



October 2023

SUGAR PROGRAM

Alternative Methods for Implementing Import Restrictions Could Increase Effectiveness

Accessible Version

Why GAO Did This Study

The U.S. is among the world's largest sugar producers and consumers. The Agriculture and Food Act of 1981 contained provisions to support the price of U.S. sugar and, according to USDA, established the current structure of the U.S. sugar program. The program was reauthorized most recently in 2018.

GAO was asked to review the effects of the U.S. sugar program. This report examines (1) the benefits of the U.S. sugar program and groups likely to benefit, (2) the costs of the U.S. sugar program and groups likely to bear the costs, (3) how agreements with Mexico on sugar affect imports and the overall U.S. economy, and (4) how other trade agreements affect the U.S. sugar program, and how they are implemented.

GAO reviewed agency documents and data and interviewed federal officials, academics, and industry stakeholders including groups representing sugar producers and sugar using industries. GAO also conducted a literature review on the effects of the U.S. sugar program on the economy and trade.

What GAO Recommends

GAO is recommending that (1) USDA evaluate the effectiveness of the current method and alternative methods for allocating raw sugar tariff-rate quotas, (2) USTR evaluate alternative allocation methods for consistency with U.S. law and international obligations, and (3) USTR use the results of these evaluations to validate or change its quota allocation method. USDA and USTR concurred with our recommendations.

View [GAO-24-106144](#). For more information, contact Kimberly Gianopoulos at (202) 512-8612 or gianopoulosk@gao.gov.

SUGAR PROGRAM

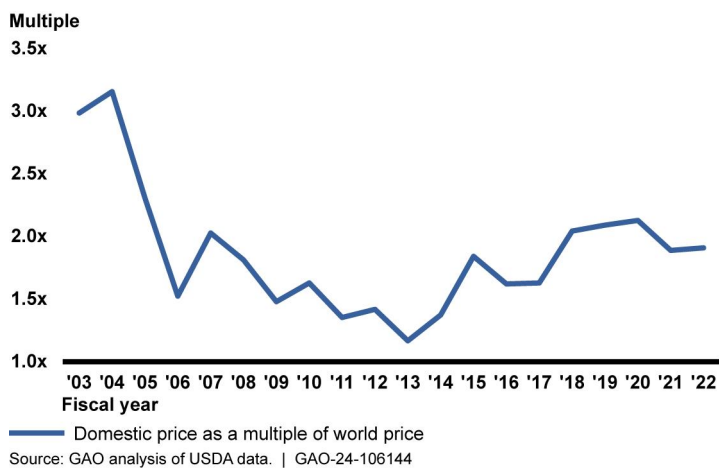
Alternative Methods for Implementing Import Restrictions Could Increase Effectiveness

What GAO Found

The U.S. sugar program, administered by the U.S. Department of Agriculture (USDA), provides substantial benefits to sugar producers. Because the program guarantees relatively high prices for domestic sugar, sugar farmers benefit significantly, and sugar farms are substantially more profitable per acre than other U.S. farms. Research GAO reviewed suggests the U.S. sugar program results in an increase in domestic sugar production and higher profits for farmers, totaling an estimated \$1.4 billion to \$2.7 billion in additional benefits annually.

The U.S. sugar program creates net costs to the economy, because higher sugar prices created by the program cost consumers more than producers benefit, according to research GAO reviewed. According to some studies, the program costs consumers an estimated \$2.5 billion to \$3.5 billion per year, yielding net costs to the economy of approximately \$1 billion per year. Other studies estimate that the program leads to declines in U.S. employment in industries that rely heavily on sugar, such as confectionery manufacturing. In 2022 U.S. consumers, including food manufacturers, paid twice the world price for sugar.

Difference between U.S. and World Raw Sugar Prices, 2003 to 2022



Accessible data table for Difference between U.S. and World Raw Sugar Prices, 2003 to 2022

| FY | Domestic price as a multiple of world price |
|------|---|
| 2003 | 2.98579 |
| 2004 | 3.156708 |
| 2005 | 2.307227 |
| 2006 | 1.523606 |
| 2007 | 2.027558 |

| FY | Domestic price as a multiple of world price |
|-----------|--|
| 2008 | 1.812973 |
| 2009 | 1.479745 |
| 2010 | 1.629023 |
| 2011 | 1.35341 |
| 2012 | 1.418223 |
| 2013 | 1.167153 |
| 2014 | 1.373585 |
| 2015 | 1.841534 |
| 2016 | 1.621308 |
| 2017 | 1.628961 |
| 2018 | 2.043257 |
| 2019 | 2.090762 |
| 2020 | 2.128151 |
| 2021 | 1.888917 |
| 2022 | 1.909274 |

Source: GAO analysis of USDA data. | GAO-24-106144

Nearly half of U.S. imports of sugar come from Mexico, and according to studies these imports have a significant effect on the U.S. market. Beginning in 2008, sugar imported from Mexico became duty-free and quota-free. In 2014, the U.S. and Mexico agreed to set a minimum price and quantity limits on Mexican imports. Subsequently, imports of Mexican sugar fell and prices rose, benefiting U.S. sugar producers but increasing the cost to consumers and the economy.

Almost half of U.S. sugar imports are subject to trade commitments made through the World Trade Organization (WTO) and free trade agreements. The U.S. Trade Representative (USTR) allocates WTO tariff rate quotas, with input from USDA, among sugar-importing countries using a method based on 40-year-old data. In practice, this has led to fewer sugar imports than planned and delays in obtaining sugar. USDA and USTR have not considered alternatives to their allocation method. Without considering new methods, USDA and USTR may be missing opportunities to make sugar allocations more effective and efficient.

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Abbreviations

| | |
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| BLS | Bureau of Labor Statistics |
| CBP | U.S. Customs and Border Protection |
| ERS | Economic Research Service |
| FAPRI | Food and Agriculture Policy Research Institute |
| FAS | Foreign Agricultural Service |
| FSA | Farm Service Agency |
| ICE | Intercontinental Exchange |
| NAFTA | North American Free Trade Agreement |
| NAICS | North American Industry Classification System |
| NASS | National Agricultural Statistics Service |
| USDA | U.S. Department of Agriculture |
| USITC | U.S. International Trade Commission |
| USTR | Office of the U.S. Trade Representative |
| USMCA | United States–Mexico–Canada Agreement |
| WTO | World Trade Organization |

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October 31, 2023

The Honorable Earl Blumenauer
Ranking Member
Subcommittee on Trade
Committee on Ways and Means
House of Representatives

The Honorable Ann McLane Kuster
House of Representatives

The U.S. is historically among the world’s largest sugar producers and consumers, and relies on imports to help meet consumer demand. The first U.S. tariff on sugar was imposed in the Tariff Act of 1789 at 1 cent a pound for brown sugar, 3 cents on loaf sugar, and 1.5 cents for all other sugar. The U.S. has since used a variety of approaches to manage the sugar market, including the current U.S. sugar program, which provides price support to domestic sugar producers. According to a 2017 study, sugar had by far the highest trade protection of any U.S. good, agricultural or non-agricultural.¹

The Agriculture and Food Act of 1981, as amended, contained provisions to support the price of U.S. sugar and, according to the U.S. Department of Agriculture (USDA), established the current structure of the national sugar program.² The program, administered by USDA, has been

¹U.S. International Trade Commission (USITC), *The Economic Effects of Significant U.S. Import Restraints: Ninth Update 2017*, USITC Publication 4726 (Washington, D.C.: September 2017).

²Agriculture and Food Act of 1981, Pub. L. No. 97-98, Tit. IX, 95 Stat. 1213, 1257 (1981), (codified at 7 U.S.C. § 1446). USDA defines the “U.S. sugar program” to mean the following programs: a nonrecourse, marketing assistance loan program (7 U.S.C. § 7272); an inventory disposition program to sell any Commodity Credit Corporation sugar inventory to bioenergy producers (7 U.S.C. § 8110); the collection of data from sugarcane processors, sugar beet processors, cane refiners, and importers of sugar, syrup, and molasses (7 U.S.C. § 7272); and flexible marketing allotments for sugar (7 U.S.C. §§1359aa et seq.). See also 7 C.F.R. part 1435.

amended and reauthorized several times, most recently in the 2018 farm bill.³

The sugar program supports U.S. sugar producers in several ways. First, the program controls the amount of sugar that can be sold on the U.S. market and thereby raises the domestic price of sugar. Second, the sugar program supports domestic sugar producers by offering them loans at a rate established by law; the sugar serves as collateral for these loans. The program allows processors to forfeit their sugar to the federal government instead of repaying their loans in certain situations. The loan rate acts as a price floor, incentivizing sugar producers not to sell sugar in the U.S. at a price below the loan rate.⁴ Third, to minimize forfeitures, the sugar program maintains domestic sugar prices with tariff-rate quotas that restrict the amount of sugar that can be imported into the U.S. at a low tariff rate.⁵

The U.S. also has trade agreements that affect the U.S. sugar market. Sugar imported from Mexico accounts for nearly half of all sugar imports to the U.S. and is subject to restrictions under agreements between the U.S. and Mexico. In addition, the U.S. Trade Representative (USTR), in coordination with USDA, administers tariff-rate quotas among countries to implement U.S. trade commitments under the World Trade Organization (WTO) Agreement and free trade agreements. Sugar is the largest imported agricultural commodity by volume subject to tariff-rate quotas, according to U.S. Customs and Border Protection (CBP).

Because the most recent authorization of the sugar program will end on September 30, 2024, Congress is considering reauthorization of the U.S. sugar program, during a time of consumer concern about food affordability and inflation. U.S. consumers recently saw the largest

³Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 1301, 132 Stat. 4490, 4511 (2018), (codified at 7 U.S.C. § 7272). The authorization is in effect for sugar beets and sugarcane through the 2023 crop year which runs through September 30, 2024.

⁴The loan rate is the price per pound that producers will be repaid for forfeited sugar, which effectively creates a floor for domestic sugar prices.

⁵ The term “sugar” refers to a number of different products, including raw and refined sugar products, derived from sugarcane and sugar beets. For more information about how sugar is defined for purposes of the sugar program, see 7 C.F.R. § 1435.2. For information about different categories of sugar imports subject to duties under trade agreements, see Chapter 17 of the U.S. Harmonized Tariff System, which includes descriptions of categories of sugar products, including raw and refined sugar, as well as the duties that apply.

percentage increase in food prices since the 1980s, according to the Bureau of Labor Statistics.⁶ Increases in food prices can pose a particular hardship for low-income households, whose food expenditures comprise an average of 30 percent of their total income, according to USDA.

You asked us to review the effects of the U.S. sugar program, particularly on consumers. This report examines (1) benefits of the U.S. sugar program and which groups are likely to benefit, (2) costs of the U.S. sugar program and which groups are likely to bear the costs, (3) how agreements with Mexico on sugar affect imports and the overall U.S. economy, and (4) how other trade agreements affect the U.S. sugar program, and how they are implemented.

To determine the benefits and costs of the U.S. sugar program and characteristics of producers, users, and consumers, we collected data on sugar farmers from USDA's Census of Agriculture and from the USDA Farm Services Agency. We assessed the reliability of these data by interviewing USDA officials responsible for these datasets, reviewing data handbooks and documentation, and conducting electronic testing of the data. We determined these data are sufficiently reliable for our purposes of estimating the number and size of sugar farms in the U.S. and comparing the profits of sugar farms to non-sugar farms. We also analyzed data from the Bureau of Labor Statistics and the Census Bureau to study U.S. sugar-using companies. We assessed the reliability of these data by reviewing data documentation and handbooks, and determined these data are sufficiently reliable for our purposes of assessing costs and employment trends in food manufacturing.

We also conducted a literature review of relevant studies on the effects of the U.S. sugar program. We found five studies published since the year 2000 that met our criteria for relevancy and methodological rigor, including whether the study modeled and quantified the effect of the U.S. sugar program on the U.S. economy. These studies model the effect of the program on U.S. employment, producer surplus, consumer surplus, or total welfare, which we refer to as "benefits" (when positive) or "costs"

⁶GAO, Food Prices: Information on Trends, Factors, and Federal Roles, [GAO-23-105846](#) (Washington, D.C.: Mar. 28, 2023).

(when negative) throughout this report.⁷ Because the studies we found focused on economic or financial costs and benefits of the program, we focused our analysis on these costs and benefits.⁸

To examine the extent to which U.S. sugar producers are competitive on the world market, we analyzed production cost data from GlobalData (formerly LMC International). GlobalData's Agri-business division specializes in global agricultural commodity and agribusiness sectors.⁹ We reviewed research on the effects of the sugar program and trade agreements on trade. We interviewed selected academic and knowledgeable industry stakeholders about the effects of the U.S. sugar program and potential reforms to the program. We selected academics who had authored relevant studies. We selected industry groups that represented a range of views across different groups of sugar producers and users.

To examine how agreements with Mexico on sugar affect imports and the overall U.S. economy, we conducted a literature review. We reviewed selected studies published since 2000 that met our criteria for relevancy and methodological rigor, including whether the study modeled and quantified the effect of the U.S. sugar program and trade agreements on trade. Using data from USDA and the Census Bureau, we also assessed changes before and after sugar gained duty-free and quota-free treatment under NAFTA in 2008 and the 2014 agreements with Mexico, which restricted Mexico's sugar exports into the U.S. To assess the reliability of the USDA and Census data, we performed electronic checks, consulted USDA officials on the accuracy and completeness of the data, and

⁷Producer surplus is the difference between the amount a producer is paid for a unit of a good and the minimum amount the producer would accept to supply that unit. It is measured by the area between the price and the supply curve for that unit. Consumer surplus is the difference between what a consumer pays for a unit of a good and the maximum amount the consumer would be willing to pay for that unit, holding income and the prices of other goods constant. It is measured by the area between the price paid and the demand curve for that unit.

⁸We calculate results based on a change from an economy without the sugar program to an economy with the sugar program. Therefore, some results vary from those reported in papers that describe the percentage change from an economy with the sugar program to an economy without the sugar program.

⁹The data consist of a production cost index by country and a ranking of the selected countries based on these indices rather than actual costs. We assessed the reasonableness of the methodology used to estimate production costs and determined that the methodology was reasonable. However, due to the proprietary nature of the model we were not able to assess the details of the company's methodology.

compared the data to published figures when possible. We determined that these data were reliable for the purposes of examining changes over time.

To examine how other trade agreements affect the U.S. sugar program and how they are implemented, we reviewed and analyzed laws and regulations, trade agreements and related documentation, and relevant federal register notices. We determined that the WTO agreement and several free trade agreements were pertinent to the U.S. sugar program. We also interviewed USDA, USTR, Commerce, CBP and U.S. International Trade Commission officials to identify the roles and responsibilities of each agency in implementing the U.S. sugar program, tariff-rate quotas, trade agreements, and the suspension agreements with Mexico.

We obtained and analyzed USDA data on sugar imports under different trade programs, and calculated usage rates by country and year for allocated tariff-rate quotas. We analyzed these data for consistency and consulted USDA officials on the accuracy and completeness of the data. In instances where we identified potential discrepancies in the data, we contacted relevant agency officials and obtained information to resolve the inconsistencies. We determined that the data we used were sufficiently reliable for our purposes of analyzing U.S. sugar imports and tariff-rate quota fill rates. See appendix I for more information about our objectives, scope, and methodology.

We conducted this performance audit from July 2022 to October 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

U.S. Sugar Production

Sugar is produced by extracting and processing the sucrose from sugarcane and sugar beet plants (see figure 1). The sugarcane plant is a tall perennial grass grown in tropical and semitropical climates. Sugarcane typically is milled into raw sugar and then is sent to a refinery,

which further processes it into refined sugar for consumption. The sugar beet is an annual crop grown in temperate climates. Beet sugar is transformed directly into refined sugar by beet processors. Once harvested, both sugarcane and sugar beet plants must be processed before their sucrose deteriorates.

Figure 1: Photos of Sugarcane and Sugar Beets

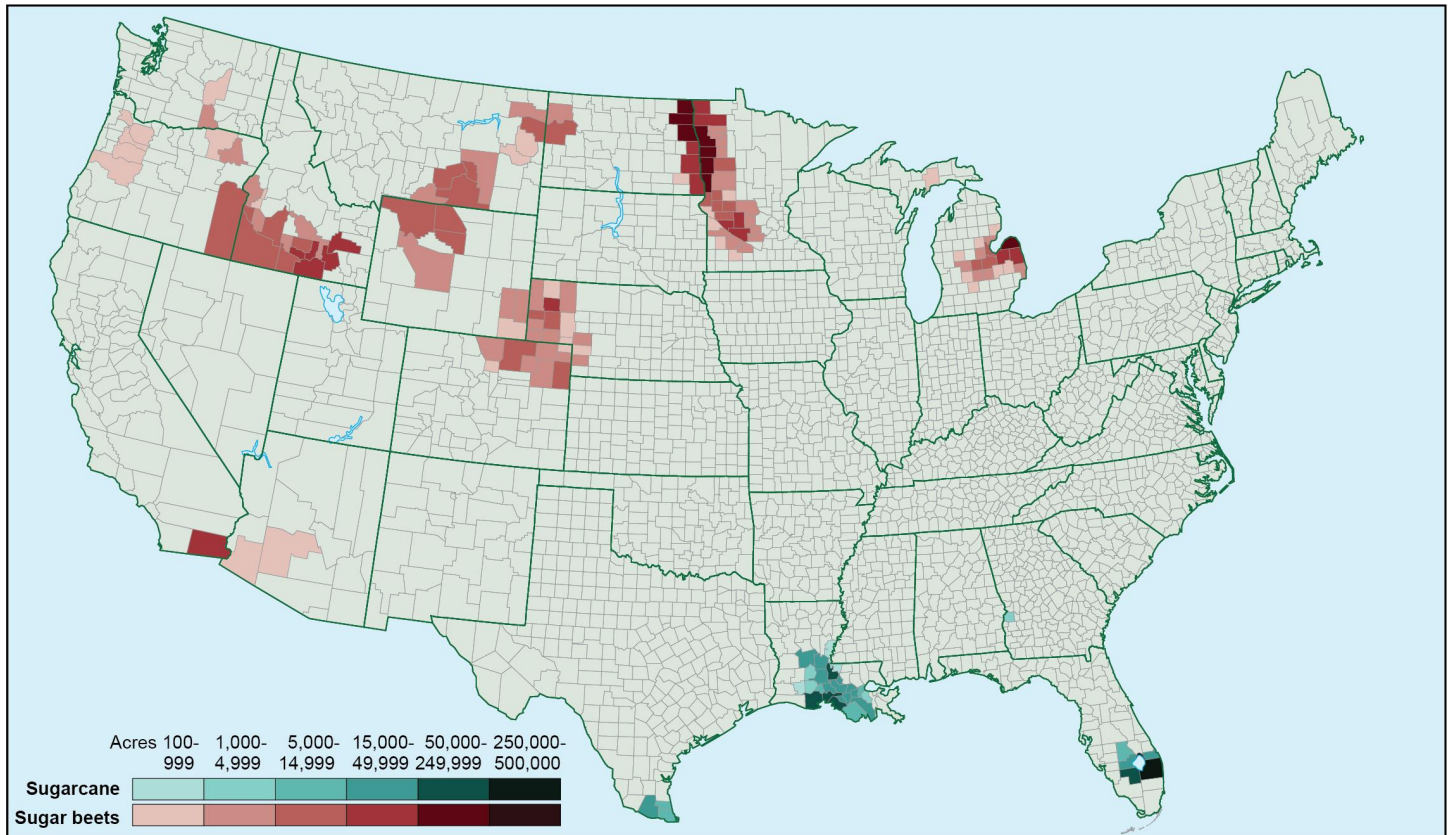


Source: USDA Agricultural Research Service (Photo). | GAO-23-106144

The U.S. produces both sugarcane and sugar beets, unlike most other sugar-producing countries, according to USDA. Sugarcane and sugar beets account for about 45 percent and 55 percent, respectively, of domestic sugar production.

