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Increasing Tariffs on Almond and Walnut Exports to Turkey

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Abstract

The retaliatory tariffs against U.S. agricultural exports emerging in mid-2018 have been removed by all countries except for China and Turkey. The tariffs put in place by Turkey largely targeted U.S. tree-nut exports. As of November 2023, Turkey increased the most-favored-nation duty, the tariff that all World Trade Organization members pay, on almonds and walnuts, which further increased the tariff on U.S. exports. This report used a computable general equilibrium model to estimate the impacts to U.S. tree-nut exports from the higher tariff. In addition to the most-favored-nation tariff, the authors examined nontariff barriers that push the effective tariff rate for almonds and walnuts sometimes beyond Turkey's bound rate (the highest tariff allowed by the World Trade Organization) for imports of tree nuts. The report uses that information to consider a scenario that applied the bound rate for almonds and walnuts to Turkey's imports. Results indicate that Turkey decreases imports of tree nuts from the United States (and the world) if most-favored-nation tariffs are increased. The effects are magnified if the bound rates are considered. Results from the model indicate that increasing most-favored-nation rates would lead to decreases in U.S. exports to Turkey of almonds by 19.4 percent and walnuts by 26.6 percent.

Keywords: nuts, computable general equilibrium, exports, tariffs, retaliatory tariffs

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Introduction

Tariffs are a tax that governments impose on imports for a variety of reasons, including to raise revenue and to protect domestic industries. Global tariffs have decreased since 1994 and the start of the World Trade Organization (WTO) due to commitments made to lower trade barriers and an increase in free trade agreements. The average tariff decreased from 8.6 percent (trade-weighted) in 1994 to 2.6 percent in 2017 (World Bank, 2022). However, agricultural products tended to have a higher tariff than manufactured products (Beckman & Arita, 2017). Non-Tariff Barriers (NTBs) have emerged as the major friction to global trade (Sanjuan-Lopez et al., 2021), including for agriculture. NTBs are defined as policy measures (other than tariffs) that can potentially have an economic effect on international trade in goods, changing quantities traded or prices, or both (Beckman et al., 2024). Schwarzenberg (2023) noted that the increased use of NTBs could be because of lower tariffs and the need to protect domestic producers. Farris et al. (2024) and Arita et al. (2017) noted that NTBs might be used as a safety measure for imported products (especially agricultural products), hence NTBs are often in the form of sanitary and phytosanitary (SPS) measures or technical barriers to trade (TBT). NTBs are also often much larger in ad-valorem equivalent terms (ad-valorem equivalent means expressing a tax/tariff in terms of percent of the import value (Beckman, 2021)) than tariffs (Beckman et al., 2024).

Despite a general decrease in tariffs over time, some countries have increased tariffs. One example is the retaliatory tariffs placed on the United States in 2018 (see the box, "Retaliatory Tariffs"). Most countries, except for China and Turkey, have removed or suspended these tariffs. The tariffs Turkey initiated largely targeted U.S. tree-nut exports, and recently, Turkey increased the most-favored-nation (MFN) duty—the tariff that all WTO members pay, on almonds and walnuts. Although all countries exporting to Turkey would face a higher tariff, the addition of the retaliatory tariff puts the United States at a competitive disadvantage. This research does not consider that some countries (e.g., the United Arab Emirates) might have a trade agreement that features a lower tariff.

Retaliatory Tariffs

In 2018, the United States applied tariffs of 25 percent on steel imports and 10 percent on aluminum imports from most foreign suppliers (with exceptions for certain countries) based on a Trade Expansion Act of 1962 (Section 232) investigation initiated by the Department of Commerce to address national security concerns. Additionally, after a positive determination of a Section 301 investigation by the U.S. Trade Representative to address concerns with intellectual property and technology transfer, the United States applied 25 percent tariffs on a broad range of goods from China. In response to these trade actions, Canada, China, the European Union, India, Mexico, and Turkey responded with retaliatory tariffs affecting some U.S. agricultural exports to those countries. Grant et al. (2021) estimated that as a result of the retaliatory tariffs, U.S. agricultural producers experienced direct annualized losses of between $13.5 billion and $18.7 billion. Morgan et al. (2022) estimated that from mid-2018 through the end of 2019, U.S. agricultural losses from retaliatory tariffs totaled $27.2 billion, with State-level losses concentrated in the Midwest. China, India, and Turkey all targeted U.S. tree-nut exports with retaliatory tariffs, with direct U.S. agricultural losses through the end of 2019 estimated to be about $219 million (Morgan et al., 2022). Morgan et al. (2022) provided information on estimates from other economic studies, assessing the totality of retaliatory tariffs, including those that use a similar model to the one the authors used. Carter and Steinbach (2022) estimated that foregone almond exports to Turkey totaled 49.3 million pounds.

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Of the countries that imposed retaliatory tariffs affecting U.S. agricultural products, as of November 2023, only tariffs from Turkey and China remained in effect. The retaliatory tariff Turkey applied on tree nuts is 10 percent (although the tariff was 20 percent from August 2018 through May 2019). Canada and Mexico initiated retaliatory tariffs in July 2018, but these tariffs were removed in May 2019 with the signing of the United States-Mexico-Canada Agreement (USMCA). The European Union implemented retaliatory tariffs in June 2018; however, these tariffs were suspended in October 2021 after the United States and the European Union reached an arrangement to address global steel and aluminum excess capacity. India initiated retaliatory tariffs in June 2019 and lifted the tariffs in September 2023 in conjunction with the G20 New Delhi Leaders' Summit. Note that the United States still has the Section 232 tariffs in place against Turkey. Tariffs under Section 232 are still being applied in China, and some tariffs under Section 301 tariffs are being exempted.

To examine how the increased MFN rate could affect U.S. tree-nut exports, report authors used a computable general equilibrium (CGE) model to estimate the economic impacts. They also examined Non-Tariff-Barriers (NTBs) that further increase the effective tariff rate for imports. The authors estimated that since January 2021, Turkey's effective rate for U.S. almond and walnut imports has exceeded the MFN rate and sometimes exceeded Turkey's bound rate for imports of tree nuts (the bound rate is the tariff rate that countries commit not to exceed in the WTO). The authors also considered a scenario in which tariffs reached the bound rate (the maximum tariff they can apply to WTO nations) for almonds and walnuts.

