

The impact of Chinese retaliatory tariffs on U.S. cotton industry

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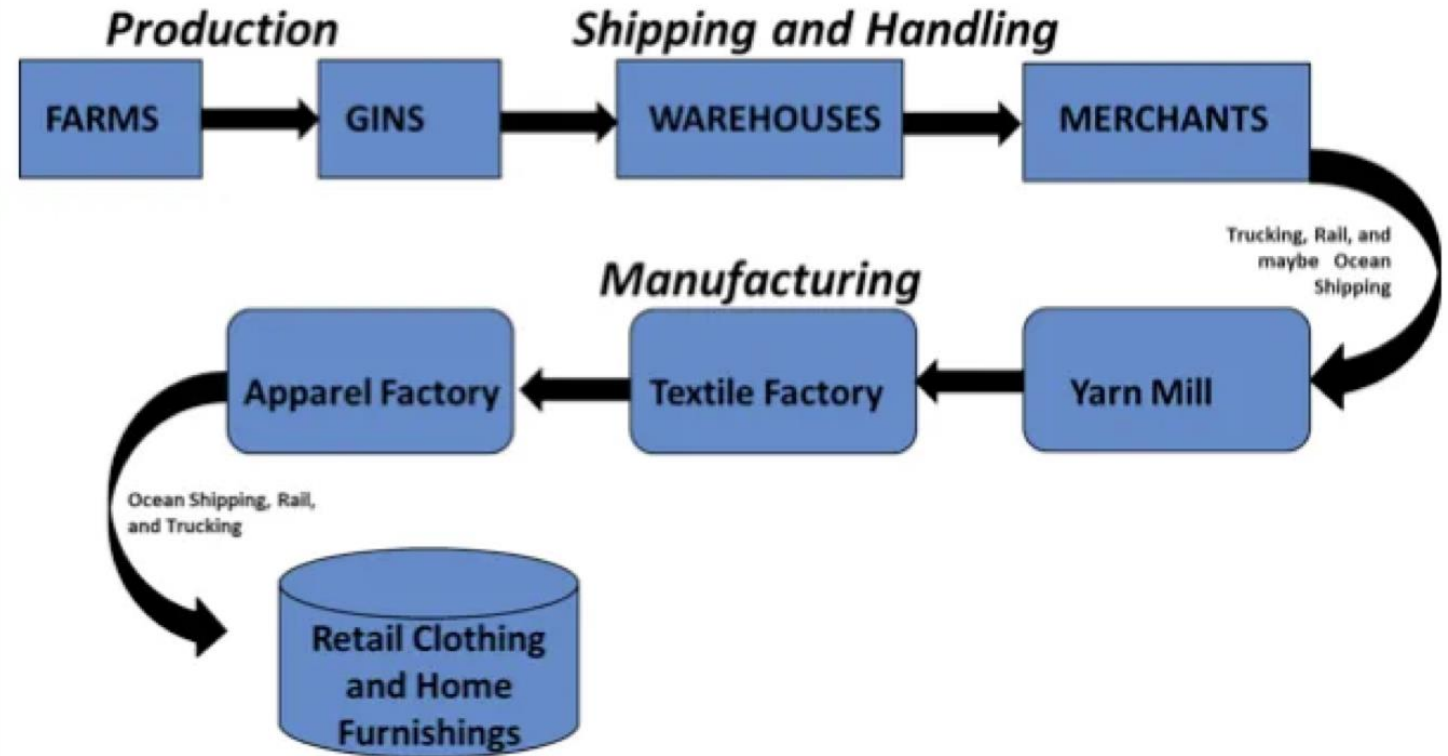


1. An intimate bilateral trade relationship

- The economic reform since late 1970s brought strong income growth, radical urbanization and a rising middle class for China.
- China's agricultural dilemma underscores its incapacity to satisfying domestic demands.
- The U.S. agriculture relies on trade: a trade surplus has been observed since 1959 and it constitutes 20% of farmers' income (USDA-FAS, 2018).

Global Cotton Supply Chain

- Raw cotton produced in the U.S. is exported to China
- The textile-made apparel products manufactured in China are exported back to the U.S.