Sugarcane is primarily produced in Florida, Louisiana, and Texas. The largest U.S. region for sugar beet production is the Red River Valley of western Minnesota and eastern North Dakota. Sugar beets are also grown in states including Michigan, Colorado, Montana, Nebraska, Wyoming, California, Idaho, Oregon, and Washington. See figure 2 for a map of sugar acreage by crop at the county level.

Figure 2: Map of U.S. Sugar Farms, 2022



Source: GAO analysis of USDA Farm Services Agency Crop Acreage Report (data); Map (Map Resources). | GAO-24-106144

Accessible data table for Figure 2: Map of U.S. Sugar Farms, 2022

| State | County | Crop | Number of Acres | Color and Band |
|------------|------------|-------------|-----------------|----------------|
| Arizona | Maricopa | sugar beets | 592.89 | Red 1 |
| Arizona | Yuma | sugar beets | 343.42 | Red 1 |
| California | Imperial | sugar beets | 25392.35 | Red 4 |
| Colorado | Boulder | sugar beets | 811.515 | Red 1 |
| Colorado | Larimer | sugar beets | 3369.332 | Red 2 |
| Colorado | Logan | sugar beets | 4929.462 | Red 2 |
| Colorado | Morgan | sugar beets | 2570.91 | Red 2 |
| Colorado | Phillips | sugar beets | 1036.238 | Red 2 |
| Colorado | Sedgwick | sugar beets | 465.8316 | Red 1 |
| Colorado | Washington | sugar beets | 1060.93 | Red 2 |
| Colorado | Weld | sugar beets | 12091.57 | Red 3 |

Letter

| State | County | Crop | Number of Acres | Color and Band |
|------------------|------------------------|------------------|-----------------|----------------|
| Colorado | Yuma | sugar beets | 6527.958 | Red 3 |
| Florida | Glades | sugarcane | 35244.27 | Teal 4 |
| Florida | Hendry | sugarcane | 101400.3 | Teal 5 |
| Florida | Highlands | sugarcane | 7154.04 | Teal 3 |
| Florida | Martin | sugarcane | 19110.95 | Teal 4 |
| Florida | Palm Beach | sugarcane | 377288 | Teal 6 |
| Georgia | Stewart | sugarcane | 123 | Teal 1 |
| Idaho | Ada | sugar beets | 1924.3 | Red 2 |
| Idaho | Bingham | sugar beets | 31449.75 | Red 4 |
| Idaho | Blaine | sugar beets | 1733.64 | Red 2 |
| Idaho | Canyon | sugar beets | 10997.03 | Red 3 |
| Idaho | Cassia | sugar beets | 32496.41 | Red 4 |
| Idaho | Elmore | sugar beets | 5780.139 | Red 3 |
| Idaho | Gem | sugar beets | 587.5 | Red 1 |
| Idaho | Gooding | sugar beets | 3617.38 | Red 2 |
| Idaho | Jerome | sugar beets | 20508.06 | Red 4 |
| Idaho | Lincoln | sugar beets | 9894.02 | Red 3 |
| Idaho | Minidoka | sugar beets | 44340.87 | Red 4 |
| Idaho | Owyhee | sugar beets | 5017.765 | Red 3 |
| Idaho | Payette | sugar beets | 2282.09 | Red 2 |
| Idaho | Power | sugar beets | 19187.48 | Red 4 |
| Idaho | Twin Falls | sugar beets | 11730.45 | Red 3 |
| Idaho | Washington | sugar beets | 1604.05 | Red 2 |
| Louisiana | Acadia | sugarcane | 3508.9 | Teal 2 |
| Louisiana | Ascension | sugarcane | 16873.2 | Teal 4 |
| Louisiana | Assumption | sugarcane | 40637.63 | Teal 4 |
| Louisiana | Avoyelles | sugarcane | 24733.77 | Teal 4 |
| Louisiana | Concordia | sugarcane | 362.51 | Teal 1 |
| Louisiana | Evangeline | sugarcane | 1955.41 | Teal 2 |
| Louisiana | Iberia | sugarcane | 69121.88 | Teal 5 |
| Louisiana | Iberville | sugarcane | 42535.66 | Teal 4 |
| Louisiana | Jefferson Davis | sugarcane | 193.7 | Teal 1 |
| Louisiana | Lafayette | sugarcane | 14964.31 | Teal 3 |
| Louisiana | Lafourche | sugarcane | 26421.44 | Teal 4 |
| Louisiana | Pointe Coupee | sugarcane | 73195.5 | Teal 5 |
| Louisiana | Rapides | sugarcane | 18724.21 | Teal 4 |

Letter

| State | County | Crop | Number of Acres | Color and Band |
|-----------|----------------------|-------------|-----------------|----------------|
| Louisiana | St. Charles | sugarcane | 1764.192 | Teal 2 |
| Louisiana | St. James | sugarcane | 25590.6 | Teal 4 |
| Louisiana | St. John the Baptist | sugarcane | 8940.266 | Teal 3 |
| Louisiana | St. Landry | sugarcane | 33135.22 | Teal 4 |
| Louisiana | St. Martin | sugarcane | 39384.94 | Teal 4 |
| Louisiana | St. Mary | sugarcane | 58438.53 | Teal 5 |
| Louisiana | Terrebonne | sugarcane | 7769.416 | Teal 3 |
| Louisiana | Vermilion | sugarcane | 56004.89 | Teal 5 |
| Louisiana | West Baton Rouge | sugarcane | 16581.58 | Teal 4 |
| Louisiana | West Feliciana | sugarcane | 962.09 | Teal 1 |
| Michigan | Arenac | sugar beets | 4325.74 | Red 2 |
| Michigan | Bay | sugar beets | 13464.48 | Red 3 |
| Michigan | Clinton | sugar beets | 1062.348 | Red 2 |
| Michigan | Eaton | sugar beets | 140.92 | Red 1 |
| Michigan | Genesee | sugar beets | 125.94 | Red 1 |
| Michigan | Gladwin | sugar beets | 494.74 | Red 1 |
| Michigan | Gratiot | sugar beets | 8695.933 | Red 3 |
| Michigan | Huron | sugar beets | 54063.96 | Red 5 |
| Michigan | Ionia | sugar beets | 938.24 | Red 1 |
| Michigan | Iosco | sugar beets | 264.182 | Red 1 |
| Michigan | Lapeer | sugar beets | 664.29 | Red 1 |
| Michigan | Mecosta | sugar beets | 129.32 | Red 1 |
| Michigan | Midland | sugar beets | 3319.754 | Red 2 |
| Michigan | Montcalm | sugar beets | 1385.98 | Red 2 |
| Michigan | Saginaw | sugar beets | 14373.17 | Red 3 |
| Michigan | St. Clair | sugar beets | 2325.49 | Red 2 |
| Michigan | Sanilac | sugar beets | 31478.75 | Red 4 |
| Michigan | Schoolcraft | sugar beets | 157.76 | Red 1 |
| Michigan | Shiawassee | sugar beets | 2143.9 | Red 2 |
| Michigan | Tuscola | sugar beets | 23362.57 | Red 4 |
| Minnesota | Becker | sugar beets | 9416.4 | Red 3 |
| Minnesota | Big Stone | sugar beets | 468.87 | Red 1 |
| Minnesota | Brown | sugar beets | 1108.83 | Red 2 |
| Minnesota | Chippewa | sugar beets | 38379.34 | Red 4 |
| Minnesota | Clay | sugar beets | 55306.08 | Red 5 |

Letter

| State | County | Crop | Number of Acres | Color and Band |
|-----------|-----------------|-------------|-----------------|----------------|
| Minnesota | Cottonwood | sugar beets | 149.56 | Red 1 |
| Minnesota | Douglas | sugar beets | 895.122 | Red 1 |
| Minnesota | Grant | sugar beets | 13704.97 | Red 3 |
| Minnesota | Kandiyohi | sugar beets | 15025.61 | Red 4 |
| Minnesota | Kittson | sugar beets | 33840.1 | Red 4 |
| Minnesota | Lac qui Parle | sugar beets | 807.64 | Red 1 |
| Minnesota | Lyon | sugar beets | 719.3904 | Red 1 |
| Minnesota | McLeod | sugar beets | 3111.47 | Red 2 |
| Minnesota | Mahnomen | sugar beets | 4852.14 | Red 2 |
| Minnesota | Marshall | sugar beets | 49815.44 | Red 4 |
| Minnesota | Meeker | sugar beets | 4904.826 | Red 2 |
| Minnesota | Norman | sugar beets | 50384.15 | Red 5 |
| Minnesota | West Otter Tail | sugar beets | 4890.46 | Red 2 |
| Minnesota | Pennington | sugar beets | 1080.75 | Red 2 |
| Minnesota | East Polk | sugar beets | 1704.88 | Red 2 |
| Minnesota | West Polk | sugar beets | 117314.1 | Red 5 |
| Minnesota | Pope | sugar beets | 6205.017 | Red 3 |
| Minnesota | Red Lake | sugar beets | 2220.24 | Red 2 |
| Minnesota | Redwood | sugar beets | 4968.01 | Red 2 |
| Minnesota | Renville | sugar beets | 39580.77 | Red 4 |
| Minnesota | Sibley | sugar beets | 2399.052 | Red 2 |
| Minnesota | Stearns | sugar beets | 3510.957 | Red 2 |
| Minnesota | Stevens | sugar beets | 8704.404 | Red 3 |
| Minnesota | Swift | sugar beets | 14393.96 | Red 3 |
| Minnesota | Traverse | sugar beets | 7804.583 | Red 3 |
| Minnesota | Wilkin | sugar beets | 60115.13 | Red 5 |
| Minnesota | Yellow Medicine | sugar beets | 4278.14 | Red 2 |
| Montana | Big Horn | sugar beets | 10727.93 | Red 3 |
| Montana | Carbon | sugar beets | 3610.42 | Red 2 |
| Montana | Dawson | sugar beets | 460 | Red 1 |
| Montana | Prairie | sugar beets | 424.17 | Red 1 |
| Montana | Richland | sugar beets | 9422.628 | Red 3 |
| Montana | Roosevelt | sugar beets | 1813.03 | Red 2 |
| Montana | Rosebud | sugar beets | 2700.72 | Red 2 |
| Montana | Treasure | sugar beets | 5256.099 | Red 3 |
| Montana | Yellowstone | sugar beets | 6264.749 | Red 3 |

Letter

| State | County | Crop | Number of Acres | Color and Band |
|-----------------|-----------------------|-------------|-----------------|----------------|
| Nebraska | Banner | sugar beets | 1106.71 | Red 2 |
| Nebraska | Box Butte | sugar beets | 22476.76 | Red 4 |
| Nebraska | Chase | sugar beets | 1580.17 | Red 2 |
| Nebraska | Cheyenne | sugar beets | 2211.22 | Red 2 |
| Nebraska | Dawes, North Sioux | sugar beets | 263.754 | Red 1 |
| Nebraska | Deuel | sugar beets | 862.6143 | Red 1 |
| Nebraska | Garden | sugar beets | 313.01 | Red 1 |
| Nebraska | Keith | sugar beets | 1851.68 | Red 2 |
| Nebraska | Kimball | sugar beets | 3112.8 | Red 2 |
| Nebraska | Morrill | sugar beets | 6209.772 | Red 3 |
| Nebraska | Perkins | sugar beets | 693.9781 | Red 1 |
| Nebraska | Scotts Bluff | sugar beets | 10887.34 | Red 3 |
| Nebraska | Sheridan | sugar beets | 2175.31 | Red 2 |
| Nebraska | South Sioux | sugar beets | 1067.892 | Red 2 |
| North Dakota | Cass | sugar beets | 24550.92 | Red 4 |
| North Dakota | Grand Forks | sugar beets | 57087.87 | Red 5 |
| North Dakota | McKenzie | sugar beets | 7255.218 | Red 3 |
| North Dakota | Pembina | sugar beets | 93180.56 | Red 5 |
| North Dakota | Ransom | sugar beets | 118 | Red 1 |
| North Dakota | Richland | sugar beets | 34505.61 | Red 4 |
| North Dakota | Traill | sugar beets | 44820.6 | Red 4 |
| North Dakota | Walsh | sugar beets | 73954.36 | Red 5 |
| North Dakota | Williams | sugar beets | 1942.749 | Red 2 |
| Oregon | Clackamas | sugar beets | 132.4 | Red 1 |
| Oregon | Lane | sugar beets | 582.05 | Red 1 |
| Oregon | Linn | sugar beets | 141.68 | Red 1 |
| Oregon | Malheur | sugar beets | 11329.24 | Red 3 |
| Oregon | Marion | sugar beets | 556.65 | Red 1 |
| Oregon | Umatilla | sugar beets | 133.43 | Red 1 |
| Oregon | Union | sugar beets | 1661.76 | Red 2 |

| State | County | Crop | Number of Acres | Color and Band |
|--------------|----------------|------------------|-----------------|----------------|
| Oregon | Washington | sugar beets | 178.51 | Red 1 |
| Texas | Cameron | sugarcane | 13296.12 | Teal 3 |
| Texas | Hidalgo | sugarcane | 20587.05 | Teal 4 |
| Texas | Willacy | sugarcane | 5246.458 | Teal 3 |
| Washington | Benton | sugar beets | 2573.74 | Red 2 |
| Washington | Grant | sugar beets | 281.31 | Red 1 |
| Wyoming | Big Horn | sugar beets | 9544.59 | Red 3 |
| Wyoming | Fremont | sugar beets | 1724.57 | Red 2 |
| Wyoming | Goshen | sugar beets | 1589.39 | Red 2 |
| Wyoming | Laramie | sugar beets | 523.64 | Red 1 |
| Wyoming | Park | sugar beets | 8690.702 | Red 3 |
| Wyoming | Platte | sugar beets | 1625.57 | Red 2 |
| Wyoming | Washakie | sugar beets | 7549.11 | Red 3 |

Source: GAO analysis of USDA Farm Services Agency Crop Acreage Report. | GAO-24-106144

Notes: Counties with fewer than 100 acres of sugarcane or sugar beets are not included in this map. This map covers acres of sugarcane and sugar beets planted in crop year 2022, which runs from October 1, 2022 through September 30, 2023.

According to USDA, sales were almost \$1.5 billion for sugarcane and approximately \$1.8 billion for U.S. sugar beets in the 2021 crop year.¹⁰ Together, sugarcane and sugar beets account for less than 1 percent of the cash receipts received by U.S. farmers for all agricultural commodities.

U.S. Sugar Program

The current structure of the U.S. sugar program was established in the Agriculture and Food Act of 1981, according to USDA. The program has been reauthorized, with some modifications, in successive farm bills. The goal of the sugar program is to maintain an adequate supply of raw and refined sugar in the market while minimizing federal costs, according to USDA officials. The sugar program uses various tools to restrict the amount of sugar available to the U.S. market and support U.S. sugar prices, including federal sugar loans and import restrictions.

¹⁰Cash receipts are defined by USDA as the cash income the farm sector receives from commodity sales.

Sugar loans. USDA provides loans to domestic sugarcane and sugar beet processors at statutory loan-rate levels.¹¹ The average loan rates for fiscal years 2020 through 2024 are 19.75 cents per pound for raw sugar and 25.38 cents per pound for refined beet sugar. The loans are nonrecourse, which means U.S. processors can forfeit sugar pledged as collateral in lieu of cash repayment of the loan. Sugar processors have an incentive to forfeit on these loans if domestic sugar prices fall below a certain level. This creates a price floor for domestic sugar. The program is to be operated by USDA, to the maximum extent practicable, at no cost to the federal government by avoiding loan forfeitures—a requirement added in the 2002 farm bill.¹²

Import restrictions. The supply of sugar imports into the U.S. are subject to tariff-rate quotas, which set the quantity of sugar permitted to enter the country under a low tariff. Quantities in excess of the tariff-rate quota amount must enter at a higher rate of duty.¹³ Tariff-rate quotas on sugar apply to imports of raw cane sugar, refined sugar, sugar syrups, specialty sugars and sugar-containing products. These import restrictions help USDA maintain a domestic price of sugar above the USDA loan rate. After April 1st of each fiscal year, the Secretary of Agriculture may increase the tariff-rate quota for raw sugar, above the minimum level necessary to comply with obligations under international trade

¹¹U.S.C. § 7272. USDA makes loans to processors and not directly to producers because sugarcane and sugar beets are bulky and perishable, and therefore processed into sugar before they can be traded and stored. To qualify for loans, processors must agree to provide payments to producers that are proportional to the value of the loan received by the processor.

¹²Farm Security and Rural Investment Act of 2002, Pub. L. No. 107-171, § 1401, 116 Stat. 134, 185.

¹³The basic in-quota tariff is 1.4606 cents per kilogram (0.663 cents per pound) for raw sugar and 3.6606 cents per kilogram (1.660 cents per pound) for refined sugar. The out-of-quota tariff is 33.87 cents per kilogram (15.36 cents per pound) for raw sugar, and 35.74 cents per kilogram (16.21 cents per pound) for refined sugar. Tariff rates are adjusted based on the sugar's polarity, which refers to the amount of light that can be refracted through the sugar. Unrefined and darker sugars, such as sugars which contain molasses, have less polarity than refined sugars. The basic in-quota tariff rates are based on a polarity of 100 degrees.

agreements that have been approved by Congress, if certain criteria are met.¹⁴

Other components of the program include marketing allotments.¹⁵ Marketing allotments limit the amount of sugar sold in the U.S. for human consumption by domestic sugarcane and sugar beet processors. USDA establishes an overall allotment quantity of not less than 85 percent of estimated domestic consumption for the fiscal year. This overall allotment is divided as roughly 46 percent raw cane sugar and 54 percent refined beet sugar.

Trade Agreements

The amount of sugar imports reflects U.S. commitments made under various trade agreements, including multilateral and bilateral trade agreements, and other trade programs.

World Trade Organization (WTO). The U.S. negotiated sugar tariff-rate quotas, which may be referred to as World Trade Organization (WTO) tariff-rate quotas, as part of the Marrakesh Agreement Establishing the WTO.¹⁶ Under the agreement, the U.S. agreed to provide access to tariff-

¹⁴ 7 U.S.C. § 1359kk. In setting and adjusting the quota level, USDA compares year-end projections of the sugar stocks held by U.S. producers with projections of domestic sugar use (an indicator known as the stocks-to-use ratio). Adjustments made prior to April 1st must be consistent with flexible marketing allotment requirements in 7 U.S.C. § 1359cc(b)(2) and 7 U.S.C. § 1359ee(b). In case of an emergency shortfall of sugar prior to April 1, due to by a war, flood, hurricane, or other natural disaster, or other similar event as determined by the Secretary, USDA is directed to take action to increase the supply of sugar, including increasing the tariff-rate quota for raw sugar to accommodate reassignment to imports. However, an emergency shortfall has never been declared, according to USDA officials. Additional U.S. Note 5(a)(i) of Chapter 17 of the Harmonized Tariff Schedule of the U.S. authorizes the Secretary to set the minimum amounts of raw and refined sugar subject to in-quota tariff rates under the U.S.' WTO commitments. Additional U.S. Note 5(a)(ii) authorizes the Secretary to increase these limits to assure adequate supplies of sugar are available in the U.S. market.

¹⁵The Feedstock Flexibility Program is another component, which diverts sugar in excess of domestic food consumption requirements to ethanol production. Under the Feedstock Flexibility Program, if loan forfeitures are likely, USDA is required to purchase surplus sugar and sell it to bioenergy producers to reduce the surplus in the food use market and support higher sugar prices.

