



中国农业科学院农业经济与发展研究所
INSTITUTE OF AGRICULTURAL ECONOMICS
AND DEVELOPMENT, CAAS

Trade Cost and Growth of Agricultural Trade in Regions of China

Jia Wei

2017.10.12

I. Features of China's Agricultural Trade

- China's agricultural trade has kept increasing, yet trade deficit remains large. Since accession to the WTO in 2001, China has witnessed a rapid growth in agro-trade. The agro-trade value rose from USD 26.97 billion in 2000 to USD 184.56 billion in 2016, with an annual average growth rate of 13.67%, and the peak appeared in 2014 at USD 194.5 billion. The export and import value of China's agro-products increased from USD 14.69 billion and USD 12.108 billion in 2000 to USD 72.99 billion and USD 111.57 billion in 2016 respectively. China's agricultural trade turned from surplus to deficit in 2004 and the trade deficit reached the highest point in 2013 at USD 51.04 billion.

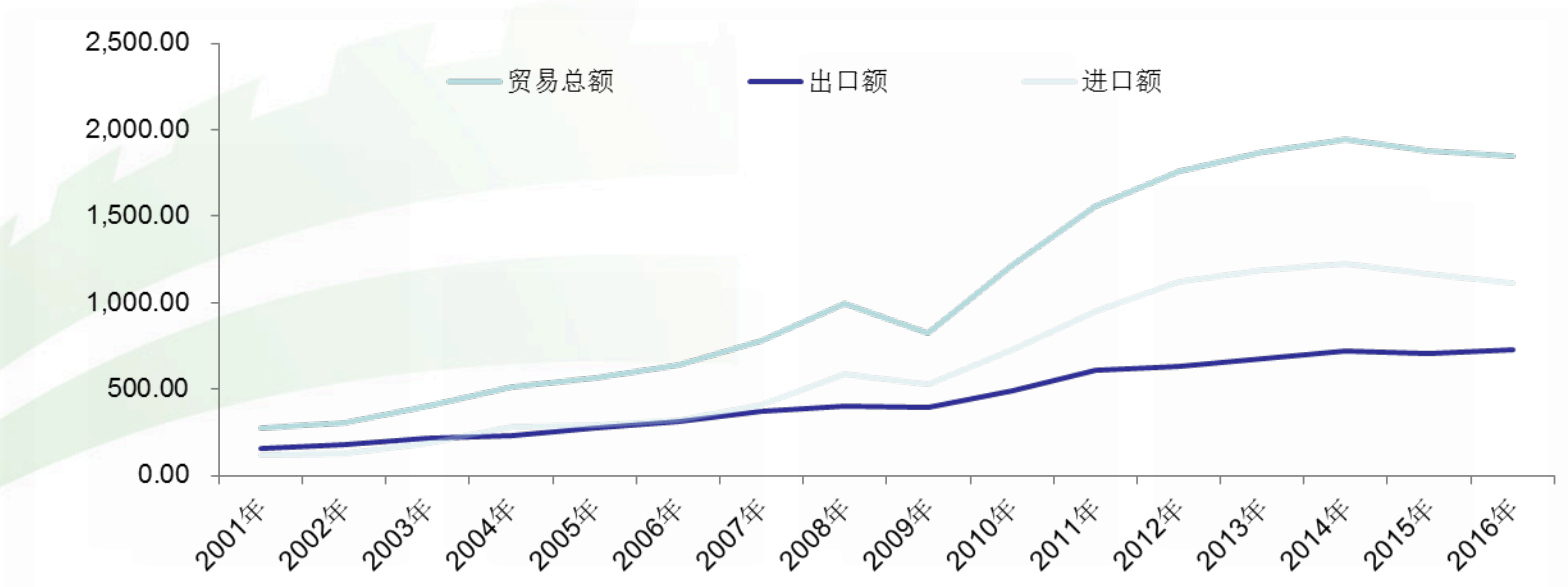


Figure 1 Change in China 's Agricultural Trade

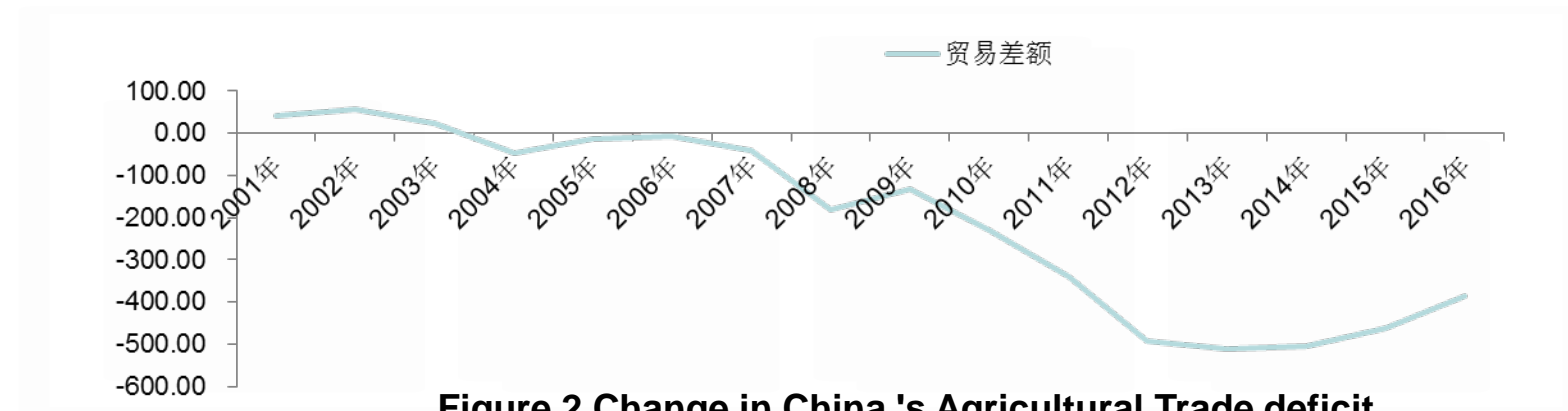


Figure 2 Change in China 's Agricultural Trade deficit



- The regional and inter-regional trade has a high share in the total trade value, yet shows a clear sign of decline.

According to statistics, in 2010, China's regional and inter-regional agro-trade value was 14 and 2.44 times the nation's total foreign agro-trade value, and its inter-regional agro-export and import value was 3.02 and 2.05 times the total foreign agro-trade value of the nation. Regional agro-export constitutes the main part of the