Source: Liu, Y., Robinson, J. R., & Shurley, W. D. (2018). China's potential cotton tariffs and US cotton exports: Lessons from history. *Choices*, 33(2), 1-6.

Overview

- Before the 2019 trade conflict, U.S. cotton exports to China had witnessed significant and steady growth overtime in demand for China's expanding textile business. (Nguema, 2019)
- U.S. has become the leading customer for Chinese textiles and clothing exports since the year 2005 (World Integrated Trade Solution, 2018).
- The presence of 25% cotton tariffs imposed by China and 15% textile tariffs imposed by the U.S.

2. Research Question

- Is there a quantitative tool adaptable for scrutinizing cotton and textile trade issues?
- What potential impacts will the cotton tariff and textile tariff have on their corresponding sectors in the U.S. and China?
- What are the implications of cotton tariff and textile tariff with respect to global cotton supply chain?

3.1 Standard GTAP Model

- A multi-regional, multi-sectoral, computable general equilibrium model, with perfect competition and constant returns to scale (Hertel, 1997).



3.1 GTAP-CTTN (Cotton) Model

– derived from standard GTAP Version 10

Regional aggregation in GTAP-CTTN Sectoral aggregation in GTAP-CTTN

agg.reg.name	agg.reg.detail
China	China
USA	The United States
Vietnam	Vietnam
S.SE.ASIA	South and Southeastern Asia
Brazil	Brazil
LAM	Latin America
Europe	Europe
ROW	Rest of the World

agg.sec.name	agg.sec.detail
cott	plant-based fibers
tex	textiles and wearing apparel
crop	crops
food	livestock and processed food
mnfc	manufacturing
serv	services

3.2 Experimental Design

- Case 1: China imposes 25% of importing tariffs on U.S. cotton exports.
- Case 2: U.S. imposes 15% of importing tariffs on Chinese textiles.
- Case 3: A combination of China's 25% cotton tariffs and America's 15% textile tariffs.
- Changes in economic well-being (Section 4.1; measured by GDP), export value (4.2) , price (4.3), export volume (4.4) and employment situation (4.5) are simulated by the GTAP-CTTN model for each case.

Result Analysis 4.1

Changes in economic well-being by region and by case (million USD)

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-143.0	-1108.0	-1250.0
USA	86.0	-3908.0	-3824.0
Vietnam	1.0	247.0	258.0
S.SE.ASIA	2.5	-100.0	-97.5
Brazil	0.0	148.9	148.8
LAM	0.5	57.3	57.8
Europe	-26.0	64.0	40.0
ROW	-1.5	33.8	32.3
Total	-80.5	-4565.1	-4634.7

- Negative impacts of tariff imposition are re-channeled back to their original executors.

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- The magnitude of changes caused by Case 2 is significantly larger than that caused by Case 1.

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ROW	-1.5	33.8	32.3
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- Negative impacts of tariff imposition are re-channeled back to their original executors.
- The magnitude of changes caused by Case 2 is significantly larger than that caused by Case 3.
- The Global economic welfare reduces in all cases.

Result Analysis 4.2.1

Changes in cotton export values by region and by case (%)

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-0.80	3.46	2.65
USA	-13.72	0.31	-13.07
Vietnam	10.80	-3.06	7.46
S.SE.ASIA	4.28	-0.73	3.44
Brazil	2.34	0.98	3.28
LAM	2.50	0.39	2.83
Europe	3.19	-0.05	3.09
ROW	3.67	0.57	4.18
Total	0.00	0.20	-0.51

- The U.S. cotton export value decreases dramatically in Case 1;

Result Analysis 4.2.1

Changes in cotton export values by region and by case (%)

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LAM	2.50	0.39	2.83
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Total	0.00	0.20	-0.51

- The U.S. cotton export value decreases dramatically in Case 1;
- Vietnam's export value exhibits the highest growth in Case 1;

Result Analysis 4.2.1

Changes in cotton export values by region and by case (%)

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- The U.S. cotton export value decreases dramatically in Case 1;
- Vietnam's export value exhibits the highest growth in Case 1;
- 15% tariffs on Chinese textile exports accounts for the increase of China's cotton export value.