Historical Changes From Retaliatory Tariffs

To examine how retaliatory tariffs have affected U.S. exports to Turkey for tree nuts, the authors examined historical changes from retaliatory tariffs.[1] This provides some insights into possible changes from the tariff scenarios. For each product, the values (table 1) or quantities (table 2) of U.S. tree-nut exports to Turkey were aggregated annually and compared with baseline 2017 levels, the last full calendar year before the imposition of retaliatory tariffs. While comparisons of trade flows before and after different events can provide insight into shifting trends and associations, it is important to note that these types of comparisons do not necessarily establish a causal link between any given event (e.g. retaliatory tariffs or changes in MFN rates[2]) and the change in trade flows (as could be examined in an econometric model, for example).

Almonds can be sold either in shell or shelled; they are aggregated in the CGE model.[3] Shelled almonds were the second highest valued U.S. tree-nut export to Turkey, totaling $82.3 million in 2017 (TDM, 2023) (table 1). After the retaliatory tariffs, U.S. shelled almond exports to Turkey declined 4 percent to $78.7 million in 2018 before recovering to above 2017 levels in each of the following years. In 2017, U.S. in-shell almond exports to Turkey were $64.3 million before declining to $20.0 million in 2018 and remaining below 2017 levels through 2022. Similar trends were found for the quantity of U.S. shelled and in-shell almond exports (table 2). These divergent trends highlight how retaliatory tariffs can have different effects on products in the

[1] Tariffs raise the price of imported items, which could lead to a supply-side impact whereby producers in the importing country increase production of domestic goods (Beckman, 2021).

[2] Other events may have also affected agricultural trade during this period, including, for example, the Coronavirus (COVID-19) pandemic (Arita et al., 2022).

[3] Turkey imports both shelled and in-shell tree nuts. In 2022, 78 percent of Turkey's almond imports, 38 percent of pistachio imports, and 7 percent of walnut imports were shelled.

same commodity category. Since 2017, Turkey's market share of U.S. shelled almond exports has increased from 2.5 percent to 3.8 percent, while the market share for U.S. in-shell almonds has declined from 6.0 percent to 2.5 percent (table 3).

Table 1
Annual value of selected U.S. tree-nut exports to Turkey, 2017–22

Product	2017	2018		2019		2020		2021		2022	
	Value (million U.S. dollars)	Value (million U.S. dollars)	Percent change from 2017	Value (million U.S. dollars)	Percent change from 2017	Value (million U.S. dollars)	Percent change from 2017	Value (million U.S. dollars)	Percent change from 2017	Value (million U.S. dollars)	Percent change from 2017
Almonds, in shell	64.26	19.96	-69	48.95	-24	26.91	-58	35.56	-45	30.25	-53
Almonds, shelled	82.27	78.69	-4	97.05	18	110.86	35	97.06	18	126.94	54
Walnuts, in shell	115.46	107.69	-7	133.68	16	93.84	-19	91.50	-21	85.16	-26
Walnuts, shelled	9.73	2.18	-78	3.22	-67	4.41	-55	4.64	-52	7.61	-22
Pistachios, in shell	23.09	62.01	169	47.62	106	8.46	-63	13.99	-39	90.87	293
Pistachios, shelled	11.28	6.83	-39	7.79	-31	3.12	-72	14.80	31	56.22	398

Source: USDA, Economic Research Service using data from Trade Data Monitor (2023).

Table 2

Annual quantity of selected U.S. tree-nut exports to Turkey, 2017–22

Product	2017	2018		2019		2020		2021		2022	
	Quantity (kg millions)	Quantity (kg millions)	Percent change from 2017	Quantity (kg millions)	Percent change from 2017	Quantity (kg millions)	Percent change from 2017	Quantity (kg millions)	Percent change from 2017	Quantity (kg millions)	Percent change from 2017
Almonds, in shell	14.87	5.34	-64	13.50	-9	8.29	-44	10.46	-30	9.37	-37
Almonds, shelled	13.31	12.63	-5	15.72	18	21.33	60	20.45	54	26.26	97
Walnuts, in shell	33.12	36.83	11	45.30	37	33.18	0	32.28	-3	28.26	-15
Walnuts, shelled	2.40	0.57	-76	1.09	-55	0.95	-61	1.46	-39	2.63	9
Pistachios, in shell	3.56	9.57	169	6.95	95	1.38	-61	1.95	-45	13.80	287
Pistachios, shelled	1.56	0.84	-46	0.85	-45	0.65	-59	2.10	34	8.28	431

Source: USDA, Economic Research Service using data from Trade Data Monitor (2023).

Table 3
Turkey's share of U.S. tree-nut exports by value (percent)

Products	2017	2018	2019	2020	2021	2022
Almonds, in shell	5.95	2.01	4.7	2.54	3.21	2.51
Almonds, shelled	2.52	2.33	2.63	3.24	2.88	3.84
Walnuts, in shell	22.59	25.47	26.94	22.55	23.99	21.07
Walnuts, shelled	1.13	0.25	0.43	0.53	0.54	0.86
Pistachios, in shell	1.71	4.32	2.72	0.6	0.85	5.63
Pistachios, shelled	17.31	9.78	7.36	4.6	14.52	30.79

Source: USDA, Economic Research Service using data from Trade Data Monitor (2023).

For in-shell almonds, the United States accounts for more than 95 percent of Turkey's imports, with Australia and Iran representing smaller shares (figure 1). Since 2017, little variation existed in market shares for in-shell almonds. However, the U.S. share in Turkey's shelled almond imports has been more volatile, falling from a high of 80 percent in 2018 to 52 percent in 2019 before rising to 60 percent in 2022. Iran has remained the second largest exporter of shelled almonds to Turkey, except for low exports in 2018. (TDM, 2023). Since 2018, Australia and Spain have accounted for larger shares of the shelled market compared to before retaliatory tariffs were implemented.

Figure 1
Market shares for Turkey's major tree-nut imports, 2017–22

Note: Market shares are calculated using import quantity.

Source: USDA, Economic Research Service using data from Trade Data Monitor (2023).

U.S. walnut exports to Turkey are dominated by in-shell trade flows. For example, in 2022, the value of U.S. in-shell walnut exports to Turkey was $85.2 million compared with $7.6 million for shelled walnuts (table 1). In contrast to almonds, U.S. exports for both in-shell and shelled walnuts have declined in the wake of retaliatory tariffs with 2022 trade values below 2017 levels, 26 percent for in-shell and 22 percent for shelled walnuts.

