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Theme Overview: U.S.–China Trade Dispute and Potential Impacts on Agriculture

Mary A. Marchant and H. Holly Wang

JEL Classifications: F1, P2, Q13, Q17, Q18

Keywords: Agriculture, China, Exports, Trade war, U.S.-China trade

The United States and China, the world's largest economic powers, have dueled in an escalating trade dispute since January 2018. This ever-changing story continues to evolve, with additional tariffs announced by the United States as we go to press in late May 2018. Given this recent dispute that has moved agriculture from the back pages to the front pages of media, *Choices* publishes this special issue on "U.S.-China Trade Dispute and Potential Impacts on Agriculture." This trade dispute is important to U.S. agriculture, because China has been the United States' top agricultural export market outside of North America since 2009 with an annual sale of nearly $20 billion in 2017 (USDA, 2018b). In 2017, top U.S. agricultural exports to China included soybeans, cotton, hides and skins for leather products, fish, dairy, sorghum, wheat, nuts and pork (USDA, 2018a).

Noting the theory of comparative advantage and that China has one-fifth of the world's population—four times that of the United States—but only one-tenth of the world's arable land, China primarily exports labor-intensive manufactured products to the United States (e.g., electronics), and the United States primarily exports land-intensive agricultural commodities to China (e.g., soybeans). While the United States has a large trade deficit with China, it has a trade surplus in agricultural products.

As background to the 2018 trade dispute, the U.S. Trade Representative issued its *2017 Report to Congress on China's WTO Compliance* in January 2018. The first tariff action occurred on January 22, when the United States imposed import duties on Chinese solar panels and washing machines. China then announced an anti-dumping and countervailing duty investigation on U.S. sorghum imports on February 4. Next, the United States imposed tariffs on imported steel (25%) and aluminum (10%) products from China on March 23. China responded on April 2 by imposing tariffs on $3 billion of U.S. products, including a 25% tariff on pork and a 15% tariff on fruits, nuts, wine, and other agricultural products.

For round two, on April 3, Washington released a potential list of 1,333 products subject to a forthcoming 25% tariff on $46.2 billion on imported Chinese products. Beijing responded immediately on April 4, with a forthcoming 25% tariff on a potential list of 106 products worth $49.8 billion of U.S. goods, including soybeans, DDGS, beef, cotton, and other agricultural products as wells as automobiles and aircraft (Bown, 2018a, b). On April 5, President Trump asked the U.S. Trade Representative for an additional list of potential Chinese imports worth $100 billion to be considered for tariffs. On April 17, China announced an import duty of 178.6% on sorghum imports, to be applied the next day. Tension between the two governments mounted and rounds of negotiations were in vain.

On May 20, Treasury Secretary Mnuchin announced the trade war was put on hold as the two governments agreed to work out a solution for the huge deficit. This cooperation was short-lived. As this publication goes to press during the week of June 3, 2018, the White House announced on May 29, 2018 its "Statement on Steps to Protect Domestic Technology and Intellectual Property from China's Discriminatory and Burdensome Trade Practices," which proposed 25% tariffs on $50 billion of goods imported from China containing “industrially significant technology,” with specific products to be identified in June 2018 and tariffs applied soon after.

Threats of Chinese tariffs on U.S. agricultural imports shook the U.S. agricultural sector. Attention focused on the potential loss of farm income, with a surge of short articles published in the popular media. To help provide a deeper analysis on the trade policy impact, we organize this China theme issue with five articles: Zheng et al. and Taheripour and Tyner estimate the loss on multiple relevant crops using a partial equilibrium model and a general equilibrium model, respectively. Both studies focus on soybeans, while wheat, pork, and a few other commodities are also considered. Hansen et al., Countryman and Muhammad, and Liu et al. examine sorghum, wine, and cotton, respectively, and point out potential export reductions as a result of such tariffs.

Although the current trade dispute continues to evolve, it is valuable for us to understand the potential negative impact and to be informed of possible consequences. It is our sincere hope that U.S. and Chinese negotiators will reach an agreement, since both countries ultimately lose with a trade war, as seen from the 1930s Smoot–Hawley Tariff.

Finally, this theme issue builds upon two prior *Choices* issues on China: 1) “U.S. Commodity Markets Respond to Changes in China’s Ag Policies” (Marchant, 2017) and 2) “China as the Leading U.S. Agricultural Export Market” (Wang, 2015).

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Additionally, the authors are grateful to *Choices* editors Kynda Curtis and Alison Davis for proposing this special issue on U.S.–China Trade Disputes and to them and all authors in this special issue for working with us to make this issue a reality given the timeliness and relevance of the topic.

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Predicting Potential Impacts of China's Retaliatory Tariffs on the U.S. Farm Sector

Yuqing Zheng, Dallas Wood, H. Holly Wang, Jason P. H. Jones

JEL Classifications: F14, Q17, Q18

Keywords: Soybeans, Cotton, Sorghum, Pork, Trade war

Trade tensions have been escalating between the United States and China in recent months. In early April 2018, China proposed increasing import tariffs by as much as 25 percentage points on hundreds of U.S. products. These tariffs were proposed as a response to the announcement that the United States proposed tariffs on a number of Chinese imports, including steel and aluminum (as the result of U.S. 301 investigation and U.S. 232 Trade Action).

Among the most important agricultural commodities affected by China's retaliatory tariffs are soybeans, cotton, sorghum, and pork. Table 1 presents the current and new applied tariffs for these commodities. These products are defined using the Harmonized System (HS), an international nomenclature for classifying products traded between countries. Soybeans, cotton, and sorghum are associated with unique 6-digit HS codes. China has placed retaliatory tariffs on each of these products and on various pork products. The pork tariffs differ based on the cut of meat and whether it is fresh or frozen. To capture the effects of these tariffs on the pork trade as a whole, we define pork at a more aggregate level using a more aggregate 4-digit HS code. The new applied tariff on pork was implemented on April 2, 2018, but the new tariffs on the other commodities do not have implementation dates. These will depend on further bilateral negotiation. However, the threat might become reality, as the first round of negotiation on May 4 ended with no deal and the second round of negotiation on May 18 ended with a trade war being put "on hold."

Table 1. Tariff Schedule on the Four Agricultural Commodities

Commodity	HS Code	HS Code Description	Current Tariff (%)	New Applied Tariff (%)	Implementation Date
Soybeans	120190	Soya beans; other than seed, whether or not broken	3	28	To be determined
Cotton	520100	Cotton; not carded or combed	1 (in quota), 40 (out quota)	26 (in quota), 64 (out quota)	To be determined
Sorghum	100790	Cereals; grain sorghum, other than seed	2	27	To be determined
Pork	0203	Meat; of swine, carcasses and half-carcasses, frozen	12–20	37–45	April 2, 2018

Source: Inouye (2018), USDA (2018).

Although quick statistics on the impacts on U.S. farmers' losses from individual commodities have been cited in recent media reports (Muhammad and Smith, 2018; Wang, 2018), further analysis is needed. In this article, we use a partial equilibrium trade model to predict potential impacts of China's retaliatory tariff on the U.S. farm sector for soybeans, cotton, sorghum, and pork. Our results provide timely and useful information to U.S. policy makers, producers, and other agricultural stakeholders about the breadth of impact of these retaliatory tariffs.

Importance of the Chinese Market to U.S. Producers

China is an important export market for U.S. soybeans, cotton, sorghum, and pork. Table 2 breaks down the top five exports markets for each of these products. The table lists the four commodities in descending order of export value to China, which is the top export market for U.S. soybeans and sorghum, a close second (after Vietnam) for U.S. cotton, and fifth for U.S. pork. Specifically, in 2017, the United States exported $12.4 billion worth of soybeans, $971.3 million of cotton, $835.7 million of sorghum, and $237.2 million of pork to China. In terms of trade reliance, these numbers represent 49%, 74%, 56%, and 17% of total U.S. exports and 57%, 17%, 81%, and 5% of U.S. exports to China, respectively, for the four commodities (last two rows in Table 2). This means, for example, that about half of U.S. sorghum was exported, most of it going to China. While the United States exported most of its produced cotton, only a small fraction went to China. For pork, China only accounted for 5% of U.S. exports. Although most of China's pork imports come from the European Union, about one-fifth of China's pork imports come from the United States, exhibiting a degree of dependence on the U.S. market. These numbers highlight the importance of the Chinese market, especially for soybeans and sorghum. Based on the table, we would expect soybeans and sorghum to be most affected by the tariff change.

Table 2. Top Export Markets for U.S. Soybeans, Cotton, Sorghum, and Pork (million $) in 2017

Destination	Soybeans	Destination	Cotton	Destination	Sorghum	Destination	Pork
China	$12,356.0	Viet Nam	$1,058.5	China	$835.7	Japan	$1,535.0
Mexico	$1,594.9	China	$971.3	Mexico	$75.3	Mexico	$1,170.2
Netherlands	$1,102.7	Turkey	$730.2	Japan	$32.3	Rep. of Korea	$423.7
Japan	$975.7	Indonesia	$501.6	Sudan	$20.9	Canada	$379.2
Indonesia	$922.1	India	$433.2	Somalia	$13.5	China	$237.2
% of U.S. production exported	49%		74%		56%		17%
% of U.S. exports to China	57%		17%		81%		5%

Source: UN Statistics Division - Commodity Trade (UN Comtrade, 2017).

Global Simulation Model

We analyze the short-run quantitative impacts of a 25% tariff increase on U.S. domestic prices, production, exports, and welfare for all four commodities using the Global Simulation Model (GSIM). Some products, like cotton, face different tariff rates depending on how much of the product is being imported (i.e., in-quota rates versus out-quota rates). To keep things tractable, we increase the weighted average tariff rate for each product by 25 percentage points. This model employs national product differentiation, which assumes that consumers can differentiate products from different countries and allows us to simultaneously assess trade policy changes at the industry level and on a global or national level.

Francois and Hall (2003) developed the GSIM, which is now the underlying model used by the U.S. Food and Drug Administration (FDA) Regulation and Enforcement Policy Trade Impact Model project, led by the authors (a model that the FDA uses to quickly analyze the effects of potential FDA policy options on the international trade of FDA-regulated products), and the World Bank World Integrated Trade Solution (WITS) Global Tariff Cuts and Trade Simulator. Zheng et al. (2017) provide a recent application of the GSIM model to the U.S. orange juice industry, including technical details. Our results estimate the economic impacts that such tariffs will bring to the farm sector and the extent to which the federal government can adjust or respond when considering how to mitigate those impacts.

Predicting Potential Impacts of China's Retaliatory Tariff

We run the GSIM for each of the four commodities by populating it with 1) United Nations trade statistics for the top 24 trading partners of the United States, 2) U.S. production data from the United Nations FAOSTAT database, 3) bilateral tariff rates obtained from the World Bank's Trade Analysis and Information System (TRAINS) and the World Trade Organization's Tariff Database, and 4) elasticities from the trade literature measuring the sensitivity of import demand and export supply to prices and the degree of substitution between countries (e.g., how Chinese consumers are willing to substitute U.S. pork with European pork). We select the year 2016 to make data compatible across sources. Table 3 shows the predicted impacts of the retaliatory tariffs on the United States. Using these data, our model predicts several impacts from the 25% retaliatory tariff:

- Impact on domestic U.S. prices: We predict that U.S. domestic prices will decrease by 3.9% for soybeans, 1.2% for cotton, 10.6% for sorghum, and 0.6% for pork. The price decrease will be most profound for sorghum, considering the high degree of dependence on Chinese demand for U.S. sorghum.
- Impact on U.S. production: We predict that U.S. production of soybeans will decrease by 1.6%, cotton will decrease by 0.2%, sorghum will decrease by 2.1%, and pork will decrease by 0.2%.
- Impact on U.S. exports to China: We predict that the value of U.S. exports to China will decrease by 34.2% for soybeans, 18.8% for cotton, 22.5% for sorghum, and 83.3% for pork. These declines will be partially offset by increases in exports to other countries (Figures 1–4).
- Impact on producer surplus: We predict that U.S. soybean producers will lose $1.8 billion (4%), cotton producers will lose $67.6 million (1.3%), sorghum producers will lose $246.2 million (10.5%), and pork producers will lose $178.9 million (0.7%) over the next year.