total agro-export of all regions across the country; regional, inter-regional and foreign export value represented 81.15%, 14.16% and 4.69% of the total agro-export of all regions across the country. Inter-regional agro-trade value is on the rise and it is undeniable that inter-regional agro-trade value far outstrips foreign agro-trade value.

Table 1 eight regional agricultural trade unit: RMB billion

| 地区 | North | Northeast | East | Central | South | Southwest | Northwest | Other countries and regions in the world | The other regions in china |
|--|-------|-----------|--------|---------|-------|-----------|-----------|--|----------------------------|
| North | 54.74 | 2.24 | 13.31 | 2.30 | 1.24 | 0.69 | 1.25 | 2.27 | 21.03 |
| Northeast | 2.92 | 58.18 | 9.14 | 1.48 | 0.14 | 0.27 | 0.36 | 4.01 | 14.31 |
| East | 5.35 | 2.78 | 180.20 | 2.44 | 2.45 | 1.20 | 2.37 | 18.17 | 16.59 |
| Central | 1.76 | 0.57 | 6.52 | 109.61 | 4.53 | 2.52 | 1.50 | 1.67 | 17.40 |
| South | 1.26 | 0.16 | 2.34 | 0.98 | 66.78 | 1.24 | 0.90 | 4.73 | 6.88 |
| Southwest | 1.88 | 0.27 | 4.20 | 1.81 | 3.67 | 74.90 | 0.83 | 1.63 | 12.66 |
| Northwest | 2.56 | 0.40 | 5.84 | 2.26 | 0.80 | 0.96 | 38.31 | 1.21 | 12.82 |
| Other countries and regions in the world | 6.54 | 3.55 | 25.81 | 1.18 | 10.98 | 1.10 | 0.40 | 7416.09 | 49.56 |
| The other regions in china | 15.73 | 6.42 | 41.35 | 11.27 | 12.83 | 6.88 | 7.21 | 33.69 | — |

- Regions in China have clear differences in agro-trade, and Eastern China is still the most important region in this regard.