The United States represents the largest share of Turkey's in-shell walnut imports, followed by Chile and China. The U.S. market share was 45 percent in 2017 before falling to 36 percent in 2019 and rising to more than 44 percent in 2020 through 2022. China's share of in-shell walnut exports to Turkey increased from 2 percent in 2017 to nearly 15 percent in 2022. For shelled walnuts, the United States exports a smaller share to Turkey. U.S. shelled walnuts were 11 percent of Turkey's imports in 2017 before declining to 2, 1, and 3 percent in 2018, 2019, and 2020, respectively. In 2021 and 2022, the U.S. market share in Turkey increased to 7 and 11 percent, respectively (TDM, 2023). Since 2017, China has also increased its share of shelled walnut exports to Turkey, accounting for 41 percent in 2022, up from 3 percent in 2017. The increase in China's share of exports occurred in tandem with declines in walnut shares from Ukraine.

U.S. annual pistachio trade[4] appears to have been more volatile compared to almonds and walnuts. From 2017 to 2018, U.S. in-shell pistachio exports to Turkey more than doubled in value from $23.1 million to $62 million (table 1). U.S. in-shell pistachio export values remained high in 2019 ($47.6 million) before decreasing to 8.5 million in 2020 and 14 million in 2021. In 2022, U.S. in-shell pistachio exports increased 293 percent above baseline levels, rising to $90.9 million. U.S. shelled pistachio exports to Turkey have usually been smaller in value compared with in-shell exports. U.S. shelled pistachio exports were $11.3 million in 2017 and declined in 2018–20, following retaliatory tariffs (table 1). In 2022, U.S. shelled pistachio exports to Turkey increased to $56 million, nearly four times the 2017 levels (TDM, 2023).

The U.S. share of Turkey's in-shell pistachio market increased from 39 percent in 2017 to more than 76 percent in both 2018 and 2019, before falling to about 23 percent in 2020 and 2021 (figure 1). However, in 2022, the U.S. market share of in-shell pistachios rebounded to 86 percent. Iran has remained the second largest pistachio exporter to Turkey. For shelled pistachios, the market is more competitive but still dominated by the United States and Iran. A similar rebound pattern for the U.S. share of Turkey's shelled pistachio imports is noted; the U.S. market share was above 60 percent in 2017 and 2018; it declined to 25 percent in 2020 and rebounded to 77 percent in 2022 (TDM, 2022).

Table 4 presents U.S. exports of almonds, walnuts, and pistachios for 2017 through 2022. Relative to 2017, the overall volume of U.S. tree-nut exports for these product lines declined by approximately 3.3 percent in 2018 before increasing above 2017 levels in 2019 through 2022. Table 5 presents Turkey's imports for the same commodities from 2017 through 2022. This is similar to the trend in which Turkey's imports declined in 2018 relative to 2017 before increasing in the following years. Together, these two tables may provide some intuition for the CGE model for how tree-nut exports and imports for the United States and Turkey may respond to the modeled tariff shocks.

[4] According to USDA, FAS (2022), imported pistachios are not sold on the domestic market but are instead brought into free trade zones for processing and re-export.

Table 4
United States tree-nut exports to world, 2017–22

Quantities (kg millions)										
Products	**2017**	**2018**		**2019**		**2020**		**2021**		**2022**	
	Quantity (kg millions)	**Quantity** (kg millions)	**Percent change from 2017**	**Quantity** (kg millions)	**Percent change from 2017**	**Quantity** (kg millions)	**Percent change from 2017**	**Quantity** (kg millions)	**Percent change from 2017**	**Quantity** (kg millions)	**Percent change from 2017**
Almonds, in shell	219.46	204.15	-6.98	214.55	-2.24	288.45	31.44	269.56	22.83	305.01	38.98
Almonds, shelled	548.80	537.87	-1.99	570.78	4.00	628.45	14.51	688.69	25.49	681.61	24.20
Walnuts, in shell	139.24	131.54	-5.53	157.08	12.81	138.45	-0.57	116.82	-16.11	112.74	-19.03
Walnuts, shelled	120.92	113.46	-6.17	121.71	0.65	129.60	7.17	147.68	22.12	154.25	27.56
Pistachios, in shell	184.70	185.25	0.30	219.39	18.78	170.09	-7.91	209.97	13.68	217.46	17.73
Pistachios, shelled	7.43	7.64	2.77	10.03	34.94	7.48	0.70	10.45	40.61	21.15	184.66
All	1220.56	1179.90	-3.33	1293.53	5.98	1362.53	11.63	1443.16	18.24	1492.23	22.26

kg = kilograms.

Source: USDA, Economic Research Service using data from Trade Data Monitor (2024).

Table 5
Turkey tree-nut imports from world, 2017–22

Quantities (kg millions)											
Products	**2017**	**2018**		**2019**		**2020**		**2021**		**2022**	
	Quantity (kg millions)	**Quantity** (kg millions)	**Percent change from 2017**	**Quantity** (kg millions)	**Percent change from 2017**	**Quantity** (kg millions)	**Percent change from 2017**	**Quantity** (kg millions)	**Percent change from 2017**	**Quantity** (kg millions)	**Percent change from 2017**
Almonds, in shell	15.55	7.35	-52.74	10.90	-29.90	10.89	-29.94	7.47	-51.99	10.27	-33.93
Almonds, shelled	14.63	15.75	7.62	22.38	52.97	28.22	92.87	27.23	86.11	37.11	153.59
Walnuts, in shell	70.92	61.19	-13.72	88.05	24.15	63.49	-10.48	78.09	10.11	69.78	-1.61
Walnuts, shelled	8.75	10.28	17.38	16.98	93.94	9.17	4.76	9.21	5.20	14.81	69.16
Pistachios, in shell	6.86	15.55	126.79	12.30	79.40	8.73	27.28	10.34	50.81	20.34	196.59
Pistachios, shelled	4.37	3.45	-21.01	3.06	-29.90	4.68	7.28	5.82	33.28	9.47	116.85
All	121.08	113.57	-6.20	153.68	26.92	125.19	3.39	138.16	14.10	161.78	33.61

kg = kilograms.

Source: USDA, Economic Research Service using data from Trade Data Monitor (2024).