Table 3. Predicted Changes Resulting from China's Retaliatory Tariffs on the United States

Commodity	U.S. Domestic Price	U.S. Domestic Production	Percentage Change of U.S. Export to China	U.S. Producer Surplus (million, and %)
Soybeans	−3.9%	−1.6%	−34.2%	−$1,847.3; −4.0%
Cotton	−1.2%	−0.2%	−18.8%	−$67.6; −1.3%
Sorghum	−10.6%	−2.1%	−22.5%	−$246.2; −10.5%
Pork	−0.6%	−0.2%	−83.3%	−$178.9; −0.7%

Figure 1. Change in U.S. Soybean Exports by Country (%)

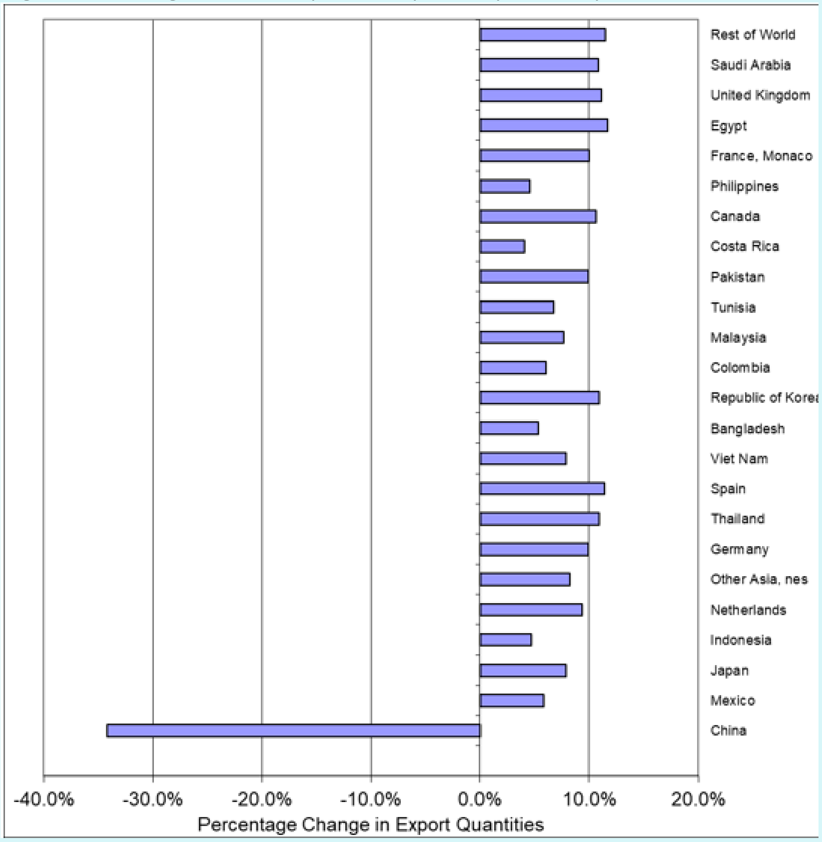


Figure 2. Change in U.S. Cotton Exports by Country (%)

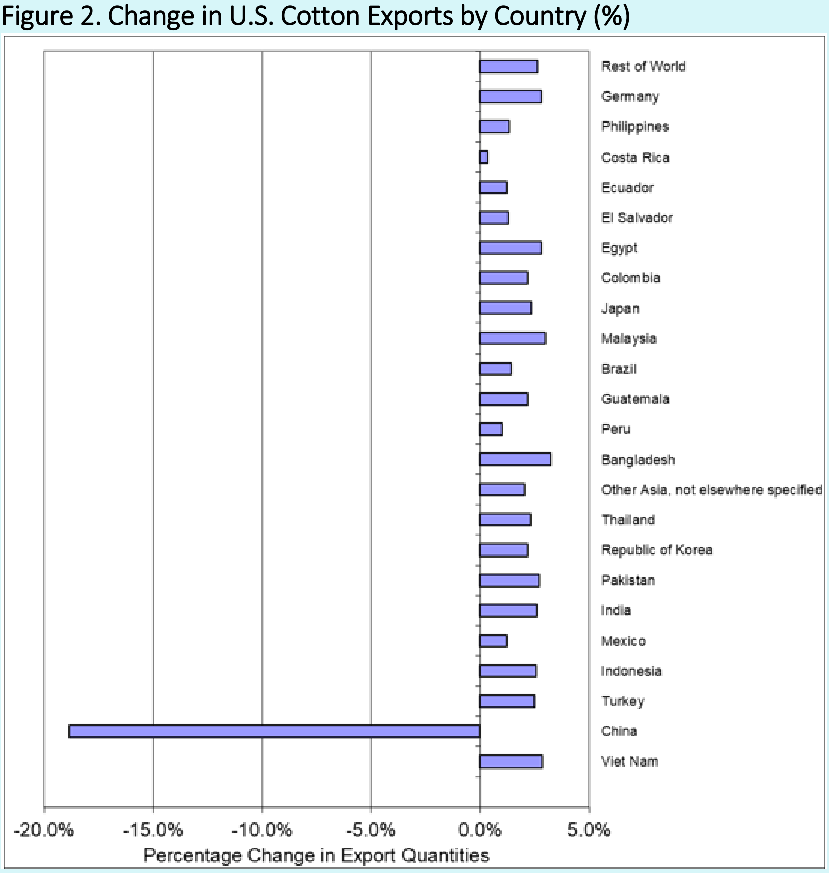


Figure 3. Change in U.S. Sorghum Exports by Country (%)

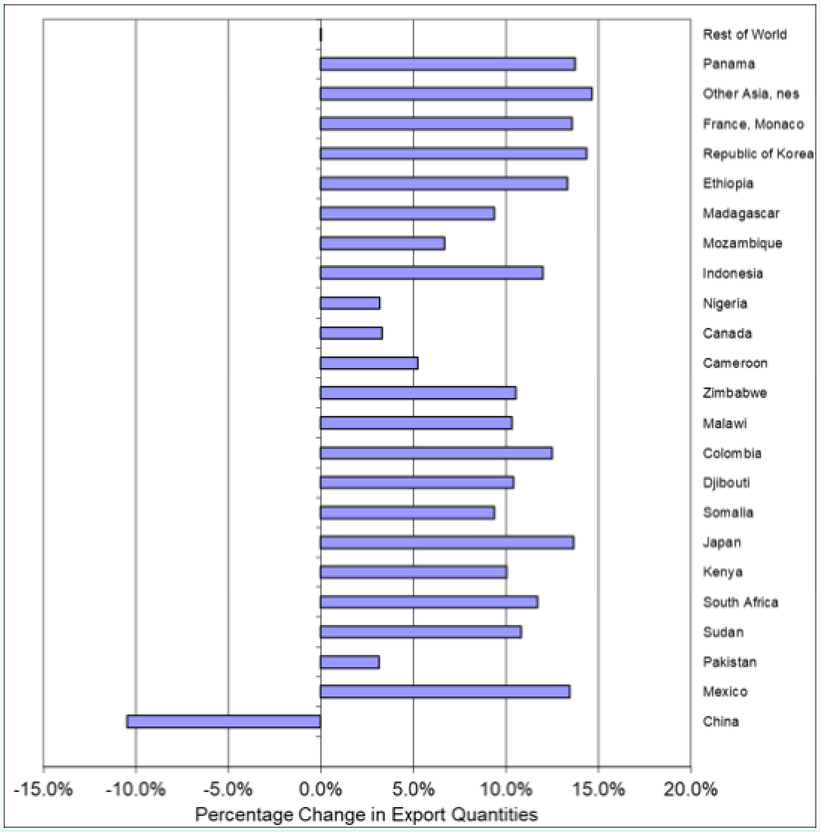
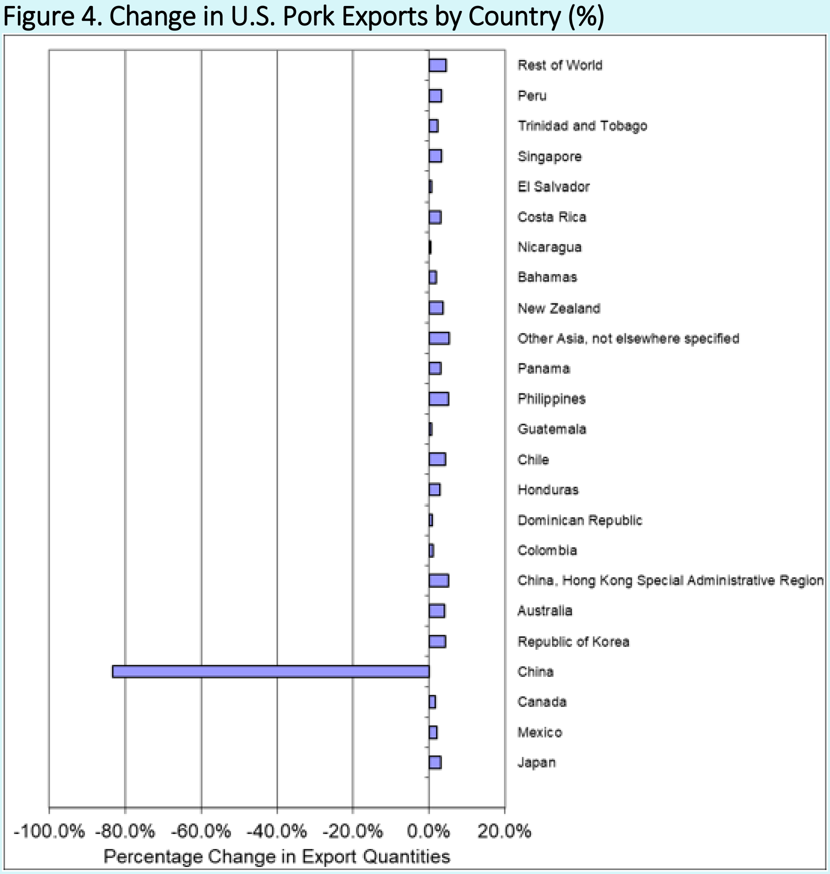


Figure 4. Change in U.S. Pork Exports by Country (%)



Summary

We used GSIM to predict the impact of China's retaliatory tariffs on four major agricultural commodities—soybeans, cotton, sorghum, and pork. Based on our analysis, we predict that 1) prices of these commodities will fall by 0.6% (pork) to 10.6% (sorghum), 2) exports of these commodities to China will fall significantly (up to 83% in the case of pork), while exports to other countries will increase, and 3) U.S. producers will suffer significant losses due to the decline in exports and prices (soybean producers will lose $1.8 billion).

However, other factors may attenuate or strengthen our predictions. For example, the Chinese government has implemented policies to increase soybean planting acreage at the cost of corn acreage, a commodity for which China has accumulated a high inventory. Such policy changes may result in exports of this commodity to fall even further, which would make our predictions a conservative estimate.

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Impacts of Possible Chinese 25% Tariff on U.S. Soybeans and Other Agricultural Commodities

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JEL Classifications: F13, F167, Q17

Keywords: International trade, Soybeans, Sorghum, Tariffs,

Trade conflicts between the United States and China have escalated recently. The Chinese government has threatened to impose a 25% tariff on 128 U.S. products in response to a U.S. proposal to impose a 25% tariff on imported products from China (USDA, 2018a). The Chinese list includes several agricultural products, including (but not limited to) soybeans, wheat, corn, sorghum, and beef. Among these commodities, soybeans is the largest agricultural export from the United States to China. Since the United States produces large amounts of soybeans (117 million metric tons (MMT) in 2016) and exports more than half that to other countries, the Chinese tariff on U.S. soybeans alone could generate major economic consequences for U.S. agriculture. In addition to soybeans, China also imports significant quantities of wheat, sorghum, and corn from the United States. Extending the coverage of Chinese tariffs on these products could amplify the economic implications of China's retaliation policy for U.S. agriculture.

This article highlights the economic consequences of a possible Chinese 25% tariff on U.S. soybeans, wheat, corn, sorghum, and beef. To accomplish this task, we rely on the recent analysis done using the GTAP-BIO model (Taheripour and Tyner, 2018). We show that the Chinese retaliation trade policy, if implemented and continued for several years, could have major implications for the U.S. economy and its agricultural sector.