The regional, inter-regional and foreign agro-import value accounts for 79.40%, 13.85% and 6.75% of the total agro-imports of all regions across China. Eastern China has the country's highest inter-regional agro-import value of RMB 413.5 billion; Northern China has the country's highest inter-regional agro-export value of RMB 210.3 billion. The regional, inter-regional and foreign agro-trade value in Eastern China is RMB 1.802 trillion, RMB 579.4 billion and RMB 439.8 billion respectively, all higher than other regions in the country.

• **II Trend of Changes in Agricultural Trade Cost in Chinese Regions**

The trade cost has long been neglected in mainstream economic studies. However, with the development of international trade, the importance of the trade cost has become ever more noticeable. The price of goods, which includes tariffs and tariff equivalents and excludes normal technical barriers, is 170% higher than the production cost of goods. The trade cost of economically developed countries is lower than that of underdeveloped ones (Anderson and van Wincoop, 2004). Some literature used Novy (2011)'s method to measure the transportation cost (such as Jacks et al., 2008; Xu Tongsheng et al., 2012). The advantage of Novy (2011)'s study is that the calculation is easy to perform and understand, and trade flow information of two trading parties is directly used in the calculation of the trade cost. This paper refers to above studies in calculating the cost of China's regional and foreign agricultural trade .

- Generally speaking, the agro-trade cost in the regions of China shows a downward trend. In 2002 and 2010, the inter-regional agro-trade cost in China averaged 0.92 and 0.75, and the foreign agro-trade cost was 1.26 and 0.98, respectively. The average cost of inter-regional agro-trade is clearly lower than the cost of foreign agro-trade. In 2002 and 2010, China's foreign agro-trade cost was 1.37 and 1.31 times the average cost of its inter-regional agro-trade. But the gap has been narrowing down. Since China joined the WTO in 2001, it has decreased tariff rates of agro-products, reduced non-tariff barriers and measures, and improved the level of liberalization of agricultural trade. All these have contributed to the dropping cost of foreign agro-trade in the regions of China, even to a level far lower than developed countries.

Table 2 Agro-trade cost in Chinese regions in 2002 and 2010

| Year | Region | Inter-regional agro-trade cost | | | | | | | Average inter-regional agro-trade cost |
|------|--|--------------------------------|-----------|------|---------|-------|-----------|-----------|--|
| | | North | Northeast | East | Central | South | Southwest | Northwest | |
| 2002 | North | 0.00 | 0.78 | 0.60 | 0.99 | 0.90 | 0.83 | 1.03 | 0.70 |
| | Northeast | — | 0.00 | 0.62 | 1.01 | 0.92 | 0.85 | 1.05 | 0.71 |
| | East | — | — | 0.00 | 0.80 | 0.72 | 0.66 | 0.84 | 0.61 |
| | Central | — | — | — | 0.00 | 1.14 | 1.06 | 1.29 | 0.95 |
| | South | — | — | — | — | 0.00 | 0.97 | 1.19 | 0.71 |
| | Southwest | — | — | — | — | — | 0.00 | 1.10 | 0.81 |
| | Northwest | — | — | — | — | — | — | 0.00 | 0.93 |
| | Other countries and regions in the world | 1.02 | 1.02 | 0.81 | 1.55 | 0.87 | 1.63 | 1.62 | 0.00 |
| 2010 | North | 0.00 | 0.56 | 0.42 | 0.69 | 0.74 | 0.78 | 0.60 | 0.62 |
| | Northeast | — | 0.00 | 0.54 | 0.89 | 1.37 | 1.20 | 0.99 | 0.75 |
| | East | — | — | 0.00 | 0.66 | 0.73 | 0.76 | 0.60 | 0.58 |
| | Central | — | — | — | 0.00 | 0.70 | 0.71 | 0.66 | 0.80 |
| | South | — | — | — | — | 0.00 | 0.65 | 0.79 | 0.72 |
| | Southwest | — | — | — | — | — | 0.00 | 0.79 | 0.84 |
| | Northwest | — | — | — | — | — | — | 0.00 | 0.77 |
| | Other countries and regions in the world | 1.07 | 1.09 | 0.77 | 1.52 | 0.92 | 1.50 | 1.58 | 0.00 |

- In terms of the trade cost from one region to all other regions in China, in 2010, Eastern region's inter-regional and foreign agro-trade costs were the lowest at 0.58 and 0.77; Southwestern region's inter-regional agro-trade cost was the highest at 0.84; and the Northwestern region's foreign agro-trade cost was the highest at 1.58. The average inter-regional agro-trade cost in China showed different trends of change. The inter-regional agro-trade cost in Northern, Eastern, Central and Northwestern regions was declining, and the cost in Northwestern and Central regions in particular fell by 17.20% and 15.79% respectively.

