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A Preliminary Analysis of the Effects of China's Cotton Tariff on the Chinese and U.S. Cotton Markets

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Abstract

This analysis examined the effects of the implementation of the Chinese retaliatory tariff on U.S. cotton exports and the world cotton market using a partial equilibrium model of the world fibre market. A unique characteristic of this model is that China's cotton imports are divided into imports from the United States and imports from the rest of the world (ROW). Compared to a base-level estimate, the imposed tariff on U.S. cotton imports would decrease Chinese cotton imports from the United States and increase imports from ROW. Meanwhile, it would put downward pressure on the world cotton price and the U.S. cotton farm price.

Keywords: cotton, international trade, tariff

Introduction

In response to the Trump administration's proposed and implemented 25 percent tariff on products imported from China, the Chinese government imposed a 25 percent retaliatory tariff on multiple U.S. goods, including cotton, starting on July 6, 2018. Historically, China has employed a two-tier tariff structure for cotton imports, popularly known as a tariff-rate quota (TRQ), to protect its cotton industry. It levied a 1 percent duty on imports under the annual quota of 894,000 tons (equivalent to 4,106 thousand bales) per its World Trade Organization entry commitments, while volumes in excess of that level were subject to a 40 percent tariff. Since the implementation of the new policy, U.S. cotton faces retaliatory tariffs of 26 percent for the "in-quota" quantity, and 65 percent for the rest.

MacDonald et al. (2010) reveal that world cotton prices have been highly correlated with China's net cotton imports for decades, and therefore the volatility of China's cotton imports augments its importance and impacts on world cotton prices. Given the size of its cotton industry, China has played a dominant role on the world cotton market for many years. As of 2017, China is the world's largest consumer (33 percent) and stockholder (47 percent) of cotton, the second-largest producer (22 percent), and the third-largest importer (14 percent) (USDA PSD, 2018). Since Chinese accession into the World Trade Organization in 2001[1] and the phase-out of the Multi Fibre Arrangement (MFA) between 1995 and 2005,[2] the rapid growth of cotton consumption by textile mills in China has widened the production deficit. Traditionally, China has relied on imports to fill the gap (about 31 percent of the total mill use since 2010). Figure 1 shows that China's market for imported cotton is mainly dominated by U.S. exports, constituting 44 percent of Chinese total cotton imports in 2017. Other major cotton suppliers to China are Australia (22 percent), India (10 percent), Uzbekistan (8 percent), Brazil (6 percent) and Benin (3 percent), which collectively account for 49 percent of China's cotton imports. Given its size, any policy changes in China regarding cotton and textiles could thus have a major impact on the global cotton market.

The recent trade policy change has created concerns about potential impacts on the U.S. cotton industry and global cotton trade. Of the total cotton production in the United States, nearly 80 percent is exported to international markets, with China being the primary destination. In 2017, China was the third-largest customer for U.S. cotton, positioned behind Bangladesh and Vietnam, importing U.S. cotton exports valued at US$978 million (USDA GATS, 2018).