Three Major Players in the Global Market for Soybeans

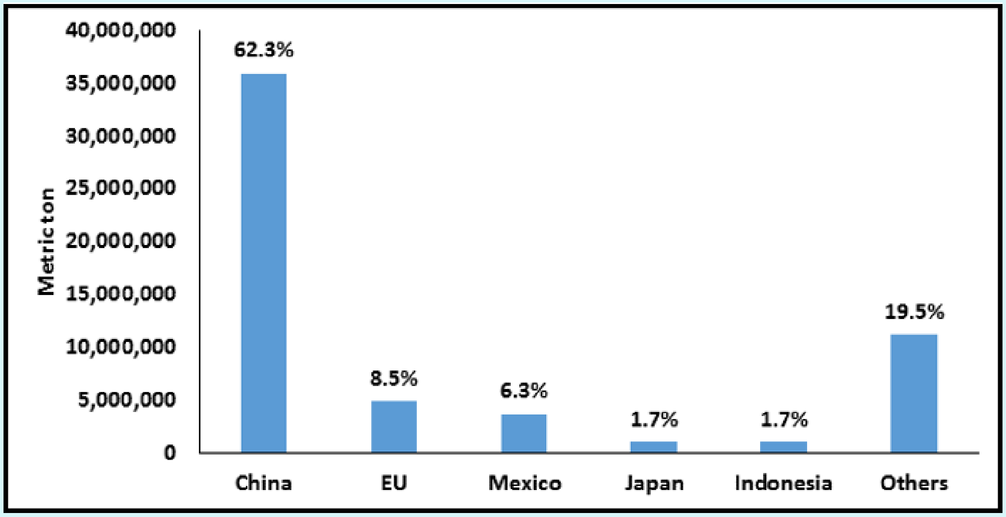
China is the world's largest soybean importer and imported 93.5 MMT of soybeans in 2016, about 65% of global soybean imports (USDA, 2018b). China imports soybeans mainly from Brazil and the United States. The shares of these two countries in China's imports in 2016 were about 44% and 42%, respectively. Currently, the United States and Brazil are the two largest soybean producers and exporters globally. They produced 116.9 MMT and 114.1 MMT of soybeans in 2016, respectively. In 2016, the United States exported 59.2 MMT of soybeans and Brazil about 63.1 MMT (USDA, 2018b).

Figure 1 shows the major destinations for U.S. soybean exports. China is by far the largest importer of U.S. soybeans, followed by the European Union and Mexico. Until 2012, the United States was the world's largest soybean producer and exporter. Since then, Brazil has exported more soybeans than the United States. While the United States is still the largest producer, Brazil could produce more soybeans than the United States in the future.

In recent years, production of soybeans has increased rapidly in Brazil, much faster than in the United States. Production of soybeans in the United States and Brazil were about 75.1 MMT and 39.5 MMT in 2000 (USDA, 2018b), respectively. In 2000, U.S. production was twice that of Brazil. Between 2000 and 2016, soybean production increased by 189% in Brazil and 56% for the United States (Figure 2). In this period, Brazil adopted GMO soybeans, which helped expand its soybean production rapidly.

Brazil competes very closely with the United States in the world soybean market. Since China is the largest soybean importer and imports large amounts of soybeans from the United States and Brazil, any changes in China's soybean trade policies could have major implications for both the United States and Brazil.

Figure 1. U.S. Soybean Exports by Major Destinations

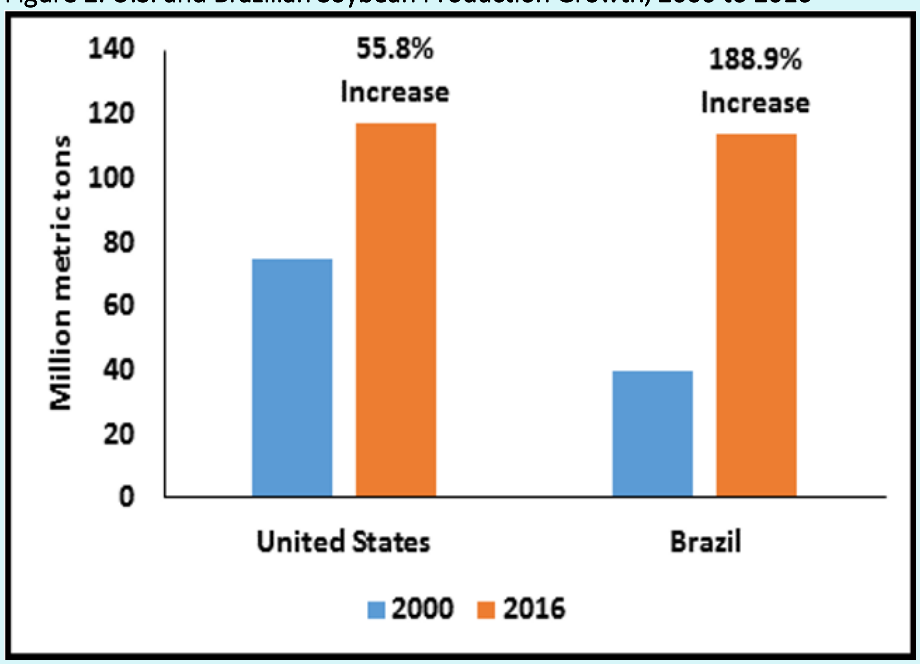


Note: Figures on the bars represent share of each country in US soybeans exports.
Source: USDA (2018c).

Other Main U.S. Agricultural Products Exported to China

The United States produced 384.8 MMT of corn, 62.8 MMT of wheat, and 12.2 MMT of sorghum in 2016 and exported, respectively, 14%, 46%, and 50% of these products to other countries (USDA, 2018b,c). The United States exports significant quantities of these commodities to China: 0.3 MMT of corn (0.5% of total U.S. exports), 0.9 MMT of wheat (3.8% of total U.S. exports), and 5.4 MMT of sorghum (78.8% of total U.S. exports) in 2016 (USDA, 2018c). While China receives very small shares of U.S. exports of corn and wheat, it is an important market for sorghum in addition to soybeans. China's share of U.S. beef exports is insignificant.

Figure 2. U.S. and Brazilian Soybean Production Growth, 2000 to 2016



Source: USDA (2018c).

Potential Impacts of the 25% China Tariff

Taheripour and Tyner (2018) used Global Trade Analysis Project-Biofuels (GTAP-BIO), a well-known global economic model, to evaluate the global economic impacts of Chinese tariffs on their imports of U.S. soybeans, corn, wheat, sorghum, and beef. Taheripour, Cui, and Tyner (2017) and Taheripour, Zhao, and Tyner (2017) described the latest version of this model and its improvements over time. GTAP-BIO traces production, consumption, and trade of all goods and services at the global scale by country. The simulations made with this model determine changes in demand and supply of all goods and services and their prices in each region; changes in bilateral trade among all trade partners for all goods and services; changes in allocation of resources; country-by-country changes in economic gains or losses (economic welfare); among other outputs. The latest version of this model represents the world economy in 2011. Since the global soybean market (and also markets for other agricultural products) experienced major changes in production and trade in recent years, Taheripour and Tyner (2018) updated the database of this model to represent the world economy in 2016 to provide more up-to-date analyses.

Economic models usually use trade elasticities to simulate trade relationships among trade partners worldwide. Smaller trade elasticities imply less reaction among trade partners in response to changes in economic variables (such as tariffs or other trade restrictions), and larger elasticities allow for larger responses. Therefore, the projections of these models depend on the sizes of the trade elasticities. The GTAP-BIO model uses a set of standard trade elasticities. We first examine the impacts of the 25% Chinese tariff on U.S. agricultural products with these standard trade elasticities. Recent research done at Purdue University by Yao and Hillberry (2018) suggests that soybean trade elasticities may be higher than the standard values in GTAP. Earlier work by Hillberry et al. (2005) also supports higher elasticities. For this reason, we repeat our simulation with a set of higher trade elasticities for soybeans. We present results for two simulation cases:

- Case 1: A 25% increase in Chinese tariffs on U.S. soybean, corn, wheat, sorghum, and beef imports, using the standard GTAP trade elasticities.
- Case 2: A 25% increase in Chinese tariffs on U.S. soybean, corn, wheat, sorghum, and beef imports, using elevated trade elasticities for soybeans.

We present simulation results for changes in trade, production, producer prices, and welfare (economic well-being). It is important to note that the GTAP-BIO simulations represent medium- to long-run impacts, which means that the tariffs would need to remain in effect for at least 3–5 years. These are not short-run impacts.

Trade Impacts

Given that soybeans are traded worldwide, we analyze the trade impacts for this commodity in detail. Table 1 presents the changes in soybean trade given the standard and higher trade elasticities. In this table, rows represent major exporters and columns represent major importers. This table represents percentage changes in quantities of traded soybeans compared to the base year of 2016. Therefore, it is important to recall that the bases are quite different for each region. A large percentage change on a small base may not be as important as a small percentage change on a large base. In general, one can make the following major conclusions from the results presented in Table 1:

1. Chinese imports of U.S. soybeans fall substantially under both cases, but the changes are much larger with the elevated elasticities. The reductions for the standard and higher trade elasticities are 48% and 91%, respectively.
2. Total U.S. soybean exports also fall in both cases. The total decline in U.S. soybean exports is not as large as the decline in Chinese imports, as exports to some other regions increase. In other words, trade diversion is expected to occur. For example, in the top panel of Table 1, Chinese imports from the United States fall 48%, but U.S. global exports fall 24%. Exports to other countries make up about half of the loss in Chinese exports. Brazil and other exporters capture more of the Chinese market, and the United States takes some of the markets that other exporters give up.
3. Global soybean imports decrease by a small percentage in both cases.
4. Brazilian exports to China increase 18% and 36% in the standard and elevated elasticity cases, respectively. Chinese imports from Brazil and other South American countries increase in both cases.

In general, the 25% Chinese tariff could reduce exports of U.S. soybeans to China by about 17 MMT in the long run given standard trade elasticities. In response in this case, the United States would export more to the European Union (by 0.65 MMT) and the rest of the world (by 2.6 MMT). With the standard trade elasticities, total U.S. soybean exports drop by 14 MMT. Given higher trade elasticities, China's soybean imports from the United States drop by 32.6 MMT. In this case, U.S. soybean exports go up by 1.9 MMT to the European Union and by 10.7 MMT to the rest of the world. Given elevated trade elasticities, total U.S soybean exports drop by 20 MMT. These figures indicate that Chinese tariffs could seriously harm U.S. soybean exports.

Table 1. Changes in Bilateral Trade of Soybeans Due to 25% Chinese Tariff on U.S. Soybeans (%)

		Exporters			
	Importers	European Union	China	Rest of the World	Global
Case 1: Standard GTAP trade elasticities	United States	13.2	−47.7	15.3	−24.1
	Brazil	−16.9	18.0	−13.1	14.7
	Rest of South America	−14.0	22.4	−9.9	15.8
	Global	7.5	−5.3	4.7	−2.5
	Importers	European Union	China	Rest of the World	Global
Case 2: Elevated trade elasticities for soybeans	United States	38.6	−90.6	64.1	−34.2
	Brazil	−80.0	36.1	−73.3	24.8
	Rest of South America	−76.6	62.3	−64.2	36.6
	Global	15.3	−5.3	13.4	−0.2

The proposed Chinese tariffs will not significantly affect the global markets for corn, wheat, and sorghum or cause significant changes in the total U.S. exports of these products. However, the tariffs decrease U.S. exports of corn, wheat, and sorghum to China by 42% (0.11 MMT), 82% (0.74 MMT), and 13% (0.68 MMT), respectively. These results are not sensitive to the size of soybean trade elasticities.

Production Impacts

Table 2 presents the impacts of the examined cases on the outputs of selected commodities produced worldwide. The top panel shows the results for the standard trade elasticities and the bottom panel for the higher elasticities. The results represent percentage changes in the quantities of outputs of the selected commodities compared to the 2016 base year. Note again that these are 3–5 year, medium-term impacts after global changes in production have had time to materialize. The results all follow the expected patterns:

1. U.S. soybean production declines by 11%–15%.
2. Brazilian soybean production increases by 9%–15%.
3. Chinese soybean production increases by 3%–5%.
4. U.S. sorghum production decreases by 4%.
5. Rapeseed production increases in the United States and China and declines in Brazil.
6. Declines for soybeans are higher given the elevated trade elasticities than given the base GTAP elasticities.

The results presented in Table 2 confirm that the Chinese tariffs could significantly reduce U.S. soybean production and increase soybean production in Brazil, the rest of South America, and China. U.S. sorghum production also declines to some extent.

It is important to note that the use of elevated soybean trade elasticities will change the outputs of other commodities as well. These changes are relatively large for the United States and Brazil. For the United States, given the elevated soybean trade elasticities, soybean production drops more, encouraging farmers to allocate more cropland to producing other commodities. On the other hand, given the elevated soybean elasticities, Brazil produces and exports more soybeans, encouraging farmers to shift a larger portion of land to soybean production.