¹⁶The WTO was established on January 1, 1995, as a result of the *Marrakesh Agreement Establishing the World Trade Organization*, Apr. 15, 1994, 1867 U.N.T.S. 154. The WTO facilitates the implementation, administration, and operation of multiple agreements that govern trade among its member countries.

rate quotas for 1,117,195 metric tons raw value for raw sugar, and 22,000 metric tons raw value for refined sugar.

Suspension Agreements with Mexico. The U.S., like many of its trading partners, has enacted antidumping and countervailing duty laws to remedy the unfair trade practices of other countries and foreign companies that cause or threaten to cause material injury to domestic producers and workers.¹⁷ U.S. antidumping and countervailing duty laws authorize Commerce to impose antidumping duties on certain imports that are dumped (i.e., sold at less than fair value) and countervailing (offsetting) duties on certain imports subsidized by foreign governments.¹⁸ Commerce also has the authority to enter into an agreement to suspend an antidumping or countervailing duty investigation when the relevant parties reach an agreement and when certain criteria are met.¹⁹ Imports of sugar from Mexico into the U.S. are subject to terms of antidumping and countervailing duty suspension agreements, signed in 2014, that dictate minimum prices and limits on quantities of sugar that Mexico can export to the U.S.

Free Trade Agreements. Tariff-rate quotas for certain sugar and syrup goods and sugar-containing products are available to some countries under free trade agreements with the U.S., provided that the country has a trade surplus in these goods. These free trade agreements include an agreement with Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and the Dominican Republic, known as the Dominican Republic-Central America Free Trade Agreement, as well as agreements with Chile, Colombia, Morocco, Panama, and Peru. Under the U.S.-Mexico-Canada Agreement (USMCA), which replaced NAFTA, sugar

¹⁷The authority for the imposition of these duties is found in the Tariff Act of 1930 (June 17, 1930), c.497, Title VII, as amended. Antidumping duties are authorized by 19 U.S.C. § 1673 and countervailing duties are authorized by 19 U.S.C. § 1671.

¹⁸According to 19 C.F.R. § 351, “fair value” is a term used during an antidumping investigation and is an estimate of normal value. Normal value is the price of the good in the foreign producers’ home market or third-country market, as appropriate. In certain circumstances, normal value may be based on a constructed value representing the foreign companies’ cost of production, plus an amount for profit. Commerce calculates the prices of the imported goods in the U.S. and in foreign markets, making adjustments where appropriate, and determines that dumping is occurring if the price of the imported good in the U.S. (export price or constructed export price) is lower than its normal value.

¹⁹See 19 U.S.C. §§ 1671c and 1673c. According to Commerce, suspension agreements require ongoing monitoring by Commerce to ensure compliance and effectiveness.

from Mexico may enter the U.S. duty-free and quota-free.²⁰ However, antidumping and countervailing duty suspension agreements between the U.S. and Mexico dictate minimum prices and limits on quantities of sugar that Mexico can export to the U.S. The USMCA affords Canada a tariff-rate quota of 9,600 metric tons for refined beet sugar.²¹

Implementing Agencies

USDA administers the U.S. sugar program. Other federal entities also have roles related to implementation of the sugar program.

Figure 3: U.S. Sugar Program Implementing Agencies



Source: U.S. Department of Agriculture, U.S. Trade Representative, U.S. International Trade Commission, U.S. Department of Commerce, and U.S. Customs and Border Protection (Emblems). | GAO-23-106144

USDA administers the sugar program in cooperation with other agencies and offices. According to USDA officials, they monitor the domestic sugar market to assess whether supplies are adequate to fill projected U.S. demand for sugar. USDA develops and reviews a variety of market indicators and information, including the World Agricultural Supply and Demand Estimates of stocks, consumption, production, and imports, and other market indicators in evaluating whether supplies are adequate to satisfy projected U.S. demand.

One of these indicators is the stocks-to-use ratio. The size of the stocks-to-use ratio is important because a low stocks-to-use ratio is associated with a lower tariff-rate quota, tighter supplies, and higher prices; a high

²⁰U.S.-Mexico-Canada Agreement Implementation Act, Pub. L. No. 116-113, 134 Stat. 11 (2020).

²¹USMCA paragraph 14(c) of Chapter 2 (National Treatment and Market Access for Goods), also establishes what USTR refers to as a “bonus tariff-rate quota” for refined sugar from Canada.

stocks-to-use ratio is associated with a higher tariff-rate quota, larger supplies, and lower prices. USDA has generally considered an ending stocks-to-use ratio of between 13.5 percent and 15.5 percent to be desirable, according to USDA. However, the amount of sugar imports permitted under the suspension agreements with Mexico are calculated based on a 13.5 percent stocks-to-use ratio.

USTR develops and coordinates U.S. trade policy and oversees negotiations with other countries. USTR administers the tariff-rate quotas pursuant to the U.S.' WTO and free trade agreement commitments. USTR also allocates WTO tariff-rate quotas that result from an increase in the raw sugar quota, and may also reallocate unused tariff-rate quotas.

Commerce and U.S. International Trade Commission (USITC) share responsibility for conducting antidumping and countervailing duty investigations. In the initiation phase, Commerce examines a petition filed on behalf of a domestic industry alleging unfair trade practices by foreign entities or governments and determines whether to initiate an antidumping or countervailing duty investigation.²² If Commerce begins an investigation, both USITC and Commerce then conduct separate, concurrent investigations to make preliminary and final determinations. If the final determinations affirm that goods are being dumped or subsidized and that injury to a domestic industry has occurred, then Commerce issues an order for CBP to collect offsetting duties equal to the dumping margin or subsidy rate determined by Commerce in its investigation.

Commerce also has the authority to enter into an agreement to suspend an antidumping or countervailing duty investigation when the relevant parties reach an agreement and certain criteria are met. Commerce has responsibility for ongoing monitoring of the suspension agreements to ensure compliance. If requested by an interested party, USITC will assess whether suspension agreements reached by Commerce will remedy the injury domestic producers have experienced because of unfairly traded imports. As GAO recently reported, current antidumping and countervailing duty laws contain no provision for USITC to consider

²²Commerce is also authorized by statute to self-initiate investigations. 19 U.S.C. §§ 1671a(a), 1673a(a)(1).

potential negative economic effects on consumers when determining injury to domestic producers, according to USITC officials.²³

CBP facilitates trade coming into the U.S. and enforces U.S. customs and trade laws. When sugar arrives at U.S. ports, CBP implements the sugar quotas. CBP ensures that goods are properly classified and collects duties, as appropriate. For example, CBP conducts testing on samples of imported sugar to ensure that it is correctly classified as either raw or refined sugar.

Benefits of the U.S. Sugar Program and Groups Likely Benefitting

What are the benefits associated with the U.S. sugar program?

The U.S. sugar program incentivizes domestic sugar production and helps U.S. sugar producers, which include farmers and refiners, to compete in the U.S. market with foreign sugar producers.

Increased profits for U.S. sugar farmers

The U.S. sugar program results in higher domestic sugar prices, which generally leads to overall higher profits for U.S. sugar farmers. According to studies that modeled the effects of the U.S. sugar program, the program results in an estimated \$1.4 billion to \$2.7 billion in additional financial benefits annually for sugar producers.²⁴ According to USDA Crop Acreage Report data, there were approximately 14,000 sugar farms in the

²³GAO, Antidumping and Countervailing Duties: Process Design Helps Ensure Proceedings Are Based on Accurate and Complete Information, [GAO-23-105794](#) (Washington, D.C.: Dec. 12, 2022).

²⁴See GAO (2000), Koo (2002), and Lewer and Parrish (2020). These studies span two decades, and aspects of the U.S. sugar market and trade policy have changed over this time period. However, the studies use similar methodologies, and results depend largely on assumptions about the difference between the U.S. and world sugar price, and how sensitive producers and consumers are to these prices. According to our analysis of USDA Sugar and Sweetener Yearbook table data, the inflation-adjusted difference between U.S. and world refined sugar prices was 18 to 25 cents per pound in 2000, and 28 to 36 cents per pound in 2022. See Appendix II for more information on how we used these studies.

U.S. in 2022.²⁵ This is an average estimated benefit of approximately \$100,000 to \$190,000 annually per sugar farm in 2022, although these benefits will vary substantially by farm size.²⁶

Sugar farms are substantially more profitable than non-sugar farms. According to USDA Census of Agriculture data, farms that grew sugarcane in 2017 earned an average of 24.3 percent higher net income per acre, and farms that grew sugar beets earned an average of 54.2 percent higher net income per acre, than the average non-sugar farm in the U.S.²⁷ Sugar farms also tend to have more acreage than other farms in the U.S. Because of this, net income on farms that grow sugarcane was 8.3 times higher than the average non-sugar farm in the U.S., and net income on farms that grow sugar beets was 7.2 times higher than the average non-sugar farm in the U.S., according to 2017 Census of Agriculture data.

Sugar farm profits may have changed since the most recent Census of Agriculture survey results from 2017.²⁸ According to USDA farm income and wealth statistics, total U.S. farm production expenses rose by 26.0 percent from 2017 to 2022. However, sugarcane prices rose by 44 percent and sugar beet prices rose by 48 percent during this period, so sugar farm profits may have increased since 2017.

²⁵According to USDA officials, the USDA Crop Acreage Report defines “farms” differently than in other datasets such as the Census of Agriculture. For the Crop Acreage Report, each operating arrangement is counted separately. For example, if a farmer rents land from three different landlords on shares, each of those arrangements would be counted as an individual farm, whereas the Census of Agriculture would count that as one farm because the same producer operates all that land.

²⁶This calculation assumes that all benefits from the U.S. sugar program that accrue to sugar processors are passed on to sugar farmers. At least 11 of the 13 sugar processors that received marketing allocations from USDA in fiscal year 2022 were either co-operatives or privately owned by families or companies that also own sugar farms, according to our analysis. We assessed sugar processor ownership by reviewing fiscal year 2022 USDA sugar marketing allocation announcements, USDA Rural Development data on sugar co-operatives, and sugar processor websites.

²⁷GAO has not determined what share of the higher net income is directly attributable to the sugar program.

²⁸The USDA Census of Agriculture is conducted every five years. According to USDA, Census of Agriculture data for 2022 will be released in spring or summer 2024.

Increased overall domestic sugar crop production and employment in sugar farming

The U.S. sugar program contributes to higher prices for domestic sugar, which incentivizes U.S. production. Most studies we found that modeled the impacts of the sugar program estimated that the program largely results in a net increase in domestic sugar crop production, with a 1 to 13 percent increase in sugarcane production and near 0 to 19 percent increase in sugar beet production.²⁹

The increase in domestic sugar crop production most likely leads to increased employment in some parts of the sugar industry. According to the latest available USDA Census of Agriculture data, sugar farms employed nearly 34,000 thousand full or part-time hired laborers at some point in 2017. The USITC estimated that the program results in 14 percent higher employment in sugarcane farming, and 0.4 percent lower employment in sugar beet farming, with a total effect of a 4 percent increase in sugar farming employment.³⁰ Studies that model the effect of the program on sugar refining employment have mixed results, with some studies suggesting the program leads to fewer sugar refining jobs, and other studies which suggest the program creates sugar refining jobs.³¹

Protection from foreign subsidies

U.S. sugar industry representatives stated that the sugar program is important for supporting domestic sugar production and prices in the face of rising input costs and the widespread use of foreign subsidies. According to the OECD's Agricultural Policy Monitoring and Evaluation

²⁹The U.S. sugar program also sets marketing allotments that limit the amount of sugar that domestic sugar processors can sell in the U.S. All the studies in our review that model the impact of the program on production found that the program results in increased sugarcane farming, and all but one found that the program increases sugar beet farming. See Table 6 of Appendix II for more information.

³⁰See USITC (2017). According to USITC, the estimate that the U.S. sugar program reduces sugar beet farming production and employment is dependent on market conditions that existed in 2015 and suggests that beet sugar production in 2015 was competitive with imported sugar. According to the USITC, a change in market conditions, in particular whether international sugar prices are below U.S. loan rates, could alter these results. Other studies found that the program results in slight increases in sugar beet production.

³¹See Beghin & Elobeid (2015) and USITC (2017).

2022, sugar is the most highly supported agricultural good worldwide.³² By incentivizing sugar production across many sugar-producing regions of the world, foreign subsidies and other policies could lower the price of sugar traded on the world market. U.S. sugar producers argue that they would be competitive in an unsubsidized global market, but they cannot compete with artificially low global prices due to foreign subsidies.

According to OECD, the U.S. supports sugar at a higher rate than most leading sugar producing countries. For example, approximately 17 percent of Indian sugar farm receipts and 0 percent of Brazilian sugar farm receipts in 2021 came from government support, in comparison to 42 percent of U.S. sugar farm receipts in 2021, according to OECD data (see table 1). As shown in table 1, among countries that accounted for at least 5 percent of global sugar production in 2021-2022, the U.S. had the second-highest level of government support for sugar farms, behind China.

Table 1: Sugar Production, Exports, and Government Support for Top Sugar-Producing Countries

| Country | Percent of Global Production, 2021/2022 | Percent of Global Exports, 2021/2022 | Percent of Revenue from Government Support, 2021 |
|----------------|---|--------------------------------------|--|
| India | 20 | 18 | 17 |
| Brazil | 20 | 40 | 0 |
| European Union | 9 | 2 | 9 |
| Thailand | 6 | 11 | Not listed |
| China | 5 | 0 | 54 |
| U.S. | 5 | 0 | 42 |

Source: USDA Foreign Agricultural Service Production, Supply and Distribution data; OECD Agricultural Support Estimates | GAO-24-106144

Note: 2021/2022 is the most recent market year that has been completed. The European Union was presented as a single unit in the source datasets. European Union (EU) member countries included in this analysis are the EU-27: Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

In addition, the U.S. sugar program is not the only available means of protecting domestic production. The U.S. has antidumping and

³²See OECD (2022). The OECD defines “support” as any gross transfer from consumers and taxpayers to agricultural producers that arises from government policy and creates a gap between domestic and border prices. All else equal, these types of support should lead to an increased global supply of sugar and therefore a lower price of internationally traded sugar.

countervailing duty laws that authorize the assessment of antidumping duties on certain products exported to the U.S. at unfairly low prices (i.e., dumped) and countervailing duties on certain products exported to the U.S. that are subsidized by foreign governments.³³ Imports of sugar from Mexico into the U.S. are subject to terms of antidumping and countervailing duty suspension agreements, signed in 2014, that dictate minimum prices and limits on quantities of sugar that Mexico can export to the U.S.

Both the U.S. sugar program and the U.S. antidumping and countervailing duty suspension agreements protect the domestic sugar industry. This makes sugar an outlier in terms of trade protection; even before accounting for the suspension agreements with Mexico, sugar had by far the highest trade protection of any U.S. good, agricultural or non-agricultural, according to a 2017 USITC study.³⁴ The USITC found that U.S. sugar program import restraints increased the import price of raw and refined sugar by 28 percent and 55 percent, respectively.

Which groups are likely to benefit from the sugar program?

Because sugarcane farming is highly concentrated, many of the benefits of the U.S. sugar program go to a small number of farmers. According to USDA Crop Acreage Report data, the average sugar farm in Florida has over 2,400 acres of sugarcane, and some farms have over 20,000 acres of sugarcane. Other sugar farms in the U.S., including both cane and beet farms, tend to be much smaller, with the average farm below 300 acres of sugarcane or sugar beets. Outside of Florida, there are no U.S. farms with more than 20,000 acres of sugarcane or sugar beets. The largest 1

³³The authority for the imposition of these duties is found in the Tariff Act of 1930 (June 17, 1930), c.497, Title VII, as amended. Antidumping duties are authorized by 19 U.S.C. § 1673 and countervailing duties are authorized by 19 U.S.C. § 1671.

³⁴See USITC (2017). Specifically, USITC estimated the percent increase in price of imports due to import restraints for sectors with significant import restraints. USITC identified sectors with significant import restraints based on 2015 data and expected changes from 2015 to 2020. The study found that U.S. import restraints (including import restraints not necessarily associated with the sugar program, according to USITC officials) raised the price of imported raw cane sugar by 29.3 percent, and the price of imported refined sugar by 56.6 percent. The good with the next-highest price increase due to import restraints was butter, with an import price increase of 20.8 percent.

percent of farms planted 25 percent of all sugarcane or sugar beet acres in 2022.

The sugar program likely has mixed effects on the sugar processing industry. The U.S. sugar program benefits processors by (1) restricting imports of refined sugar, which reduces competition from foreign producers and allows processors to set higher prices; and (2) providing loans to sugar processors with the ability to forfeit the loans and use sugar in lieu of cash repayment, which helps sugar processors finance their operations while they wait to be paid. However, the U.S. sugar program also increases the price of raw sugar by restricting imports of raw sugar to the U.S., which raises input costs for cane sugar refiners. A USITC study that modeled the effect of the sugar program on sugar processing output found that the program resulted in 5 percent higher net value of sales of refined sugar from cane, and 0.4 percent lower net value of sales of refined sugar from beets, resulting in a net increase in refined sugar sales.³⁵

According to U.S. sugar industry representatives, the sugar processing industry has low profit margins, and many plants have closed over the past few decades or switched to a co-operative ownership structure.³⁶ At least 11 of the 13 sugar processors that received marketing allocations from USDA in fiscal year 2022 were either co-operatives, or were privately owned by families or companies that also own sugar farms, according to our analysis.³⁷ According to industry representatives, the farmer-owned structure of these processing facilities gives the sugar farming industry more reliable access to processing capacity, which is important for a heavy, perishable crop such as sugar beets.

According to data from GlobalData (formerly LMC International), U.S. cane and beet sugar costs of production are slightly below the world

³⁵See USITC (2017).

³⁶A co-operative is a business owned and democratically controlled by the people who use its services and whose benefits are derived and distributed equally based on use.

³⁷Marketing allocations are amounts of U.S. sugar production that USDA grants to different sugar processors. We assessed sugar processor ownership by reviewing fiscal year 2022 USDA sugar marketing allocation announcements, USDA Rural Development data on sugar co-operatives, and sugar processor websites.

average costs of production.³⁸ Of the 23 countries we examined, which account for 90 percent of sugar produced worldwide, the U.S. has the 11th lowest cost of sugar production.³⁹ In general, favorable agricultural climates and lower input costs contribute to lower sugar production costs. Table 2 below ranks the top producing countries in terms of their cost of production.

Table 2: Ranking of Selected Countries According to Sugar Production Costs

| Rank (ranked from lowest to highest cost) | Cost of production index value | Country | Type of sugar produced | Percent of total world production (2017-2021 average) |
|---|--------------------------------|------------------------|------------------------|---|
| 1 | 0.68 | Brazil (Central/South) | Cane | 20.8 |
| 2 | 0.75 | Colombia | Cane | 1.3 |
| 3 | 0.78 | Guatemala | Cane | 1.6 |
| 4 | 0.85 | Brazil (Northeast) | Cane | 1.6 |
| 5 | 0.85 | EU-28 | Beet | 10.5 |
| 6 | 0.85 | Nicaragua | Cane | 0.4 |
| 7 | 0.87 | El Salvador | Cane | 0.5 |
| 8 | 0.89 | Mexico | Cane | 3.4 |
| 9 | 0.91 | Australia | Cane | 2.4 |
| 10 | 0.92 | Pakistan | Cane | 3.5 |
| 11 | 0.95 | USA | Beet and Cane | 4.2 |
| 12 | 0.98 | Egypt | Beet and Cane | 1.4 |
| 13 | 0.98 | Dominican Republic | Cane | 0.3 |
| 14 | 0.99 | Russia | Beet | 3.6 |
| 15 | 1.02 | Canada | Beet | 0.1 |

³⁸The GlobalData cost estimates are derived from an engineering cost model. Countries can be compared directly because GlobalData uses the same model for all countries. The model builds up field and factory costs based on the quantity of inputs and the price of each input by country. As a result, there are a variety of factors driving cost estimates, such as the country's yields for cane and beets, fertilizer prices, and agricultural wages. They use a bottom-up approach (i.e., collecting information on input prices, technology, etc.) to estimate production costs in and across countries. To account for year-to-year fluctuations in costs, the ranking we provide here is based on the average production cost index during the 2017-2021 period. We obtained GlobalData sugar production costs indexes for the top 15 sugar producing countries in the world, as well as for countries that ship sugar into the U.S. under a free trade agreement.