Barriers to Trade With Turkey

Most-Favored-Nation (MFN) Rates

Turkey's MFN tariffs on tree nuts have varied over the last 6 years (table 6). From 2018 through 2021, U.S. walnut and almond exports to Turkey faced an MFN rate of 15 percent (USDA, FAS, 2018b). The retaliatory tariff was added to the MFN rate. After the imposition of the 10 percent retaliatory tariff, the total tariff rate for U.S. walnut and almond exports to Turkey increased to 25 percent. Although pistachios are generally not used for domestic consumption, the retaliatory tariff was also applied to that product. In 2022 and for most of 2023, the MFN tariff rate was reduced on almonds and walnuts, ranging from 2 to 4 percent. Beginning in November 2023, MFN rates for almonds and walnuts were raised to 2018–21 levels of 15 percent.

Table 6
Most-favored-nation (MFN) tariffs for almonds and walnuts in Turkey (percent)

Years	Almonds	Walnuts
2018–21	15	15
2022	4	4
2023 (January–October)	2	4
2023 (November–present)	15	15

Source: USDA, Economic Research Service based on data from USDA, Foreign Agricultural Service (2023a).

Non-Tariff Barriers (NTBs)

In addition to the most-favored-nation tariffs, Turkey has NTBs that raise the effective tariff. One NTB is an "oversight reference price" mechanism used to establish the customs value on which tariffs are based. If imports come in below the reference price level (table 7), tariffs are paid based on the reference price. If imports come in above the reference price level, tariffs are paid based on the actual import value. In effect, this mechanism sets a minimum tariff level for exports to Turkey.

Table 7
Reference 2022 price for almonds and walnuts, U.S. dollars per metric ton

Shelled almonds	6,900
In-shell almonds	4,400
Shelled walnuts	6,500
In-shell walnuts	3,500

Source: USDA, Economic Research Service based on data from USDA, Foreign Agricultural Service (2023a).

Another non-tariff barrier is Turkey's imposition of an "additional financial responsibility tax" (AFRT), which requires a set tax to be paid on imports of tree nuts, regardless of the actual import value or reference price value (table 8). This tax was introduced in 2022 and also increased recently in conjunction with the increase in MFN rates (table 6). For example, the AFRT for shelled almonds increased 15 percent to $124. This tax or its equivalent is in place for imports only (USDA, FAS, 2023a).

Table 8
Additional financial responsibility tax, per metric ton

	2022–October 2023	November 2023	U.S. dollar increase	Percent increase
Shelled almonds	818	942	124	15
In-shell almonds	452	580	128	28
Shelled walnuts	573	1,099	526	92
In-shell walnuts	307	406	99	32

Source: USDA, Economic Research Service based on data from USDA, Foreign Agricultural Service (2022, 2023a).

These NTBs effectively increased the total duties paid on imports of almonds and walnuts to levels well above the MFN and retaliatory rates.[5] Import prices for U.S. walnuts and almonds in Turkey have trended lower since 2013/14, resulting in the percentage of increased actual duties paid to rise considerably. Table 9 shows that on a U.S. dollars per pound basis, Turkish importers have had to effectively pay extra duties ranging from $0.07/pound in 2021 for in-shell almonds to $0.58/pound for shelled walnuts in 2023. On a percentage basis, based on the authors' calculations, the amount of average annual extra duties paid have ranged from an 18 percent higher effective duty for in-shell almonds in 2021 to a 341 percent higher effective duty for shelled walnuts in 2023 (table 10). By applying the oversight reference price and the additional financial responsibility taxes, Turkey appears to have exceeded the expected duties based on MFN and retaliatory tariffs and exceeded the bound rates at times (figures 2, 3).

Table 9
Average extra duties paid by year (U.S. dollars per pound)

	2021	2022	2023
Shelled almonds	0.16	0.45	0.54
In-shell almonds	0.07	0.26	0.29
Shelled walnuts	0.40	0.45	0.58
In-shell walnuts	0.16	0.21	0.30

Note: The duties are average import duties relative to the average import price for that year.

Source: USDA, Economic Research Service calculations using data from USDA, Foreign Agricultural Service (2018a, 2022, 2023a), World Trade Organization (2023a), and Trade Data Monitor import-unit values (2023).

[5] Turkey also maintains a Resource Utilization Support Fund mechanism that requires importers to show that imports have been paid in full at the time of importation or pay an additional 6 percent of the import cost into this fund. The stated purpose of this measure is to discourage payment defaults, but it is not a requirement for credit purchases of domestic products. This report does not consider this potential NTB.

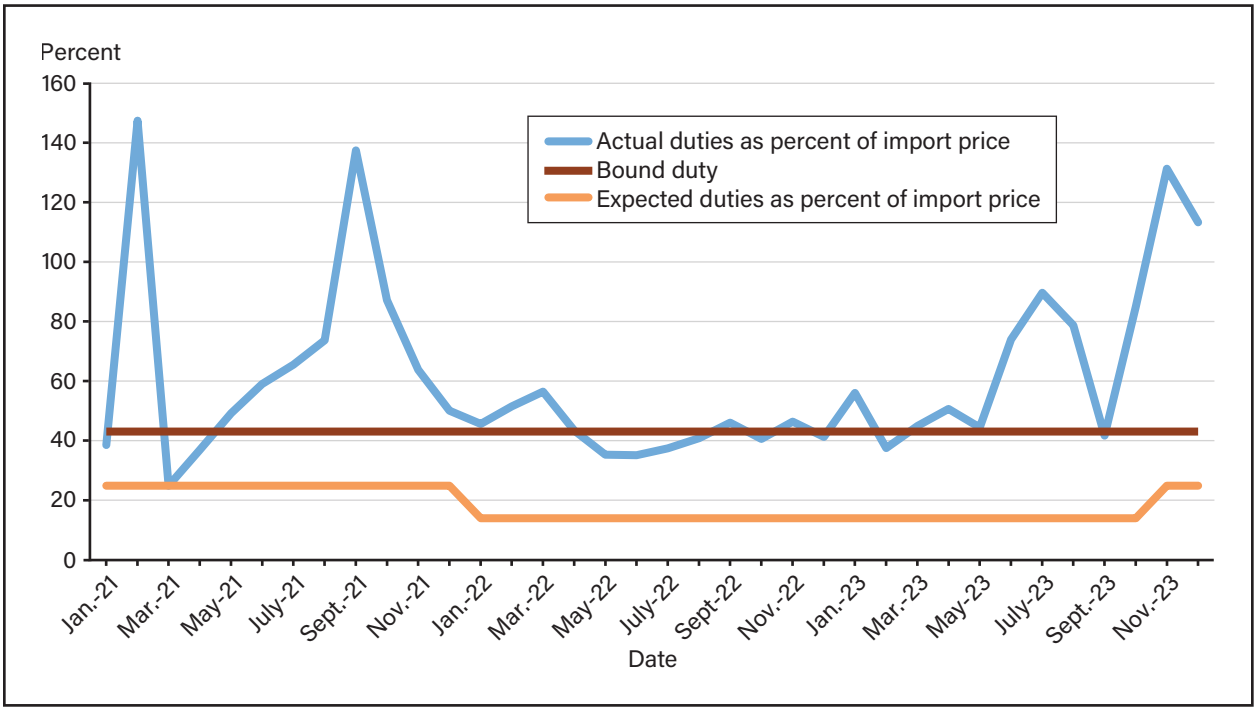
Table 10
Average extra duties paid by year (percent)

