Comparative Advantage and Competitiveness of Soy Exporters in International Trade while Undergoing Us–China Trade Disputes

Dr. Ting Jenn Ling – Yangling, Shaanxi, China | jennling@nwafu.edu.cn
Professor Dr. Wang Zheng Bing – Yangling, Shaanxi, China | wzb1964@nwafu.edu.cn*
Professor Dr. Mad Nasir Shamsudin – Selangor, Malaysia | mns@upm.edu.my
Pham Thi Cam Nhung – Yangling, Shaanxi, China | lucypham@nwafu.edu.cn
Dr. Chen Guang - Yangling, Shaanxi China | guangchen0516@nwafu.edu.cn

Aim/Purpose	This research identified China's agricultural commodities demand on soy and comparing the comparative advantage, competitiveness of world soy exporters.
Background	The world's largest agricultural commodities importer-China had bought 10.7 % of world agricultural commodities (US$1,167.2 billion) during year 2017. Studying China's demand in order to formulate export strategies is crucial especially for BRIC countries.
Methodology	Reveal Comparative advantage (RCA), Comparative Advantage above Average (CAaA) and Export Competitive Advantage (XCA) were used in this study.
Findings	Analysis shows that Brazil, USA, Argentina, Canada, Paraguay, Uruguay and Ukraine who supply more than 97% of world soy export have better comparative advantage and competitiveness over other soy exporters in the world. Russia and Netherlands are picking up with offering lower export price.
Impact on Society	Due to US-China Trade dispute, China has switched soy import and purchase from the US to Brazil. That has caused US$3 billion wealth loss for both countries.
Keywords	International Trade, US-China Trade Dispute, Comparative Advantage, Soybean

AREAS OF CONTRIBUTION

Paper Category

☒	Original Research	☐	Position Paper	☒	Comparative
☐	Case Study	☐	Technical Briefs	☐	Opinion
☐	Reviews	☐	Student Paper	☐	Innovation Ideas

Type of Digital Innovation	Industry	Discipline
☐ Radical	☐ Media	☐ Business Technology
☐ Incremental/Enhancing	☐ Telecom	☐ Human Resources
☐ Disruptive	☐ Consumer Financial Services	☒ Management
☐ Breakthrough	☐ Retail	☐ Marketing
☒ Basic Research	☐ Technology	☐ Finance
☐ Sustaining	☐ Insurance	☐ Accounting
☐ Architectural	☐ Consumer Products	☐ Computer Science
☐ Component/Modular	☒ Non-Profit	☐ Engineering
☐ Destroying	☒ Business/Professional Services	☐ Medicine / Healthcare
	☐ Higher Education	☐ Law
	☐ K-12 Education	☐ History
	☐ Training	☐ Philosophy
	☐ Health Care	☐ Religion/Theology
	☐ Manufacturing	☐ Mathematics
	☐ Transportation	☐ Physics
		☐ Digital Media
		☐ Astrology
		☐ Social Sciences
		☐ Art and Culture
		☐ Psychology/Consciousness
		☐ Astronomy
		☒ Economics

Human Elements Addressed

☐	Personality Traits	☐	Development	☐	Mental Wellbeing
☐	Behaviour	☐	Environmental	☐	Consciousness
☐	Cognition	☒	Social	☐	Physical Wellbeing

INTRODUCTION

US-CHINA TRADE DISPUTE

The US–China trade dispute started with the announcement of potential tariffs imposed on $360 billion of Chinese goods by US President Donald Trump in January 2018. In the past two years, the ongoing negotiations between China and the US have proven difficult, with some challenging issues that cannot be tolerated (BBC, 2020). The US–China trade dispute issue has raised concerns among scholars and government offices around the world about a global economic slowdown, potentially leading to a world recession. As reported by WTO Director General Roberto Azevedo in April 2019, rising trade tensions increased economic uncertainty, merchandise trade volume growth was expected to fall by 2.6% in 2019, and world GDP growth was estimated to slow from 2.9% in 2018 to 2.6% in 2019 and 2020 (WTO,2019). Indeed, the volume of increases in world merchandise trade fell from 4.6% in 2017 to 3% in 2018, as reported by Roberto in a WTO press release on 1st Oct 2019.