³⁹We also separately examined the cost of production index for countries that produce sugar derived from beets and for countries that produce sugar derived from cane. Of the seven top beet sugar-producing countries, which account for 87 percent of worldwide beet sugar production, the U.S. ranks third. Among the top 19 cane sugar-producing countries, the U.S. ranks tenth.

| | | | | |
|----|------|------------|---------------|------|
| 16 | 1.04 | India | Cane | 19.3 |
| 17 | 1.06 | Thailand | Cane | 6.2 |
| 18 | 1.13 | Turkey | Beet | 1.6 |
| 19 | 1.17 | Honduras | Cane | 0.3 |
| 20 | 1.33 | Costa Rica | Cane | 0.2 |
| 21 | 1.42 | Panama | Cane | 0.1 |
| 22 | 1.55 | Indonesia | Cane | 1.3 |
| 23 | 2.03 | China | Beet and Cane | 6.0 |

Source: GlobalData | GAO-24-106144

Notes: The ranking is based on the average estimated cost of production index during the 2017 through 2021 period. Green highlighted rows are for countries for which the estimated cost of production is below the estimated world average cost of production and blue highlighted rows are for countries for which the estimated cost of production is above the world average cost of production. The selected countries are for the top 15 sugar producing countries in the world, as well as for countries that ship sugar into the U.S. under a free trade agreement. We present the EU-28 region as a country in accordance with our data source. The EU-28 region includes all 27 countries of the European Union and the United Kingdom.

Costs of the U.S. Sugar Program and Groups that Bear the Costs

What are the financial costs associated with the U.S. sugar program?

The U.S. sugar program causes higher prices for sugar users (cane sugar refiners, food manufacturers, and end consumers) in the U.S. In 2022, U.S. wholesale refined sugar prices were more than double the world price, at 52.3 cents per pound of refined beet sugar and 59.7 cents per pound of refined cane sugar versus a world refined sugar price of 24.2 cents per pound.⁴⁰ Studies that model the effect of the U.S. sugar program consistently find that the program substantially raises the U.S. price of sugar. The most recent study in our literature review that models the impact of the sugar program on prices estimated that the program raised the price of imported refined sugar by 55 percent.⁴¹ According to

⁴⁰The U.S. and world prices are not directly comparable for several reasons, including varying transportation costs, and the fact that removing the U.S. sugar program would likely raise the global price of sugar due to increased demand for foreign sugar. The difference between the U.S. and world price can be instructive, but papers that model the sugar program can provide a better estimate of the price difference caused by the program.

⁴¹For more information, see USITC (2017). Studies in our literature review find the U.S. sugar program raises refined sugar prices by 26 percent to 62 percent.

the literature, sugar users in the U.S. lose an estimated \$2.5 billion to \$3.5 billion of consumer benefits per year due to the high prices caused by the sugar program.⁴² The literature suggests that the negative impact on sugar users outweighs the positive impact on sugar producers, resulting in an estimated overall economic loss to the U.S. economy of \$780 million to \$1.6 billion per year.

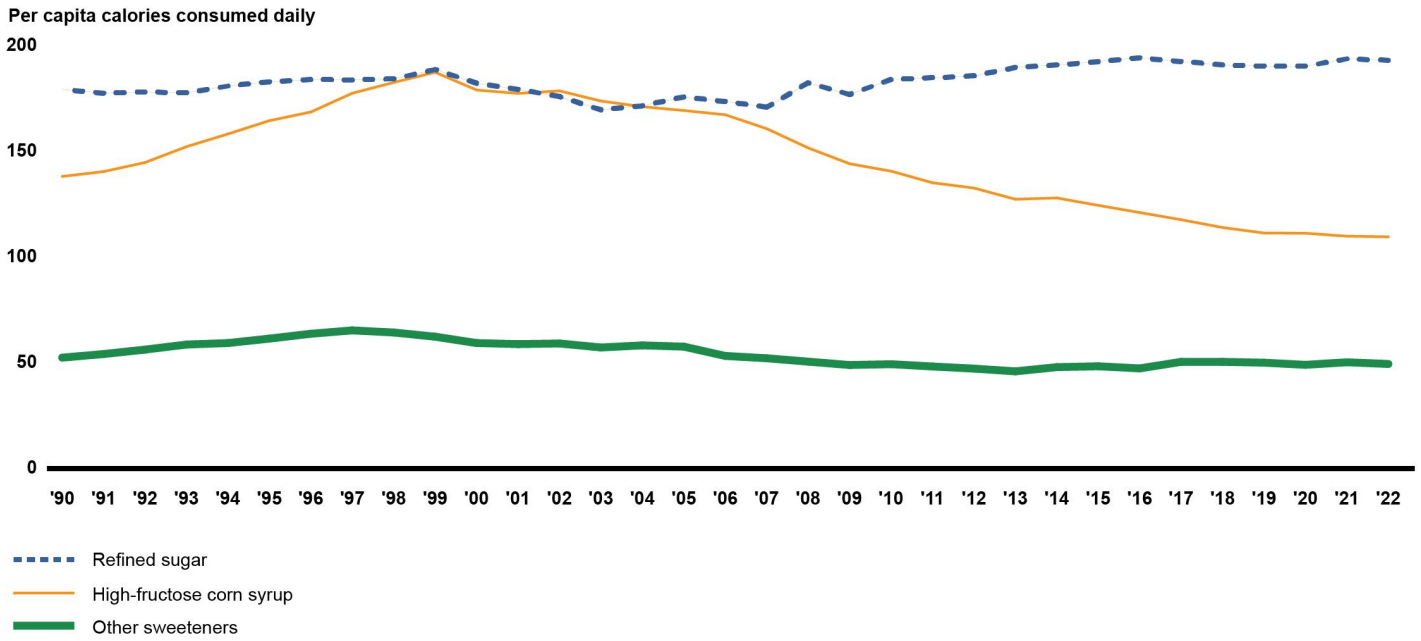
Which groups bear the costs of the sugar program?

Sugar user groups we spoke to said they pay at least twice the world price for sugar, and that they pass most of these costs on to consumers of their products. However, it is unclear what percent of the estimated \$2.5 billion to \$3.5 billion cost per year of the sugar program is borne by end consumers. We found one study that met our criteria for inclusion and modeled the effects of the program under different pass-through assumptions.⁴³ GAO (2000) estimated that, depending on assumptions about how costs are passed on, consumers take on 42 to 97 percent of the costs of the program, and lose \$1.0 billion to \$3.4 billion of consumer surplus per year. This estimated cost is distributed widely across American consumers, and averages approximately \$3 to \$10 per person in 2022. As shown in figure 4, U.S. per capita use of sugar has increased slightly over the past two decades, despite declines in the use of other sweeteners.

⁴²See GAO (2000), Koo (2002), and Lewer & Parrish (2020). These studies span two decades, and aspects of the U.S. sugar market and trade policy have changed over this time period. However, the studies use similar methodologies, and results depend largely on assumptions about the difference between the U.S. and world sugar price, and how sensitive producers and consumers are to these prices. According to our analysis of USDA Sugar and Sweetener Yearbook table data, the inflation-adjusted difference between U.S. and world refined sugar prices was 18 to 25 cents per pound in 2000, and 28 to 36 cents per pound in 2022. See Appendix II for more information on how we used these studies.

⁴³See GAO (2000). Specifically, GAO modeled costs under a scenario where sugar refiners are able to pass increased costs on to consumers but other food manufacturers are not, and also under a scenario where both sugar refiners and food manufacturers are able to pass all costs on to consumers.

Figure 4: U.S. Per Capita Daily Use of Caloric Sweeteners, 1990-2022



Source: USDA Economic Research Service Sugar and Sweetener Yearbook Tables. | GAO 24-106144

Accessible data table for Figure 4: U.S. Per Capita Daily Use of Caloric Sweeteners, 1990-2022

| Year | Refined sugar | High-fructose corn syrup | Other sweeteners |
|------|---------------|--------------------------|------------------|
| 1990 | 179.5 | 138.3 | 52.5 |
| 1991 | 177.7 | 140.6 | 54.2 |
| 1992 | 178.3 | 144.9 | 56.3 |
| 1993 | 177.9 | 152.4 | 58.7 |
| 1994 | 181.1 | 158.4 | 59.4 |
| 1995 | 183.1 | 164.7 | 61.5 |
| 1996 | 184.2 | 168.8 | 63.8 |
| 1997 | 184.0 | 177.7 | 65.4 |
| 1998 | 184.5 | 182.8 | 64.4 |
| 1999 | 188.9 | 187.6 | 62.4 |
| 2000 | 182.4 | 179.2 | 59.4 |
| 2001 | 179.5 | 177.6 | 58.9 |
| 2002 | 176.1 | 178.8 | 59.2 |
| 2003 | 169.8 | 174.0 | 57.3 |
| 2004 | 171.8 | 171.3 | 58.3 |

| Year | Refined sugar | High-fructose corn syrup | Other sweeteners |
|------|---------------|--------------------------|------------------|
| 2005 | 175.9 | 169.5 | 57.7 |
| 2006 | 173.8 | 167.5 | 53.3 |
| 2007 | 171.1 | 160.9 | 52.2 |
| 2008 | 182.6 | 151.8 | 50.6 |
| 2009 | 177.1 | 144.3 | 49.0 |
| 2010 | 184.2 | 140.8 | 49.4 |
| 2011 | 185.0 | 135.3 | 48.3 |
| 2012 | 185.9 | 132.8 | 47.3 |
| 2013 | 189.9 | 127.5 | 46.0 |
| 2014 | 191.0 | 128.1 | 48.0 |
| 2015 | 192.7 | 124.6 | 48.4 |
| 2016 | 194.5 | 121.2 | 47.4 |
| 2017 | 192.7 | 117.8 | 50.5 |
| 2018 | 191.1 | 114.1 | 50.5 |
| 2019 | 190.5 | 111.5 | 50.1 |
| 2020 | 190.5 | 111.4 | 49.1 |
| 2021 | 194.0 | 110.0 | 50.3 |

Source: USDA Economic Research Service Sugar and Sweetener Yearbook Tables. | GAO-24-106144

Note: USDA estimates the number of daily per capital calories consumed by subtracting food losses from U.S. sweetener deliveries for food and beverage consumption.

Distributional effects. The costs of the U.S. sugar program disproportionately affect low-income households. Food costs are a large part of a low-income budget; according to USDA, in 2021 the lowest-income households spent an average 30.6 percent of their income on food, whereas the highest-income households spent an average of 7.6 percent of their income on food.⁴⁴ The share of spending on sugar for households in the 10th income percentile is nearly four times that of households in the 90th income percentile, according to the USITC.⁴⁵

Product quality effects. According to industry representatives, food manufacturers can substitute high-fructose corn syrup for sugar in some products, but it is not a viable substitute in many products due to differing properties of the two sweeteners. Food manufacturers we spoke with indicated that in the past year sugar supply delays, exacerbated by the

⁴⁴Here, lowest-income households refers to households in the lowest 20 percent income group, and highest-income households refers to households in the top 20 percent income group.

⁴⁵See USITC (2017).

U.S. sugar program, have caused them to substitute some sugar with high-fructose corn syrup to continue manufacturing. According to industry representatives, using corn syrup in products that are designed to use sugar can result in a product that has a shorter shelf life or less structural integrity.

How does the U.S. sugar program affect sugar-using companies?

Although the U.S. sugar program protects domestic production of raw and refined sugar, it raises costs for many food manufacturers, which likely reduces domestic production of foods that use sugar.

Higher costs for sugar-using companies

In 2022, U.S. refined sugar prices were more than twice the world refined sugar price. Increased sugar prices are taken on by food manufacturing companies that use sugar and may be passed on to consumers, but the exact proportion of cost sharing is unclear. GAO (2000) estimated that food manufacturers may take on 0 to 55 percent of the costs of the program, depending on the extent to which they are able to pass costs on to consumers.⁴⁶ The study found that if food manufacturers do not pass raised costs on to consumers, they could lose up to \$1.8 billion per year, adjusted for inflation. If food manufacturers are able to pass all costs on to consumers, the U.S. sugar program could still theoretically reduce their profits via reduced demand for their products.

The effect of the program on costs varies by type of food manufacturer. Sugar represents a small percentage of costs in some manufactured food products, but averages as much as 9 to 10 percent of material costs for confectionery and chocolate products, according to the 2017 Economic Census. The greatest negative effects are most likely in industries where sugar represents the highest percent of material costs: confectionery manufacturing; dry pasta, dough, and flour mixes; breakfast cereal; and cookie and cracker manufacturing.

⁴⁶See GAO (2000). Specifically, GAO modeled costs under a scenario where sugar refiners are able to pass increased costs on to consumers but other food manufacturers are not, and also under a scenario where both sugar refiners and food manufacturers are able to pass all costs on to consumers.

Reduced domestic production and employment

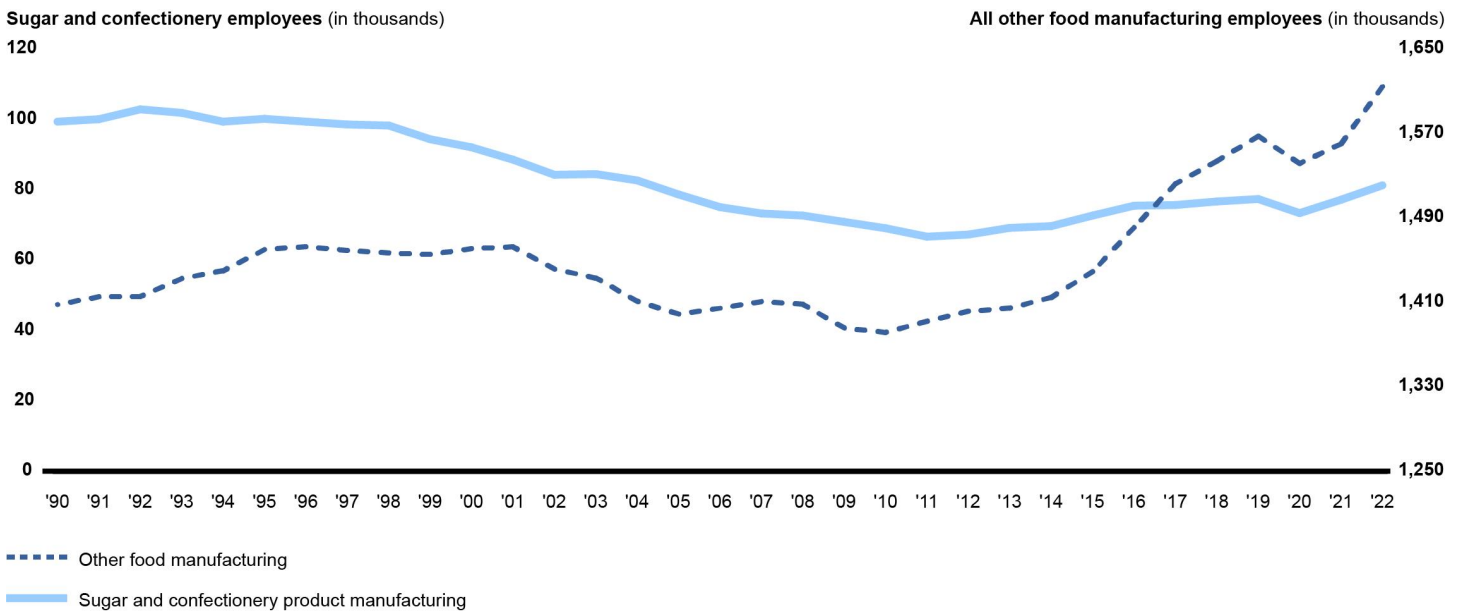
If costs are substantially higher in one country than another, that provides an incentive for companies to move abroad. According to representatives of sugar-using industries, some confectionery manufacturers have chosen to move production to Mexico or Canada rather than update or expand existing manufacturing plants in the U.S. A study that modeled the impacts of the U.S. sugar program on domestic food production found that U.S. production of many sugar-using products was lower due to the U.S. sugar program. The results vary by sugar-using product; for example, the study found a 1 percent reduction in bread and bakery manufacturing and a 34 percent reduction in chocolate and confectionery manufacturing.⁴⁷

The same study modeled the impact of the U.S. sugar program on U.S. employment in food manufacturing. The study estimated that the U.S. sugar program led to 3 percent less employment in food manufacturing, or approximately 18,500 fewer workers. The industry most affected was confectionery manufacturing; according to the study, the confectionery manufacturing workforce in 2020 was 31 percent smaller than it would be without the sugar program.

As shown in figure 5, employment in sugar-using product manufacturing has declined over the past 30 years, despite an increase in overall food manufacturing employment, according to data from the Bureau of Labor Statistics. Specifically, the number of employees in sugar and confectionery product manufacturing declined by 18% from 1990 to 2022, while the number of employees in other food manufacturing increased by 15% during this period.

⁴⁷See Beghin & Elobeid (2015). In addition to modeling the impact of the program on raw and refined sugar production, the study also modeled the impact of the program on the following food manufacturing industries: breakfast cereal; chocolate and confectionery manufacturing from cacao beans; confectionery manufacturing from purchased chocolate; nonchocolate confectionery manufacturing; frozen food; fruit and vegetable canning, picking and drying; ice cream and frozen desserts; bread and bakery products; cookies, crackers and pasta; snack foods; flavoring syrup and concentrate; soft drinks and ice.

Figure 5: Number of Employees in Sugar-Using Product Manufacturing versus Other Food Manufacturing, 1990-2022



Source: GAO analysis of Bureau of Labor Statistics Current Employment Statistics survey data. | GAO 24-106144

Accessible data table for Figure 5: Number of Employees in Sugar-Using Product Manufacturing versus Other Food Manufacturing, 1990-2022

| | Sugar-using product manufacturing | Other food manufacturing |
|------|-----------------------------------|--------------------------|
| 1990 | 99.4 | 1407.9 |
| 1991 | 100.1 | 1415.2 |
| 1992 | 102.9 | 1415.5 |
| 1993 | 101.9 | 1432.6 |
| 1994 | 99.4 | 1439.9 |
| 1995 | 100.2 | 1459.9 |
| 1996 | 99.4 | 1462.6 |
| 1997 | 98.6 | 1459.3 |
| 1998 | 98.3 | 1456.6 |
| 1999 | 94.4 | 1455.4 |
| 2000 | 92.1 | 1461.0 |
| 2001 | 88.6 | 1462.5 |
| 2002 | 84.3 | 1441.5 |
| 2003 | 84.5 | 1433.0 |
| 2004 | 82.7 | 1411.0 |

| | Sugar-using product manufacturing | Other food manufacturing |
|------|-----------------------------------|--------------------------|
| 2005 | 78.7 | 1398.9 |
| 2006 | 75.1 | 1404.3 |
| 2007 | 73.3 | 1410.8 |
| 2008 | 72.7 | 1408.1 |
| 2009 | 70.9 | 1385.5 |
| 2010 | 69.1 | 1381.5 |
| 2011 | 66.7 | 1392.1 |
| 2012 | 67.3 | 1401.5 |
| 2013 | 69.2 | 1404.5 |
| 2014 | 69.7 | 1414.6 |
| 2015 | 72.7 | 1439.1 |
| 2016 | 75.5 | 1481.0 |
| 2017 | 75.7 | 1522.3 |
| 2018 | 76.7 | 1544.1 |
| 2019 | 77.4 | 1567.5 |
| 2020 | 73.4 | 1541.6 |
| 2021 | 77.2 | 1560.2 |
| 2022 | 81.3 | 1614.5 |

Source: GAO analysis of BLS current employment statistics survey data. | GAO-24-106144

Note: The Bureau of Labor Statistics (BLS) category of sugar and confectionery product manufacturing includes the cane and beet sugar processing industries.