Result Analysis 4.2.1

Changes in cotton export values by region and by case (%)

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Europe	3.19	-0.05	3.09
ROW	3.67	0.57	4.18
Total	0.00	0.20	-0.51

- The U.S. cotton export value decreases dramatically in Case 1;
- Vietnam's export value exhibits the highest growth in Case 1;
- 15% tariffs on Chinese textile exports accounts for the increase of China's cotton export value.
- Textile tariff has a cross-sectoral effect on cotton exports

Result Analysis 4.2.2

Changes in textile export values by region and by case (%)

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-0.06	-8.17	-8.22
USA	0.10	-1.34	-1.25
Vietnam	0.01	8.57	8.57
S.SE.ASIA	-0.01	4.79	4.78
Brazil	0.01	4.20	4.21
LAM	0.06	15.96	16.01
Europe	0.04	0.66	0.70
ROW	0.05	3.13	3.18
Totoal	0.00	-0.98	-0.98

- China's textile export value drops noticeably in Case 2 and Case 3

Result Analysis 4.2.2

Changes in textile export values by region and by case (%)

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-0.06	-8.17	-8.22
USA	0.10	-1.34	-1.25
Vietnam	0.01	8.57	8.57
S.SE.ASIA	-0.01	4.79	4.78
Brazil	0.01	4.20	4.21
LAM	0.06	15.96	16.01
Europe	0.04	0.66	0.70
ROW	0.05	3.13	3.18
Totoal	0.00	-0.98	-0.98

- China's textile export value drops noticeably in Case 2 and Case 3.
- LAM, Vietnam, S.SE.ASIA and Brazil are winners.

Result Analysis 4.2.2

Changes in textile export values by region and by case (%)

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
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USA	0.10	-1.34	-1.25
Vietnam	0.01	8.57	8.57
S.SE.ASIA	-0.01	4.79	4.78
Brazil	0.01	4.20	4.21
LAM	0.06	15.96	16.01
Europe	0.04	0.66	0.70
ROW	0.05	3.13	3.18
Total	-0.00	-0.98	-0.98

- China's textile export value drops noticeably in Case 2 and Case 3.
- LAM, Vietnam, S.SE.ASIA and Brazil are winners.
- Cotton tariff doesn't indicate a cross-sectoral effect on textile sectors

Changes in cotton price by region and by case (%)



Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	3.24	0.14	3.38
USA	-0.91	0.15	-0.74
Vietnam	-0.21	0.12	-0.08
S.SE.ASIA	0.09	0.31	0.40
Brazil	0.08	0.02	0.09
LAM	-0.37	0.15	-0.2
Europe	0.07	0.01	0.08
ROW	-0.04	0.03	-0.01

- 15% American tariff on Chinese textile exports revealed little effect on cotton price for all regions

Changes in cotton price by region and by case (%)



Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	3.24	0.14	3.38
USA	-0.91	0.15	-0.74
Vietnam	-0.21	0.12	-0.08
S.SE.ASIA	0.09	0.31	0.40
Brazil	0.08	0.02	0.09
LAM	-0.37	0.15	-0.2
Europe	0.07	0.01	0.08
ROW	-0.04	0.03	-0.01

- 15% American tariff on Chinese textile exports revealed little effect on cotton price for all regions
- China exhibited the largest increase and the U.S. observed a mild decrease in cotton price under Case 2 and Case 3.

Changes in cotton price by region and by case (%)



Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	3.24	0.14	3.38
USA	-0.91	0.15	-0.74
Vietnam	-0.21	0.12	-0.08
S.SE.ASIA	0.09	0.31	0.40
Brazil	0.08	0.02	0.09
LAM	-0.37	0.15	-0.2
Europe	0.07	0.01	0.08
ROW	-0.04	0.03	-0.01

- 15% American tariff on Chinese textile exports revealed little effect on cotton price for all regions
- China exhibited the largest increase and the U.S. observed a mild decrease in cotton price under Case 2 and Case 3.
- The remaining regions indicated subtle changes in domestic cotton prices under Case 1 and Case 3.