Although US–China trade tensions were estimated to decrease the world trade volume growth, some countries have benefited from this conflict situation, such as soy exporters. Soy is the largest export item among US agricultural exports, marked at an average US$20.9 billion per year or 16% of U.S agricultural exports (Justin Choe, 2019). As the world's largest soy importer (buying more than 62% of the world's soy export volume in 2017), China is the main customer of the US, importing more than 63% of US soy exports (US$12.2 billion) in 2017. Due to bilateral trade tension, US soy exporting to China decreased by 75% in 2018, amounting to $3.1 billion (USDA, 2019). Table 1(a) and 1(b) shows some of the total export amounts of key soy exporters and their exports to China in 2017 and 2018.

Table 1(a): World Main Soy Exporter and Export Amounts to China for 2017 (based on HS 120190)

Export Country	2017 Soy Export Value in USD	% / World Total	Export to China year 2017	2017 China EMD
Brazil	25,712,173,321	45%	20,310,207,678	79%
USA	21,464,692,740	37%	12,224,417,839	57%
Argentina	2,718,259,610	5%	2,414,514,435	89%
Paraguay	2,131,880,917	4%	0-	0%
Canada	1,866,317,099	3%	767,223,648	41%
Uruguay	1,192,454,966	2%	495,400,792	42%
Ukraine	1,059,462,703	2%	5,880,520	0.56%
Russia	167,061,282	0.29%	138,892,681	83%
World Total	**57,743,104,412**		**36,363,359,528**	

Table 1(b): World Main Soy Exporter and Export Amounts to China for 2018 (based on HS 120190)

Export Country	2018 Soy Export Value in USD	% / World Total	Export to China year 2018	2018 China EMD
Brazil	33,182,500,679	56%	27,342,586,075	82%
USA	17,063,487,884	29%	3,119,229,048	18%
Argentina	1,370,467,100	2%	1,313,216,580	96%
Paraguay	2,201,497,385	4%	0-	0%
Canada	2,185,830,858	4%	1,348,758,738	62%
Uruguay	521,214,877	1%	210,312,491	40%
Ukraine	831,121,358	1%	131,039.00	0.02%
Russia	289,092,034	0.49%	244,131,370	84%
World Total	58,908,136,057		33,589,125,156	

Source: UNComtrade, EMD=Export Market Dependency

Meanwhile, other soy exporter countries, such as Brazil, Canada and Russia, who are the main competitors to US Soy exports, have seized the opportunity and replaced the US in supplying soy to China. The declining US\$ 9 billion soy export in US–China trade was replaced by Brazil with US\$ 7 billion, Canada with US\$ 0.58 billion, and Russia with US\$ 0.1 billion.

Despite the moral factors behind US–China trade tensions, most scholars, government officers, and corporate leaders agree that trade with China is important. An American CBC report noted that trade with China supported approximately 2.6 million American jobs and created \$216 billion of growth in 2015, while China purchased 7.3% of all US exports— \$165 billion in goods and services in 2015 (Vicki, 2017). Imported commodities from China, Canada, and Mexico accounted for almost half of US imports. Households, firms, and workers could be negatively affected by having to pay higher costs for imported goods due to the costs of production inputs, which will potentially cause economic losses. On the other hand, raising trade barriers on US–China goods may significantly affect the firms and workers who are relying on those exports (Fernando, 2018). Studies show that exporting to China enhances the growth effects in economics (Baliamoune, 2011). However, very little research has been done on the demands of China as the world's largest importer, especially for agricultural commodities. To enhance exports to China, government officers, entrepreneurs, and corporate leaders are very interested in determining what products China wants and how much quantity need and at what price China wishes to import those products. Moreover, determining who is currently supplying goods to China and analyzing the competitiveness or advantages of current exporters in the world is needed as well.