Table 2. Changes in Production of Selected Commodities Due to 25% Chinese Tariffs on Targeted Commodities (%)

	Commodity	United States	European Union	Brazil	Rest of South America	China	Other	Total
Case 1: Standard GTAP trade elasticities	Rice	2.9	0.1	−0.9	−0.3	0.0	0.0	0.0
	Wheat	1.9	−0.2	−5.4	−1.6	0.2	−0.1	0.1
	Sorghum	−4.3	0.2	−1.7	−0.9	−0.8	0.1	−1.2
	Grains	1.2	0.0	−1.7	−1.0	−0.3	−0.2	0.0
	Soybeans	−10.6	−0.2	9.3	3.2	3.1	0.1	−0.5
	Rapeseed	6.7	0.4	−2.5	0.3	2.0	0.9	1.4
	Commodity	United States	European Union	Brazil	Rest of South America	China	Other	Total
Case 2: Elevated trade elasticities for soybeans	Rice	3.9	0.2	−1.6	−0.6	−0.1	0.0	0.0
	Wheat	2.9	−0.3	−8.9	−3.1	0.2	0.0	0.0
	Sorghum	−4.0	0.3	−2.8	−1.6	−0.9	0.1	−1.1
	Grains	1.7	0.0	−2.9	−1.9	−0.3	−0.2	0.0
	Soybeans	−14.7	−16.1	15.4	6.6	5.4	−1.9	0.0
	Rapeseed	7.4	0.4	−6.0	−1.4	2.0	0.6	1.3

Price Impacts

The price impacts of the 25% Chinese tariff on the U.S. agricultural products are limited, according the simulation results obtained from the GTAP-BIO model, which projects medium- to long-run price impacts. The U.S. producer price for soybeans drops by about 4% in response to the 25% Chinese tariff, given the standard trade elasticities, and by about 5% given the higher elasticities. In both simulation scenarios, the changes in the producer prices for most other commodities in the United States and China are small. However, all agricultural commodity prices increase in Brazil, some by relatively larger percentages (2%–5%).

Economic Welfare

Table 3 provides changes in economic welfare. Economists use the concept of economic welfare to characterize changes in economic well-being of a country or region. Several general conclusions can be drawn from the economic welfare analysis:

1. U.S. economic welfare falls by $2.2–$2.9 billion annually in both cases.
2. Welfare also falls by $1.7–$3.4 billion per year for China in both cases. Interestingly, Chinese economic well-being falls more than that of the United States in the elevated elasticity case. In this case, China imports more soybeans from non–U.S. sources, which increases the price of soybeans compared to the case using standard trade elasticities.
3. In both cases, Brazil's economic well-being increases by $1.5–$2.8 billion per year.
4. South America has $0.7–$1.4 billion increase in economic well-being from per year.
5. All other countries experience a collective gain in economic well-being, but it is less than $1 billion per year in both elasticity cases.
6. Global economic welfare falls by −$1.2 to −$1.8 billion per year in both cases.
7. The economic welfare gains or losses are usually higher under the elevated trade elasticities than under the base case GTAP values.

Table 3. Changes in Economic Welfare Due to 25% Chinese Tariffs on Targeted Commodities (million USD at 2016 prices)

Region	Case 1: Standard GTAP trade elasticities	Case 2: Elevated trade elasticities for soybeans	Average of Cases 1 and 2
United States	−2,206.0	−2,903.6	−2,554.8
European Union	15.9	−119.4	−51.8
Brazil	1,531.9	2,756.6	2,144.3
Rest of South America	671.9	1,375.5	1,023.7
China	−1,744.5	−3,363.5	−2,554.0
Other	575.4	440.4	507.9
Total	−1,155.4	−1,814.1	−1,484.8

Summary

The simulation results examined in this paper show that the 25% Chinese tariff is a lose–lose proposition for both China and the United States. The loss in economic well-being is about the same in both countries. Brazil sees a significant increase in soybean production and an improvement in economic well-being.

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Additional Information

Link to working paper: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=5654

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Upheaval in China's Imports of U.S. Sorghum

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JEL Classifications: Q17, Q18

Keywords: Agriculture imports, Policy, Trade dispute

This article discusses sorghum in a global context and describes how China became the world's major importer. We present an overview of China's sorghum consumption—both as food and as feed—and explain the sudden increase in imported sorghum from the United States, discussing the trade and domestic policies that led to this surge in sorghum imports and other feed alternatives to corn. Recent Chinese policies such as sorghum tariffs are discussed and prior forward-looking research anticipating potential disruptions in sorghum trade are presented. Last is a brief discussion on the importance of U.S. trade with China as well as U.S. exported agriculture products, which until recently have not faced trade restrictions and do not conflict with China's food self-sufficiency and security policies.

Sorghum Trade and China's Recent Trade Actions

In 2014/15, China became the world's largest importer of sorghum, which is primarily used for animal feed. This sudden increase in sorghum imports was driven by demand for lower-priced livestock feed. Maintained by import restrictions with tariff-rate quotas (TRQs) and bans on unapproved genetically modified corn, China's domestic corn prices were up to 1.5 times higher than the international market, despite subsidies to corn producers and, until recently, price supports for farmers (Gale, 2017). Sorghum does not have genetically modified varieties or TRQs, which could have been used to restrict imports.

Prior to the surge in sorghum imports, the Chinese feed sector had begun importing distillers' dried grains with solubles (DDGS), another feed substitute for corn, from the United States in 2007. China quickly became the largest market for U.S. DDGS exports in 2010 and maintained this position from 2012 through 2016. However, in January 2017, China announced anti-dumping and countervailing duties on imports of U.S. DDGS. In 2017, U.S. DDGS exports to China decreased significantly, dropping from the top U.S. DDGS export market to eighth, a decrease of 84% from 2016 (USDA, 2018a).

Similarly, on February 4, 2018, China's Ministry of Commerce announced an anti-dumping and countervailing duty investigation against the United States for China's imports of U.S. sorghum grain. This announcement may have been a reaction to recent trade tensions between the United States and China, specifically U.S. tariffs on imports of Chinese solar panels (January 22, 2018) and washing machines (February 3, 2018) (Patton, 2018). Then on April 17, China announced an import duty of 178.6% on the value of U.S. sorghum imports, to be applied the following day, April 18. Traders and shippers reacted immediately, halting exports from U.S. ports. Ships already en route were diverted to alternative destinations, such as Saudi Arabia, Spain, Vietnam, and Japan. The U.S. Gulf sorghum export price fell by about 4% after China's April 18 announcement (International Grains Council, 2018), but some sorghum farmers reported a much larger drop in the sorghum farm price. However, this import duty was short-lived, as China announced on May 18 that it would drop the 178.6% duty on sorghum imports from the United States and withdrew its anti-dumping investigation. Unfortunately, trade relationships do not quickly return to previously normal trading conditions. Given the uncertainty of trade issues and current relationship between the United States and China, both U.S. farmers and traders remain cautiously optimistic about the sorghum trade.

Global Sorghum Production and Consumption

The world's largest producers of sorghum are the United States, Nigeria, Mexico, India, and Sudan, with China typically ranked seventh or eighth largest. Production yields in the United States, China, and Mexico can be 3 to 8 times greater than yields in India and Sudan. Sorghum is produced in a number of U.S. states but most concentrated in Texas and Kansas, which account for about 80% of the U.S. area planted to sorghum (USDA, 2018c).

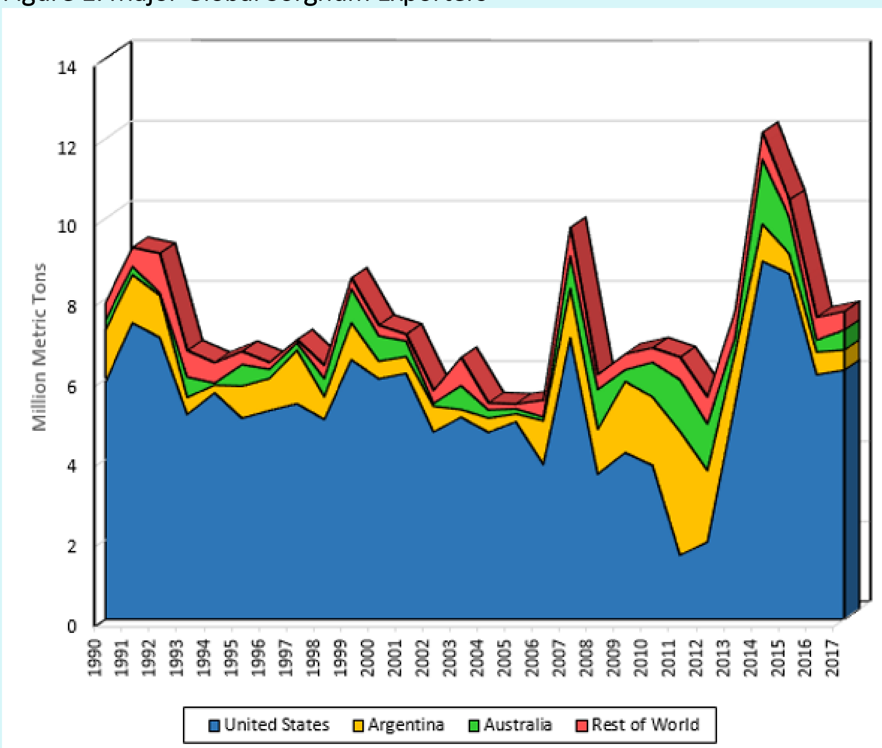
The world's largest consumers of sorghum are typically its largest producers, since sorghum is a thinly traded market with few trading countries. However, China has emerged as the largest global consumer of sorghum in the past 5 years. The largest sorghum-consuming countries in 2016/17 for *both* food and feed were China, Nigeria, Sudan, Mexico, the United States, India, and Ethiopia (USDA, 2018b), accounting for 65% of the world's sorghum consumption. Prior to 2013/14, most sorghum consumption in China (70%–80%) was for food, seed, and industrial use, not for feed (USDA, 2018b). Most sorghum was used to produce baijiu, a common Chinese alcoholic drink.

The largest markets for sorghum *feed* have historically been Mexico and the United States. Prior to 2012/13, the largest sorghum feed–consuming markets included Mexico, the United States, European Union, Brazil, Australia, Japan, and Argentina. Beginning in 2012, demand for sorghum feed increased in China; by 2014/15, China had become the largest sorghum-consuming country in the world. In 2013/14–2016/17, almost 75% of sorghum was used for feed in China. China's dominance in sorghum consumption has continued to the present (USDA, 2018b).

Global Sorghum Trade

The United States is the largest sorghum exporter, accounting for 77% of the world share over the past 5 years (USDA, 2018b), followed by Argentina and Australia. These three countries account for close to 94% of global sorghum exports over the past 5–10 years (Figure 1).

Figure 1. Major Global Sorghum Exporters



Source: USDA (2018b).

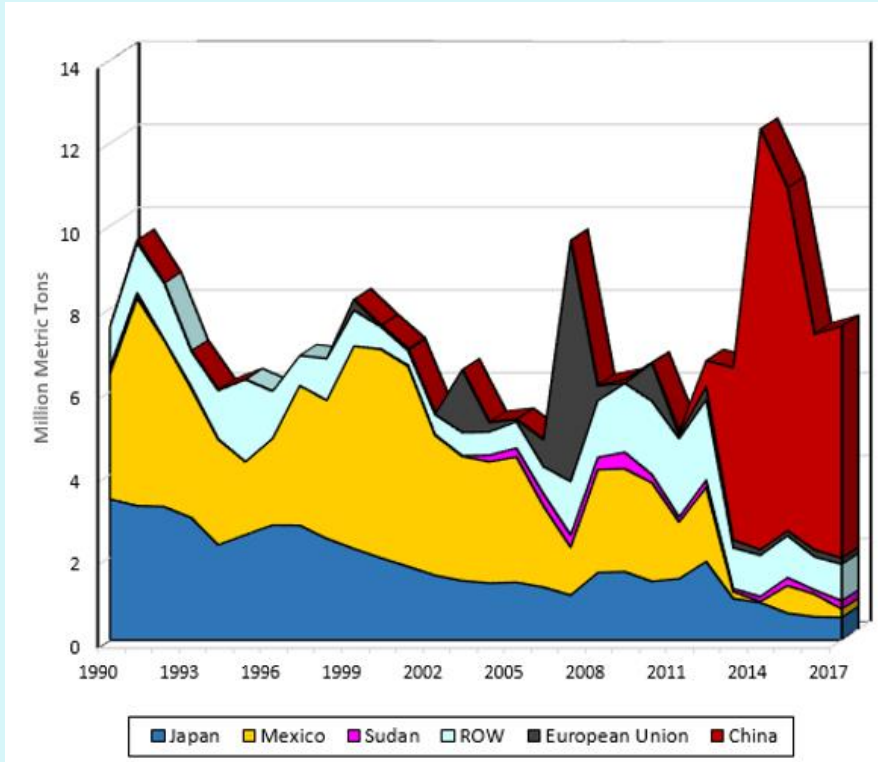
Prior to 2012/13, China imported very little sorghum, totaling 224 thousand metric tons the previous 10 years (Figure 2). China exhibited strong growth in sorghum imports as a substitute feed for corn beginning in 2012/13, as the price of China's domestic corn increased. China was the world's largest sorghum importer from 2014/15 through 2017/18. China's imports increased to 10.2 million metric tons by 2014/15, 82% of the world's imports (USDA, 2018b). For the past 2 years, imports have been much less—5.2 million metric tons in 2016/17 and 5.6 million metric tons in 2017/18—as China's domestic corn prices fell due to the elimination of its price support program and release of corn stocks.