Delays in accessing sugar

Sugar-using companies we spoke with said that the administration of the U.S. sugar program sometimes prevents them from obtaining sugar when it is needed. Representatives from these companies said that they typically do not have the capacity to store large amounts of sugar on-site, and instead tend to incorporate sugar into their production process as soon as it is delivered. According to industry representatives, the regulations on U.S. sugar supply can compound other supply chain issues, such as railway delays or a bad U.S. crop year. The amount of sugar imports permitted from Mexico are based on a 13.5 percent stocks-to-use ratio, which sugar users told us leads to a very low amount of excess sugar available for purchase when needed. In addition, USDA can only increase the amount of the WTO tariff-rate quota for raw and refined sugars after half the fiscal year has passed, unless emergency shortfalls occur. Finally, the U.S. mostly allows only raw sugar to be imported, and according to industry representatives there is not always available

capacity at refineries to quickly process raw sugar into refined sugar for use by food manufacturers.

The supply issues created by the U.S. sugar program are an additional cost to sugar-using companies that is not directly included in the studies we used to estimate the costs of the program on sugar users. Sugar-using industry representatives told us that at times sugar supply issues have forced some confectioners to temporarily shut down production, cancel orders, or pay double the typical price of sugar.

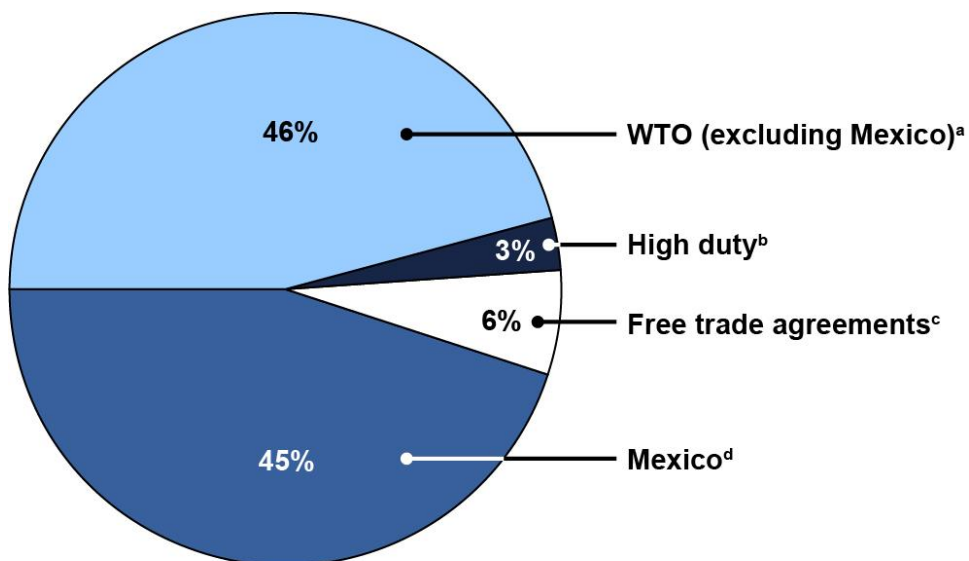
Trade Agreements with Mexico That Affect Sugar Imports

How do imports from Mexico contribute to the U.S. sugar market?

Imports from Mexico account for nearly half of U.S. sugar imports. From 2006 through 2022, imports from Mexico accounted for 45 percent of all imported raw sugar into the U.S. (see figure).⁴⁸

⁴⁸We excluded U.S. imports of refined sugar under the WTO tariff-rate quota, and imports under the re-export program. In fiscal year 2022, U.S. imports of sugar under the WTO refined sugar tariff-rate quota accounted for about 7 percent of overall U.S. imports and imports under the re-export program accounted for about 8 percent of overall imports. In fiscal year 2022, Mexico accounted for 35 percent for raw sugar imports under the re-export program.

Figure 6: Sources of Raw Sugar Imports for U.S. Market, Fiscal Years 2006 to 2022



Source: GAO analysis of CBP and USDA data. | GAO-24-106144

Accessible data table for Figure 6: Sources of Raw Sugar Imports for U.S. Market, Fiscal Years 2006 to 2022

| WTO | High duty | FTA | Mexico |
|-----|-----------|-----|--------|
| 46 | 3 | 6 | 45 |

Source: GAO analysis of CBP and USDA data. | GAO-24-106144

Note: Shares are a percent of total raw sugar imported from fiscal years 2006 to 2022.

^aSugar imported under World Trade Organization tariff-rate quota commitments, excluding Mexico. According to USTR, Mexico is allocated a portion of the WTO tariff-rate quota to ensure consistency with WTO commitments, even though it does not use it.

^bSugar imported at high duty tariff-rate. Data for high duty sugar were only available from 2008 onward.

^cSugar imported under the Dominican Republic-Central America Free Trade Agreement and other free trade agreements with Colombia, and Panama is comprised of a basket of certain sugar and syrup goods and sugar-containing products, which includes raw sugar.

^dSugar imported from Mexico, under the North American Free Trade Agreement (NAFTA) from 2006 to 2014, until the suspension agreements with Mexico were signed in December 2014, and under the suspension agreements from 2014 through 2022.

What are the trade agreements with Mexico affecting U.S. sugar?

Trade agreements with Mexico have affected the U.S. sugar market, including North American Free Trade Agreement (NAFTA) and

antidumping and countervailing duty suspension agreements between the U.S. and Mexico. Beginning in 2008, trade in sugar between the U.S. and Mexico became duty-free and quota-free under NAFTA, and that treatment continues under the U.S.-Mexico-Canada Agreement (USMCA) agreement that replaced NAFTA in 2020. In addition, the implementation of antidumping and countervailing duty suspension agreements, signed in 2014 have affected the U.S. sugar market.

In April 2014, Commerce initiated separate investigations to determine whether sugar imports from Mexico were being dumped in the U.S. and whether manufacturers, producers, or exporters of sugar from Mexico were receiving countervailable subsidies. Commerce reached preliminary determinations that dumping was occurring or was likely to occur, and that producers and exporters of sugar from Mexico were receiving countervailable subsidies.

In December 2014, Commerce entered into agreements that suspended the antidumping and countervailing duty investigations into sugar from Mexico. The countervailing duty suspension agreement imposes annual limits on Mexican sugar exports to the U.S., and the antidumping suspension agreement establishes minimum prices for imported Mexican sugar.

How did U.S. imports and sugar prices change after trade agreements with Mexico?

The quantity of U.S. sugar imports from Mexico rose sharply after Mexico achieved duty-free, quota-free access to the U.S. market in 2008 under NAFTA. Conversely, U.S. sugar imports from Mexico decreased after the suspension agreements were signed in 2014.⁴⁹ Specifically,

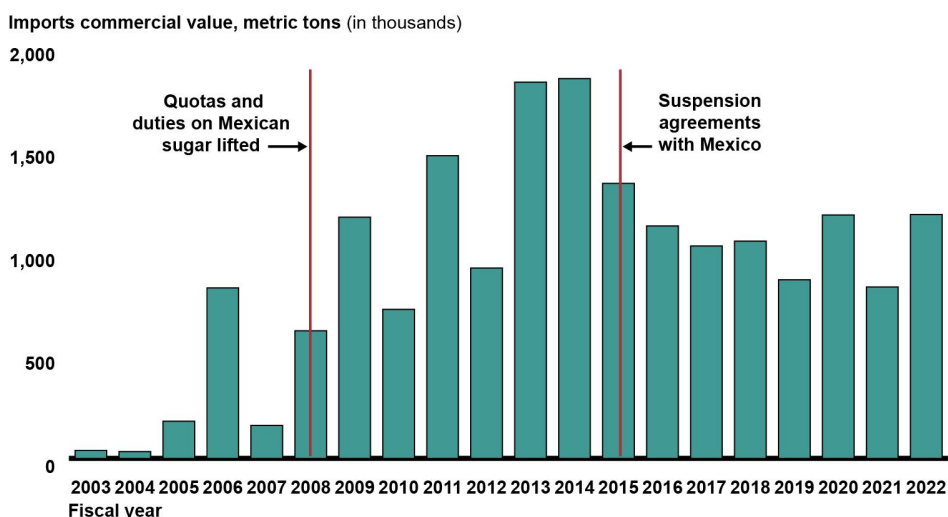
⁴⁹These increases and decreases in imports are based on descriptive statistics. As a result, we cannot definitively state whether these changes were due to trade agreement with Mexico or other factors. For example, U.S. imports from Mexico are affected by a variety of factors such as changes in demand and production. Sugar production is also driven by a variety of factors, including changes in weather and prices.

Overall U.S. imports of sugar increased by about 64 percent after 2008 and increased by about 5 percent after the suspension agreements. See appendix III.

We also examined U.S. imports of sugar containing products and they have been on an increasing trend, increasing at a faster rate during the suspension agreements period. See appendix III.

- During the fiscal year 2003 through 2007 period, before Mexico achieved duty-free, quota-free access, U.S. imports from Mexico averaged about 248 thousand metric tons per year. During the duty-free, quota-free period (fiscal year 2008 through 2014), imports from Mexico averaged about 1,226 thousand metric tons, an almost four hundred percent increase, versus the prior period (fiscal year 2003 through 2007). Overall U.S. imports of sugar also rose.
- Imports from Mexico decreased after the suspension agreements were signed in 2014. Imports from Mexico averaged about 1,077 thousand metric tons after the suspension agreements took effect (fiscal year 2015 through 2022), a 12 percent decrease from the average during the duty-free, quota-free period.⁵⁰ Overall U.S. imports of sugar, however, continued to rise.

Figure 7: U.S. Imports of Sugar from Mexico, Fiscal Years 2003 - 2022



Source: GAO analysis of USDA data. | GAO-24-106144

⁵⁰We are not including imports under the re-export program, only direct imports for U.S. consumption. Note that the suspension agreements do not apply to Mexican sugar imports under the re-export program. In fiscal year 2022, Mexico accounted for 16 percent of refined sugar imports and 35 percent for raw sugar imports under the re-export program.

When we describe changes after the suspension agreements took effect, we analyzed averages from fiscal year 2015 through 2022. Given that the suspension agreements were effective December 19, 2014, the period includes slightly over two months when Mexico still had duty-free quota free access.

Accessible data table for Figure 7: U.S. Imports of Sugar from Mexico, Fiscal Years 2003 - 2022

| FY | Imports from Mexico (thousands of metric tons, commercial value) |
|-----------|---|
| 2003 | 38.9958 |
| 2004 | 32.9783 |
| 2005 | 180.298 |
| 2006 | 827.523 |
| 2007 | 160.235 |
| 2008 | 619.783 |
| 2009 | 1171.03 |
| 2010 | 723.773 |
| 2011 | 1469.72 |
| 2012 | 924.54 |
| 2013 | 1826.73 |
| 2014 | 1844.55 |
| 2015 | 1335.44 |
| 2016 | 1128.44 |
| 2017 | 1031.64 |
| 2018 | 1055.06 |
| 2019 | 867.569 |
| 2020 | 1181.99 |
| 2021 | 832.672 |
| 2022 | 1184.27 |

Source: GAO analysis of USDA data. | GAO-24-106144

Notes: The analysis includes U.S. imports from Mexico under heading 1701, "Cane or beet sugar and chemically pure sucrose, in solid form", of the Harmonized Tariff Schedule of the U.S. It excludes imports under two U.S. sugar re-export programs which, according to USDA, are operated to help U.S. sugar refiners and manufacturers of sugar-containing products compete in world markets. These programs allow licensed participants to buy sugar priced in the world market, rather than higher-priced U.S. sugar, for use in products that will be exported onto the world market.

The difference between U.S. raw sugar prices and world prices decreased after Mexico achieved duty-free, quota-free access to the U.S.

market under NAFTA in 2008 and increased substantially after the suspension agreements.⁵¹ Specifically,

- Before fiscal year 2008, U.S. raw sugar prices were, on average, 11.7 cents (140 percent) higher than world raw sugar prices. From fiscal year 2008 through 2014, U.S. raw sugar prices were, on average, 8.4 cents (46 percent) higher than world raw sugar prices.⁵² U.S. prices that are closer to world prices are associated with a lower cost of the U.S. sugar program to the U.S. economy and consumers. However, under the U.S. sugar program, low U.S. sugar prices can lead to sugar loan forfeitures. According to a USDA report, in fiscal year 2013, U.S. sugar market prices fell below loan forfeiture levels, resulting in forfeitures on sugar loans amounting to over \$171 million.⁵³
- The difference between U.S. and world raw sugar prices increased after the suspension agreements were signed. After the suspension agreements went into effect in December of 2014, U.S. raw sugar prices were, on average, 13.2 cents (89 percent) higher than world raw sugar prices, an almost 57 percent increase in the average difference from 2008 through 2014.

Figure 8 below illustrates changes in U.S. and worldwide raw sugar prices between 2003 and 2008, when Mexico gained duty-free and quota-free access to the U.S. sugar market under NAFTA, and between 2008 and 2022, which includes the period after the suspension agreements between the U.S. and Mexico were signed in 2014.

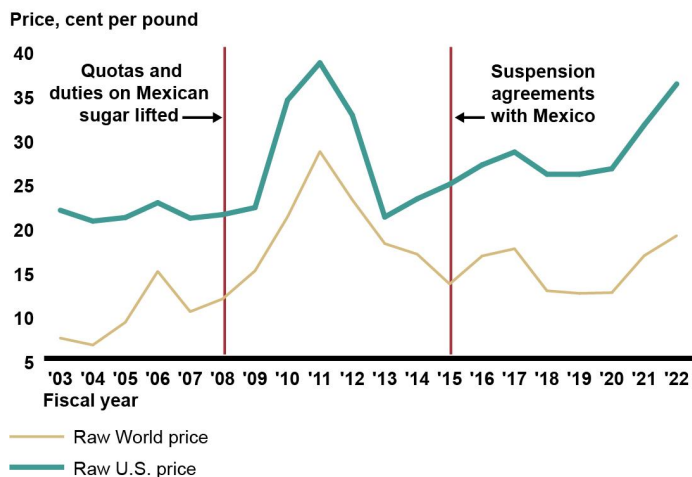
⁵¹These changes are descriptive and we are not controlling for other factors. As a result, we cannot definitively state whether these changes were due to trade agreements with Mexico or other factors. Prices are driven by a variety of factors such as changes in demand and changes in supply in the U.S. and in rest of the world. For example, there are fluctuations in U.S. sugar production. See appendix III for changes in U.S. sugar production.

⁵²Given that we are examining the difference between U.S. and world prices, adjusting for inflation leads to the same results.

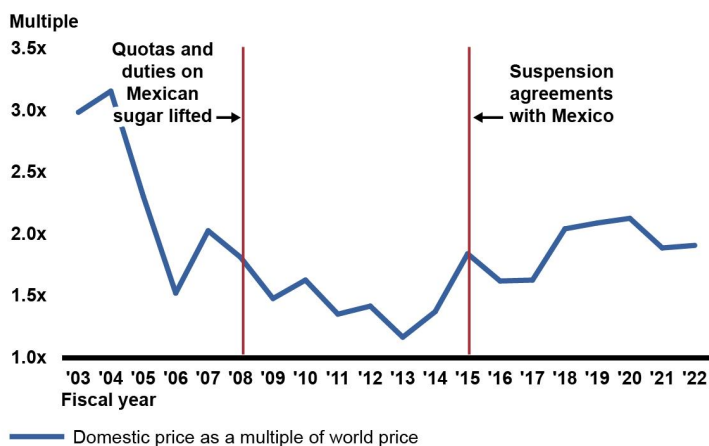
⁵³According to a USDA report, higher-than-average yields in both Mexico and the U.S. led to abundant crops in 2012-2013 and 2014, which in turn placed downward pressure on prices in the integrated U.S.-Mexico market. See Zahniser et al. "A New Outlook for the U.S.-Mexico Sugar and Sweetener Market." USDA ERS. SSSM-335-01. August 2016.

Figure 8: U.S. and World Raw Sugar Prices, Fiscal Years 2003 - 2022

World and U.S. raw sugar prices, fiscal year 2003-2022.



Difference between U.S. and world raw sugar prices, fiscal year 2003-2022.



Source: GAO analysis of USDA data. | GAO-24-106144

Accessible data tables for Figure 8: U.S. and World Raw Sugar Prices, Fiscal Years 2003 - 2022

| FY | Raw US Price | Raw World Price |
|------|--------------|-----------------|
| 2003 | 21.755833 | 7.2864584 |
| 2004 | 20.54 | 6.5067782 |
| 2005 | 20.943333 | 9.0772764 |
| 2006 | 22.624167 | 14.849092 |
| 2007 | 20.865833 | 10.291116 |
| 2008 | 21.2675 | 11.73073 |
| 2009 | 22.068333 | 14.913608 |
| 2010 | 34.2325 | 21.014134 |
| 2011 | 38.461667 | 28.418333 |
| 2012 | 32.531667 | 22.938333 |
| 2013 | 21 | 17.9925 |
| 2014 | 23.0625 | 16.79 |
| 2015 | 24.712197 | 13.419356 |
| 2016 | 26.8975 | 16.59 |
| 2017 | 28.3575 | 17.408333 |
| 2018 | 25.854015 | 12.653333 |
| 2019 | 25.838333 | 12.358333 |
| 2020 | 26.469643 | 12.437857 |

| FY | Raw US Price | Raw World Price |
|------|--------------|-----------------|
| 2021 | 31.415833 | 16.631667 |
| 2022 | 36.062927 | 18.888293 |

| FY | Domestic price as a multiple of world price |
|------|---|
| 2003 | 2.98579 |
| 2004 | 3.156708 |
| 2005 | 2.307227 |
| 2006 | 1.523606 |
| 2007 | 2.027558 |
| 2008 | 1.812973 |
| 2009 | 1.479745 |
| 2010 | 1.629023 |
| 2011 | 1.35341 |
| 2012 | 1.418223 |
| 2013 | 1.167153 |
| 2014 | 1.373585 |
| 2015 | 1.841534 |
| 2016 | 1.621308 |
| 2017 | 1.628961 |
| 2018 | 2.043257 |
| 2019 | 2.090762 |
| 2020 | 2.128151 |
| 2021 | 1.888917 |
| 2022 | 1.909274 |

Source: GAO analysis of USDA data. | GAO-24-106144

Notes: The raw world price is based on the Intercontinental Exchange (ICE) Sugar No. 11 contract, which is the world benchmark contract for raw sugar trading, according to ICE. The raw U.S. price is based on the ICE Sugar No. 16 contract, which prices physical delivery of US-grown (or foreign origin with duty paid by deliverer) raw cane sugar at one of five U.S. refinery ports, according to ICE.

What does research suggest about how trade agreements with Mexico affect the domestic sugar market and the U.S. economy?

According to five studies we reviewed, the U.S. economy benefited from the duty-free, quota-free treatment of sugar under NAFTA, but implementation of the suspension agreements resulted in losses to the U.S. economy.