	2021	2022	2023
Shelled almonds	28	129	191
In-shell almonds	18	119	145
Shelled walnuts	179	210	341
In-shell walnuts	75	151	315

Note: The duties are average import duties (including taxes) relative to the average import price for that year.

Source: USDA, Economic Research Service calculations using data from USDA, Foreign Agricultural Service (2018a, 2022, 2023a), World Trade Organization (2023a), and Trade Data Monitor import-unit values (2023).

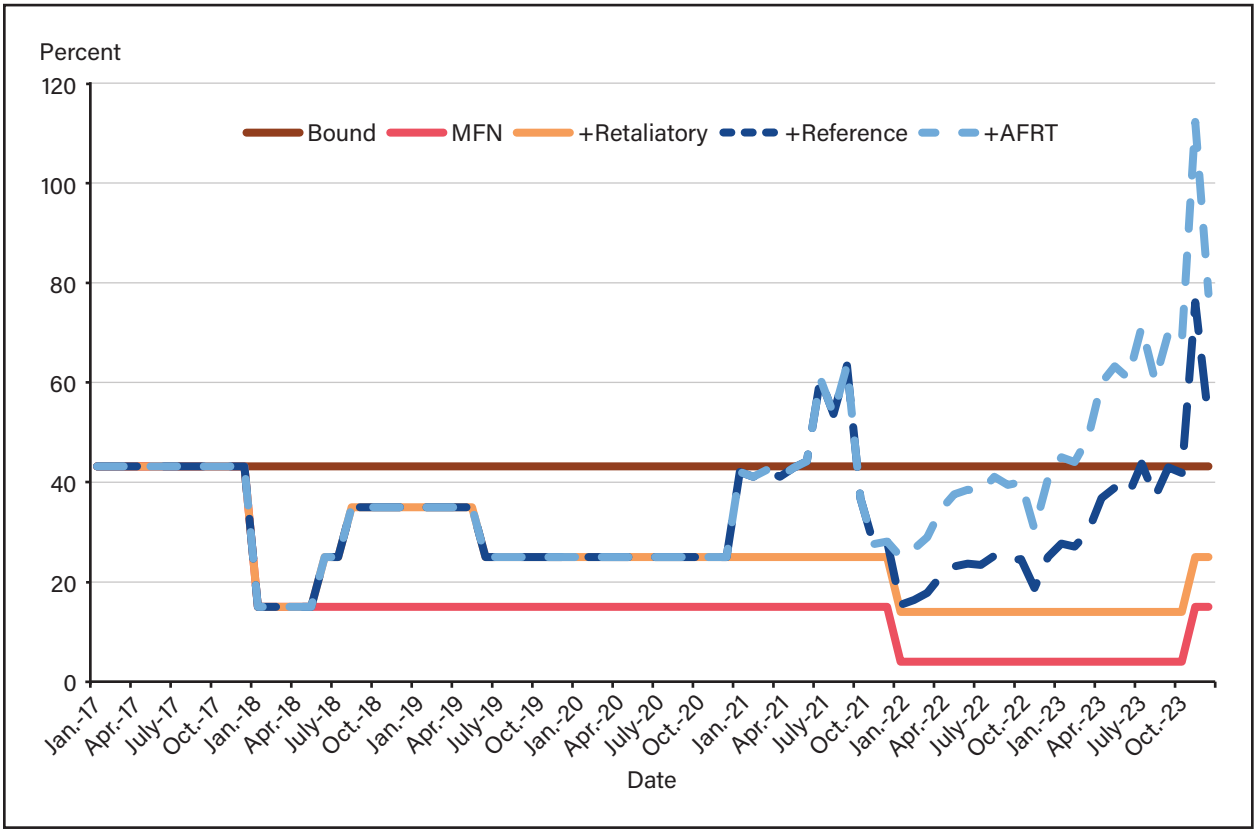
Figure 2
Turkey import duties of shelled walnuts, actual versus expected



Note: Actual duties include most-favored-nation (MFN) and retaliatory duties based on reference price system plus additional financial responsibility tax. Expected duties include only MFN and retaliatory duties based on stated import transaction value.

Source: USDA, Economic Research Service using data from USDA, Foreign Agricultural Service (2018a, 2022, 2023a), World Trade Organization (2023a), and Trade Data Monitor import-unit values (2023).

Figure 3
Cumulative effective duty paid from tariffs and non-tariff barriers on imports of in-shell walnuts to Turkey



MFN = most favored nation; AFRT = additional financial responsibility tax.

Source: USDA, Economic Research Service using data from USDA, Foreign Agricultural Service (2018a, 2022, 2023a), World Trade Organization (2023a), and Trade Data Monitor import-unit values (2023).

Economic Impacts of Tariffs

An economic model known as GTAP-HS[6] was used to analyze the impacts of the increase in tariffs (see the box, "Computable General Equilibrium (CGE) Model"). This CGE model accounts for inter-industry and global linkages to arrive at a new equilibrium, providing information on changes to production, prices, and trade. The model was used to analyze the European Union's Farm to Fork policy (Beckman et al., 2020; 2022b). Note that the model was originally based on 2014 data, but the authors updated tree-nut trade to 2022 using actual historical changes.[7]

[6] HS refers to Harmonized System, the system of classifying traded products at different aggregation levels.

[7] Updating the entire economic model, as was done in Beckman and Countryman (2021), would involve information on every commodity, including every fruit, vegetable, and nut.