Changes in textile price by region and by case (%)

Result Analysis 4.3.2

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	0.02	-0.16	-0.14
USA	0.00	0.77	0.77
Vietnam	0.01	-0.07	-0.06
S.SE.ASIA	0.01	0.03	0.04
Brazil	0.01	-0.02	-0.02
LAM	0.00	0.04	0.05
Europe	0.01	-0.02	-0.02
ROW	0.00	-0.02	-0.02

- The magnitude of changes on textile prices are much smaller than that on cotton prices for all regions.
- The USA exhibits a moderate increase in textile price; China shows a mild decrease in average for Case 2 and Case 3.

Changes in textile price by region and by case (%)

Result Analysis 4.3.2

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	0.02	-0.16	-0.14
USA	0.00	0.77	0.77
Vietnam	0.01	-0.07	-0.06
S.SE.ASIA	0.01	0.03	0.04
Brazil	0.01	-0.02	-0.02
LAM	0.00	0.04	0.05
Europe	0.01	-0.02	-0.02
ROW	0.00	-0.02	-0.02

- the magnitude of changes on textile prices are much smaller than that on cotton prices for all regions.
- The USA exhibits a moderate increase in textile price; China shows a mild decrease in average for Case 2 and Case 3.
- All regions excluding China and USA remain at constant level in textile prices.

Changes in cotton export volume by region and by case (%)



Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-0.97	4.00	3.01
USA	-12.92	0.16	-12.42
Vietnam	10.51	-3.57	6.64
S.SE.ASIA	4.15	-1.08	2.95
Brazil	2.26	0.96	3.18
LAM	2.52	0.21	2.68
Europe	3.09	-0.05	2.99
ROW	3.64	0.56	4.14
Totoal	-0.59	0.09	-0.47

- The trend of changes in export volume is highly analogous to that in export value.
- A sharp decline is observed in the U.S. cotton export volume across Case 1 and Case 3.

Changes in cotton export volume by region and by case (%)



Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-0.97	4.00	3.01
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Vietnam	10.51	-3.57	6.64
S.SE.ASIA	4.15	-1.08	2.95
Brazil	2.26	0.96	3.18
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- The trend of changes in export volume is highly analogous to that in export value.
- A sharp decline is observed in the U.S. cotton export volume across Case 1 and Case 3.
- Vietnam exhibits the strongest growth in cotton export volume under Case 1 and Case 3.

Changes in cotton export volume by region and by case (%)



**Result
Analysis
4.4.1**

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-0.97	4.00	3.01
USA	-12.92	0.16	-12.42
Vietnam	10.51	-3.57	6.64
S.SE.ASIA	4.15	-1.08	2.95
Brazil	2.26	0.96	3.18
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- 15% tariffs on Chinese textile exports accounts for the increase of China's cotton export volume.

Changes in cotton export volume by region and by case (%)



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- Vietnam exhibits the strongest growth in cotton export volume under Case 1 and Case 3.
- 15% tariffs on Chinese textile exports accounts for the increase of China's cotton export volume.
- Textile tariff has a cross-sectoral effect on cotton export volumes

Changes in textile export volume by region and by case (%)



Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-0.08	-8.02	-8.09
USA	0.11	-1.63	-1.53
Vietnam	0.00	8.51	8.50
S.SE.ASIA	-0.02	4.72	4.70
Brazil	0.01	4.21	4.22
LAM	0.06	15.89	15.94
Europe	0.04	0.67	0.70
ROW	0.05	3.14	3.18
Totoal	0.00	-0.93	-0.95

- China's textile export volume drops significantly in Case 2 and Case 3.

Changes in textile export volume by region and by case (%)



Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
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USA	0.11	-1.63	-1.53
Vietnam	0.00	8.51	8.50
S.SE.ASIA	-0.02	4.72	4.70
Brazil	0.01	4.21	4.22
LAM	0.06	15.89	15.94
Europe	0.04	0.67	0.70
ROW	0.05	3.14	3.18
Totoal	0.00	-0.93	-0.95

- China's textile export volume drops significantly in Case 2 and Case 3.
- LAM, Vietnam, S.SE.ASIA and Brazil are winners.