The objective of this paper is to identify China's import demand for soybean and reveal the competitiveness and comparative advantages of each soy exporter country through index analysis. Furthermore, we introduce two new international trade evaluation approaches to complement existing indexes in elaborating international trade phenomena.

LITERATURE REVIEW

The roles and importance of foreign trade were initially discussed by Adam Smith in the Wealth of Nations. In this book, Smith explained how a country could benefit from importing foreign commodities instead of producing them at home. Particularly, Smith invented the concept of absolute advantage for international trade, discussed in chapter II entitled "Restraints upon Importation from Foreign Countries of Such Goods as Can Be Produced at Home". According to Smith, a country may have an absolute advantage in growing certain products due to its natural environment, which may cause the production costs for particular commodities to be much lower compare to other countries. Hence, to gain maximum wealth, a country should buy products from the countries with lower production costs rather than produce them at home. Later, Ricardo explained the concept of the comparative advantage of lower production costs as the effect of technological or skill-based advantages in his book "On the Principal of Political Economic and Taxation". At present, countries around the world have specialized into producing certain commodities, allowing the international division of labor to happen naturally. This means the total world exports of certain commodities are highly dominated by a few countries who contribute more than 70% of the total world export volume. This phenomenon was proven by Paul Krugman in his work on the international trade monopoly approach. This happens due to the combined effect of absolute advantage and comparative advantage, through which specialization in producing certain products has created economies of scale and, subsequently, product differentiation among exporter countries (Krugman, 1980). Presently, international trade on commodities mostly reflects patterns of monopolies or oligopolies as described by Kurgman's monopoly approach

The most well-known international trade evaluation method is the revealed comparative advantage (RCA) index, introduced by Bela Balassa in 1965. The RCA is used to calculate the relative advantage of a certain country in exporting a certain class of goods or services based on international export trade flows. The RCA index was improved by Peter Drysdale to form the trade complementary index and many other trade evaluation approaches. However, we dis-

covered that the RCA index is biased in representing the competitiveness of exporter countries and thus fails in providing a fair contraposition to comparative advantage. Therefore, we introduce two indexes to complement the RCA evaluation in this study.

METHODOLOGY

The import and export trade data in this work were obtained from Trade Portal, Statistic Division, Department of Economic and Social Affairs, United Nation (UN Comtrade). This study mainly focuses on analyzing trade data for 2018 and 2017 (pre US–China Trade dispute period) to identify the soy import demands of China, the dependency of China's imports upon its current supplying countries, and the competitiveness of soy exporter countries in the world. The competitiveness of exporter countries is analyzed with the Revealed comparative advantage (RCA) index, the Comparative Advantage above Average (CAaA) index, and the Export Competitiveness Advantage (XCA) index. This study also discovered that the export figure reported by exporter country is always different from the import figure reported by importer countries. For example, the USA reported US$ 3 billion in soy exported to China in the year 2018, but China's record shows that US$ 7.6 billion soy was imported from the USA during 2018. To avoid bias in index calculations, evaluation formulas that involve both export and import figures were excluded, e.g., the trade intensity index. In this study, all export figures were adopted from the data uploaded by exporter countries to the UN Comtrade portal, while all import figures were taken from data uploaded by the importer (China).

EXPORT MARKET DEPENDENCY (EMD) AND IMPORT MARKET DEPENDENCY (IMD) INDEX

The export market dependency index (EMD) is used to evaluate the degree of the importance or dependency (measured in percentage %) of the exporter country towards the importer country in buying particular commodities, while the import market dependency index (IMD) is used to determine the dependency of the importer countries toward the exporter country in supplying one commodity. The formula for export market dependency, EMD, is

$$EMD = XS_{ab} / TXS_a$$

while the formula for import market dependency IMD is

Comparative Advantage and Competitiveness of Soy

$$IMD = IS_{ba} / TIS_b$$

Where X= export; I=import; S= soy, b= country B, a=country A, and T= total.