- Most Chinese regions showed falling cost of inter-regional agro-trade, and undeniably a few regions saw a light increase. For example, the inter-regional agro-trade cost rose by 41.18%, 48.91% and 15.15% in Northeast and Southwest, Northeast and South, and East and Southwest of China respectively.

- **III Trade Cost and Growth of Agricultural Trade**
- The model the paper tries to build is a CGE(The Computable General Equilibrium model) about pure exchanges among eight regions and two sectors in the world, and is improved on the basis of the model built by Whalley and Xin (2009). The paper focuses on China and divides the world into eight regions and two sectors. The eight regions include Northern China, Northeastern China, Eastern China, Central China, Southern China, Southwestern China, Northwestern China, and other countries and regions in the world. Two sectors consist of agricultural and non-agricultural products. The paper uses the Constant Elasticity of Substitution (CES) functions to describe the trend of cargo trade flow among 7 Chinese regions and other countries and regions in the world.



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- Taking into consideration the trajectory of agro-trade costs in all Chinese regions during 2002-2010, the paper adopts a counterfactual approach to make the following simulated scenarios: ① Scenario 1: suppose that the inter-regional agro-trade cost in 2010 was the same with that in 2002 and the foreign agro-trade cost was the actual value of 2010; ② Scenario 2: suppose that the inter-regional agro-trade cost in 2010 declined and included only transportation cost, and the foreign agro-trade cost was the actual value of 2010; ③ Scenario 3: suppose that the foreign agro-trade cost in all regions of China reduced and included only the transportation cost, and the inter-regional agro-trade cost was the actual value of 2010; ④ Scenario 4: both inter-regional and foreign agro-trade costs declined and included only respective transportation costs. The benchmark scenario is the actual value of the regional, inter-regional and foreign agro-trade in China in 2010.



1. Analysis of agricultural trade from the national perspective. Table 2 shows the influence of the trade cost on China's regional, inter-regional and foreign agro-trade under different simulated scenarios. In general, the change in the trade cost has a big impact on China's agro-trade value, and the trade cost and the two-way agro-trade value change in the opposite direction. The inter-regional agro-trade cost has a big influence on China's regional and inter-regional agro-trade value, and a small influence on the foreign agro-trade value. The foreign agro-trade cost has a large influence on China's regional, inter-regional and foreign agro-trade value, and the influence is the largest on the foreign agro-trade value and the second largest on the regional agro-trade value.

Table 3 Changes in China's regional, inter-regional and foreign agro-trade under different scenarios

| | Bench -mark scenario | Scenario 1 | | Scenario 2 | | Scenario 3 | | Scenario 4 | |
|------------------------------------|----------------------------|---------------------|--------------------|---------------------|--------------------|---------------------|--------------------|---------------------|--------------------------------|
| | | Absolute changes | Relative change | Absolute changes | Relative change | Absolute changes | Relative change | Absolute changes | Rel ativ e cha nge |
| Regional agro-trade value | 582.70 | 18.67 | 3.20 | -114.11 | -19.58 | -77.00 | -13.21 | -124.50 | - 21.3 7 |
| Interregional agro-trade value | 101.64 | -13.81 | -13.58 | 96.56 | 95.00 | -5.59 | -5.50 | 56.66 | 55. 74 |
| Export value in foreign agro-trade | 33.69 | 0.63 | 1.87 | -2.26 | -6.70 | 17.45 | 51.80 | 20.10 | 59. 65 |
| Import value in foreign agro-trade | 49.56 | -0.27 | -0.54 | -1.40 | -2.82 | 39.71 | 80.13 | 35.12 | 70. 85 |
| Foreign agro-trade value | 83.25 | 0.36 | 0.43 | -3.66 | -4.39 | 57.17 | 68.66 | 55.21 | 66. 32 |

- When China's inter-regional and foreign agro-trade cost decreased to the transportation cost, compared with the benchmark scenario, the inter-regional and foreign agro-trade value increased by 55.74% and 66.32% respectively, and the export and import value rose by RMB 201 billion and RMB 351.2 billion. Compared with scenario 3, when the inter-regional agro-trade cost reduced to the transportation cost in scenario 4, the inter-regional agro-trade value rose by 61.24% and the foreign agro-trade value fell by 2.34%, among which export up by 7.58% and import down by 9.28%. China's agro-trade deficit narrowed. Based on scenario 4, we could deduce that with other factors remaining unchanged, to reduce the trade cost to the transportation cost contributed 35.79% and 39.87% to inter-regional and foreign agro-trade growth respectively.

