)
Source: Author's calculations

According to the cross-product group results in Figure 3, Türkiye's comparative advantage in peach and nectarine exports is higher than that of apricot, sour cherry and plum product groups in 2012-2023. On the other hand, in the period 2012-2017, the peach and nectarine product group was found to have a comparative advantage over the cherry product group. On the other hand, it was determined that the peach and nectarine product group had a comparative disadvantage against cherry in 2018-2023.

Based on the increase in comparative advantage in peach and nectarine, it appears that competitiveness has increased in stone fruit groups, consistent with Duru et al. (2022). However, despite Çelik et al. (2019) asserting that Türkiye's comparative advantage in cherry production has diminished over time, the current study has revealed that the comparative advantage of cherry over other stone fruits has, in fact, increased. The comparative advantage of cherry over peach and nectarine can be attributed to its higher export value and income per unit kilogram.

Despite the fact that a considerable proportion of sour cherry production is utilised as a raw material in the food industry, resulting in a reduction in exports, there has not been a notable decline in the comparative advantage of sour cherries. Given that the utilisation of sour cherries as a raw material in the food industry confers greater added value than additional exports, the absence of a substantial enhancement in the comparative advantage of this fruit is not regarded as unfavourable. Furthermore, this study diverges from the findings of Duru et al. (2022), which indicated that the comparative advantage of peach and nectarine exhibited a more pronounced increase than that of apricot and plum. Moreover, as previously indicated by Süygün (2021), the results of this study are in alignment with the conclusion that the competitiveness of fresh apricot is considerable.

The current study demonstrates that Türkiye's comparative advantage in the peach and nectarine product group is contingent upon an analysis of the leading peach and nectarine exporting countries. In addition to Türkiye, the remaining four countries in the top five are Spain, the USA, Chile, Italy and Greece. The results of the analysis conducted within this framework are presented in Figure 4.

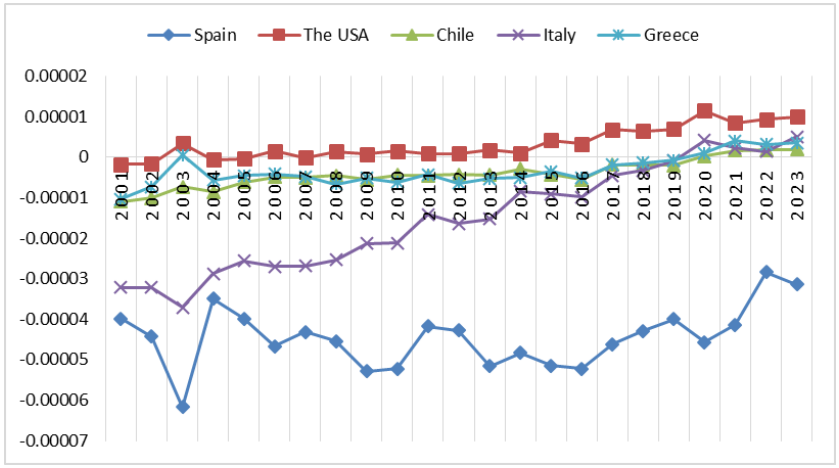

Figure 4. NRCA cross-country comparison values

Şekil 4. NRCA çapraz ülke karşılaştırması değerleri

Source: Author's calculations

Figure 4 illustrates that Türkiye has increased its competitive position in the global peach and nectarine market, as reflected in the rising exports of these commodities to other countries. In comparison to leading peach and nectarine exporters, including Spain, the USA, Chile, Italy and Greece, Türkiye has witnessed a positive trend, with its exports growing consistently over time. With the exception of 2001, 2002, 2004, 2005 and 2007, Türkiye enjoyed a comparative advantage in peaches and nectarines relative to the USA but was at a comparative disadvantage vis-à-vis Spain. Conversely, prior to 2019, Türkiye was at a comparative disadvantage in peaches and nectarines relative to Chile, Italy and Greece. From 2020 onwards, Türkiye has exhibited a comparative advantage in peaches and nectarines relative to Chile, Italy, and Greece. Furthermore, the NRCA values for Türkiye's cyclical comparative advantage are illustrated in Figure 5.