The EMD and IMD indexes are functionally similar to the trade intensity index (Tii) in evaluating the dependency or intensity of a country import/export towards another country. However, the trade intensity index may be biased due to incorporating data from both the exporter and importer, as in most cases, these data are not consistent. This scenario occurred in the soy trade between China and the USA during 2018, as discussed above. Therefore, using EMD and IMD could be easier and could precisely determine the intensity scenario in evaluating import export trade for a particular country.

REVEALED COMPARATIVE ADVANTAGE INDEX (RCA)

There are large numbers of studies on the analysis and measurement of bilateral trade. The revealed comparative advantage approach (RCA index) invented by Balassa is one of the most well-known and frequently applied methods. The RCA index assesses the comparative advantage of one country in proportion to the world trade in a certain commodity. Computation of the RCA provides a convenient approach for describing the strength of bilateral trade in measuring the advantage of a particular country in certain commodities compared to other countries. The formula for calculating the RCA is

$$RCA = (XS_b / TX_b) \div (XS_w / TX_w)$$

Where X= export, S=soy, b= country B, w=world, and T= total.

When the RCA index is greater than ONE (>1), the commodity's share in a particular national export is higher than the commodity's share in the world exports, interpreted as the country having a better comparative advantage in this particular commodity. In contrast, an RCA <1 reveals a particular country to have a lower comparative advantage in exporting a particular commodity. However, using the proportion of a particular commodity over the total world trade amount as the denominator leads to significant bias on the RCA index when comparing the competitiveness of each exporter country in an export certain commodity. A country who strongly relies on exporting one commodity will gain a higher RCA score compared to others with larger export volumes but diversified in export commodities. This was proven in our paper, where Paraguay, with an RCA score of 76.62 and a soy export amount of US$ 2 bil-

lion, had a higher RCA score compared to the USA, with a soy export amount of US$17 billion and an RCA score of 3.22 in 2018. This result will be discussed in section 4. Therefore, this paper proposes two new approaches for complementing the weaknesses of RCA: the comparative advantage above average (CAaA) index and the export competitive advantage (XCA) index.

COMPARATIVE ADVANTAGE ABOVE AVERAGE INDEX (CAAA)

The Comparative Advantage above Average (CAaA) approach integrates the RCA mechanism by Balassa and the international trade monopoly approach by Paul Krugman. According to Krugman's international trade monopoly approach, the production and export of a certain commodity will be gradually monopolized by a few countries with the continuous improvement of technology and economies of scale in producing this commodity. Krugman's approach is widely reflected in the international trade phenomena today, especially in agriculture-based commodity exports. This study found that soy exports are highly monopolized by Brazil and USA, as these two countries contribute more than 85% of the world's total soy export volume, while Paraguay, Canada, Argentina, Ukraine, Russia, the Netherlands, and Belgium contributed another 13.7%. Out of the total 89 soy exporters, these nine countries comprise 98.7% of the total world soy export volume. The CAaA evaluates a country's bilateral export strength compared to other countries who export the same commodity by using the world average export for a particular commodity as the denominator and integrating Krugman's international trade monopoly ideology. The CAaA score is more precise for comparing the strengths of exports within the same commodity. The formula for CAaA is

$$CAaA_{ij} = \frac{X_{ij}}{\frac{\sum_{i=1}^{n_i} X_{ij}}{n_i}}$$

Where X= export, i=country i, and j=commodity j.

A CAaA value above (or below) 1 indicates that a country's export of a particular commodity is more (or less) than the world's average export for this commodity. Dividing the CAaA index scores of two countries will produce a comparative measurement figure indicating the degree of the advantage strength (or weakness) of one country compared to another.