Changes in textile export volume by region and by case (%)



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LAM	0.06	15.89	15.94
Europe	0.04	0.67	0.70
ROW	0.05	3.14	3.18
Totoal	0.00	-0.93	-0.95

- China's textile export volume drops significantly in Case 2 and Case 3.
- LAM, Vietnam, S.SE.ASIA and Brazil are winners.
- Cotton tariff doesn't show a cross-sectoral effect on textile export volumes.

Result Analysis 4.5.1

Changes of employment in cotton sector by region and by case (%)

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	1.44	-2.88	-1.48
USA	-8.02	0.95	-6.86
Vietnam	3.44	3.36	6.68
S.SE.ASIA	0.59	1.41	1.98
Brazil	0.95	0.44	1.38
LAM	-0.15	1.29	1.14
Europe	0.81	0.01	0.81
ROW	0.55	0.28	0.82

- Employment in the American cotton basis decreases substantially under Case1.

Result Analysis 4.5.1

Changes of employment in cotton sector by region and by case (%)

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Vietnam	3.44	3.36	6.68
S.SE.ASIA	0.59	1.41	1.98
Brazil	0.95	0.44	1.38
LAM	-0.15	1.29	1.14
Europe	0.81	0.01	0.81
ROW	0.55	0.28	0.82

- Employment in the American cotton basis decreases substantially under Case1.
- Vietnam experiences the most beneficial employment effect in all cases.

Result Analysis 4.5.1

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Brazil	0.95	0.44	1.38
LAM	-0.15	1.29	1.14
Europe	0.81	0.01	0.81
ROW	0.55	0.28	0.82

- Employment in the American cotton basis decreases tremendously under Case1.
- Vietnam shows the biggest job increases in all cases.
- Cross-sectoral effects of textile tariffs on cotton sectors

Result Analysis 4.5.2

Changes of employment in textile sector by region and by case (%)

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-0.04	-3.26	-3.30
USA	0.03	4.19	4.22
Vietnam	0.01	7.72	7.17
S.SE.ASIA	0.01	1.92	1.92
Brazil	0.00	0.06	0.06
LAM	0.03	4.12	4.14
Europe	0.03	0.33	0.36
ROW	0.03	0.90	0.93

- American trade policy increases domestic jobs and cuts down China's employment rate.

Result Analysis 4.5.2

Changes of employment in textile sector by region and by case (%)

Region	Case 1: 25% of Chinese tariff on American cotton exports	Case 2: 15% of American tariff on Chinese textile exports	Case 3: Combination of 25% cotton and 15% textile tariffs
China	-0.04	-3.26	-3.30
USA	0.03	4.19	4.22
Vietnam	0.00	7.72	7.17
S.SE.ASIA	0.01	1.92	1.92
Brazil	0.00	0.06	0.06
LAM	0.03	4.12	4.14
Europe	0.03	0.33	0.36
ROW	0.03	0.90	0.93

- American trade policy increases domestic jobs and cuts down China's employment rate.
- Vietnam produces the strongest growth in employment in textile sector, followed by LAM.