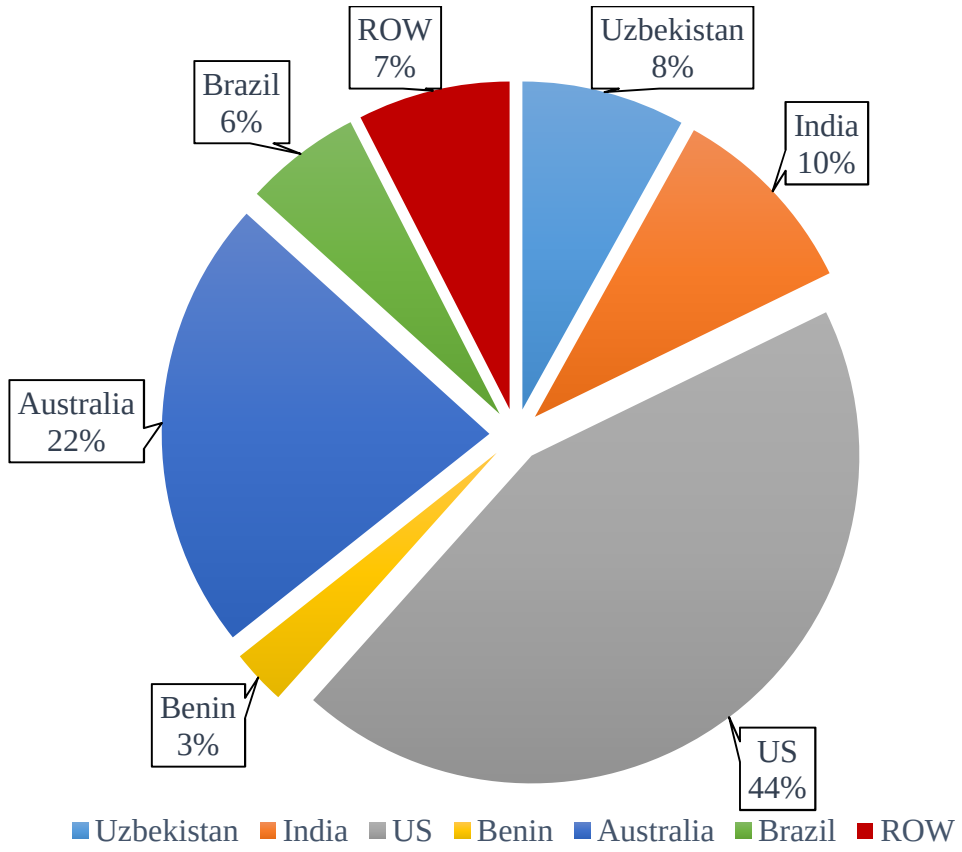

Figure 1 Market share of major cotton suppliers in China's cotton market in 2017.
Data source: China Cotton Association database

Historical trends suggest that such trade policy changes as the recent retaliatory tariff can be expected to put downward pressure on U.S. cotton exports and the world cotton price (Liu, Robinson and Shurley, 2018), but the question is, what are the magnitudes of the actual effects? The purpose of this study is to estimate the potential impacts of the Chinese cotton tariffs on U.S. cotton exports and the world cotton market. To accomplish this goal, an analysis was conducted using a partial equilibrium world fibre model. Once the model was estimated, a ten-year baseline was developed under a set of plausible assumptions regarding macroeconomic and other variables. Next, a scenario was developed where China places a 25 percent tariff on imports of U.S. cotton beginning with the 2018/19 crop year. The results obtained were compared to the baseline level to evaluate the effects of China's retaliatory tariff.

Methods

A partial equilibrium econometric simulation model of U.S. and other major cotton markets, known as the World Fiber Model (Pan and Hudson, 2011), is used to estimate

the effects of China's retaliatory tariff on the world cotton market. The world fibre model has been extensively used in the past for policy analysis, including most recently Capps, Williams and Hudson (2016); Williams et al. (2011); MacDonald et al. (2010); Pan, Hudson and Ethridge (2010); Welch et al. (2008); Chaudhary et al. (2008); Pan et al. (2008, 2007, 2005); Fadiga et al. (2006); Li, Mohanty and Pan (2005); and Ramirez et al. (2004).

In addition to the United States, this model includes 34 major cotton producing and consuming countries, including 17 cotton exporting countries/regions: India, Brazil, Australia, Uzbekistan, Benin, Burkina Faso, Chad, Mali, Cote d'Ivoire, Nigeria, Zimbabwe, Kazakhstan, Tajikistan, Turkmenistan, Egypt, Argentina, and other Africa; and 16 cotton importing countries/regions: China, Bangladesh, Turkey, Vietnam, Pakistan, Taiwan, Japan, South Korea, Indonesia, Malaysia, Mexico, EU, Russia, other Asia, other Americas, and other Europe. The representative country model includes supply, demand (domestic use and exports), ending stocks and market equilibrium for cotton and man-made fibres. The established model is used to perform analysis on the expected behaviour of natural fibre markets in response to potential changes in trade, technological, economic and policy factors, and evaluate the impacts of these changes on the included cotton and textiles markets.