U.S. sorghum producers responded to China's increasing import demand by increasing sorghum-planted acreage beginning in 2013/14 (USDA, 2018c). U.S. sorghum exports have increased over the past 5 years, beginning in 2013/14, and averaged 7.1 million metric tons, compared to 3.7 million metric tons from 2008/09 to 2012/13 (USDA, 2018a). U.S. sorghum exports relative to production increased to their highest level (81%) in 2014/15 and have averaged 62% over the past 5 years, compared to an average of 35% from 2008/09 to 2012/13.

Prior to 2013, the United States did not export sorghum to China. Beginning in 2009, as China's domestic corn prices increased, major U.S. feed exports to China included only DDGS and corn. By 2014, the value of sorghum exports surpassed DDGS and corn combined (Figure 3), and sorghum became the major U.S. feed export to China. The combined value of DDGS, corn, and sorghum was almost $4 billion in 2015, falling to over $1 billion in 2017 (USDA, 2018a). This decrease can be attributed to a variety of factors:

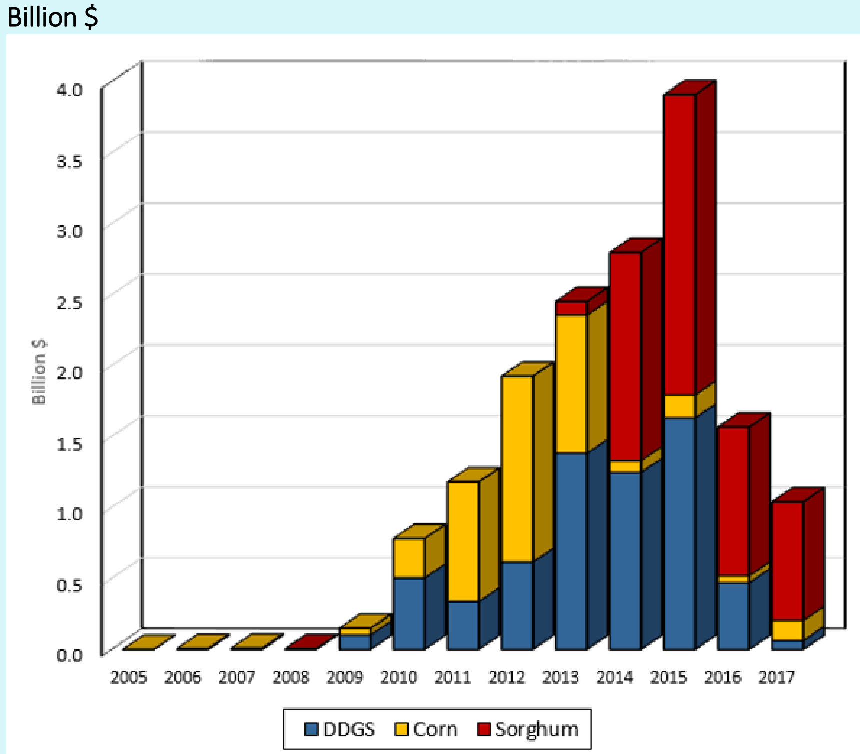
1. Ukraine began to gain market share in corn due to U.S. corn with GM traits, which were eventually approved by China (MIR162, approved December 2014, and Duracade, approved July 2017);
2. China requested an anti-dumping and countervailing investigation against DDGS imports in late 2015;
3. the world price of corn had begun to decline;
4. China's domestic corn price decreased.

Figure 2. Major Global Sorghum Importers



Source: USDA (2018b).

Figure 3. Value of U.S. DDGS, Corn, and Sorghum Exports to China in Billion $



Source: USDA (2018a).

Since 2013, China has become the predominant market for U.S. sorghum exports, accounting for an average of 86% of U.S. sorghum exports from 2014 to 2017. In 2014, China imported 93% of U.S. sorghum exports (USDA, 2018a). Contemporaneously, as the United States increased its sorghum exports to China, exports to historically leading destinations such as Japan and Mexico fell.

The majority of China's sorghum imports, close to 57% over the past 5 years, have been to the southern China ports of Huangpu and Guangzhou in Guangdong province, followed by Nanjing and Shanghai in central-coastal China, both on the Yangtze River. Together these four ports account for almost 80% of China's sorghum imports over the past 5 years (GTA, 2018). The southern region does not have enough locally produced corn to meet the growing feed demand from its poultry and pork industries and must either import feed or procure it through boats from Northeast China. From these ports, grains are transported to large feedmills and feeding operations for pork, poultry, and ducks.

China's Corn Policies Lead to Imports of Feed Substitutes

Corn is the primary feed grain in China. China's agricultural and trade policies in the corn sector drive much of the growth for sorghum demand and imports (Zhang, 2017). China initiated a price support program and a temporary reserve program for corn in 2008 to support Chinese farmers' incomes and to move China toward self-sufficiency (Gale, 2013). Under these programs, when the corn market price is less than the support price, the Chinese authorities purchase corn from farmers at the support price and accumulate corn in national storage facilities (Wu and Zhang, 2016). Under this price support and strategic reserve policy, China's support price for corn continuously increased, reaching a high of $361 per metric ton in 2014/15. These artificial price signals increased China's domestic corn production and generated excessive corn stockpiles (Hejazi and Marchant, 2017).

To sustain these price support policies, China needed to effectively control the supply of imports through TRQs on corn imports allocated to state-owned and non-state-owned enterprises. However, while China's corn price remained high domestically, China's feed operations sought to import cheaper feed substitutes such as sorghum, which was not subject to quantity restrictions or regulations on GM varieties (which did not exist). The absence of trade restrictions and TRQs on sorghum made it easier for a large number of Chinese feed compounders to import (Bond, et al. 2015). Sorghum is considered a low-cost feed substitute for corn, and China was projected to maintain high sorghum import volumes (Hansen and Gale, 2014). China's sorghum feed-to-use ratio increased significantly, from less than 10% in 2010 to more than 80% in 2014. In contrast, China's corn feed-to-use ratio remained steady during this period, at approximately 70% (Wang and Malaga, 2016). However, the magnitude of China's sorghum market demand is still very small compared to China's corn market (i.e., China's corn demand continues to be much larger than China's sorghum demand).

From 2016 onward, the situation began to change in China for three reasons: 1) extremely large corn stockpiles; 2) cheaper but limited corn imports from the world market; and 3) quality deterioration of Chinese corn stocks. China ended its price support policy and temporary reserve program for corn in the key producing geographic area, Northeast China—Heilongjiang, Jilin, Liaoning and Inner Mongolia—as a pilot program to decrease China's excessive corn stockpiles. On March 28, 2016, Liu Xiaonan, China's Deputy Director of the Economy and Trade Department of the National Development and Reform Commission (NDRC), announced that the temporary reserve policy in the three Northeastern provinces and in Inner Mongolia would be terminated. Instead, a new mechanism of "marketized purchases" and a direct payment subsidy policy toward corn would be implemented in these areas (Robinson, 2016). The change in China's corn policy resulted in a lower Chinese domestic corn price, which brought higher corn demand. Thus, the demand for sorghum, one of most important corn substitutes for feed use, decreased significantly. This new policy led to declines in China's corn price, corn production, and imports of sorghum.

Impacts of China Restricting Sorghum Imports

Three previous studies have examined the impact of a reduction in China's sorghum imports: Hansen, et al. (2015), Wang and Malaga (2016), and Zhang (2017). Because China is currently the world's dominant sorghum importer, the U.S. and world sorghum market are likely to be significantly affected if China reduces sorghum imports.

According to Hansen, et al.'s (2015) research, if China banned almost all sorghum imports, a decrease of about 98%, the global sorghum price would fall on average about 25% over the projection period (2016–2025) and China's global import share would fall sharply from 61% to 2%. In their analysis, China continued to import a small quantity of sorghum, about 90,000 metric tons, consistent with prior import behavior. Lower global prices would lead to increased imports by other countries, especially Mexico, and, to a lesser degree, Japan. As a result of China's restriction on sorghum imports, production and exports in major sorghum supplying regions (the U.S., Argentina, and Australia) would decrease, due to lower global prices. Wang and Malaga's (2016) results suggested that China's sorghum imports will decrease when the government eliminates the subsidy policy for corn, which is the temporary reserve program for corn and the price paid by the government to farmers. This research indicates that sorghum imports by China will decrease, but not to the levels that occurred prior to 2013.

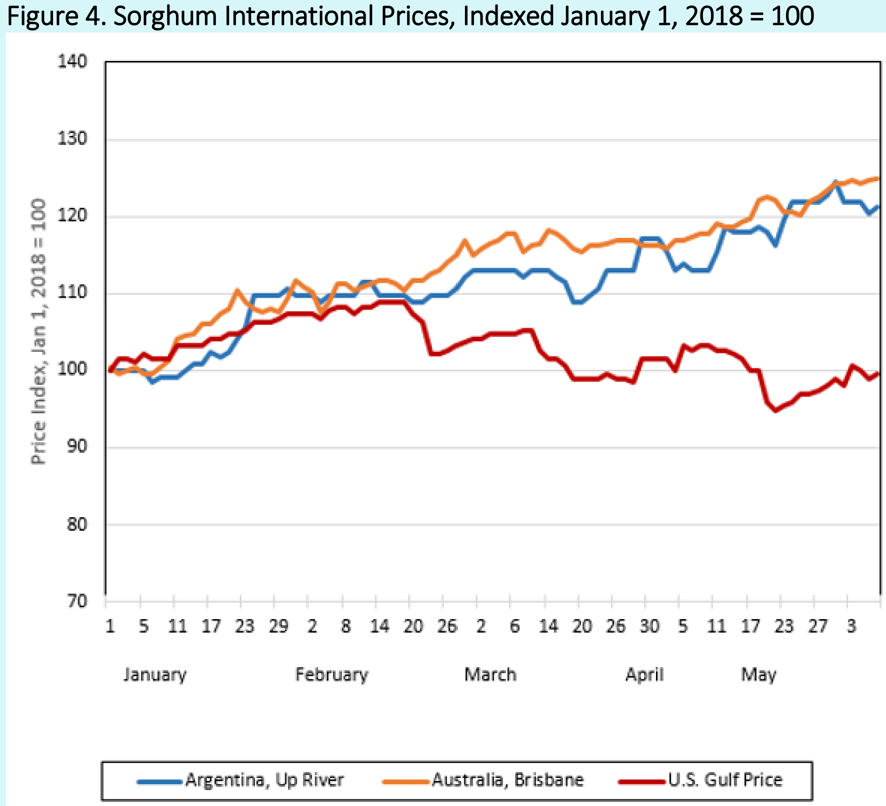
Zhang (2017) sought to analyze the impacts on the U.S. and global sorghum market if China reduced sorghum imports from all countries. Three scenarios were considered, with the largest being a 70% decrease in sorghum imports from the USDA-ERS's baseline projection in year 1 and 90% in all subsequent years. This policy scenario affected China's sorghum feed demand (40.56% decline), global sorghum price (18.3% decline), and China's sorghum stocks (63.88% decline) significantly in the first year after the shock. Sorghum exports from the United States, Argentina, and Australia decreased by 25.04%, 36.16% and 13.36%, respectively, in the first year after the shock. Mexico's sorghum imports increased by 63.49% for the first year. Japan's sorghum imports did not increase significantly.

International Sorghum Prices

There are three major international sorghum export prices: 1) Argentina's Up River price, 2) Australia's Brisbane (QLD) price, and (3) the U.S. Gulf price (International Grains Council, 2018). These prices have exhibited diverging price patterns since mid- to late-February 2018, after China announced its anti-dumping and countervailing duty investigation on February 4. On January 1, 2018, the three prices (in USD/metric ton) were $123, $249, and $193 for Argentina, Australia, and the United States, respectively. From January 1 through February 19, all three prices increased. However, beginning on February 20, the U.S. price fell by 5% over the next 7 business days, while prices for both Argentina and Australia continued to increase. The Argentina and Australia prices increased by 21% and 25%, respectively, from January 1 through May 8. The U.S. Gulf price continued to decline after February 8, and by May 8 it had fallen to $192, almost to January 1 levels.

The day after China announced its 178.6% import duty on U.S. sorghum imports, April 17, the U.S. Gulf price decreased by almost 5%. In Figure 4, the three international daily prices are indexed to 100, beginning on January 1, 2018. Figure 4 exhibits the price divergence of the U.S. Gulf price from the Argentina and Australia prices from January 1 through May 8. By May 8, the U.S. Gulf price as

Figure 4. Sorghum International Prices, Indexed January 1, 2018 = 100



Source: International Grains Council (2018).