EXPORT COMPETITIVE ADVANTAGE INDEX (XCA)

The export competitive advantage, XCA, index is different from all other eval-uation indexes which utilizes the total export value in US dollars (US$) as its calculation input. Formulization of the Export Competitive Advantage (XCA) is based on trade volume in kilograms (kg) and the average export price. In XCA, the commodity weight and average export price are evaluated separately as independent inputs to avoid potential biases caused by differences in pricing. Thereafter, both of the figures produced by the calculations are incorporated separately into the formula to form the XCA index. In XCA analysis, neither a higher volume nor lower pricing indicate better competitiveness. Thus, a higher export volume in kilograms with a lower export price indicates that a country's commodity export holds a stronger advantage over other countries. The for-mula for XCA is
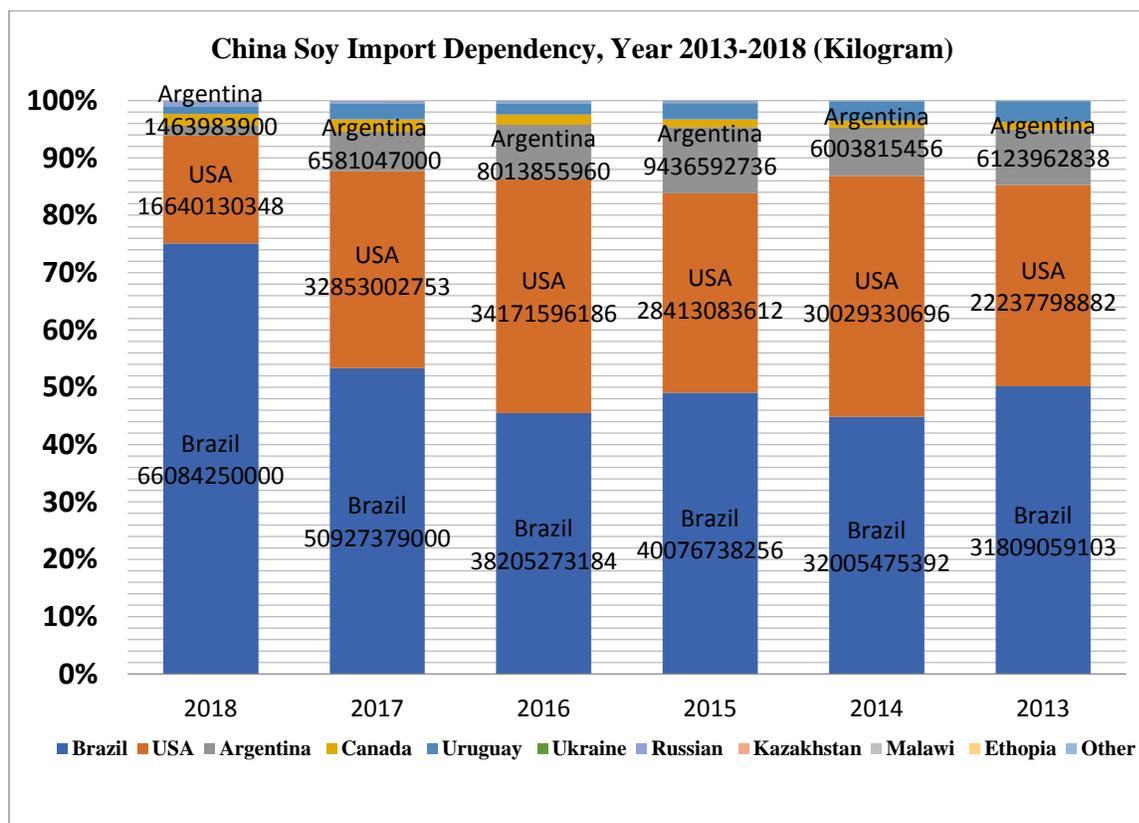
$$XCA_{ij} = \frac{\frac{M_{ij}}{\sum_{i=1}^{n_i} M_{ij}}}{\frac{P_{ij}}{\sum_{i=1}^{n_i} P_{ij}}} = \frac{\frac{M_{ij}}{\sum_{i=1}^{n_i} P_{ij}}}{P_{ij} \sum_{i=1}^{n_i} M_{ij}}$$

Where i= country I, j=commodity j, P= price, and M= export.