Cotton production in each country and region defined in the model is derived from behavioural equations for cotton harvested area and yield. Generally, the acreage equations are specified as a function of the expected net returns for cotton and competing crops, whereas yield is dependent on expected cotton price and time trend to account for technological developments in agricultural production. For major cotton producing countries such as the United States, China and India, regional supply responses are estimated to capture differences in climate, water availability and other natural resources that influence acreage planting decisions in different parts of those countries. For example, to account for varying regional acreage and yield responses to other competing crops, U.S. cotton production is divided into for production regions: (1) Delta; (2) Southeast; (3) West; and (4) Southwest (irrigated and non-irrigated). Similarly, man-made fibre supply (primarily polyester) is estimated by modeling capacity and utilization rates separately for each country. Production capacity of man-made fibre is generally specified as lagged prices of man-made fibre, crude oil prices and a time trend, while the utilization equation is specified as current input and output prices.

Overall cotton demand is derived from estimates of total fibre consumption using a two-step process. In the first step, total textile fibre consumption is estimated as a residual of textile fibre consumption and the net trade of textile fibre. In the second step,

total fibres are subsequently allocated among various fibres, such as cotton, wool, and polyester (representing man-made fibres), based on relative prices and other factors.

Apart from supply and demand sectors for cotton and man-made fibres, the model also includes behavioural equations for ending stocks and trade. Cotton trade is estimated separately for exports and imports. The trade equations account for tariffs, quotas and tariff-rate-quotas and other border policies. Additionally, a series of equations of international price and trade linkages for cotton, man-made fibre, cotton fibre textiles, and man-made fibre textiles are included to close the model. Finally, the world cotton price (A-index) and polyester prices are endogenously solved in the model by respectively equalizing world exports and imports and man-made fibre supply and demand. For more information on parameter estimates and diagnostic statistics, please see Technical Documentation of the World Fiber Model by Pan and Hudson (2011).

The unique characteristic of this model compared with others is that China's cotton imports are divided into imports from the Unites States and imports from the rest of the world (ROW). The import equation is specified as a function of the ratio of the international cotton price to Chinese domestic cotton prices, Chinese disposable income per capita and a time trend. For the equation of cotton imports from ROW, the international cotton price was calculated by converting the world representative price (A-index) into domestic currency equivalents, while the imported cotton price for the U.S. is estimated by adding the in-quota tariff to the world price expressed in domestic currency.

Data

The annual data sets used in the estimation process were obtained from several different sources. Cotton data on acreage, yield, production, mill use, ending stocks and trade were collected from the Production, Supply & Demand (PS&D) database of the Foreign Agricultural Service of the U.S. Department of Agriculture (USDA). U.S. cotton regional acreage, yield and production were obtained from the National Agricultural Statistic Service (NASS), USDA. Data concerning U.S. cotton farm and mill prices were obtained from various issues of Cotton and Wool Yearbook published by the Economic Research Service (ERS), USDA. Prices of competing crops were derived from various yearbooks for different crops published by the ERS as well. Data on consumption and trade of textile and man-made fibre as well as man-made fibre production capacity and utilization were collected from various issues of *Fiber Organon* published by the Fiber Economic Board. All prices and income were expressed in real terms before estimating the behavioural equations.

Policy Simulation

The estimated econometric model was used to develop a ten-year baseline projection (2018 – 2028), which allows for comparison of short- and medium-term effects and provides important implications for policy analysis. Some imbalances seem dramatic in the short term but soon alleviate through adjustments in production, mill use and ending stocks, while other effects may be consistent or build up slowly over the ten-year period. The baseline simulation is normally conducted with a set of assumptions about the current general economy as well as agricultural and trade policies in major exporting and importing countries. In addition, the model is driven by a set of macroeconomic variables, such as real GDP, consumer price index (CPI), exchange rates and population growth. Projections for these macroeconomic variables as well as those for acreage, yield, prices for competing crops (e.g., corn, rice, soybean and wheat) and crude oil prices were obtained from the World and U.S. Agricultural Outlook published by Food and Agricultural Policy Research Institute (FAPRI).