- When the foreign agro-trade cost came down to the transportation cost, the reduction of the inter-regional agro-trade cost had a clear impact on the growth of the inter-regional agro-trade value, and little impact on the growth of the foreign agro-trade value; whereas the trade resistance from a third party had little impact on two-way trade. From the simulated scenarios, we could deduce that if both the inter-regional and foreign agro-trade cost reduced by 1%, then the inter-regional and foreign agro-trade value would rise by 1.36% and 0.61% respectively.
- The ratio of the inter-regional agro-trade growth to the inter-regional agro-trade value, and the ratio of the foreign agro-trade growth to the foreign agro-trade value in Scenario 4.



- **2. Analysis of agricultural trade from the regional perspective.** In general, the trade cost has almost equal influence on the growth of the overall agro-trade and the foreign agro-trade, but has different influences on the growth of agro-trade in different regions.

Table 4 Changes in China's regional, inter-regional and foreign agro-trade

| | | Scenario 1 | | Scenario 2 | | Scenario 3 | | Scenario 4 | |
|-----------|--------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | | Absolute change | Relative change | Absolute change | Relative change | Absolute change | Relative change | Absolute change | Relative change |
| north | Inter-Regional agricural trade | 3.45 | 6.31 | -16.34 | -29.86 | -4.09 | -7.46 | -18.03 | -32.95 |
| | Reginal agricural trade | -10.72 | -29.18 | 20.66 | 56.24 | -4.19 | -11.4 | 9.59 | 26.12 |
| | Foreign agro-trade value | 1.78 | 20.17 | 0.77 | 8.72 | 7.52 | 85.31 | 12.18 | 138.28 |
| | Regional Agro-Trade deficit | -0.1 | -1.93 | -0.91 | -17.11 | 6.36 | 119.74 | 8.3 | 156.26 |
| | Foreign agro-trade deficit | -1.53 | 35.69 | -1.67 | 39.09 | -3.94 | 92.27 | -10.14 | 237.22 |
| Northeast | Inter-Regional agricural trade | 2.4 | 4.12 | -16.77 | -28.82 | -6.28 | -10.79 | 5.37 | 9.23 |
| | Reginal agricural trade | 0.47 | 2.26 | 27.87 | 134.48 | -1.95 | -9.41 | -7.57 | -36.55 |
| | Foreign agro-trade value | 0.64 | 8.46 | -0.36 | -4.81 | 7.66 | 101.3 | 5.17 | 68.35 |
| | Regional Agro-Trade deficit | -0.16 | -2.09 | -2.85 | -36.12 | 0.83 | 10.55 | -9.65 | -122.42 |
| | Foreign agro-trade deficit | 0.3 | 66.1 | -1.01 | -219.19 | -2.19 | -475.1 | 4.97 | 1078.27 |
| East | Inter-Regional agricural trade | 3.25 | 1.8 | -18.85 | -10.46 | -25.25 | -14.01 | -35.04 | -19.45 |
| | Reginal agricural trade | 1.41 | 2.43 | 29.87 | 51.58 | 1.24 | 2.13 | 25.35 | 43.76 |
| | Foreign agro-trade value | -4.07 | -9.24 | -0.69 | -1.56 | 2.9 | 6.6 | 2.72 | 6.18 |
| | Regional Agro-Trade deficit | -5.48 | 22.14 | 7.27 | -29.37 | -8.49 | 34.26 | -1.1 | 4.45 |
| | Foreign agro-trade deficit | 3.69 | -48.37 | -0.39 | 5.16 | 6.76 | -88.49 | 8.86 | -115.98 |