In contrast with the approach taken by Bayav and Çetinbaş (2021), a comparative ranking was conducted for the world's leading exporters of peaches and nectarines. In this context, Türkiye has become the second country with the highest comparative advantage in the world after Spain as of 2021. However, the difference between the comparative advantage of Türkiye and that of Chile, Greece and Italy remained limited. In particular, Greece and Italy stand out as more significant competitors, given that they produced and exported peaches and nectarines during similar periods to Türkiye.

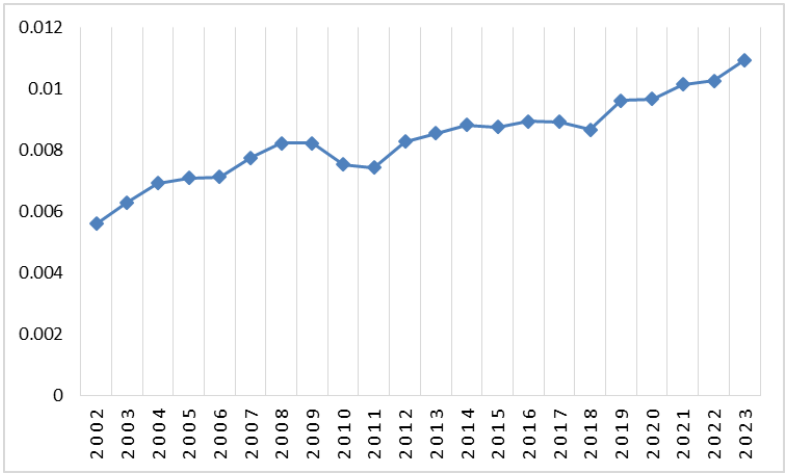

Figure 5. Periodic NRCA comparison values

Şekil 5. Dönemsel NRCA karşılaştırma değerleri

Source: Author's calculations

Figure 5 illustrates that Türkiye's exports in the peach and nectarine product group exhibit both positive and increasing periodic NRCA values. In this context, it can be seen that Türkiye has increased its comparative advantage in the peach and nectarine product group over the course of the period under review. It is noteworthy that in the years 2010, 2011 and 2018, the periodic NRCA values exhibited a decreasing rate of increase. In this context, it was observed that Türkiye maintained its comparative advantage in peach and nectarine exports by increasing them.
Türkiye has experienced significant growth in peach and nectarine production, resulting in a competitive position in the global market. In comparison to other stone fruits, Türkiye possesses a comparative advantage in the apricot, cherry, and plum product categories, while exhibiting a comparative disadvantage in the cherry product category. Additionally, Türkiye has consistently ranked second after Spain in global competitiveness since 2019. However, to ensure a robust competitive position, Türkiye must diversify its market. A notable aspect of Türkiye's trade dynamics is the disproportionate concentration of its peach and nectarine exports, which are primarily directed towards Russia, accounting for approximately 71% of total exports. The imposition of import restrictions by Russia could have a deleterious effect on Türkiye's competitiveness in the global market. To mitigate these risks and ensure sustainable competitiveness, it is recommended that Türkiye focus on diversifying its export markets, targeting countries with higher net import values such as Canada, Mexico, Switzerland, the UK, Belgium, Germany, and Saudi Arabia. Simultaneously, to increase competitiveness, Türkiye should focus on improving production quality, harvesting at optimal ripeness, and developing efficient storage facilities. To facilitate the exportation of peaches and nectarines over a longer period, it is imperative to cultivate early-maturing varieties in warmer regions and late-maturing species in cooler areas. Furthermore, it is crucial to expand the nectarine selection, particularly for consumer groups with a low propensity to consume peaches due to their hairy structure. Consequently, it is recommended that Türkiye prioritize the production, distribution, and promotion of peach and nectarine varieties that align with consumer preferences, rather than engaging in price competition.

STATEMENT OF CONFLICT OF INTEREST

The author(s) declare no conflict of interest for this study.

AUTHOR'S CONTRIBUTIONS

All processes were carried out by the corresponding author.

STATEMENT OF ETHICS CONSENT

Ethical approval is not applicable because this article does not contain any studies with human or animal subjects.

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