Once the baseline was developed, an alternative scenario was estimated by placing a 25 percent tariff on U.S. cotton imports relative to the baseline projections beginning from 2018/19, with all other conditions remaining the same as in the baseline. Results are reported as percentage annual changes over the period 2018/19 – 2028/29 in terms of changes from baseline estimates. Tables 1 and 2 report the results of cotton production, consumption, trade and prices of the two scenarios for China and the United States, respectively.

Chinese Cotton Market Reponses

Obviously, China's 25 percent retaliatory tariff on U.S. cotton is expected to decrease U.S. cotton exports but increase exports from other major cotton producing countries/regions to meet Chinese mills' demand. Cotton imports from the United States are projected to decline by 6.52 percent in the first year and continue to decline over the rest of the projection period, with an average 5.20 percent per year lower relative to the baseline. On the other hand, cotton imports from ROW are projected to increase at an annual average rate of 0.10 percent above the baseline through 2028/29. Although the decreasing trade places downward pressure on world cotton prices, changes in the A-index compared to the baseline drop considerably from the first-year highs by the end of the analysis period. The decrease in the A-index price is 0.48 percent in 2028/29 as compared to 1.46 percent in 2018/19 (bottom of table 1). This is mainly due to the production adjustments from China and the rest of the world.

Meanwhile, China's ending stocks are estimated to continue the drawdown for the rest of the projection period at an annual average decrease of 9.12 percent below the baseline. In addition, domestic cotton production is expected to decline over the time

frame due to lower world cotton prices, but the magnitudes are negligible (around 0.12 percent on average). Cotton mill use is virtually unaffected by the implementation of the import cotton tariff over the same time horizon (around 0.08 percent on average).

U.S. Cotton Market Reponses

In the U.S. cotton market, the imposed tariff on U.S. cotton is projected to lower U.S. cotton exports by an average 0.16 percent per year through 2028/29, compared to the projected baseline. It is interesting that the policy change results in U.S. cotton exports being reduced by only 0.15 percent from the baseline level in the first year (2018/19). While the reduction in the next year (2019/20) reaches 0.26 percent, the trade effects are somewhat mitigated towards the later period. By the end of the projection period, the decline in exports is 0.13 percent. This pattern is due, in part, to the near-term U.S. shipments to China being either cancelled or rolled into the next year after imposition of the tariff on July 6, 2018. That is to say, the imposed tariff could be a shock to the U.S. cotton market in the short run. However, the effects dissipate over time as U.S. cotton exports adjust to the impacts by switching to other emerging textile producing countries, such as Vietnam and Bangladesh. U.S. cotton finds a home, just at a lower price.

Due to the declining cotton exports, the U.S. cotton farm price is negatively impacted and is projected to decline initially by 1.32 percent and to average a 0.58 percent decline per year over the entire projection period. U.S. cotton farmers respond to weaker cotton export demand and reduce cotton production by 0.23 percent in 2019/20 and by an average of 0.12 percent each year relative to the baseline. Meanwhile, the decline in U.S. cotton exports leads to an increase in ending stocks, higher by an average of 0.13 percent than the projected baseline.

Conclusion

A partial equilibrium model of world fibre markets is developed to quantify the impacts of China's retaliatory tariff on the Chinese and U.S. cotton markets. The model includes behavioural equations of supply, demand and trade for cotton and man-made fibres. In addition, this model solves for domestic and international prices of cotton endogenously. One of the unique characteristics of this study is that China's cotton imports are divided into imports from the United States and imports from the rest of the world, making it possible to incorporate appropriate tariffs for cotton imports from different sources.