Table 5 Changes in China's regional, inter-regional and foreign agro-trade

| | | Scenario 1 | | Scenario 2 | | Scenario 3 | | Scenario 4 | |
|-----------|-----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | | Absolute change | Relative change | Absolute change | Relative change | Absolute change | Relative change | Absolute change | Relative change |
| Central | Inter-Regional agricultural trade | 2.47 | 2.26 | -23.86 | -21.77 | -28.67 | -26.16 | -26.58 | -24.25 |
| | Regional agricultural trade | -10.58 | -36.93 | 38.37 | 133.91 | 0.21 | 0.72 | 29.63 | 103.41 |
| | Foreign agro-trade value | 0.00 | 0.16 | -0.07 | -2.53 | 19.74 | 691.43 | 14.09 | 493.59 |
| | Regional Agro-Trade deficit | 1.20 | 19.57 | -3.11 | -50.78 | -6.76 | -110.21 | 5.21 | 84.92 |
| | Foreign agro-trade deficit | -0.08 | -17.22 | -0.36 | -74.58 | -16.63 | -3416.02 | -10.81 | -2220.27 |
| South | Inter-Regional agricultural trade | 0.90 | 1.35 | -9.94 | -14.88 | -6.68 | -10.00 | -14.29 | -21.39 |
| | Regional agricultural trade | -2.43 | -12.32 | 24.73 | 125.62 | -2.94 | -14.92 | 20.38 | 103.50 |
| | Foreign agro-trade value | 2.53 | 16.12 | -2.95 | -18.77 | 5.17 | 32.91 | 2.91 | 18.53 |
| | Regional Agro-Trade deficit | 1.02 | -17.04 | -0.13 | 2.10 | 2.06 | -34.60 | 0.22 | -3.61 |
| | Foreign agro-trade deficit | -2.10 | 33.62 | 3.00 | -47.96 | -0.11 | 1.80 | 2.63 | -42.04 |
| Southwest | Inter-Regional agricultural trade | 2.57 | 3.44 | -15.38 | -20.53 | -2.97 | -3.96 | -20.94 | -27.97 |
| | Regional agricultural trade | 1.98 | 10.12 | 32.03 | 163.95 | -1.64 | -8.42 | 21.14 | 108.20 |
| | Foreign agro-trade value | -0.52 | -19.18 | -0.13 | -4.90 | 8.17 | 300.13 | 10.54 | 387.51 |
| | Regional Agro-Trade deficit | 2.21 | 38.19 | 2.08 | 35.98 | 4.02 | 69.57 | -1.84 | -31.85 |
| | Foreign agro-trade deficit | 0.49 | 93.23 | -0.12 | -22.01 | -4.05 | -762.71 | -7.61 | -1432.53 |
| Northwest | Inter-Regional agricultural trade | 3.63 | 9.47 | -12.98 | -33.88 | -3.07 | -8.01 | -14.98 | -39.11 |
| | Regional agricultural trade | -7.74 | -38.64 | 19.57 | 97.75 | -1.91 | -9.52 | 14.80 | 73.91 |
| | Foreign agro-trade value | -0.01 | -0.38 | -0.22 | -13.55 | 5.52 | 343.01 | 7.59 | 471.73 |
| | Regional Agro-Trade deficit | 1.33 | 23.66 | -2.36 | -41.97 | 1.96 | 34.95 | -1.13 | -20.06 |
| | Foreign agro-trade deficit | 0.12 | 14.46 | -0.30 | -37.07 | -2.58 | -317.61 | -2.92 | -359.85 |



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- China's inter-regional agro-trade cost remained at the 2002 level, and the regional agro-trade value showed an upward trend. Compared with the benchmark scenario, the regional agro-trade value of Northwestern region increased clearly by RMB 36.3 billion. The inter-regional agro-trade value in most regions of China declined. The inter-regional agro-trade value came down by RMB 107.2 billion, RMB 105.8 billion, RMB 24.3 billion and RMB 77.4 billion respectively in Northern, Central, Southern and Northwestern regions. The inter-regional agro-trade value in other regions had a slight increase, by 2.26%, 2.43% and 10.12% in Northeastern, Eastern and Southwestern regions respectively. Generally speaking, the inter-regional agro-trade cost had a small yet diverse influence on the foreign agro-trade value of the regions in China.