NAFTA

The duty-free, quota-free treatment of sugar under NAFTA that began in 2008 resulted in gains to consumers that exceeded the losses to producers, due to increasing imports and lower prices, according to studies. Specifically:

- Imports and prices: two studies estimated that NAFTA led to an increase in U.S. imports of sugar from Mexico of 255 to 522 percent and a decrease in domestic raw sugar prices of 9 to 22 percent.⁵⁴
- U.S. economy: One study estimated the U.S. economy benefitted from implementation of NAFTA for sugar imports by an annual average of \$170 million to \$447 million. According to the study, U.S. consumers gained \$756 million to \$2.1 billion, which outweighs the loss to U.S. producers (estimated between \$585 million to \$1.7 billion).⁵⁵

Suspension agreements

In contrast, the suspension agreements with Mexico reduced imports and increased prices, which resulted in losses to consumers that exceeded the gains to sugar producers, according to studies. Specifically:

- Imports and prices: Implementing the suspension agreements with Mexico decreased U.S. imports of sugar from Mexico by about 8 to 17

⁵⁴See Abler et al. (2008). The study uses a partial equilibrium model to estimate projections for 2008 through 2015 under a low-import and a high-import scenario. According to the study's projections, under NAFTA, duty-free sugar imports from Mexico could undermine the program's ability to operate on a "no-cost" basis to taxpayers as there could be stock accumulation and prices could fall below the loan rate. The study suggests that the replacement of the current sugar program by one similar to other major U.S. crop programs would solve the problem of potential stock accumulation, but would induce significant fiscal outlays through direct payments.

See Schmitz and Lewis (2015). The study uses a partial equilibrium model to estimate the impact of NAFTA on the U.S. economy by estimating the impact of a counterfactual scenario in which Mexico is restricted to its pre-2008 tariff-rate quota.

See Appendix II for more information on the selected studies.

⁵⁵See Schmitz, and Lewis (2015).

Note that the study did not estimate any impacts on government expenditures. However, while the U.S. sugar program is in effect, a trade agreement that increases imports could cause prices to fall below the loan rate and lead to forfeitures and thus, associated government expenditures.

percent according to three studies and increased domestic raw sugar prices by 1 to 28 percent according to three studies.⁵⁶

- U.S. economy: Two studies estimated the suspension agreements resulted in a loss to the U.S. economy of \$20 million to \$693 million annually, as the gain to producers of \$69 million to \$814 million was outweighed by the loss to consumers of \$89 million to \$2.1 billion.⁵⁷

Tariff-Rate Quotas, Allocation Methods, and Free Trade Agreements for Sugar Imports

How much sugar is imported into the U.S. under tariff-rate quotas?

From 2006 through 2022, about half of U.S. raw sugar imports entered the country under WTO tariff-rate quota commitments (46 percent).⁵⁸ Beginning in fiscal year 1995,⁵⁹ the U.S. began providing market access

⁵⁶See Sinclair and Countryman (2019). See Carter, Saitone, and Schaefer, (2019). See Schmitz, (2018). In order to estimate the effects of the suspension agreements, Sinclair and Countryman (2019) and Schmitz (2018) use a partial equilibrium model while Carter et al (2019) use an ex-post regression analysis. Note that Schmitz (2018) estimates the lowest increase in U.S. raw sugar prices and the lowest decrease in imports from Mexico. The study examined only the effect of the price floor aspect of the suspension agreements (i.e., the antidumping suspension agreement).

⁵⁷See Sinclair and Countryman (2019) and Schmitz (2018). Schmitz (2018) estimates the smaller impacts on the U.S. economy. The study examined only the effect of the price floor aspect of the suspension agreements (i.e., the antidumping suspension agreement).

Note that the study of Sinclair and Countryman (2019) estimates the larger impacts on the U.S. economy and includes the effect of the suspension agreements on government revenue, finding that it would increase by \$558 million as a result of the suspension agreements because the suspension agreements yielded higher prices, leading to an increase in imports from tariff-rate quota countries and subsequently an increase in tariff revenue collected. The effect on the government revenue is added to the consumer and producer surplus estimates to estimate the overall effect on the U.S. economy. According to the study, because the simulated prices under the free-trade with Mexico scenario are above the expected loan rate, even with a reversion to NAFTA-like policies, the study does not predict impacts on government expenditures from loan forfeitures.

⁵⁸Almost all (92 percent) of sugar imported into the U.S. was raw. The remainder (8 percent) was refined.

⁵⁹The WTO was established on January 1, 1995, as a result of the *Marrakesh Agreement Establishing the World Trade Organization*, Apr. 15, 1994, 1867 U.N.T.S. 154.

through tariff-rate quotas for no less than 1,117,195 metric tons raw value of raw sugar annually, under its WTO commitments. USTR allocates that amount among 40 countries using tariff-rate quotas.⁶⁰ Of the roughly 19 million metric tons of raw sugar imported from 2006 through 2022, six countries accounted for about two-thirds of all WTO imports, with Brazil and the Dominican Republic each accounting for 17 percent of U.S. imports under WTO tariff-rate quotas, followed by the Philippines (12 percent), Australia (10 percent), Guatemala (6 percent), and Peru (5 percent).

In addition to the raw sugar imported under WTO commitments and from Mexico under USMCA, six percent of raw sugar imported into the U.S. came in under other free trade agreements. The U.S. has free trade agreements besides USMCA that contain provisions on sugar, including the Dominican Republic–Central America Free Trade Agreement and agreements with Chile, Colombia, Morocco, Panama, and Peru, which set tariff-rate quotas for certain sugar and syrup goods and sugar-containing products that may be imported duty-free into the U.S. Provisions in certain free trade agreements require countries to be net exporters of certain sugar and syrup goods and sugar-containing products (i.e. have a sugar trade surplus) to qualify for in-quota, duty-free imports into the U.S.⁶¹ From 2006 through 2022, the U.S. imported sugar under four free trade agreements with almost all (96 percent) entering under the Dominican Republic-Central America Free Trade Agreement, or the free trade agreement between Colombia and the U.S.

How are tariff-rate quotas set and allocated for imported sugar?

Prior to the beginning of each fiscal year, USDA sets the initial WTO tariff-rate quota amount for raw sugar at a minimum of 1,117,195 metric tons to

⁶⁰According to USDA, tariff-rate quotas allow countries to export specified quantities of a product to the U.S. at a relatively low tariff, but subject all imports of the product above a pre-determined threshold to a higher tariff. Currently, the basic in-quota rate for raw sugar is 1.4606 cents per kilogram, and 33.87 cents per kilogram for raw sugar imported above the threshold.

⁶¹USTR has consistently determined that Chile and Morocco are net importers of sugar and therefore they have not been permitted to import sugar to the U.S. under their respective free trade agreements. For all years other than 2015, Peru was also determined to be a net importer of sugar and unable to export sugar under their free trade agreement. Beginning in 2020, Canada began exporting sugar to the U.S. under the USMCA.

comply with WTO commitments, as required by statute.⁶² USTR then allocates the total amount of tariff-rate quotas among countries, and does so proportionally among 40 countries based on those countries' market share of sugar imports to the U.S. between 1975 and 1981.⁶³ This method of allocation is known as the historical shares allocation method, introduced in 1982.⁶⁴

If countries are unable to fill their quota in a given year, they are asked if they are willing to surrender their quota. USDA determines when and whether to reallocate WTO tariff-rate quotas, according to USTR. At USDA's request, USTR then reallocates any unused surrendered tariff-rate quotas, as well as the tariff-rate quotas from other countries that were unable to fulfill their allocations, proportionally among the 40 countries, based on the countries' historical share and their ability to supply additional sugar.⁶⁵

After April 1, USDA may increase the raw sugar quota as needed to provide adequate supplies of raw sugar in the domestic market, while maintaining sugar prices above loan forfeiture levels. After USDA announces the tariff-rate quota increase, USTR allocates it by again dividing it among the 40 countries based on their historical share and ability to supply additional sugar. The full process is illustrated in figure 9.

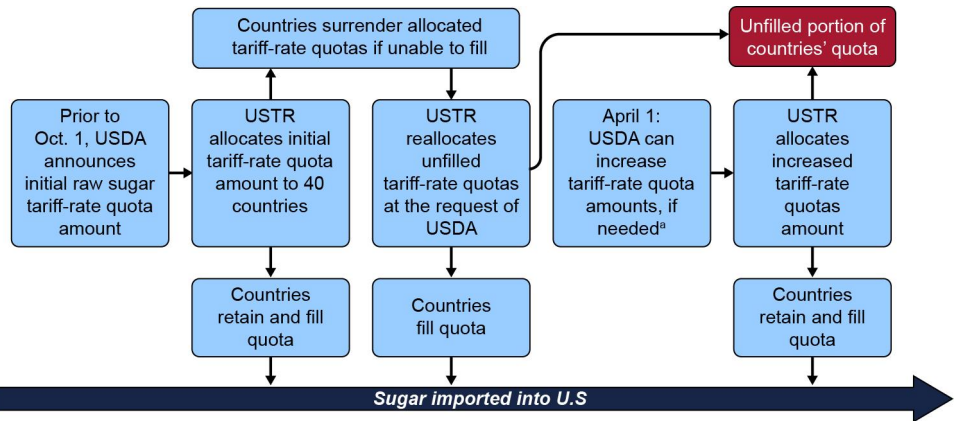
⁶²7 U.S.C. § 1359kk.

⁶³According to USDA, the period from 1975 to 1981 was the last time access to the U.S. market was relatively unrestricted by quotas, and coincided with the period when the sugar program had lapsed.

⁶⁴According to USTR, the U.S. moved from an absolute quota to a tariff-rate quota in 1990, and, according to USTR, there have been subsequent modifications to the legal framework for administering the tariff-rate quota.

⁶⁵USTR determines which countries will be able to fill the reallocated tariff-rate quotas based on survey data collected by USDA's Foreign Agriculture Service.

Figure 9: Allocation Process Leaves Some Tariff-Rate Quota Unfilled



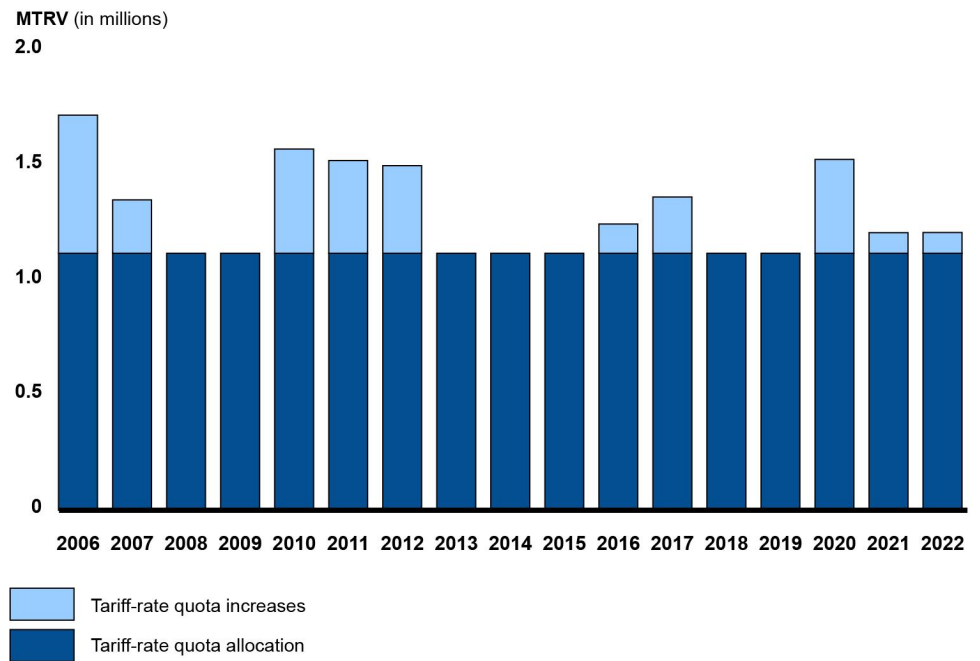
Legend: USDA = U.S. Department of Agriculture; USTR = Office of the U.S. Trade Representative.

Source: GAO analysis of USDA and USTR information. | GAO-24-106144

Note: ^aUSDA may also increase the tariff-rate quota amount prior to April 1 of each fiscal year in the event of an emergency shortage of sugar in the U.S. market caused by war, flood, hurricane, natural disaster, or other similar event, if certain conditions are met. See 7 U.S.C. § 1359kk.

From 2006-2022, USDA increased the WTO raw sugar allocated tariff-rate quota amount in ten of the 17 years, based on its analysis of projected demand. The size of the increases ranged from more than 50 percent in 2006, to 8 percent in 2022, as shown in fig. 10 below.

Figure 10: Raw Sugar Tariff-Rate Quota Allocation, Fiscal Years 2006 to 2022



Accessible data table for Figure 10: Raw Sugar Tariff-Rate Quota Allocation, Fiscal Years 2006 to 2022

| Fiscal Year | TRQ base allocation | TRQ Increases |
|-------------|---------------------|---------------|
| 2022 | 1,117,195 | 90,721 |
| 2021 | 1,117,195 | 90,100 |
| 2020 | 1,117,195 | 408,233 |
| 2019 | 1,117,195 | 0 |
| 2018 | 1,117,195 | 0 |
| 2017 | 1,117,195 | 244,690 |
| 2016 | 1,117,195 | 127,006 |
| 2015 | 1,117,195 | 0 |
| 2014 | 1,117,195 | 0 |
| 2013 | 1,117,195 | 0 |
| 2012 | 1,117,195 | 381,017 |
| 2011 | 1,117,195 | 403,694 |
| 2010 | 1,117,195 | 453,592 |
| 2009 | 1,117,195 | 0 |

| Fiscal Year | TRQ base allocation | TRQ Increases |
|-------------|---------------------|---------------|
| 2008 | 1,117,195 | 0 |
| 2007 | 1,117,195 | 232,354 |
| 2006 | 1,117,195 | 600,556 |

Source: GAO analysis of US Dept. of Agriculture data. | GAO-106144

Tariff-rate quota reallocations occur most years, and USDA increased tariff-rate quota amounts in more than half of the years we reviewed. According to USDA, to make these adjustments, USDA staff continually evaluate market indicators to determine whether domestic supplies are adequate and whether a reallocation of unused tariff-rate quotas is necessary. To determine countries' intent to fulfill their quota and the amount of unused tariff-rate quotas to reallocate, USDA and USTR send out a tariff-rate quota allotment survey to quota-holding countries every year. According to USDA, tariff-rate quota reallocations made prior to March are offset by a reduction in Mexico's export limit under the U.S.-Mexico countervailing duties suspension agreements, resulting in no net increase in the supply of raw sugar.⁶⁶

However, in 5 of the 11 years for which reallocations occurred between 2010 and 2022, the reallocations were announced in June or later. According to some tariff-rate quota-holding countries, this timing—three-quarters of the way through the quota year—occurs after they have already shipped their base allocation. Furthermore, these countries stated the timing makes it difficult to impossible to arrange the additional shipment on short notice.

Additionally, some sugar users we spoke to told us the timing of the reallocation and increase process has caused supply chain issues and has prevented sugar users from obtaining sugar needed for production. Specifically, they mentioned that when raw sugar is imported late in the fiscal year, sugar refineries are typically operating at or close to full capacity. As a result, the reallocated and increased raw sugar can take months to be refined for production, limiting the amount of sugar available, according to sugar users.

Every year dating back to 1996, raw sugar imports have been less than the in-quota quantities established by USDA, leading to persistent shortfalls. This is in part due to the historical allocation method, which

⁶⁶According to USDA, reallocations made after April result in a net increase in raw sugar supply for the fiscal year since, by that time, Mexico's export limit is set for the remainder of the fiscal year and is no longer readjusted.

uses the same 40 countries each year based on 40-year-old market conditions and import patterns, despite some of those countries no longer producing or exporting sugar, according to USDA officials. For example, Haiti, along with Gabon, have never used their tariff-rate quotas. Of the 40 countries receiving tariff-rate quotas, seven have not used their tariff-rate quotas to import any raw sugar to the U.S. in the last 15 years.⁶⁷ According to USTR, these countries typically do not respond to the survey to inform USTR and USDA of whether they intend to use their tariff-rate quotas. Additionally, as shown in Table 3, half of these 40 countries have filled less than 75 percent of their allocations in total between 2006 and 2022.

Table 3: Countries with the Lowest Sugar Tariff-Rate Quota Fill Rates, Fiscal Years 2006 - 2022

| Country | Tariff-Rate Quota Fill Rate |
|---------------------|-----------------------------|
| Gabon | 0% |
| Haiti | 0% |
| Madagascar | 0% |
| Mexico | 0% |
| St. Kitts and Nevis | 0% |
| Trinidad-Tobago | 0% |
| Congo | 0% |
| Uruguay | 14% |
| Papua New Guinea | 25% |
| Cote d'Ivoire | 38% |
| Barbados | 39% |
| India | 46% |
| Mauritius | 57% |
| Jamaica | 58% |
| Taiwan | 62% |
| Malawi | 63% |
| Belize | 65% |
| Paraguay | 67% |
| Guyana | 69% |
| Mozambique | 71% |

Source: GAO analysis of U.S. Department of Agriculture data. | GAO-24-106144

⁶⁷According to USTR, Mexico is allocated quota to ensure consistency with WTO commitments, even though it does not use them. Mexican raw sugar is imported into the U.S. under the suspension agreements and USMCA.

Note: Taiwan is listed as a country for consistency with the original dataset.

As shown in Table 4, the remaining 20 countries receiving tariff-rate quotas filled at least 75 percent of their allocated quota from 2006 to 2022.

Table 4: Countries with the Highest Sugar Tariff-Rate Quota Fill Rates, Fiscal Years 2006 - 2022

| Country | Tariff-Rate Quota Fill Rate |
|--------------------|-----------------------------|
| South Africa | 98% |
| El Salvador | 98% |
| Guatemala | 98% |
| Brazil | 96% |
| Nicaragua | 97% |
| Australia | 96% |
| Honduras | 94% |
| Costa Rica | 94% |
| Peru | 93% |
| Panama | 92% |
| Dominican Republic | 92% |
| Ecuador | 88% |
| Colombia | 88% |
| Thailand | 87% |
| Argentina | 87% |
| Philippines | 86% |
| Fiji | 84% |
| Eswatini | 82% |
| Zimbabwe | 76% |
| Bolivia | 75% |

Source: GAO analysis of U.S. Department of Agriculture data. | GAO-24-106144

After accounting for tariff-rate quota increases and reallocations, the U.S. imported, on average, 13 percent less raw sugar than the in-quota quantities established by USDA from 2006 through 2022, which equates to a shortfall of about 2.8 million metric tons over this timeframe. The shortfall represents an estimated value of \$1.67 billion worth of sugar at the average raw U.S. price from 2006-2022.

Have USDA and USTR considered modernizing the tariff-rate quota allocation method?

Despite the persistent shortfalls in tariff-rate quota usage, USDA and USTR have not reviewed the effectiveness of their tariff-rate quota allocation method. Dating back to 1999, GAO has noted that WTO raw sugar tariff-rate quota allocations do not reflect countries' current production and export capacities, because production capabilities and market conditions have changed since USTR first established the country-specific tariff-rate quota amounts for sugar in 1982.⁶⁸

USTR officials told us the historical shares tariff-rate quota allocation method is not the only method available that may be consistent with WTO commitments. Specifically, USTR identified three methods that, in their view, may be consistent with WTO commitments.⁶⁹ For example, the allocation process could be adjusted to a first-come, first-served approach; country-specific allocations could be made with the agreement of all historical share members; or a new historical base period could be established.

However, each of these methods present challenges and, according to USTR, any change to the current U.S. administration methodology for the raw sugar WTO tariff-rate quota may be subject to challenge by other WTO members. Moreover, USTR noted that whether an alternative method complies with WTO commitments may depend on how it is implemented. According to USTR, the U.S. also would need to consider whether adoption of an alternative method could raise concerns for U.S. exporters, who might then face similar methods implemented by other countries in the future.