The analysis results presented here represent only a first attempt at understanding the potential economic impacts on global cotton markets in the presence of China's retaliatory tariff, making use of the new data to provide some preliminary information

if the underlying macroeconomic conditions of this study are assumed. Our model does not allow for changes as behaviour (elasticities) that would likely result from a reshuffling of supply chains. Overall, placing a 25 percent tariff on U.S. cotton imports would decrease China's cotton imports from the United States by an average of 5.20 percent over the ten-year projection period of the study, increase imports from ROW very slightly (by an average of 0.10 percent), reduce U.S. cotton exports by 0.16 percent per year, and decrease the A-index and U.S. cotton farm price by 0.66 and 0.58 percent per year, respectively, through 2028/29. Although this current study attempts to capture and quantify the accurate impacts of the recent trade policy change, it is greatly constrained by the available trade data. The findings will be enhanced as more trade data become accessible. Thus, the model results should be viewed more as a preliminary analysis for understanding the potential aggregate effects rather than trying to produce specific forecasts of annual changes.

Generally speaking, the impact that the tariff on U.S. cotton imports will have on U.S. cotton exports will be relatively small, because the decrease in Chinese imports will be partly offset by a rise in imports by the rest of the world. Overall, the negative impacts on U.S. cotton exports will dissipate over time and the average rates will be minimal over the entire period. In the short term, to meet Chinese mills' demand, China will replace reduced imports of U.S. cotton with imports from Brazil, Australia and India. However, in the longer term, while imports by China decline, U.S. exports will simply be diverted to other textile-producing countries outside of China, such as Vietnam and Bangladesh.

Table 1 Estimated Effects of China's Cotton Tariff on the China Cotton Market, 2018/19 – 2028/29

	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	Average
Production	---------- **1,000 bales** ----------											
Baseline	27518.76	27987.47	29297.04	31061.79	32419.15	33054.11	33718.65	33773.54	33930.66	34082.37	34200.29	31913.08
w/ tariff	27513.21	27951.13	29265.92	31020.69	32379.17	33012.60	33677.05	33730.63	33886.44	34035.83	34157.92	31875.51
Percent change	-0.02%	-0.13%	-0.11%	-0.13%	-0.12%	-0.13%	-0.12%	-0.13%	-0.13%	-0.14%	-0.12%	-0.12%
Consumption												
Baseline	42380.62	42626.93	42623.50	42762.67	42927.36	43220.89	43448.65	43760.81	44258.51	44709.72	45097.51	43437.92
w/ tariff	42401.68	42647.71	42652.55	42793.60	42960.59	43256.73	43485.76	43798.91	44298.01	44750.24	45140.16	43471.45
Percent change	0.05%	0.05%	0.07%	0.07%	0.08%	0.08%	0.09%	0.09%	0.09%	0.09%	0.09%	0.08%
Ending Stock												
Baseline	30091.62	23575.98	18825.35	16618.29	16126.51	15843.50	16037.36	16253.52	16070.15	15350.58	14077.97	18079.17
w/ tariff	29895.01	23149.76	18166.57	15709.06	14963.16	14418.65	14347.85	14294.34	13837.00	12838.04	11285.59	16627.73
Percent change	-0.65%	-1.81%	-3.50%	-5.47%	-7.21%	-8.99%	-10.53%	-12.05%	-13.90%	-16.37%	-19.84%	-9.12%
Imports from U.S.												
Baseline	2793.68	3123.12	3324.18	3600.97	3780.45	3798.83	3816.96	3925.59	3993.13	3996.20	4023.93	3652.46
w/ tariff	2611.49	2945.26	3143.65	3417.07	3594.30	3610.37	3626.80	3733.01	3798.91	3800.12	3825.09	3464.19
Percent change	-6.52%	-5.69%	-5.43%	-5.11%	-4.92%	-4.96%	-4.98%	-4.91%	-4.86%	-4.91%	-4.94%	-5.20%
Imports from ROW												
Baseline	4290.80	5146.11	5392.46	6029.07	6367.59	6211.97	6229.34	6395.69	6264.59	6020.25	5704.74	5822.97
w/ tariff	4303.00	5151.47	5400.61	6034.54	6372.84	6216.29	6233.56	6399.61	6268.57	6024.00	5708.77	5828.48
Percent change	0.28%	0.10%	0.15%	0.09%	0.08%	0.07%	0.07%	0.06%	0.06%	0.06%	0.07%	0.10%