The denominator of the XCA index is generated from the commodity export price of a particular country compared to the world average export price of that particular commodity, while the numerator is generated by comparing the commodity export volume in kilograms by the particular country compared to the average world export in kilograms. The XCA index is generated by dividing the figure of the numerator (the score based on kilograms) with the denomina-tor (score based on price). A value of the XCA index above (or below) 1 indi-cates that a country's export of a particular commodity has a better (or poorer) competitive advantage compared to other exporter countries. A country can gain a higher XCA value either through a larger export volume or a lower ex-port price. Increases in price or decreases in export volume will decrease the index score. The XCA approach is in line with the comparative advantage con-cept of Ricardo and the absolute advantage of Smith, where a lower cost of production and a cheaper price demonstrate a better advantage. By applying the export quantity as the input, the XCA can effectively measure most agricultural, forestry and mining commodities. However, it is weak in evaluating electronics, machinery, or services where the export unit involves assembly with many parts.

FINDING

As discussed above, China is the largest soy importer in the world and buys more than 61% of the world's soy exports, with US$ 32 billion imports purchased in2017 (world export total: US$ 52.2 billion) and US$ 38 billion in 2018 (world export total: US$ 58.9 billion). Therefore, an analysis of China's import purchasing patterns, such as its import purchasing quantity, purchasing (import) price, and sources of supply is important for identifying business opportunities in related industries. Figure 1 shows the supplier countries of China's soy imports from 2013 to 2018 based on Chinese customs records.

China Soy Import Dependency, Year 2013-2018 (Kilogram)

Year	Argentina	USA	Brazil
2018	Argentina 1463983900	USA 16640130348	Brazil 66084250000
2017	Argentina 6581047000	USA 32853002753	Brazil 50927379000
2016	Argentina 8013855960	USA 34171596186	Brazil 38205273184
2015	Argentina 9436592736	USA 28413083612	Brazil 40076738256
2014	Argentina 6003815456	USA 30029330696	Brazil 32005475392
2013	Argentina 6123962838	USA 22237798882	Brazil 31809059103

Legend: **Brazil** ■ **USA** ■ **Argentina** ■ **Canada** ■ **Uruguay** ■ **Ukraine** ■ **Russian** ■ **Kazakhstan** ■ **Malawi** ■ **Ethopia** ■ **Other**

Figure 1: China Soy Import Analysis by Supplying Countries for 2013–2018 (HS120190, Kilogram)

For the past six years, Brazil, US, and Argentina have been the main suppliers who exported soy to China. Brazil, the world largest soy exporter, supplies more than 50 % of China's soy imports. In 2018, due to the China–US trade dispute, imports from the US significantly dropped, and the import purchase order shifted to Brazil. In 2018, China purchased US$ 38 billion soy (HS120190) with a purchasing price between $0.315 (Russia) and $0.445 (Ethiopia), where 75% of Chinese soy imports came from Brazil, with an average

price of $0.436 per kilogram. This is followed by 18% imported from the USA, with a price of $0.424 per kilogram. For the past ten years, the highest average price that China paid for importing soy was $0.599 per kilogram in 2012 and 2013. To gain a better understanding of the comparative export strength of each soy exporter country, we will examine the comparative advantages of soy exporter countries by applying the RCA and CAaA indexes.