Computable General Equilibrium (CGE) Model

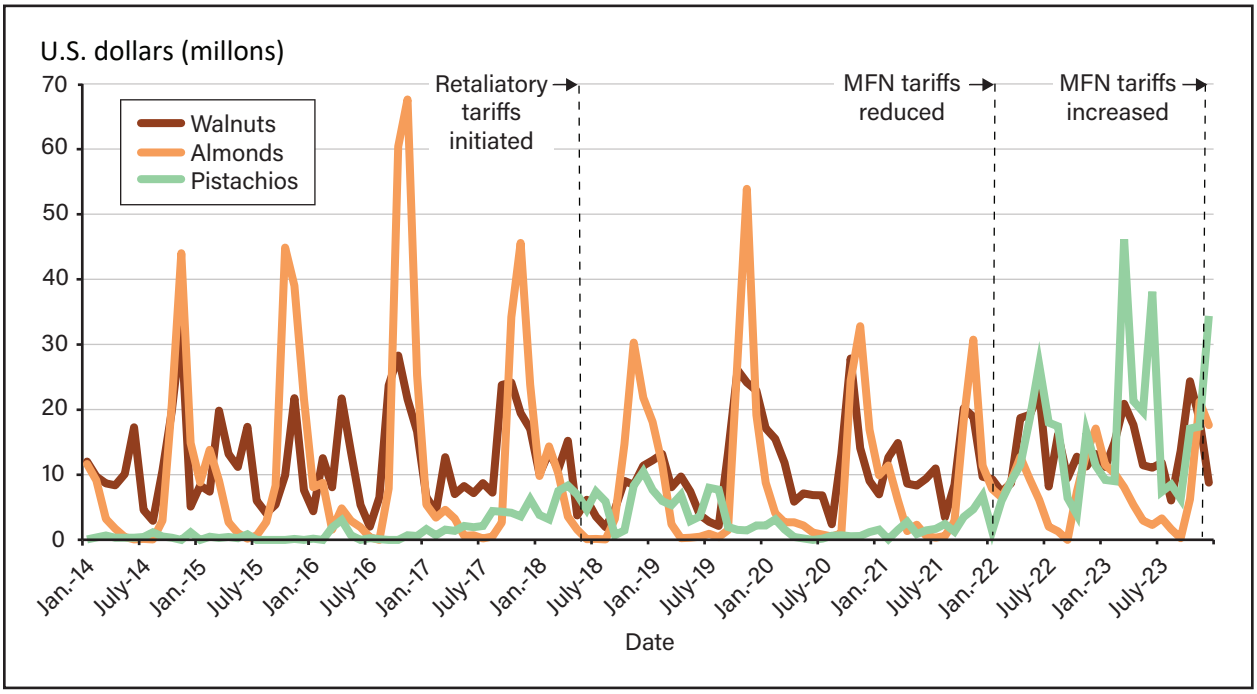
The authors utilized GTAP-HS, a computable general equilibrium (CGE) model for this report (Chepeliev et al., 2021). This model breaks the fruits, vegetables, and nuts sector in GTAP into 79 commodities. The nut commodities are almonds, brazil nuts, cashews, chestnuts, hazelnuts, pistachios, walnuts, and other nuts. Factors of production (labor and capital) are assumed to be somewhat mobile (i.e., a 3–5-year medium-run time horizon assumption for a CGE model), which follows the pattern of planting for tree nuts (i.e., tree nuts are perennial crops that take several years to bear fruit). Regions in the model are countries that imposed retaliatory tariffs on the United States in the past (Canada, China, European Union, India, Mexico, and Turkey); competitors in global markets (Argentina, Australia, Brazil, New Zealand, and Thailand); and the rest of the world (ROW). To analyze the impact from tariffs, three scenarios are specified:

The first is running the model with only the remaining retaliatory tariffs in place. This is the baseline and also includes a retaliatory tariff on pistachios. The authors then considered an increase in the MFN rate for almonds and walnuts in addition to the retaliatory tariffs. Given that imported pistachio tariff rates are already at the bound rate (USDA, FAS, 2022), we do not change their rate in the model. A final scenario considers tariffs reaching the bound rate for almonds and walnuts. This is in addition to the retaliatory tariffs.

The approach of stacking tariffs is similar to the price wedge approach to estimating non-tariff barriers, which uses the difference between domestic and imported prices to estimate the trade barrier (Beckman et al., 2022a). The model is static, providing a one-time change to a shock, thus any seasonality aspects of tree-nut trade were not incorporated.

The imposition of retaliatory tariffs and increases in MFN/bound tariffs should affect the United States because Turkey is one of the largest markets for U.S. almonds and other tree nuts. U.S. almond exports in 2022 were more than $4.6 billion, and the increase in Turkey's MFN rate threatened to reduce this amount. Retaliatory tariffs from all countries have been estimated to reduce California's almond exports by almost $755 million through the 2021/22 marketing year (Steinbach & Zhuang, 2023). In 2022, Turkey was the ninth largest export market for U.S. tree nuts (TDM, 2023). Figure 4 shows monthly U.S. exports to Turkey in value terms. Historically, U.S. tree-nut exports to Turkey have been dominated by almonds and walnuts; however, since 2022, pistachio exports have expanded rapidly, reaching and then exceeding exports of almonds and walnuts. U.S. almond and walnut exports to Turkey are seasonal, with peak exports generally occurring from October through December.

Figure 4
U.S. tree-nut export values to Turkey, 2014–23



Note: Most-favored-nation (MFN) tariffs affecting almonds and walnuts were also lowered in January 2018. Values include shelled and in-shell nuts.

Source: USDA, Economic Research Service using data from Trade Data Monitor (2023).

The results from the economic model are given in table 11. The retaliatory tariff results are the baseline as these results were already in place before the increase in the MFN rate. These results indicate that the retaliatory tariffs lead to higher prices for imports into Turkey, which causes less imports from the United States and less imports for Turkey in general. These changes lead to an increase in Turkey's production of almonds, pistachios, and walnuts. Turkey has been increasing tree-nut production due to domestic demand (USDA, FAS, 2023b).[8] The model indicates that U.S. production of almonds, walnuts, and pistachios decreases with the retaliatory tariffs in place. The United States is not able to utilize the lost tree-nut exports to Turkey, which also leads to a decrease in domestic prices in the United States. U.S. total exports of almonds were estimated to decrease the least, so almonds have the smallest production decline.