A-index	---------- **U.S. Cents/lb** ----------											
Baseline	92.69	84.66	87.40	87.85	88.71	89.24	89.72	90.67	91.19	91.74	93.31	89.75
w/ tariff	91.34	84.11	86.55	87.27	88.15	88.78	89.27	90.25	90.76	91.33	92.86	89.15
Percent change	-1.46%	-0.65%	-0.98%	-0.66%	-0.63%	-0.52%	-0.50%	-0.47%	-0.47%	-0.45%	-0.48%	-0.66%

Table 2 Estimated Effects of China's Cotton Tariff on the U.S. Cotton Market, 2018/19 – 2028/29

	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	Average
Production	----------	----------	----------	----------	----------	**1,000 bales**	----------	----------	----------	----------	----------	
Baseline	17640.32	22195.94	20520.03	20477.56	20410.69	20285.86	20416.22	20495.77	20643.63	20944.67	21174.92	20473.24
w/ tariff	17640.32	22145.64	20502.71	20443.20	20378.69	20258.16	20392.10	20472.78	20621.62	20922.23	21152.99	20448.22
Percent change	0.00%	-0.23%	-0.08%	-0.17%	-0.16%	-0.14%	-0.12%	-0.11%	-0.11%	-0.11%	-0.10%	-0.12%
Consumption												
Baseline	3299.59	3532.11	3573.74	3580.81	3578.51	3622.68	3643.68	3672.21	3634.76	3660.63	3699.65	3590.76
w/ tariff	3300.63	3532.30	3573.72	3580.45	3577.88	3622.34	3643.50	3672.15	3634.66	3660.51	3699.43	3590.69
Percent change	0.03%	0.01%	0.00%	-0.01%	-0.02%	-0.01%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%
Ending Stock												
Baseline	4301.16	6906.82	7096.06	7162.61	7155.26	7180.22	7206.77	7126.89	7144.68	7170.33	7251.90	6882.06
w/ tariff	4321.96	6916.53	7109.47	7171.79	7163.39	7186.81	7212.97	7132.57	7150.28	7175.50	7257.37	6890.79
Percent change	0.48%	0.14%	0.19%	0.13%	0.11%	0.09%	0.09%	0.08%	0.08%	0.07%	0.08%	0.13%
Exports												
Baseline	14594.96	16321.70	17000.59	17080.29	17091.40	16891.42	17000.53	17159.47	17249.52	17519.00	17656.69	16869.60
w/ tariff	14573.13	16279.84	16978.66	17048.95	17060.06	16864.63	16976.19	17136.29	17226.94	17496.37	17633.98	16843.19
Percent change	-0.15%	-0.26%	-0.13%	-0.18%	-0.18%	-0.16%	-0.14%	-0.14%	-0.13%	-0.13%	-0.13%	-0.16%
Farm Price	----------	----------	----------	----------	----------	**U.S. Cents/lb**	----------	----------	----------	----------	----------	
Baseline	72.86	65.10	67.64	68.33	68.85	69.37	69.95	70.88	71.34	71.88	73.59	69.98
w/ tariff	71.90	64.74	67.03	67.94	68.48	69.06	69.65	70.60	71.05	71.60	73.29	69.58
Percent change	-1.32%	-0.56%	-0.90%	-0.58%	-0.54%	-0.44%	-0.43%	-0.40%	-0.41%	-0.38%	-0.41%	-0.58%

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Endnotes

[1] China opened up its cotton sector as part of its WTO commitments with the establishment of a TRQ for cotton imports.

[2] The Multi-Fibre Arrangement, established in 1974, developed an import quota system which restricted exports of textiles and clothing products from most developing countries to developed countries, including the United States, the European Union, and Canada. MFA elimination led to rising textile export demand, which greatly increased Chinese mill consumption of fibres, particularly cotton.