21% and 25% lower than the respective Argentine and Australian export prices, potentially showing one of the impacts of China's import duties on U.S. sorghum.

In Summary

Growing import demand by China for animal feed substitutes for corn—DDGS, sorghum, and barley—is a direct consequence of China's domestic and trade corn policies. These policies increased China's domestic feed costs for livestock higher than those of their international competitors. China's feed industry has attempted to lower feed costs by importing feed from the United States and other countries. China's imports of the U.S. DDGS grew rapidly, from almost $2 million in 2008 to $1.6 billion by 2015 (Figure 3). However, imports declined to $470 million in 2016 and to $63 million in 2017. The most recent decline is due to China's 2017 announcement of anti-dumping and countervailing duties for DDGS.

U.S. sorghum exports to China also increased sharply, from $95 million in 2013 to $2.1 billion by 2015 and $1.04 billion in 2016, declining to $835.6 million in 2017 (USDA, 2018a). This recent decline is due to the drop in China's domestic corn prices. Recent actions by the United States on a variety of products such as solar panels, steel, and aluminum and China's trade actions against sorghum and other agricultural commodities raise uncertainty for U.S. exporters and Chinese importers of agricultural commodities.

Agricultural trade between the United States and China is critically important to job creation in both countries, lowering costs of production to create sustainable agricultural and food systems and satisfying growing and changing consumer demands. The U.S. agricultural trade experience with China has exhibited large variations depending on the specific commodities traded and China's domestic and trade policy for these commodities. The greatest growth in U.S. exports to China has been in commodities that do not conflict with China's domestic policies for maintaining self-sufficiency or food security and are in short supply in China. These include soybeans, hides and skins, specialized consumer food products, alfalfa for dairy, certain types of nuts, and other food products that are not domestically produced.

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Chinese Trade Retaliation May Diminish U.S. Wine Export Potential

Amanda M. Countryman and Andrew Muhammad

JEL Classifications: F10, F13, Q10, Q17, Q18

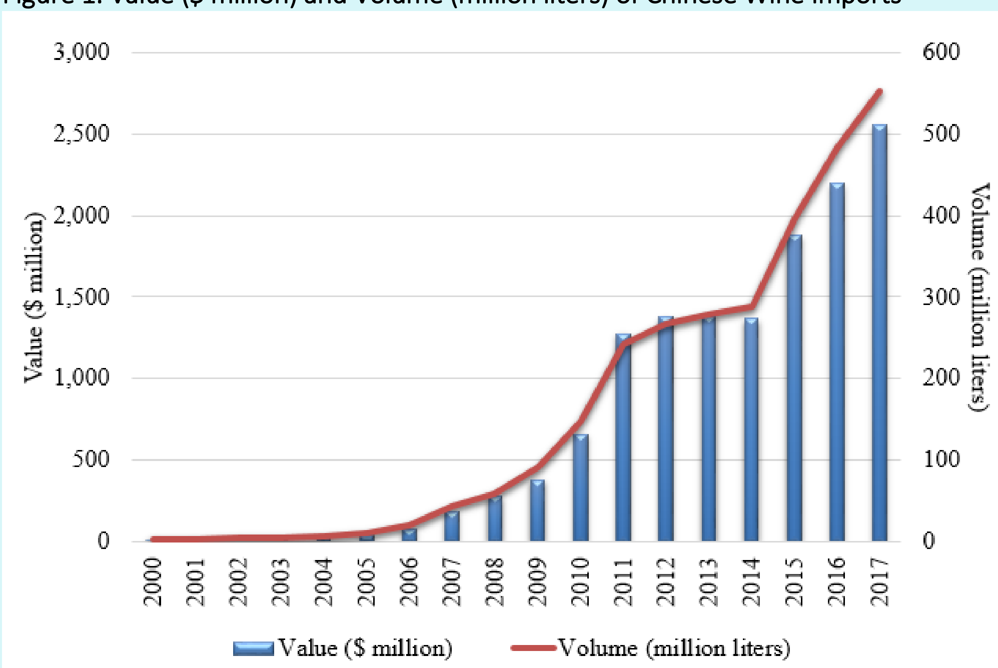
Keywords: China, Imports, Retaliatory Tariffs, Trade Policy, United States, Wine Exports

China recently announced tariffs on imports of a variety of U.S. products as countermeasures to the U.S. Section 232 tariffs on steel and aluminum products. These tariffs will affect U.S. exports of a variety of agricultural products, including wine. U.S. wine producers would like to grow China as a market, given its large consumer base and rising incomes, which will afford increasing per capita wine consumption at a time when wine demand is either decreasing or stagnant in other destination markets. In retaliation to U.S. tariffs, China proposed a 15% tariff on U.S. wine imports, which could affect the competitiveness of U.S. wine in the Chinese market. This article further describes recent changes in the composition of the Chinese wine import market, the importance of the Chinese wine market for U.S. suppliers, and the potential implications of the recently implemented tariff hikes for the competitiveness of U.S. wine in China.

Chinese Wine Imports over Time

The Chinese wine market has grown considerably, emerging from near-obscurity in the early 2000s to become the third-largest importer of wine worldwide in 2016 (U.N. Comtrade, 2018). In this article, we define wine imports using Harmonized System (HS) code 220421: *wine of fresh grapes in containers ≤ 2 liters*, which excludes bulk wine and sparkling wine. In 2016, this category accounted for more than 90% of all Chinese wine imports. China imported only \$5–\$25 million worth of wine in the early 2000s, but, by 2017, imports had risen to a value of more than \$2.5 billion (Figure 1). The value and volume of the Chinese wine import market have seen considerable growth over the last 20 years, with sustained recent growth, as the value of imports nearly doubled from 2014 to 2017. China is

Figure 1. Value (\$ million) and Volume (million liters) of Chinese Wine Imports



Source: Global Trade Atlas (2018).

now tied with Japan and France as the fifth-largest importers of U.S. wine exports (Table 1), with each accounting for 6% of total U.S. wine export value. While currently not a key destination for U.S. exports, China is poised for continued growth in per capita consumption while demand growth is less likely in Europe, Canada, and other importers of U.S. wine (Alston, Summer, and Sambucci, 2018).

Increased wine consumption in China can be attributed to rising per capita disposable incomes, increased education, and government promotion of wine as a healthy alternative to grain-based alcohol (Anderson and Wittwer, 2015; Balestrini and Gamble, 2006; Lee et al., 2009; Liu and Murphy, 2007; Mitry, Smith, and Jenster, 2009; Sun, 2009). Foreign wine is perceived to be prestigious in China, and demand continues to grow with incomes as consumers gain more familiarity with wine varieties, women garner greater gender equality, and the Chinese population pursues more Western consumption patterns (Muhammad et al., 2014; Zheng and Wang, 2017). Further, the persistence of food safety concerns and tainted wine (i.e., wine mixed with juice, water, sugar, coloring, and/or flavorings) in domestic Chinese winemaking have caused problems for consumer trust and confidence in domestic wine. Despite the prevalence of fraud associated with foreign wine, consumers show preferences for imports, particularly for higher-value wine (ATO, 2016; Dordevic et al., 2013; Muhammad et al., 2014).

Table 1. Top 10 Markets for U.S. Wine Exports, 2017

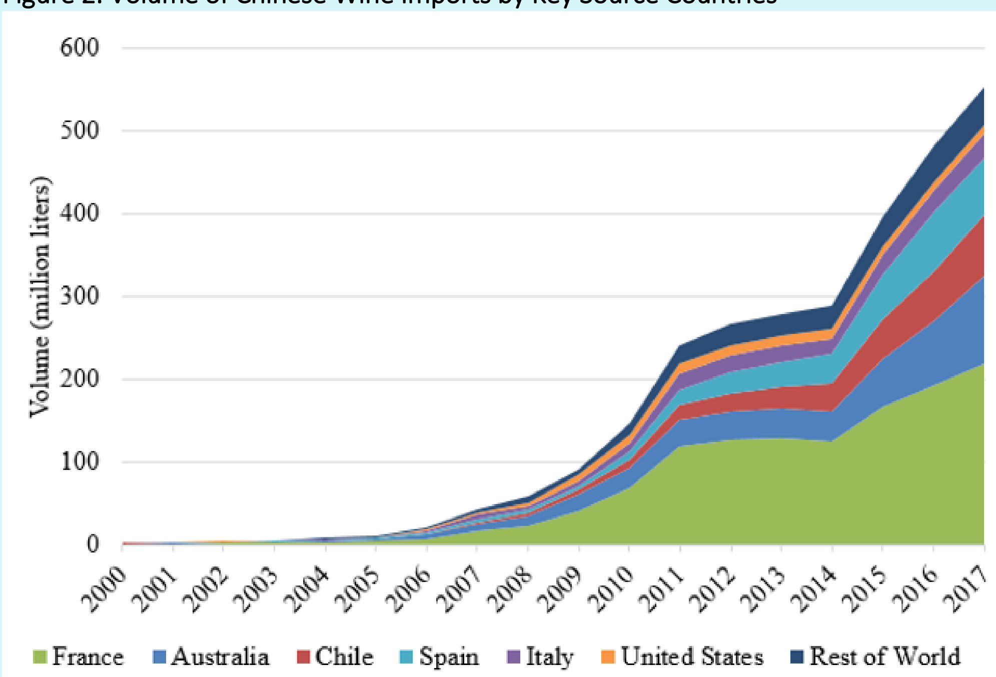
Country	Value ($1,000)
World Total	$1,166,974
Canada	383,113
Hong Kong	111,988
United Kingdom	95,311
Germany	87,867
China	67,566
Japan	66,186
France	65,042
Denmark	26,304
Sweden	23,265
Netherlands	21,722

Note: U.S. export values may not equal import values reported by China.
Source: USDA (2018).

Key Wine Suppliers to China

China is the fastest growing wine market in the world, and six countries supply nearly 93% of bottled wine imports in China: France (41% market share), Australia (27%), Chile (11%), Spain (6%), Italy (5%), and the United States (3%) (Figures 2–4, Global Trade Atlas, 2018). While the key suppliers have remained constant and imports from each country have continued to grow over time (U.S. wine is the exception), the market shares held by each country have changed. France continues to lead the market, followed by Australia. The United States has lagged in competitiveness and has declined in market share as Chinese wine imports have risen. Over the past 10 years, France and the United States have lost market share, while Australia and Chile have strengthened their position in the market.

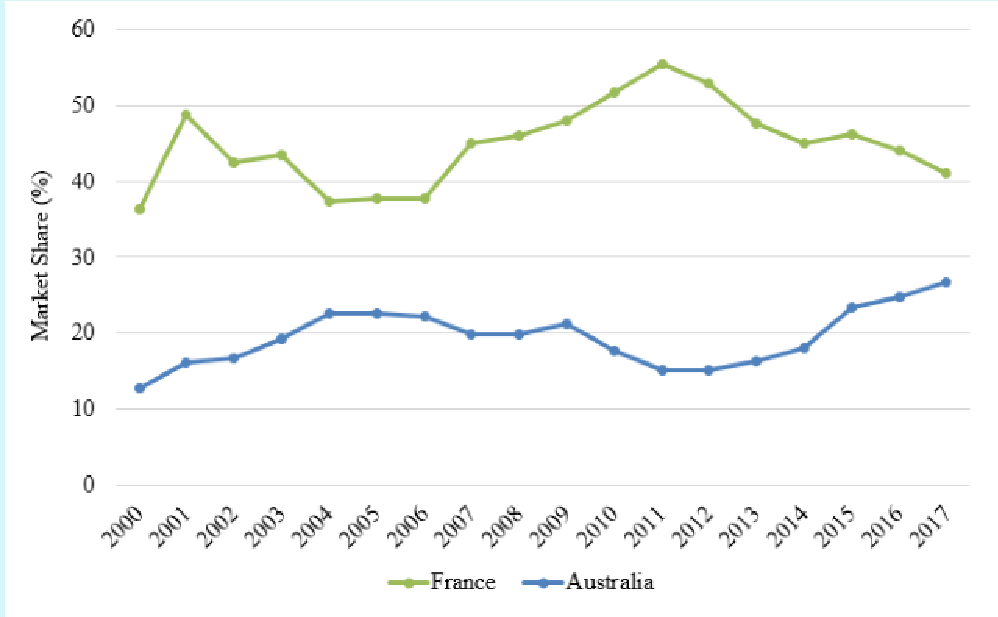
Figure 2. Volume of Chinese Wine Imports by Key Source Countries



Source: Global Trade Atlas (2018).