[8] USDA, Foreign Agricultural Service (2023b) notes that the number of bearing pistachio trees increased by 5 percent in the 2023/24 marketing year relative to 2022/23, and the number of nonbearing trees increased by 7 percent. These two numbers are larger than the 1.1–1.3 percent increase in Turkey's pistachio production in table 11.

Table 11
Economic model impacts (percent change)

		Retaliatory tariffs (10 percent)	+ MFN increase (10 percent + 15 percent)	+ Bound tariff (10 percent + 43.2 percent)
Turkey tree-nut import price	Almonds	8.7	21.6	49.4
	Pistachios	8.6	8.6	9.2
	Walnuts	5.4	16.0	43.4
Turkey total tree-nut imports	Almonds	-7.8	-17.6	-33.4
	Pistachios	-12.0	-12.0	-12.8
	Walnuts	-6.5	-17.8	-38.5
Turkey tree-nut imports from United States	Almonds	-10.1	-19.4	-34.6
	Pistachios	-12.6	-12.6	-11.7
	Walnuts	-17.7	-26.6	-43.6
Turkey tree-nut production	Almonds	3.0	7.4	15.8
	Pistachios	1.1	1.2	1.3
	Walnuts	1.5	4.1	9.6
U.S. total tree-nut exports	Almonds	0.000	-0.004	-0.011
	Pistachios	-0.015	-0.015	-0.015
	Walnuts	-0.024	-0.033	-0.049
U.S. domestic tree-nut price	Almonds	-0.5	-0.6	-0.7
	Pistachios	-1.1	-1.1	-1.1
	Walnuts	-0.9	-1.1	-1.6
U.S. tree-nut production	Almonds	-0.6	-0.7	-0.9
	Pistachios	-1.7	-1.7	-1.6
	Walnuts	-1.3	-1.8	-2.8

MFN = Most-favored-nation tariffs.

Note: Since the change in U.S. total tree-nut exports is small, three decimal digits are used. Changes in the MFN rate did not directly apply to pistachios.

Source: USDA, Economic Research Service analysis based on results from the GTAP-HS model.

The change in tariffs does not apply to pistachios, so there is little change in Turkey's imports from the United States (table 11). However, U.S. almond exports to Turkey decreased by 19.4 percent, and walnut exports decreased by 26.6 percent. Turkey's total imports of these tree nuts decreased as a result of the increase in import prices from the higher MFN tariff rates. The import price for Turkey increased by almost the same as the increase in the MFN rate (13 percent for almonds and 11 percent for walnuts). Turkey's production of almonds and walnuts both increased relative to the retaliatory tariff scenario, but there was only a small increase in pistachio production, as the MFN rate did not change for that product.

For the bound tariff scenario, the results largely followed those of the MFN increase; however, the results were magnified. Turkey's import price of almonds and walnuts increased by almost 50 percent, which is directly because the tariff rate increased by almost 50 percent. For the United States, there was a small decrease in domestic prices because of the decrease in U.S. total tree-nut exports and U.S. production. The increase in Turkey's tree-nut import price led to large decreases in imports for Turkey, total imports, and those from the United States. Notice that the decrease in total Turkish tree-nut imports was more than the decrease in imports from the United States. This indicated that the United States was still somewhat competitive despite the inclusion of the retaliatory tariffs. There was an increase in Turkey's domestic tree-nut production to try to replace the loss in imports. The model calculations by the authors indicate that U.S. tree-nut production decreased by more in the bound tariff scenario, a result of lower tree-nut exports to Turkey and less exports overall.

The authors also noted the similarities and differences between the results from the CGE model and the historical tree-nut trade data presented earlier. For example, results from the CGE model scenario on retaliatory tariffs show a decline in value for almonds, walnuts, and pistachios (table 11). The authors observed a similar pattern of results in 2018 trade data for almonds, shelled walnuts, and shelled pistachios (table 2). A significant variation is seen in the magnitude of the shocks in the historical trade data, which vary by product. For example, the CGE retaliatory tariff scenario estimates a 10.1-percent decrease in Turkey's imports of U.S. almonds, while historical trade data show declines in U.S. export quantity of in-shell almonds by 64 percent and shelled almonds by 5 percent in 2018 (table 2). There is further variation in magnitude over time when considering later trade years (table 2). Direct comparison of CGE results and historical trade patterns is difficult because historical change is affected by other factors, including supply and demand shocks, macroeconomic changes, etc. Additionally, the CGE model incorporates a static shock rather than the dynamic shocks observed over time in the trade data.

The results in levels were computed by applying the percentage change result from the GTAP-HS model to actual tree-nut trade and production numbers in 2022 (table 12). U.S. almond and walnut exports to Turkey decreased by $30.5 million and $24.7 million in the most-favored-nation increase scenario. The bound tariff scenario led to larger tree-nut export losses for the United States to Turkey: $54.4 million for almonds and $40.5 million for walnuts. In total, losses in U.S. tree-nut exports to Turkey for almonds, pistachios, and walnuts were $112 million in the bound tariff scenario, which is double the decrease with only retaliatory tariffs. If the bound tariff was in place in addition to the retaliatory tariff, the model estimated a decrease in U.S. tree-nut production of 80.07 million pounds of almonds, walnuts, and pistachios.

Table 12
Summary of impacts from the economic model

		Retaliatory tariffs	+ MFN increase	+ Bound tariff
U.S. tree-nut exports to Turkey (U.S. dollars)	Almonds	-15,936,699	-30,503,057	-54,426,967
	Pistachios	-18,530,935	-18,534,466	-17,252,894
	Walnuts	-16,453,850	-24,693,623	-40,467,960
U.S. tree-nut production (million pounds)	Almonds[1]	-14.77	-18.31	-24.09
	Pistachios[2]	-14.66	-14.66	-14.51
	Walnuts[2]	-19.55	-27.14	-41.47

MFN = Most-favored-nation tariffs.

[1] Represents a shelled basis. [2] Represents in-shell basis.

Source: USDA, Economic Research Service GTAP-HS model results were based on U.S. export data from Trade Data Monitor (2023) and production data from USDA, ERS (2023).

Conclusion

Turkey's retaliatory tariffs targeting U.S. agricultural exports were implemented in 2018 and imposed a 10 percent tariff on U.S. tree-nut exports. Turkey has also implemented several other trade policies that further place tree-nut exporters at a competitive disadvantage. These actions include increasing most-favored-nation (MFN) tariff rates on almonds and walnuts, maintaining a reference price system, and implementing an additional financial responsibility tax. These tariffs and non-tariff barriers (NTBs) have, when implemented together, sometimes exceeded the expected bound rate for certain U.S. tree-nut exports to Turkey.