Standards for internal control in the federal government state that management should use quality information to achieve objectives. An attribute of this principle requires that management identify information requirements in an iterative and ongoing process that occurs throughout an effective internal control system. As changes in the entity and its objectives and risks occurs, management changes information

⁶⁸GAO, Sugar Program: Changing the Method for Setting Import Quotas Could Reduce Cost to Users, [GAO/RCED-99-209](#) (Washington, D.C.: July 1999).

⁶⁹USTR noted that these tariff-rate quota administration methods are set out in Article XIII (Non-Discriminatory Administration of Quantitative Restrictions) of the *General Agreement on Tariffs and Trade 1994* (GATT 1994).

requirements as needed to meet these modified objectives and address these modified risks.⁷⁰

Despite high annual variability in both tariff-rate quota increases and reallocations, as well as the time lags in reallocating unused tariff-rate quotas, as of 2023, USDA and USTR have not evaluated the efficacy of the current tariff-rate quota administration process, including the timing of reallocations, in relation to fill rates and the impact on the sugar program. Past studies by a USDA economist found that different ways of administering tariff-rate quotas had varying levels of economic efficiency, some of which are more efficient than the historical allocation method. However, these studies are now over 20 years old and have not been applied to managing fill rates within the sugar program.⁷¹

USTR continues to allocate tariff-rate quotas based on over 40-year-old market conditions, including to countries that have not used them in 15 years, which has contributed to unused tariff-rate quotas. In addition, delays associated with the timing of USDA directions to USTR regarding reallocations also contribute to unused tariff-rate quotas each year. In practice, this has resulted in annual shortfalls from the levels USDA calculated were needed to satisfy anticipated demand, which undercuts one of the primary goals of the sugar program described by USDA—assuring adequate supplies of sugar. By not analyzing the different approaches and how they would support USDA in carrying out the goals of the sugar program, USDA and USTR may be missing an opportunity to improve the efficiency and effectiveness of tariff-rate quota allocations.

Conclusions

The U.S. is one of the largest producers and consumers of sugar. To supplement the national sugar supply, the U.S. relies on various trade agreements and tools, including suspension agreements and tariff-rate quotas, as well as the U.S. sugar program. The program has helped

⁷⁰GAO, Standards for Internal Control in the Federal Government, [GAO-14-704G](#) (Washington, D.C.: September 2014).

⁷¹A study conducted by USDA's Economic Research Service that analyzed seven tariff-rate quota administrative methods concluded that auctions were the best way to administer a tariff-rate quota, and noted that historical allocation is among the least economically desirable methods. *Economics of Tariff-Rate Quota Administration*, David W. Skully. Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture. Technical Bulletin No. 1893 (Washington, D.C.: April 2001).

sustain domestic production and provides major financial benefits to U.S. producers. However, it imposes even greater costs to sugar users and consumers, ultimately resulting in between \$780 million and \$1.6 billion in estimated net U.S. economic losses each year. The timing of tariff-rate quota reallocations and increases and the quota allocation method for sugar imported under U.S. WTO commitments do not reflect current market conditions, and have led to import shortfalls averaging 13 percent per year since 2006.

USDA and USTR have not considered the potential benefits of alternative allocation methods. Without analyzing alternative methods, USDA cannot determine whether the current method is most effective. USTR confirmed that options may be available that are within its current statutory authority and consistent with its WTO commitments. Determining and using the most effective available method to allocate tariff-rate quotas may help ensure that adequate supplies of sugar are available in the U.S. market, and ease potential supply chain issues. Increasing sugar imports in this manner could also lower prices and the costs of the program to the U.S. economy and consumers. While changes to the current allocation method could require USDA to decide how best to maintain a balance between the goals of ensuring adequate supplies of sugar while also minimizing costs to the federal government, until an analysis is complete, USDA may not be able to determine whether the current method effectively addresses the program's objectives.

Recommendations for Executive Action

The Secretary of Agriculture should evaluate the effectiveness of the WTO raw sugar tariff-rate quota allocation method versus other tariff-rate quota allocation methods to determine which would most effectively maintain an adequate sugar supply and minimizes costs to the government. (Recommendation 1)

The U.S. Trade Representative should evaluate alternative WTO raw sugar tariff-rate quota allocation and reallocation methods to determine their consistency with international obligations and U.S. law, and whether they have any foreign policy implications. (Recommendation 2)

The U.S. Trade Representative should use its completed evaluation and USDA's completed evaluation of WTO raw sugar tariff-rate quota allocation methods to determine whether they should continue using the current method, or select an alternative method. (Recommendation 3)

Agency Comments

We provided a draft of this report to USDA, USTR, Commerce, USITC, and CBP for review and comment. USDA and USTR provided comments via email stating that they concur with our recommendations. USDA, USTR, USITC, and CBP also provided technical comments, which we incorporated, as appropriate. Commerce did not have any comments on the report.

We are sending copies of this report to the appropriate congressional committees; the Secretaries of Agriculture, Commerce, and Homeland Security; the Commissioner of CBP; the U.S. Trade Representative; the U.S. International Trade Commission; and other interested parties. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>.

If you or your staff have any questions about this report, please contact Kimberly Gianopoulos at (202) 512-8612 or gianopoulosk@gao.gov. GAO staff who made major contributions to this report are listed in appendix IV.



Kimberly M. Gianopoulos
Director, International Affairs and Trade

Appendix I: Objectives, Scope, and Methodology

This report examines the following objectives:

1. What are the benefits of the U.S. sugar program and which groups are likely to benefit?
2. What are the costs of the U.S. sugar program and which groups are likely to bear the costs?
3. How have agreements with Mexico on sugar affected imports and the overall U.S. economy?
4. How have other trade agreements affected the U.S. sugar program, and how are they implemented?

To examine the benefits and costs of the U.S. sugar program, we conducted a literature review of relevant studies on the effects of the U.S. sugar program. We limited our results to studies that were published since 2000 and use quantitative models. For our final results, we included five studies that modeled the effects of the U.S. sugar program on domestic sugar producers, sugar users, sugar prices, or employment. Three of these studies modeled the effect of the program on U.S. producer surplus, consumer surplus, and total welfare, which we refer to as “benefits” (when positive) or “costs” (when negative) throughout this report. See Appendix II for more information on the literature review process and results.

Because the literature we found focused on economic or financial costs and benefits of the program, we also focused on these types of costs and benefits. We did not focus on the health or environmental effects of the program, or the effects on the sugar substitute industry.

To understand the effects of the U.S. sugar program on industry producers and users, we interviewed representatives from the American Sugar Alliance, the National Confectioners Association, and the Sweetener Users Association. We analyzed how other countries subsidize their sugar production, using the OECD Agricultural Policy Monitoring and Evaluation 2022 report and accompanying data on estimates of government support to agriculture.

To examine the characteristics of sugar program beneficiaries, we analyzed the number of U.S. sugar farmers and the size of their farms, using 2022 Crop Acreage Report data from the USDA Farm Services Agency (FSA). According to USDA officials, these data include the land use of all U.S. farms that participate in USDA programs, such as crop insurance. We assessed the reliability of data by interviewing USDA FSA officials responsible for these datasets, reviewing data handbooks and documentation, and conducting electronic testing of the data. We determined these data are sufficiently reliable for our purposes of estimating the number and size of sugar farms in the U.S.

We analyzed characteristics of U.S. sugar and non-sugar farmers, using Census of Agriculture data from the USDA National Agricultural Statistics Service (NASS). We used the most recent available year, 2017, and compared characteristics of sugarcane farms, sugar beet farms, and farms that grew neither sugarcane nor sugar beets. We assessed the reliability of these data by interviewing USDA NASS officials responsible for these datasets, reviewing data handbooks and documentation, and conducting electronic testing of the data. We determined these data are sufficiently reliable for our purposes of comparing the profits of sugar farms to non-sugar farms and reporting on employment on these farms.

We compared the U.S. cost of sugar production to the cost of production in other countries using data we purchased from GlobalData (formerly LMC International), a consultancy firm specializing in global agricultural commodity and agribusiness sectors. We obtained GlobalData sugarcane and sugar beet production cost indexes for the top 15 sugar-producing countries in the world, as well as for countries that ship sugar into the U.S. under a free trade agreement. The data consist of a production cost index by country averaged over the 2017 through 2021 period in order to account for year-to-year fluctuations in production costs. The indexes are anchored to the worldwide average sugar cost of production.

The GlobalData cost estimates are derived from an engineering cost model. The model builds up field and factory costs based on the quantity of inputs and the price of each input by country. As a result, there are a variety of factors driving cost estimates, such as the country's yields for cane and beets and agricultural wages. Countries can be compared directly because GlobalData uses the same model for all countries. We assessed the reasonableness of the general methodology used to estimate production costs and determined that the methodology was reasonable for our purposes of comparing production cost indexes across

countries. However, due to the proprietary nature of the model, we were not able to assess the details of the company's methodology.

To examine the characteristics of sugar users, we identified which manufactured food product industries have sugar as a high percentage of their material costs, using Economic Census data on materials consumed by type of industry in 2017, the most recent available year. We compared cane and beet sugar costs to total material costs for other types of food manufacturers, by 6-digit North American Industry Classification System (NAICS) code.

We reviewed employment trends in the sugar and confectionery product manufacturing industry as compared to other food manufacturing, using U.S. Bureau of Labor Statistics Current Employment Statistics data from 1990 to 2022. These data define sugar and confectionery product manufacturing as all industries under NAICS code 3113, including both sugar manufacturing and confectionery product manufacturing. To examine trends in U.S. sweetener consumption, we used USDA Sugar and Sweeteners Yearbook Tables data on per capita use of different types of sweeteners, from 1990 to 2021. We assessed the reliability of these data by electronic testing and reviewing data documentation and handbooks, and determined these data are sufficiently reliable for our purposes of assessing cost, employment, and consumption trends among food manufacturers and consumers.

To examine how agreements with Mexico on sugar affect imports and the overall U.S. economy, we conducted a literature review. We selected studies published since 2000 that modeled and quantified the effect of trade agreements on the U.S. economy. See Appendix II for more information on the literature review process and results.

For our results, we included five studies that modeled the effects of trade agreements with Mexico. From these studies we extracted estimates of the effect of trade agreements on U.S. prices, imports, production, overall effect on consumers (i.e. either benefits or costs depending on the agreement), overall effect on producers (i.e. either benefits or costs depending on the agreement) and overall effects on the U.S. economy, where available. We translated the impacts on prices, imports, and production to percentage terms to make the estimates more comparable across studies. We translated the estimates of overall effect on consumers, producers, and the overall economy from these studies into constant (inflation-adjusted) dollars to make the estimates more

comparable across studies.¹ See Appendix II for more information on the literature review process and results.

We also used data published by the U.S. Department of Agriculture (USDA) in its Economic Research Service's (ERS) Sugar and Sweeteners Yearbook Tables to describe changes in the relative U.S. raw sugar price, as well as U.S. sugar production over the fiscal year 2003 through 2022 period. We analyzed changes in U.S. imports of sugar from Mexico and overall sugar imports over the fiscal year 2003 through 2022 period using U.S. Census Bureau trade statistics. Specifically, we used import data under heading 1701, "Cane or beet sugar and chemically pure sucrose, in solid form," of the Harmonized Tariff Schedule of the U.S. We excluded imports under the U.S. sugar re-export program because the suspension agreements do not apply to Mexican sugar imports under the re-export program.

We also used U.S. Census Bureau trade statistics to examine changes in imports of products in industries that use sugar. We selected these industries based on one study we selected that examined effects of the U.S. sugar program on specific industries that produce sugar-containing products.² To assess the reliability of the USDA and Census data, we performed a variety of electronic checks, such as checking for missing values, consulting USDA officials on the accuracy and completeness of the data, and comparing the data to published figures when possible. We determined that these data were reliable for the purposes of examining changes in relative raw sugar prices, production, U.S. sugar imports, and imports in industries that use sugar.

We identified and reviewed five studies that estimated the effects of the U.S. sugar program and five that estimated the effect of agreements with Mexico on sugar imports and the overall U.S. economy. Despite certain limitations, we determined that the studies are sufficiently rigorous to collectively provide reliable estimates of the range of economic effects.

¹Note that there will still be differences across studies, due to methodological differences such as the type of model used or assumptions made.

²See Beghin and Elobeid (2015). The industries were for the following North American Industry Classification System (NAICS) codes: 31123 Breakfast Cereals, 31134 Nonchocolate Confectionery Products, 31135 Chocolate And Confectionery, 31141 Frozen Foods, 31142 Fruits & Vegetables canned, 31152 Ice Cream & Frozen Desserts, 31181 Bread & Bakery Products, 31182 Flour Mixes, Dough & Pasta, 31191 Snack Foods, 31193 Flavoring Extracts & Syrups, and 31211 Soft Drinks & Ices. We examined trends in the total import value for all industries as well as for each individual industry.

Although the exact estimates varied because of the different assumptions and time periods that the studies used, all the selected studies found qualitatively similar effects, including net economic costs of the sugar program. Nevertheless, the studies have specific limitations. For example, most of the studies use partial or general equilibrium models, which rely on assumptions about the responsiveness of consumers and producers to changes in prices. Moreover, most of the studies use a modeling approach that, while allowing for the isolation of certain economic effects of the U.S. sugar program and agreements with Mexico, generally do not take some market interactions into account such as how changes in sugar prices affect other industries such as substitutes for sugar.

To examine what other trade agreements affect the U.S. sugar program and how they are implemented, we analyzed data on U.S. raw sugar tariff-rate quota allocations, using U.S. Customs and Border Protection (CBP)'s Weekly Quota Status Reports. We also analyzed sugar entries from World Trade Organization (WTO) quota-allocated countries from fiscal years 2006 to 2022, published by USDA in the ERS's Sugar and Sweeteners Yearbook Tables.

We analyzed CBP's Weekly Commodity Status Report data on refined sugar tariff-rate quota allocations and entries from WTO quota-allocated countries from fiscal years 2006 to 2022. We also analyzed allocations and entries under free trade agreements from fiscal years 2006 to 2022, published by USDA ERS in the Sugar and Sweeteners Yearbook Tables. To evaluate how these agreements are implemented, we reviewed USDA Foreign Agriculture Service's (FAS) Sugar Monthly Import and Re-Export data from fiscal years 2010 to 2022 to analyze the amount of raw sugar tariff-rate quota reallocated by USTR annually and the timing of the reallocations. We used these data to analyze annual tariff-rate quota increases, including the timing of the increases, as well as the amount and timing of the allocation of increased quota. To corroborate these data, we reviewed associated Federal Register Notices for each action. We assessed the reliability of these three datasets by analyzing for consistency and consulting USDA officials on the accuracy and completeness of the data. In instances where we identified potential discrepancies, we contacted relevant agency officials and obtained information to resolve the inconsistencies. We determined that the data we used were sufficiently reliable for our purposes of analyzing U.S. sugar imports and tariff-rate quota fill rates.

Additionally, we interviewed USDA, USTR, Commerce, CBP, and U.S. International Trade Commission officials to identify the roles and

responsibilities of each agency in implementing the U.S. sugar program, tariff-rate quotas, and trade agreements. We also interviewed representatives from sugar producer and sugar user industry associations to gain their perspectives on the implementation of the U.S. sugar program.

We conducted this performance audit from July 2022 to October 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Literature Review Methodology and Results

To examine the effect of the U.S. sugar program and trade agreements on the U.S. economy, we conducted a literature review of publications on these topics. The steps of the literature review were as following:

1. GAO staff conducted a literature search for publications on the U.S. sugar program, on U.S. sugar trade with Mexico, or on the US-Mexico suspension agreement, published since the year 2000. We limited our search to resources published from January 2000 to January 2023, and located publications through searches of various databases, snowball searches, and literature identified by other GAO work on the U.S. sugar program. Specifically, to identify existing studies, we performed searches using subject and keyword searches of various databases, including ProQuest, Dialog, Ebsco, Scopus, Harvard Kennedy Think Tank search engine, Congressional Quarterly, Westlaw, AgEcon Search, and Google Scholar. We also used a snowball search technique—meaning we reviewed relevant academic literature cited in our selected studies—to identify additional studies. From all these searches, we identified 181 relevant publications.
2. Two economists independently reviewed the abstracts of these 181 publications (retrieved from the literature search results) for whether they were related to: (1) the effects of the sugar program on one or more groups in the U.S.; or (2) U.S. sugar trade or the effects of the program on trade; or (3) the cost of production of sugar farming in the U.S. or the competitiveness of U.S. sugar producers. This yielded 95 publications that were related to at least one of the three topics.
3. We reviewed these 95 publications and kept only those that estimated or modeled new results, and were either published in peer-reviewed academic journals or published by U.S. government agencies, thus excluding working papers, newspaper articles, and industry or think tank publications. This yielded 30 publications.
4. Two economists read each of these studies for relevancy and methodological rigor, including whether the paper modeled and quantified the effect of the U.S. sugar program or of trade agreements on the U.S. economy. We also contacted one or more authors from most relevant academic papers published since 2010 to discuss the methodology, results, and any threats to ideological independence of the existing research. Of the relevant authors, three agreed to talk

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with GAO. In total, five studies of the effect of the U.S. sugar program and five studies of the effect of trade agreements made it past these checks and into our literature review. See tables 5 through 9 for the studies and how they were used.

Despite certain limitations, we determined that the studies are sufficiently rigorous to collectively provide reliable estimates of the range of economic effects. Although the exact estimates varied because of the different assumptions and time periods that the studies used, the selected studies found qualitatively similar effects, including net economic costs of the sugar program. Nevertheless, the studies have specific limitations. For example, most of the studies use partial or general equilibrium models, which rely on assumptions about the responsiveness of consumers and producers to changes in prices. Moreover, most of the studies use a modeling approach that, while allowing for the isolation of certain economic effects of the U.S. sugar program and agreements with Mexico, generally do not take some market interactions into account such as how changes in sugar prices affect other industries such as substitutes for sugar.

Table 5: Studies used to estimate the effects of the U.S. sugar program on the U.S. economy

| Study | Modeling type | Effect on consumer surplus (before adjusting for inflation) | Effect on producer surplus (before adjusting for inflation) | Effect on total surplus (before adjusting for inflation) | Effect on consumer surplus (after adjusting for inflation) | Effect on producer surplus (after adjusting for inflation) | Effect on total surplus (after adjusting for inflation) |
|-------------------------------------|---------------------|---|---|--|--|--|---|
| GAO (2000) ^a | Partial equilibrium | \$1.4 to \$1.9 billion decrease | \$0.8 to \$1.0 billion increase | \$609 to \$930 million decrease | \$2.5 to \$3.4 billion decrease | \$1.4 to \$1.8 billion increase | \$1.1 to \$1.6 billion decrease |
| Koo (2002) | Partial equilibrium | \$1.9 billion decrease | \$1.2 billion increase | \$627 million decrease | \$3.3 billion decrease | \$2.2 billion increase | \$1.1 billion decrease |
| Lewer & Parrish (2020) ^b | Partial equilibrium | \$3.1 billion decrease | \$2.4 billion increase | \$690 million decrease | \$3.5 billion decrease | \$2.7 billion increase | \$780 million decrease |

Source: GAO analysis of: GAO. Sugar Program: Supporting Sugar Prices Has Increased Users' Costs While Benefiting Producers. RCED-00-126. Washington, D.C.: June 9, 2000; Koo, Won W. "Alternative U.S. and EU Sugar Trade Liberalization Policies and Their Implications." *Review of Agricultural Economics*, vol. 24, no.2 (2002): 336-352.; Lewer, Joshua J., and Lisa Parrish. "Estimating Welfare Effects from the U.S. Sugar Program." *Southwestern Economic Review*, vol. 47 (2020): 23-36. | GAO-24-106144

Notes: Inflation-adjusted values are calculated using the Consumer Price Index from the U.S. Department of Labor, Bureau of Labor Statistics. Values are expressed in 2022 dollars. Studies were selected based on a review of academic and U.S. government publications since the year 2000 that model the effect of the U.S. sugar program on the U.S. economy. When the study did not specify the base year of its results, we adjusted for inflation using the study's year of publication as the base year. Although these studies span more than two decades, the methodologies are similar and depend largely on assumptions about the difference between the U.S. sugar price and world sugar price, and how sensitive producers and consumers are to these prices. Lewer and Parrish (2020) differ from GAO (2000) and Koo (2002) in their assumptions about the world market, with GAO (2000) and Koo (2002) allowing the world market to respond to the U.S. removing the sugar program.