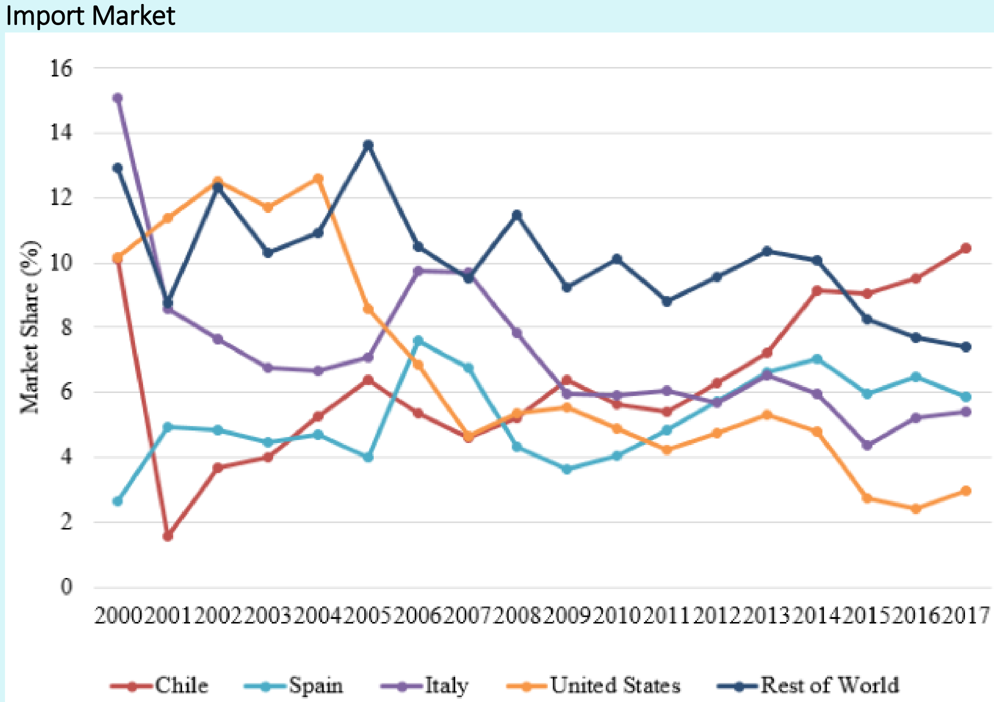
Overall, the United States and Italy have experienced the greatest declines in market share since the early 2000s. U.S. wine once accounted for more than 12% of the Chinese market but now accounts for less than 3%. In terms of volume, the United States is the only major country to have experienced a decline in the Chinese market. In 2011–2014, imports of U.S. wine peaked at 12–13 million liters (L) but have since declined to less than 10 million L in 2015–2017. This may be attributed to the preferential trade agreements that afford Australia and Chile greater market access than the U.S. and European suppliers.

Figure 3. France and Australia Market Share of the Chinese Wine Import Market



Source: Global Trade Atlas (2018).

Figure 4. Market Shares of Suppliers except France and Australia in the Chinese Wine Import Market



Source: Global Trade Atlas (2018).

Previous research shows that Chinese consumers have distinct preferences for French and Australian wine, with an estimated average of 48 cents of every additional dollar spent on imports allocated to French wine purchases and 20 cents to Australian purchases. U.S. wine imports garner an estimated 7 cents of every additional dollar spent on imported wine (Muhammad et al., 2014). Chinese consumers' association of quality with foreign wines, particularly those from France, has led to an abundance of counterfeit wine, in which bottles are reused or mislabeled, offering fake wine in the market (Dordevic et al., 2013; Holmberg, 2010; Muhammad et al., 2014; Wilkes et al., 2016). The prevalence of counterfeit French wine, in tandem with increased consumer knowledge of wine varieties from other regions, may have contributed to the decrease in France's market share over the past decade. However, the changing policy landscape affecting import tariffs and source-specific prices paid over time has changed, with further widening price differences to come in the next year.

China Wine Import Policies

Bottled wine imports into China have a Most Favored Nation (MFN) tariff rate of 14% and a 10% excise (consumption) tax. Suppliers also faced a 17% value added tax (VAT) in 2017, which was lowered to 16% on May 1, 2018 (New Zealand Trade and Enterprise, 2018; Wang, 2018). Australia faced a 5.6% import tariff in 2017 that decreased to 2.8% on January 1, 2018, and will fall to 0% in 2019 as a result of the 2015 China–Australia bilateral trade agreement. Chile also has a preferential trade agreement with China that allows Chilean wine to be imported tariff free. While the United States and key European suppliers previously shared a level playing field from a market access perspective, China imposed an additional 15% import tariff on U.S. wine starting in April 2018, in retaliation for U.S. Section 232 tariffs on steel and aluminum imports from a number of countries, including China. U.S. bottled wine now faces a 29% Chinese import tariff at a time when trade barriers for other key suppliers are falling (Inouye, 2018). The newly imposed import tariff may thwart opportunities for increased U.S. wine exports to China, with early signs of Chinese importers responding to these price impacts by canceling orders of U.S. wine shipments (Alston, Summer, and Sambucci, 2018; Bays, 2018; Decanter Staff, 2018).

Wine Prices in China

Table 2 reports imported wine prices by country. On the whole, import prices have increased over time, reflecting a greater preference for more expensive wine in China. In 2002–2004, wine prices averaged $2.67/L, ranging from $2.16/L for Spanish wine to $2.88/L for French wine. In 2006–2010, imported wine prices increased to $4.32/L; by 2013–2017, average prices had reached $4.72/L. For individual countries, 2013–2017 import prices were higher for Australian wine ($6.81/L), French wine ($5.01/L), and U.S. wine ($5.85/L), indicating that Chinese importers were sourcing higher-priced wine from Australia and the United States relative to other key suppliers, including France, on average, as the market grew.

Table 2. Average Imported Wine Prices in China, 2000–2004, 2006–2010, and 2013–2017

Time Period	World	Australia	Chile	France	Italy	Spain	U.S.	ROW
	Unit value ($/liter)							
2000–2004	$ 2.67	$ 2.78	$ 2.58	$ 2.88	$ 2.79	$ 2.16	$ 2.40	$ 2.52
2006–2010	4.32	4.36	3.41	4.92	3.78	3.30	3.50	4.26
2013–2017	4.72	6.81	3.62	5.01	4.36	2.41	5.85	4.56

Note: ROW is rest of world
Source: Global Trade Atlas (2018).

The difference between Australian and U.S. market access will widen further in 2019, as the import tariff on Australian wine will become 0. Australia and Chile have gained market share in China over the past 5 years due in part to the lower tariff burden those countries face compared to other key suppliers. The United States is already outranked by five suppliers in the Chinese market, and the newly levied import tariffs on U.S. wine are expected to further damage U.S. potential in the Chinese wine import market.

Potential Impacts of Retaliatory Tariffs

To estimate the potential effects of the retaliatory tariffs on U.S. wine in China, we use elasticity estimates from Muhammad et al. (2014), who identified the own-price elasticity for U.S. wine in China to be around −1.20.

Forecasts using elasticities are based on a general elasticity equation: $\%\Delta Q/\%\Delta P = -1.20$. Solving this for the "new" quantity we get the following forecast equation: $Q_{new} = (-1.20 \times \%\Delta P)/100 \times Q_{old} + Q_{old}$.

Based on fairly straightforward calculations,

$$\%\Delta P = 100\times(P_{new} - P_{old})/P_{old} = 100 \times (\text{import price} \times (1.29 - 1.14)/\text{import price} \times 1.14)),$$

a 15-percentage-point increase in the tariff from 14% to 29% results in a price increase of about 13.2% for U.S. wine in China, assuming that China incurs the full burden of the tariff increase. Thus, the results that follow could be seen as an upper-bound response. Given the -1.20 own-price elasticity for U.S. wine, this price increase results in a 16% decrease in Chinese imports of U.S. wine. Using 3-year (2015–2017) average imports as a baseline (9.8 million L for U.S. wine valued at approximately $6/L), imports decrease from 9.8 to 8.2 million L, which is a loss of $9.6 million at baseline prices. Note that these losses only reflect the trade diversion effect of the tariff. Losses could be even greater if the tariff results in trade destruction. Furthermore, we do not account for the likely case in which U.S. wine is shipped through Hong Kong for re-export to China, as is common with a variety of products (Carter, 2018). Accounting for potential increased exports to Hong Kong for final delivery in China could lessen the negative impacts of the increased import tariff level in our calculations.

In Summary

Chinese retaliatory import tariffs on U.S. wine may threaten the already-weakening U.S. position in the Chinese market. Australia and Chile have preferential trade agreements that increase market access in China relative to other key suppliers, and the United States now faces the largest trade barrier for wine exports to China. There is concern that the new import tariff regime may damage relations between U.S. suppliers and Chinese importers and leave U.S. wine behind other exporters in China in an era of rapid growth in wine consumption among the wider Chinese population. This may lead to long-term damage to the overall competitiveness of U.S. wine in China.

While other wine import markets are stagnant or declining, China is one of the fastest growing per capita wine consumption countries in the world. The potential for the United States to make up lost potential sales to China, beyond re-export through Hong Kong, seems challenging. However, there may be potential for high-value U.S. wine suppliers to compete with other high-end labels in the future, despite tariff hikes. Many Chinese consumers make wine-purchasing decisions based on perceptions of quality and reputation and are willing to purchase expensive, quality wine, despite high prices. The United States has the potential to stay in the Chinese wine game by conveying an image of high quality, comparable to Old World suppliers that can withstand the added pressure of price increases caused by retaliatory tariffs.

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China’s Potential Cotton Tariffs and U.S. Cotton Exports: Lessons from History

Yangxuan Liu, John R. C. Robinson, and W. Donald Shurley

JEL Classifications: F10, F13, Q17

Keywords: Agricultural trade, Cotton, Global markets, Trade retaliation

U.S. and China Trade Actions

In 2017, the United States imported approximately $506 billion in products from China and exported over $130 billion to China, leaving the United States with a $375 billion trade deficit (U.S. Census Bureau, 2017). With the goal of reducing the trade deficit, the Trump administration proposed and implemented a series of tariffs on products imported from China, which led to retaliatory actions by the Chinese government.

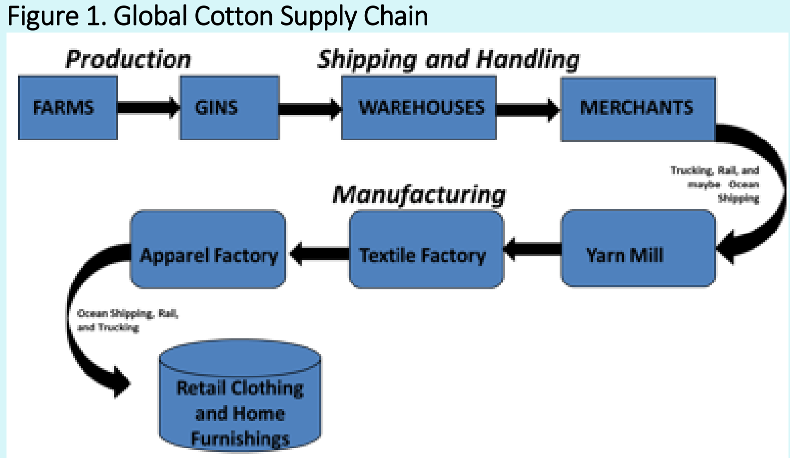
On March 23, 2018, President Trump signed an order to impose non-country-specific tariffs, with 25% tariffs on steel and 10% tariffs on aluminum. By the end of March 2018, several countries, not including China, had been granted exemptions (Shurley, 2018b). In response, on April 2, China suspended tariff reduction obligations on 128 products of U.S. origin, including an additional 25% tariff on pork and an additional 15% tariff on fruits, nuts, wine, ginseng, and ethanol, effective immediately (Inouye, 2018). Roughly $2 billion of U.S. agricultural exports to China will be impacted. On April 3, the United States formally proposed $50 billion worth of 25% tariffs on 1,333 Chinese products. China responded on the next day by announcing $50 billion worth of tariffs on 106 U.S. products, without specifying the effective date of implementation. The agricultural products on this list are worth approximately $16.5 billion of U.S. exports to China (USDA, 2018a), which might face an additional 25% tariff. This list covers the major agricultural products that the United States exports to China, including cotton (USDA, 2018a), the second-highest U.S. export by total value, after soybeans (USDA, 2018c).

The uncertainty in trade policy between China and the United States has created concerns in the U.S. cotton industry about potential negative impacts. However, there has been limited data-driven analysis and insight to help the industry understand the actual impact of Chinese tariffs on U.S. cotton exports and the global cotton trade. This article sheds light on the impact of Chinese tariffs by analyzing previous cases of Chinese cotton trade policy. With a more in-depth understanding of potential effects of the retaliatory tariffs, U.S. cotton producers and the global cotton industry can take actions to mitigate the potential impact of the proposed Chinese tariffs on cotton.