To examine how tariffs affect U.S. tree-nut exports, the report authors use a global economic model to estimate the impacts from the increase in the MFN rate for almonds and walnuts. Results from the model indicate that increasing MFN rates decreases U.S. exports to Turkey of almonds by 19.4 percent and walnuts by 26.6 percent. The increase in tariffs does not apply to pistachios, so there is little change in Turkey's pistachio imports from the United States. Turkey's total imports of these tree nuts decreases, a result of the increase in import prices from the higher MFN tariff rates. U.S. production of almonds and walnuts is estimated to decrease if MFN rates increase. This finding is because Turkey is importing less tree nuts, and the United States is not able to find other countries to import the almonds and walnuts previously destined for Turkey. For the bound tariff scenario, the results largely follow those of the MFN increase; however, the results were magnified. Note that results indicate that the United States has a small overall decrease in total tree-nut exports, while Turkey has large decreases in imports. Thus, it seems that increasing tariff rates impact domestic markets (Turkey) more than those of exporters.

References

Arita, S., Grant, J., Sydow, S., & Beckman, J. (2022). Has global agricultural trade been resilient under Coronavirus (COVID-19)? Findings from an econometric assessment of 2020. *Food Policy,* 107, 102204.

Arita, S., Beckman, J., & Mitchell, L. (2017). Reducing transatlantic barriers on U.S.-EU agri-food trade: What are the possible gains? *Food Policy*, *68*, 233–247.

Beckman, J. (2021). *Reforming market access in agricultural trade: Tariff removal and the trade facilitation agreement* (Report No. ERR-280). U.S. Department of Agriculture, Economic Research Service.

Beckman, J., & Arita, S. (2017). Modeling the interplay between sanitary and phytosanitary measures and tariff-rate quotas under partial trade liberalization. *American Journal of Agricultural Economics, 99*(4), 1078–1095.

Beckman, J., & Countryman, A. (2021). The importance of agriculture in the economy: Impacts from COVID-19. *American Journal of Agricultural Economics, 103*(5), 1595–1611.

Beckman, J., Gale, F., Morgan, S., Sabala, E., Ufer, D., Valcu-Lisman, A., Zeng, W., & Arita, S. (2022a). *China's import potential for beef, corn, pork, and wheat* (Report No. ERR-310). U.S. Department of Agriculture, Economic Research Service.

Beckman, J., Ivanic, M., Jelliffe, J., & Arita, S. (2022b). Adopt or not adopt? Mirror clauses and the European green deal. *Applied Economic Perspectives and Policy, 44*(4), 2014–2033.

Beckman, J., Ivanic, M., Jelliffe, J., Baquedano, F., & Scott, S. (2020). *Economic and food security impacts of agricultural input reduction under the European Union green deal's farm to fork and biodiversity strategies* (Report No. EB-30). U.S. Department of Agriculture, Economic Research Service.

Beckman, J., Johnson, M., & Ivanic, M. (2024). NTM reductions increases intra-Africa trade. *Agricultural Economics*, 55(2), 200–222.

Carter, C., & Steinbach, S. (2022). *California almond industry harmed by international trade issues.* ARE Update Volume 26(1), Giannini Foundation of Agricultural Economics, University of California.

Chepeliev, M., Golub, A., Hertel, T., Saeed, W., & Beckman, J. (2021). Disaggregating the vegetables, fruits, and nuts sector to the tariff line in the GTAP-HS framework. *Journal of Global Economic Analysis, 6*(1).

Farris, J., Morgan, S., & Beckman, J. (2024). *Evaluating the effects of non-tariff measures on poultry trade* (Report No. ERR-332). U.S. Department of Agriculture, Economic Research Service.

Grant, J. H., Arita, S., Emlinger, C., Johansson, R., & Xie, C. (2021). Agricultural exports and retaliatory trade actions: An empirical assessment of the 2018/2019 trade conflict. *Applied Economic Perspectives and Policy,* 22.

Morgan, S., Arita, S., Beckman, J., Ahsan, S., Russell, D., Jarrell, P., & Kenner, B. (2022). *The economic impacts of retaliatory tariffs on U.S. agriculture* (Report No. ERR-304). U.S. Department of Agriculture, Economic Research Service.

Sanjuan-Lopez, A., Gracia de Rentería, P., Ferrer Pérez, H., Philippidis, G., & Ferrari, E. (2021). *Non-tariff measures (NTMs) and intra-African trade* (JRC Technical Report 125378). European Commission.

Schwarzenberg, A. (2023). *Non-tariff measures (NTMs): An overview*. In Focus: Congressional Research Service.

Steinbach, S., & Zhuang, X. (2023). Retaliatory tariffs and container shipping disruptions cause considerable trade damages to California's almond industry. *Choices*, 38 (Quarter 2).

Trade Data Monitor (TDM), Limited. (2023). [Database] (accessed on November 7, 2023).

Trade Data Monitor (TDM), Limited. (2024). [Database] (accessed on February 15, 2024).

USDA, Economic Research Service. (2023). *Fruit and tree nuts yearbook tables*.

USDA, Foreign Agricultural Service. (2018a). *Turkey introduces new additional levy on U.S. products* (GAIN Report No. TR8018).

USDA, Foreign Agricultural Service. (2018b). *Turkey announces second round of additional levies on U.S. products* (GAIN Report No. TR8024).

USDA, Foreign Agricultural Service. (2019). T*urkey reduces the additional levies on U.S. products* (GAIN Report No. TR9012).

USDA, Foreign Agricultural Service. (2022). *Tree nuts annual* (GAIN Report No. TU2022-0041).

USDA, Foreign Agricultural Service. (2023a). *Corrected customs duty increase on almonds and walnuts* (GAIN Report No. TU2023-0038).

USDA, Foreign Agricultural Service. (2023b). *Tree nuts annual* (GAIN Report No. TU2023-0030).

USDA, Foreign Agricultural Service. (2024). *Tree nuts: World markets and trade*.

World Bank. (2022). *Tariff rate, applied, weighted mean, all products (percent)*. [Database].

World Trade Organization (WTO). (2023a). *Tariff download facility*. [Database].

World Trade Organization (WTO). (2023b). *Trade cost index*. [Database].