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^aGAO (2000) had multiple sets of results based on different assumptions, so we report the maximum range of results.

^bLewer & Parrish (2020) also estimate tariff revenues from the program to be \$551 million per year (adjusted for inflation). If these estimated tariff revenues are subtracted from the welfare loss, the total deadweight loss of the program is \$227 million per year (adjusted for inflation).

Table 6: Studies used to estimate the effects of the U.S. sugar program on domestic sugar production and prices

| Study | Modeling type | Effect on U.S. price of raw cane sugar | Effect on U.S. price of refined beet sugar | Effect on U.S. sugarcane crop production | Effect on U.S. sugar beet crop production | Effect on U.S. refined cane sugar production | Effect on U.S. refined beet sugar production |
|--------------------------------------|---------------------|--|--|--|--|--|--|
| Beghin & Elobeid (2015) ^a | Partial equilibrium | 41% increase | 58% increase | 7% increase in quantity | 7% increase in quantity | 19% decrease in quantity | ^b |
| GAO (2000) ^c | Partial equilibrium | 50% to 77% increase | 34% to 62% increase | 1% to 2% increase in quantity | 5% to 7% increase in quantity | ^b | ^b |
| Koo (2002) | Partial equilibrium | ^b | 26% increase | 13% increase in quantity | 19% increase in quantity | ^b | ^b |
| USITC (2017) | General equilibrium | 28% increase ^d | 55% increase ^d | 11% increase in value of sales | 0.3% decrease in value of sales ^e | 5% increase in value of sales | 0.4% decrease in value of sales ^e |

Source: GAO analysis of: Beghin, John C., and Amani Elobeid. "The Impact of the U.S. Sugar Program Redux." *Applied Economic Perspectives and Policy*, vol. 37, no.1 (2015): 1-33.; GAO. *Sugar Program: Supporting Sugar Prices Has Increased Users' Costs While Benefiting Producers*. RCED-00-126. Washington, D.C.: June 9, 2000; Koo, Won W. "Alternative U.S. and EU Sugar Trade Liberalization Policies and Their Implications." *Review of Agricultural Economics*, vol. 24, no.2 (2002): 336-352.; U.S. International Trade Commission (USITC). *The Economic Effects of Significant U.S. Import Restraints: Ninth Update 2017*. USITC Publication 4726. (Washington, D.C.: USITC, 2017). | GAO-24-106144

Notes: Studies were selected based on a review of academic and U.S. government publications since the year 2000 that model the effect of the U.S. sugar program on U.S. sugar production and prices. When studies had different results for different years, such as a 10-year projection, we took the average result across these years. These percentages are calculated based on a change from an economy without the sugar program to an economy with the sugar program. As a result, these results vary from the results reported in papers that describe the percentage change from an economy with the sugar program to an economy without the sugar program.

^aBeghin & Elobeid (2015) was commissioned by the Sweetener Users Association. However, we include this study in our report because it is peer-reviewed and the methodology and results are highly consistent with the other studies in our literature review.

^bResult not listed in study.

^cGAO (2000) had multiple sets of results based on different assumptions, so we report the maximum range of results.

^dResults are for the price of sugar imported into the U.S.

^eUSITC (2017) estimated that the U.S. sugar program reduces the value of sales from sugarbeets and refined beet sugar. According to USITC, those results are dependent on market conditions that existed in 2015, and suggest that beet sugar production in 2015 was competitive with imported sugar. According to the USITC, a change in market conditions, in particular whether international sugar prices are below U.S. loan rates, could alter these results.

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Table 7: Studies used to estimate the effects of the U.S. sugar program on domestic employment

| Study | Modeling type | Effect on U.S. sugarcane farming employment | Effect on U.S. sugar beet farming employment | Effect on U.S. sugar refining employment | Effect on U.S. food manufacturing employment |
|--------------------------------------|---------------------|---|--|--|--|
| Beghin & Elobeid (2015) ^a | Partial equilibrium | -. ^b | -. ^b | 2% decrease | 3% decrease |
| USITC (2017) ^c | General equilibrium | 14% increase | 0.4% decrease | 5% increase | -. ^b |

Source: GAO analysis of: Beghin, John C., and Amani Elobeid. "The Impact of the U.S. Sugar Program Redux." *Applied Economic Perspectives and Policy*, vol. 37, no.1 (2015): 1-33.; U.S. International Trade Commission (USITC). *The Economic Effects of Significant U.S. Import Restraints: Ninth Update 2017*. USITC Publication 4726. (Washington, D.C.: USITC, 2017). | GAO-24-106144

Notes: Studies were selected based on a review of academic and U.S. government publications since the year 2000 that model the effect of the U.S. sugar program on U.S. employment. When studies had different results for different years, such as a 10-year projection, we took the average result across these years. These percentages are calculated based on a change from an economy without the sugar program to an economy with the sugar program. As a result, these results vary from the results reported in papers that describe the percentage change from an economy with the sugar program to an economy without the sugar program.

^aBeghin & Elobeid (2015) was commissioned by the Sweetener Users Association. However, we include this study in our report because it is peer-reviewed and the methodology and results are highly consistent with the other studies in our literature review.

^bResult not listed in study.

^cUSITC (2017) estimated that the U.S. sugar program reduces employment in sugarbeet farming and processing. According to USITC, those results are dependent on market conditions that existed in 2015, and suggest that beet sugar production in 2015 was competitive with imported sugar. According to the USITC, a change in market conditions, in particular whether international sugar prices are below U.S. loan rates, could alter these results.

Table 8: Studies used to estimate the effect of trade agreements on U.S. sugar prices, U.S. imports from Mexico and U.S. sugar production

| Study | Trade agreement analyzed | Modeling type | Effect on U.S. sugar prices | Effect on U.S. imports from Mexico | Effect on U.S. production |
|--|--------------------------|-----------------------------|--|------------------------------------|---------------------------|
| Troy G. Schmitz and Karen E. Lewis (2015) ^a | NAFTA | Partial equilibrium | Raw sugar: 9% to 22% decrease | 255% to 372% increase ^b | 4% to 5% decrease |
| Abler et al (2008) ^c | NAFTA | Partial equilibrium | Raw sugar: 9% decrease refined: 7 % decrease | 522% increase ^d | 4% decrease |
| Troy G. Schmitz (2018) ^e | Suspension agreements | Partial equilibrium | Raw sugar: 1% increase | 8% decrease ^f | 0.6% increase |
| Wilson Sinclair and Amanda M. Countryman (2019) | Suspension agreements | Partial equilibrium | Raw sugar: 11% increase ^g | 15% decrease | <1% increase |
| Carter et al (2019) | Suspension agreements | Ex-post regression analysis | Raw: 28% increase Refined: 15% increase | 17% decrease | n/a |

Source: GAO analysis of: Schmitz, Troy G., and Karen E. Lewis. "Impact of NAFTA on U.S. and Mexican Sugar Markets." *Journal of Agricultural and Resource Economics*, vol. 40, no. 3, 2015, pp. 387–404; Abler, David, et al. "Changing the U.S. Sugar Program into a Standard Crop Program: Consequences under the North American Free Trade Agreement and Doha." *Review of Agricultural Economics*, vol. 30, no. 1, 2008, pp. 82–102; Schmitz, Troy G. "Impact of the 2014 Suspension Agreement on Sugar Between the United States and Mexico." *Agricultural Economics*, vol. 49, no. 1 (2018): 55-69; Sinclair, Wilson, and Amanda M. Countryman. "Not so sweet: Economic Implications of Restricting U.S. Sugar Imports from Mexico." *Journal of Agricultural and Applied Economics*, vol. 51, no. 3 (2019):

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Notes: When studies had different results for different years, such as the effect for each year over a four-year period, we took the average result across these years. NAFTA refers to the North American Free Trade Agreement (NAFTA) that provided Mexico with duty-free and quota free access to the U.S. market for imports of sugar beginning in 2008. The suspension agreements between the U.S. and Mexico, signed in 2014, specify minimum prices and maximum quantities for Mexican sugar exports to the U.S. For the NAFTA estimates, the studies measure the effect on the U.S. economy of Mexico having duty-free and quota free access to the U.S. market for imports of sugar starting in 2008 compared to prior to 2008 when Mexico had restricted access to the U.S. market. For the effects of the suspension agreements on the U.S. economy, the percentages are based on a change from an economy without the suspension agreements (i.e., when Mexico had duty-free and quota-free access to the U.S. market for imports of sugar) to an economy with the suspension agreements. As a result, the results vary from results reported in studies that describe the percentage change from an economy with the suspension agreements to an economy without the suspension agreements.

^aThe ranges are based on two scenarios: one that uses the Food and Agriculture Policy Research Institute (FAPRI) elasticities and another that uses high elasticities. According to the study, FAPRI provided both short-run and long-run elasticities. Given that the study models each year individually, the short run estimates were deemed appropriate for the empirical analysis. Moreover, the authors considered using the FAPRI long-run elasticity estimates as the "high" elasticities. However, a review of previous literature determined that "high" sugar elasticities were actually slightly higher than FAPRI's long-run elasticity estimates. Therefore, the authors used the "high" elasticities from previous literature to perform the sensitivity analysis rather than FAPRI's long-run sugar elasticities. The "high elasticities" scenario yields the lower impacts on price and production decreases and higher impacts on import increases.

^bThe study also examined the impact of NAFTA on overall U.S. imports of sugar and found that changes to the treatment of Mexican sugar under NAFTA that came into effect in 2008 increased overall U.S. imports of sugar by 36 to 53 percent.

^cThe study uses a partial equilibrium model to estimate projections for 2008 through 2015 under a low-import and a high-import scenario. The high-import scenario is based on a variety of assumptions, such as increased use of high fructose corn syrup and decreased use of sugar in Mexico, as well as increased duty-free exports from Mexico to the U.S. Because the study used projections, we examined actual average U.S. imports of sugar during the fiscal year 2008 through 2014 period. Actual U.S. imports of sugar were close to the average imports that the study projected under the high import scenario.

^dThe study also examined the impact of NAFTA on overall U.S. imports of sugar and on net imports of sugar containing products and found that changes to the treatment of Mexican sugar under NAFTA that came into effect in 2008 would increase overall U.S. imports of sugar by 62 percent and decrease net imports of sugar containing products by about 4 percent.

^eThe study examined only the effect of the price floor aspect of the suspension agreements (i.e., the antidumping suspension agreement).

^fThe study also estimated that the implementation of the price floor aspect of the suspension agreements (i.e., the antidumping suspension agreement) decreased overall U.S. imports of sugar by about 4 percent.

^gThe study also estimated that the implementation of both the suspension agreements increased world prices by 0.5 percent.

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Table 9: Studies used to estimate the effect of trade agreements on the U.S. economy

| Study | Trade agreement analyzed | Modeling type | Effect on consumer surplus (before adjusting for inflation) | Effect on producer surplus (before adjusting for inflation) | Effect on total surplus (before adjusting for inflation) | Effect on consumer surplus (after adjusting for inflation) | Effect on producer surplus (after adjusting for inflation) | Effect on total surplus (after adjusting for inflation) |
|--|--------------------------|---------------------|---|---|--|--|--|---|
| Troy G. Schmitz and Karen E. Lewis (2015) ^a | NAFTA | Partial equilibrium | \$612 million to 1.7 billion increase | \$474 million to \$1.3 billion decrease | \$138 to \$362 million increase | \$756 million to \$2.1 billion increase | \$585 million to \$1.7 billion decrease | \$170 million to \$ 447 million increase |
| Troy G. Schmitz (2018) ^b | Suspension agreements | Partial equilibrium | \$76.7 million decrease | \$59.3 million increase | \$17.4 million decrease | \$89.3 million decrease | \$69.1 million increase | \$20.3 million decrease |
| Wilson Sinclair and Amanda M. Countryman (2019) ^c | Suspension agreements | Partial equilibrium | \$1.7 billion decrease | \$660 million increase | \$561 million decrease | \$2.1 billion decrease | \$814 million increase | \$693 million decrease |

Source: GAO analysis of: Schmitz, Troy G., and Karen E. Lewis. "Impact of NAFTA on U.S. and Mexican Sugar Markets." *Journal of Agricultural and Resource Economics*, vol. 40, no. 3, 2015, pp. 387–404; Schmitz, Troy G. "Impact of the 2014 Suspension Agreement on Sugar Between the United States and Mexico." *Agricultural Economics*, vol. 49, no. 1 (2018): 55-69; Sinclair, Wilson, and Amanda M. Countryman. "Not so sweet: Economic Implications of Restricting U.S. Sugar Imports from Mexico." *Journal of Agricultural and Applied Economics*, vol. 51, no. 3 (2019): 368-384. | GAO-24-106144

Notes: When studies had different results for different years, such as the effect for each year over a four-year period, we took the average result across these years. NAFTA refers to the North American Free Trade Agreement (NAFTA) that provided Mexico with duty-free and quota-free access to the U.S. market for imports of sugar beginning in 2008. The suspension agreements between the U.S. and Mexico, signed in 2014, specify minimum prices and maximum quantities for Mexican sugar exports to the U.S. For the NAFTA estimates, the studies measure the effect on the U.S. economy of Mexico having duty-free and quota free access to the U.S. market for imports of sugar starting in 2008 compared to prior to 2008 when Mexico had restricted access to the U.S. market. For the effects of the suspension agreements on the U.S. economy the effects are based on a change from an economy without the suspension agreements (i.e., when Mexico had duty-free and quota-free access to the U.S. market for imports of sugar) to an economy with the suspension agreements.

Inflation-adjusted values are calculated using the Consumer Price Index from the U.S. Department of Labor, Bureau of Labor Statistics. Values are expressed in 2022 dollars. When the study did not specify the base year of its results, we adjusted for inflation using the study's year of publication as the base year.

^aThe ranges are based on two scenarios: one that uses the Food and Agriculture Policy Research Institute (FAPRI) elasticities and another that uses high elasticities. According to the study, FAPRI provided both short-run and long-run elasticities. Given that the study models each year individually, the short run estimates were deemed appropriate for the empirical analysis. Moreover, the authors considered using the FAPRI long-run elasticity estimates as the "high" elasticities. However, a review of previous literature determined that "high" sugar elasticities were actually slightly higher than FAPRI's long-run elasticity estimates. Therefore, the authors used the "high" elasticities from previous literature to perform the sensitivity analysis rather than FAPRI's long-run sugar elasticities. The "high elasticities" scenario yields the lower impacts on consumer surplus increases, producer surplus decreases and total surplus increases.

^bThe study examined only the effect of the price floor aspect of the suspension agreements (i.e., the antidumping suspension agreement).

^cFor the effects on the U.S. economy the study includes the effect of the suspension agreements on government revenue, finding that it would increase by \$452 million (\$558 million in 2022 dollars) because the suspension agreements yielded higher prices, leading to an increase in imports from tariff-rate quota countries and subsequently an increase in tariff revenue collected. The effect on the government revenue is added to the consumer and producer surplus estimates to estimate the overall effect on the U.S. economy.

Appendix III: Changes in Overall U.S. Sugar Imports, U.S. Imports of Sugar Containing Products and U.S. Sugar Production

We examined changes in overall U.S. sugar imports, U.S. imports of products in industries that use sugar (i.e. sugar containing products) and U.S. sugar production before and after trade agreements with Mexico.¹ Specifically, we examined changes in average imports and production from the fiscal year 2003 through 2007 period to the fiscal year 2008 through 2014 period (i.e. before and after the imports of sugar from Mexico gained duty-free and quota-free status under in 2008) and to the fiscal year 2015 through the 2022 period (i.e. after the suspension agreements took effect).

Overall U.S. imports of sugar, on average, rose after both trade agreements, increasing at a faster pace after 2008 and before the suspension agreements took effect. Average U.S. imports of sugar-containing products have risen since fiscal year 2003 and, increased at a faster rate during the period after the suspension agreements went into effect. U.S. sugar production, on average, increased during both periods, with a larger increase after the suspension agreements were implemented. Specifically,

- **Overall U.S. imports of sugar.** Overall U.S. imports of sugar increased from an annual average of about 1,576 thousand metric tons (commercial value) before the period when Mexico had duty-free, quota-free access to an average of about 2,582 thousand metric tons (commercial value) after Mexico had duty-free quota-free access, a 64 percent increase. Imports increased to about 2,708 thousand metric tons (commercial value) during the suspension agreements period, an increase of about 5 percent from the period before the suspension

¹These increases and decreases in overall U.S. imports of sugar, U.S. imports of sugar-containing products and production are based on descriptive statistics. As a result, we cannot state whether these changes were due to trade agreements with Mexico or other factors. Overall U.S. imports of sugar and sugar-containing products are affected by a variety of factors such as changes in demand and production. Sugar production in turn is also driven by a variety of factors, including changes in weather and prices.

agreements when Mexico had duty-free, quota-free access for sugar under NAFTA.

- **U.S. imports of sugar-containing products.** U.S. imports of sugar-containing products have been increasing since fiscal year 2003, and increasing at a faster rate since the suspension agreements were signed in 2014. Specifically, from the period between 2003 and 2007, Mexico gained duty-free and quota-free access for sugar under NAFTA in 2008, to the period from 2008 to 2014, the average annual inflation-adjusted value of U.S. imports of sugar containing products increased from about \$16 billion to about \$21 billion, a 25 percent increase. It then increased to approximately \$35 billion per year after the suspension agreements were signed, an increase of about 72 percent from the time at which Mexico gained duty-free, quota-free access in 2008.² In comparison, from the period before Mexico gained duty-free, quota-free access under NAFTA to the period after, the average annual real value of all imports, excluding sugar containing products, increased by about 4 percent. Total imports, excluding sugar containing products, increased by about 26 percent during the suspension agreements period.

U.S. sugar production. Before Mexico obtained duty-free, quota-free access to the U.S. sugar market under NAFTA in 2008, U.S. production of beet and cane sugar averaged about 8.15 million short tons (raw value) per year. After 2008, it averaged about 8.2 million short tons (raw value) per year, a 0.6 percent increase. During the period after the suspension agreements were signed, it has averaged about 8.9 million short tons (raw value) per year, about a 9 percent increase from the period when Mexico had duty-free, quota-free access.

²We selected the industries for our analysis based on the industries analyzed in Beghin and Elobeid (2015). The industries we analyzed were for the following North American Industry Classification System (NAICS) codes: 31123 Breakfast Cereals, 31132 Chocolate & Confectionery Products, 31134 Nonchocolate Confectionery Products, 31135 Chocolate And Confectionery, 31141 Frozen Foods, 31142 Fruits & Vegetables canned, 31152 Ice Cream & Frozen Desserts, 31181 Bread & Bakery Products, 31182 Flour Mixes, Dough & Pasta, 31191 Snack Foods, 31193 Flavoring Extracts & Syrups, and 31211 Soft Drinks & Ices.

We adjusted for inflation using the Import Price Index from the U.S. Department of Labor Statistics.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

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