Global Cotton Supply Chain

The global cotton supply chain is very complex (Figure 1). It transforms raw cotton material into the final products of retail clothing, home furnishings, and other products. The supply chain starts with picking the cotton boll and ginning to separate cotton lint and seed. Merchants or traders then buy cotton in bales and sell them to

Figure 1. Global Cotton Supply Chain



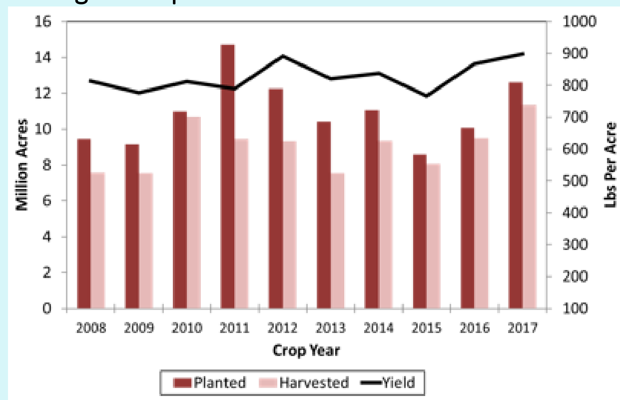
mills in the global markets. Spinners and yarn mills use a mixture of cotton and other fibers to produce yarn and fabric. A textile factory then converts the fabric into the final products and supplies the apparel and other industries. The retail industry distributes and sells the final products to consumers.

U.S. Cotton Production

American Upland cotton and American Pima cotton are two cotton species grown in the United States. While Pima cotton is primarily grown in California and Arizona (USDA, 2017), Upland cotton is the most widely planted species and constituted around 96.7% of all U.S. cotton production in 2017 (USDA, 2018e). Texas and Georgia are the top two cotton-producing states. In 2017, the United States produced 21.3 million bales of cotton, with 9.5 million bales (44.8%) from Texas and 2.25 million bales (10.6%) from Georgia (USDA, 2018e).

Figured 2 illustrates U.S. cotton acres planted and harvested and the average yield per acre. The average planted acreage for cotton in the U.S. is around 10.9 million acres for the past decade (2008–2017), with average U.S. cotton yields of 766–899 pounds/acre. For the past decade, cotton contributed around $5.48 billion annually to the U.S. farm-level production value. Average annual farm gate prices have ranged from a high of $0.935/lb in 2011 to a low of $0.491/lb in 2008 (USDA, 2018e).

Figure 2. U.S. Cotton Acres Planted and Harvested and Average Yield per Acre



Source: USDA, 2018e.

U.S. Cotton Exports

Exports are an important component of the U.S. cotton industry. The United States is the world's largest exporting country for cotton and exports around 3 to 4 times more than what is consumed domestically. Table 1 presents U.S. cotton production, imports, exports, and exports as a proportion of U.S. production for the past 10 years. On average, U.S. cotton exports for the past decade accounted for 81.5% of total U.S. production.

Table 1. U.S. Cotton Supply, Demand, and Stocks, 2008–2017

Production Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017[a]
					(million bales)					
Beginning stocks	10.05	6.34	2.95	2.60	3.35	3.80	2.35	3.65	3.80	2.75
Production	12.83	12.18	18.10	15.57	17.31	12.91	16.32	12.89	17.17	20.92
Imports	0.00	0.00	0.01	0.02	0.01	0.01	0.01	0.03	0.01	0.01
Total supply	22.88	18.52	21.06	18.19	20.67	16.72	18.68	16.57	20.98	23.68
Domestic consumption	3.28	3.54	4.08	3.13	3.85	3.84	3.79	3.62	3.31	3.48
Exports	13.26	12.04	14.38	11.71	13.03	10.53	11.25	9.15	14.92	15.50
Total demand	16.54	15.57	18.46	14.84	16.87	14.37	15.03	12.77	18.23	18.98
Ending stocks (total supply – total demand)	6.34	2.95	2.60	3.35	3.80	2.35	3.65	3.80	2.75	4.70
Exports (% of production)	103%	99%	79%	75%	75%	82%	69%	71%	87%	74%

Note: [a]Projections.
Source: USDA (2018d).

After 3 years of decline (2013–2015) in total U.S. cotton exports, largely due to reduced Chinese cotton imports, U.S. exports rebounded to almost 15 million bales for the 2016 marketing year and were projected to be 15.5 million bales for the 2017/18 marketing year, which would be the largest level on record. This high level of exports is due to large supplies, improving demand, and increased trade share for the United States (Shurley, 2018a). The strong U.S. export pattern in the past 2 years has provided price support for cotton, especially in late 2017.

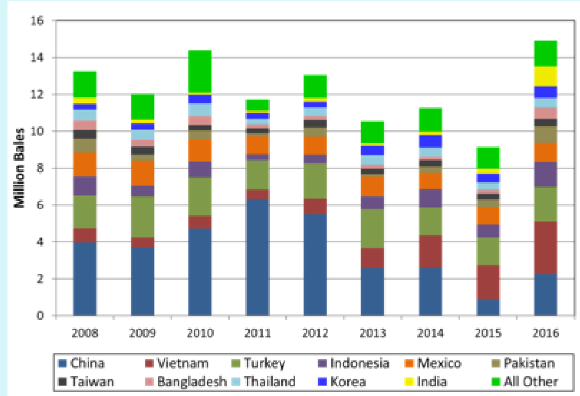
As shown in Figure 3, the rebound in cotton exports is due to higher sales to China, Vietnam, Indonesia, Bangladesh, and Pakistan (Shurley, 2018b). Due to India's low production in 2015 and 2016, above-average export sales to Indian mills also contributed to the increase in U.S. exports (Shurley, 2018b). In the 2017 marketing year, 17% of U.S. cotton exports were to Vietnam, 16% to China, 11% to Turkey, and 10% to Indonesia (Shurley, 2018b).

Figure 4 shows the market shares of major exporting countries, calculated as a country's cotton exports divided by total global exports. The U.S. market share has increased in recent years, and currently accounts for 39.4% of global exports. This increase in market share is attributed to increased U.S. production, lower production in competing countries, and strong demand for high-quality U.S. cotton (Shurley, 2018a). India (11.4%), Brazil (10.7%), and Australia (9.9%) are the major competitors with U.S. cotton in the global export market.

China Cotton Imports

As shown in Figure 5, China is the third-largest importing country for cotton, after Bangladesh (18.9%) and Vietnam (17.3%). China imported 13.0% of cotton traded globally in 2017. China is also an important customer of U.S. agriculture, in general, and of U.S. cotton specifically. Historically, China had been the largest trading partner with the United States for cotton. Starting in 2016, Vietnam became the largest trading partner with U.S. cotton and China became the second-largest trading partner (USDA, 2018c). In 2017, China bought approximately 16% of U.S. cotton exports (Shurley, 2018b). Table 2 lists the levels of production and exports for the major U.S. agricultural commodities. The total value of cotton exported to China was worth approximately $976 million last year, which is the second-highest among all the other row crops after soybeans (USDA, 2018c).

Figure 3. U.S. Cotton Exports by Destination and Crop Year (million bales)

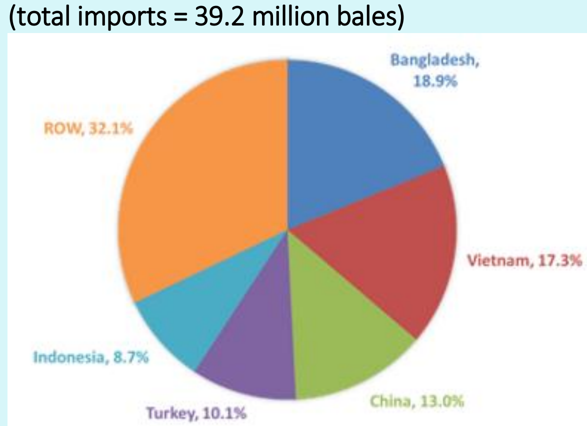


Source: National Cotton Council (2018).

Figure 4. Global Cotton Exports by Country, 2017 (total exports = 39.4 million bales)

Source: USDA (2018d).

Figure 5. Global Cotton Imports by Country, 2017 (total imports = 39.2 million bales)



Source: USDA (2018d).

Table 2. U.S. Agricultural Production and Exports, 2017

Commodity	Value of Production ($1,000 USD)[a]	Value of Exports ($1,000 USD)[b]	Value of Exports to China ($1,000 USD)[b]
Corn	48,465,485	9,117,287	142,036
Cotton	7,227,322	5,846,131	976,417
Sorghum	1,175,125	1,026,657	835,656
Soybeans	41,007,464	21,582,206	12,355,952
Tobacco	1,469,307	1,007,140	162,297
Wheat	8,142,065	6,089,240	348,727

Sources: [a]USDA (2018b). [b]USDA (2018c).

Previous Chinese Cotton Policies and Market Responses

Chinese cotton policies have shifted several times in recent years, with complex effects on the global cotton market. China expanded its government reserve policy for cotton in 2011, which continued through the 2013 crop. Operating like a traditional price support program, the Chinese government bought domestic cotton at prices of $1.40–$1.50 per pound. This cotton was withheld from the market in government reserves, which promoted an artificially high internal price for cotton from 2011 to 2013.

By 2013, there were signs of potential unwinding of the Chinese stockpiling policy. In 2014, the Chinese cotton policy shifted from price supports and building government reserves to paying growers with direct cash payments. This policy is reminiscent of the shift in U.S. farm policy in the 1970s to a target price and deficiency payment approach. Like all Chinese cotton policies, the new target price subsidy is part of a larger and complicated combination of measures. For example, China implemented a tariff-rate quota system. This system determines the amount of cotton imports at a low tariff rate within quota. Beyond the quota level, the cotton imports face a higher tariff rate. In September 2015, China announced that they would only offer a minimum amount of duty-favored import quotas for foreign cotton. In so doing, China was able to use increased amounts of domestic-produced cotton and government reserves while decreasing the need for cotton imports.

The main impact of these combined policies is clear: Chinese imports of cotton lint decreased 40% per year in the 2015 and 2016, with increased yarn imports into China (Clever, 2017). China was able to meet domestic demand for cotton first by consuming from the government cotton reserve and domestic-produced cotton, which reduced the Chinese ending stocks for cotton. Meanwhile, China increased imports of duty-free cotton yarn, as evidenced by large year-over-year increases in cotton yarn imports beginning in 2012 (WISERTrade, 2018). Unlike cotton lint, there are no quota restrictions for yarn imports, and duties are lower for yarn imports into China. Higher imports of yarn partially offset the lower cotton imports in 2015 and 2016. In 2016 marketing year, Vietnam, India, and Pakistan were China's top three suppliers for yarn, accounting for 72.6% of China's total yarn imports. China's yarn imports from Vietnam have grown rapidly as many mills have moved from China to Vietnam. This trend is expected to continue as Vietnam does not maintain import quotas on cotton and enjoys a zero tariff on yarn exports to China (Clever, 2017).

If Chinese tariffs are imposed on U.S. cotton, global cotton suppliers like India, Australia, and Brazil may experience a near-term opportunity to supply more cotton to China. In the short run, the market disruption could be a shock to the U.S. cotton futures market, particularly if hedge fund speculators sell off their long positions. However, the longer-term situation could see more U.S. exports rerouted to other cotton importing countries. This recent history of the change in China's internal cotton policy suggests a similar reshuffling effect from a bilateral Chinese tariff on imported U.S. cotton. Chinese raw cotton import tariffs would continue to stimulate imports of duty-free yarn from Vietnam, Indonesia, and the Indian subcontinent (Robinson, 2018; Shurley, 2018b).

What's Next?

China's April 4 announcement of possible tariffs on soybeans, cotton, and other U.S. exports stated that the implementation date for these tariffs would be announced later, depending on when the U.S. tariff actions would take effect (USDA, 2018a). Meanwhile, the United States allows 60 days for public feedback on the proposed tariffs for 1,333 Chinese products. The fact that these trade tariffs are not carried out immediately indicates there may be room for negotiation and that the impact of a cotton tariff could be a moot point.

China remains an important market for U.S. cotton. Meanwhile, the U.S. cotton industry has benefited from the growth in mill use in other countries. If U.S. sales of cotton into China decline as a result of a Chinese tariff, it is possible that sales to mills in other countries could increase to offset part of the decline in China. A Chinese tariff on U.S. raw cotton could continue to stimulate Chinese imports of duty-free yarn from Vietnam, Indonesia, and the Indian subcontinent. The demand for higher-quality U.S. cotton in those markets could continue to expand. Thus, the impact of a bilateral Chinese tariff on U.S. cotton may lead to a reshuffling or rerouting of, rather than a reduction in, U.S. cotton exports.

For More Information

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