Result Analysis 4.5.2

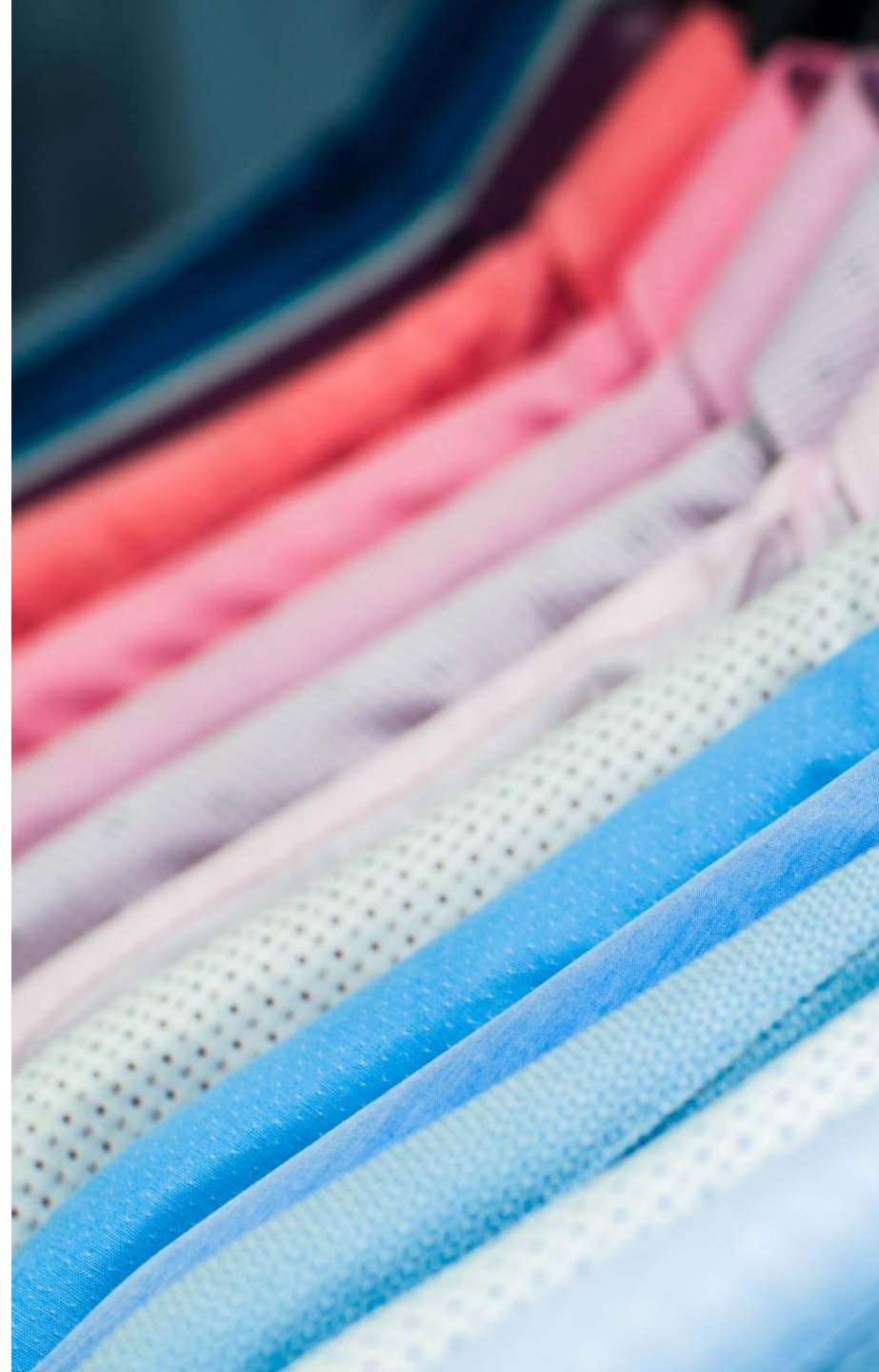
Changes of employment in textile sector by region and by case (%)

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USA	0.03	4.19	4.22
Vietnam	0.01	7.72	7.17
S.SE.ASIA	0.01	1.92	1.92
Brazil	0.00	0.06	0.06
LAM	0.03	4.12	4.14
Europe	0.03	0.33	0.36
ROW	0.03	0.90	0.93

- American trade policy increases domestic jobs and cuts down China's employment rate.
- Vietnam maintains the strongest growth in employment in cotton sector, followed by LAM.
- No visible cross-sectoral effects from cotton tariffs.

5. Conclusion

- A continuation of trade tension will deplete agricultural resources and social welfare in both the U.S. and China.
- Vietnam becomes the biggest winner in all aspects.
- Identification of the cross-sectoral effect of 15% of American-initiated textile-importing tariff on export values, export volumes, employment situations and prices for the cotton sector in several regions.





COVID-19



6. Potential implications of GTAP-CTTN

- A sharp decline in cotton demands
- The shutdown of textile factories across the globe
- Clothing retailers facing major recession
- Concerns over uncertainty
- Trade shocks and labor shocks in the corresponding sectors of the GTAP-CTTN model.

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