REVEALED COMPARATIVE ADVANTAGE (RCA) AND COMPARATIVE ADVANTAGE ABOVE AVERAGE (CAAA) ANALYSIS

The RCA by Balassa is the most commonly used tool for evaluating the comparative advantage of exporter countries in exporting certain commodities. Table 2 lists the RCA analysis results for soy exporters who obtained a score above 0.001 during 2017 and 2018. To avoid biased results due to the US–China trade dispute, an RCA analysis of 2017 is also presented. As discussed earlier, an RCA score greater than 1 indicates a country with a better comparative advantage in a particular commodity. The nine countries with an RCA score greater than 1 in 2018 were Brazil, USA, Paraguay, Canada, Argentina, Ukraine, Uruguay, Croatia, and Benin. Benin, with an RCA score of 1.17, had the lowest export quantity of 9,747 tons and an export value of US$ 3.5 million, while the world's largest soy exporter, Brazil, with an export quantity of 83,594,236 tons and an export trade value of US$ 33 billion, had an RCA score of 43.53 during 2018. Paraguay, with the highest RCA score of 76.62 in 2018, had an export volume of 6,023,844 tons and an export value of US$2 billion, while during 2017, Paraguay's RCA score was 73.77. The US, the world's second largest soy exporter, had an RCA score of 3.255 in 2018 with a total export volume of 46,196,399 tons and an export amount of US$ 17 billion, while the RCA score for the USA in 2017 was 4.17. The US–China trade dispute caused the average price of USA soy exports to drop by 4.9% from US$0.388 to US$0.369 per kilogram, while the average export price of Brazil increase by 5.3% from US$ 0.377 to US$ 0.397. During 2017, eight countries earned an RCA score greater than one: Paraguay, Brazil, Uruguay, Argentina, Ukraine, USA, Canada, and Benin.

Table 2: RCA and CAaA Analyses of Soy Export Countries for 2018 and 2017.

Country	2018 Soy Exports Total USD	2018 Soy Exports KG	2018 Price /kg	2018 RCA	2018 CAaA	2017 Price /kg	2017 RCA	2017 CaaA
Paraguay	2,201,497,384	6,023,844,275	0.365	76.624	3.326	0.348	73.77	3.54
Brazil *	33,182,500,679	83,594,236,466	0.397	43.533	50.135	0.377	35.47	42.75
Uruguay *	521,214,877	1,354,294,742	0.385	21.877	0.787	0.367	45.40	1.98