- When the inter-regional trade cost came down to the transportation cost, the inter-regional agro-trade value would have an obvious growth. The growth rate of the inter-regional agro-trade value exceeded 100% in Southwestern, Northeastern, Central, Southern and other regions; Southern and Northwestern regions saw a clear growth in the export value in the inter-regional agro-trade, up by 179.24% and 134.74% respectively compared with the benchmark scenario. Northeastern, Central, Southwestern and Northwestern regions witnessed the growth rate of over 100% in the import value in the inter-regional agro-trade. All regions except Northern region suffered from various degrees of declining export value of agricultural products. The decline in the export value was smaller than the decline in the import value. This implies that to cut inter-regional trade cost will help reduce the foreign trade deficit, and admittedly will push down the total foreign agro-trade value.

- When the foreign agro-trade cost came down to the transportation cost, the foreign agro-trade value would increase noticeably in all regions. Compared with the benchmark scenario, the foreign agro-trade value rose clearly by 691.43%, 343.01% and 300.13% in Central, Northwestern and Southwestern regions. Different regions witnessed different degrees of growth in the import and export value in the foreign agro-trade, but it is clear that the import value grew faster than the export value, thus leading to larger deficit among all regions. Fast growth in the import value happened in Southwestern, Southern and Northwestern regions by RMB 40.1 billion, RMB 180.4 billion and RMB 30.6 billion respectively; and fast growth in the export value took place in Northwestern, Southwestern and Central regions by RMB 21.8 billion, RMB 17.3 billion and RMB 17.7 billion. A surprising fact is that the import value in the Eastern region had a slight decline.

- When foreign and inter-regional agro-trade costs declined simultaneously to the transportation cost, all regions in China, except the Northeast, experienced considerable growth in the inter-regional agro-trade value. The inter-regional agro-trade value in Northern, Eastern, Central, Southern, Southwestern and Northwestern increased by RMB 137.8 billion, RMB 241.1 billion, RMB 294.2 billion, RMB 232.2 billion, RMB 227.8 billion and RMB 167.1 billion. The foreign agro-trade value did not show a downward trend. The Central, Southwestern, and Northwestern regions saw growing foreign agro-trade value, mainly thanks to increasing imports. This means that the foreign agro-trade deficit in the three regions continued to widen.



- In summary, the trade cost greatly hinders China's inter-regional agricultural trade, and to cut the inter-regional and foreign trade cost will increase the agro-trade value of all regions in China. However, lower trade cost does not exert too much influence on the foreign agro-trade in the Eastern region, and the Eastern and Northern regions are still the major regions in terms of agricultural trade in China. The trade cost has a large impact on the inter-regional and foreign agro-trade in the Central, Northwestern and Southwestern regions, which means that to reduce the trade cost might cause larger agro-trade deficit in these three regions.



- 3. Robustness testing
- Robustness is crucial for the CGE model. The paper conducts robustness testing on the elasticity of substitution. Elasticity of substitution is a key parameter in the CGE model, and normally its variation may lead to different results. The paper defines the elasticity of substitution at 5, and then makes new adjustments and simulations to the model. The simulation result with 5 as the elasticity of substitution shows little difference from the above-mentioned simulation results, yet the impact of the trade cost on the inter-regional and foreign agro-trade remains unchanged.



IV Conclusions

- First, the trade cost of all regions in China shows a downward trend and the foreign agro-trade cost is higher than the inter-regional agro-trade cost; the agro-trade cost varies from one region to another, with the Eastern region the lowest and the Northwestern and Southwestern regions among the highest.
- Second, the trade cost hinders the growth of agricultural trade in all regions of China, and to reduce the trade cost will clearly push up the two-way agricultural trade value, but has a weak influence on the growth of the agro-trade in the third party.

- Third, if the inter-regional and foreign agro-trade cost falls by 1% each, then the inter-regional and foreign agro-trade value will increase by 1.36% and 0.61% respectively; with other conditions remaining constant, to cut the trade cost to the transportation cost will contribute 35.75% and 39.87% to the inter-regional agro-trade and the foreign agro-trade.
- Fourth, the change in the trade cost has a large impact on the growth of the agricultural trade in the Central, Northwestern and Southwestern regions of China, but the East and North are still major regions in China in terms of agricultural trade.
- Fifth, to reduce the foreign agro-trade cost will enormously boost the agricultural trade, but will also widen the trade deficit. To cut the inter-regional agro-trade cost will effectively narrow the agro-trade deficit.



Thanks !!