Argentina *	1,370,467,100	3,519,021,300	0.389	7.006	2.071	0.368	13.98	4.52
Ukraine *	831,121,358	2,240,942,838	0.371	5.526	1.256	0.370	7.33	1.76
USA*	17,063,487,884	46,196,399,876	0.369	3.225	25.781	0.388	4.17	35.69
Canada*	2,183,871,618	5,443,410,989	0.401	1.526	3.300	0.410	1.33	3.10
Benin	3,529,361	9,746,745	0.362	1.166	0.005	0.192	2.06	0.01
Croatia	57,298,820	140,473,024	0.408	1.048	0.087	0.641	0.17	1.94
Rep. Moldova	5,242,561	12,836,441	0.408	0.610	0.008	0.384	0.83	0.01
Serbia	28,333,500	67,548,159	0.419	0.463	0.043	0.421	0.84	0.08
Netherlands	429,447,320	977,929,210	0.439	0.243	0.649	0.441	0.24	0.70
Romania	58,428,945	138,313,010	0.422	0.230	0.088	0.426	0.49	0.19
Russian*	289,092,034	958,396,193	0.302	0.202	0.437	0.323	0.13	0.28
Zambia	3,348,794	8,623,242	0.388	0.116	0.005	0.514	1.16	0.05
Bolivia	3,328,119	7,411,550	0.449	0.116	0.005	0.401	0.20	0.01
Belarus	12,377,700	29,071,500	0.426	0.116	0.019	NA	NA	NA
India	116,084,610	198,775,861	0.584	0.113	0.175	0.569	0.17	0.27
Belgium	126,513,568	273,086,353	0.463	0.085	0.191	0.134	0.15	0.01
Kazakhstan*	14,958,331	32,927,538	0.454	0.077	0.023	0.413	0.04	0.01
Slovakia	22,208,252	47,858,457	0.464	0.075	0.034	0.442	0.08	0.04
Austria	40,584,531	55508724	0.731	0.072	0.061	0.736	0.07	0.07
Slovenia	7,337,576	14,339,815	0.512	0.063	0.011	0.017	0.02	0.11
Hungary	17,020,109	38,325,653	0.444	0.043	0.026	0.442	0.14	0.09
France	71,460,542	161,163,182	0.443	0.040	0.108	0.524	0.03	0.07
Turkey	11,794,558	21,057,980	0.560	0.022	0.018	0.539	0.08	0.07
Germany	70,010,667	158,916,904	0.441	0.014	0.106	0.405	0.01	0.09
China	99,585,070	133,787,779	0.744	0.013	0.150	0.810	0.01	0.15
South Africa	3,047,169	5,854,263	0.521	0.010	0.005	0.009	0.00	0.00
Italy	14,855,551	21354579	0.696	0.009	0.022	0.638	0.01	0.03
UK	7,359,600	21,299,743	0.346	0.005	0.011	0.038	0.01	0.00
Poland	3,260,934	6,932,628	0.470	0.004	0.005	0.459	0.02	0.03
Spain	4,007,274	9,136,126	0.439	0.004	0.006	0.370	0.01	0.01
Czechia	2,440,471	4,462,137	0.547	0.004	0.004	0.475	0.01	0.01
Australia	2,177,082	4,909,920	0.443	0.003	0.003	0.722	0.00	0.00

Comparative Advantage and Competitiveness of Soy

| Thailand | 2,007,643 | 3183474 | 0.631 | 0.003 | 0.003 | 0.606 | 0.00 | 0.00 |
| Malaysia | 1,335,718 | 1920477 | 0.696 | 0.002 | 0.002 | 0.377 | 0.00 | 0.00 |

Source: UNComtrade

The soy comparative advantage RCA analysis results show that the RCA score was biased due to employing the global soy export value over the global total export amount as the denominator. Some countries with high dependency on single export items may obtain a higher RCA score despite their soy export values and volumes being much lower than those of other countries with greater diversification in their commodity exports. In this study, Paraguay and Uruguay had a higher RCA score than Brazil and the US in soy exports, although the former countries' export volumes and total export values were much lower. Notably, Paraguay had US$ 2 billion in soy exports and an RCA score of 76.62, indicating that Paraguay holds a better comparative advantage than the US, with an RCA score of 3.225 and $17 billion in soy exports during 2018. Moreover, Benin, with an RCA score of 1.16, has a better comparative advantage than India, who had an RCA score of 0.113 in 2018, which indicates a poorer comparative advantage according to the RCA definition. However, in the real scenario, India's soy exports totaled US$ 116 million, while Benin only exported US$ 3 million of soy in 2018. Therefore, the comparative advantage above average (CAaA) was developed with the aim of complementing RCA in comparative advantage evaluations.

The CAaA analysis shows that Brazil remained the top soy exporter with the highest CAaA scores of 50.13 in 2018 and 42.75 in 2017, followed by the US, the world's second largest soy exporter, with CAaA scores of 25.78 in 2018 and 35.69 during 2017. For 2017, eight countries score more than 1 in the CAaA analysis: Brazil (42.75), USA (35.69), Argentina (4.52), Paraguay (3.54), Canada (3.1), Uruguay (1.98), Croatia (1.94), and Ukraine (1.76). In 2018, however, only six countries scored more than 1 in the CAaA analysis. These were Brazil (50.13), USA (25.78), Paraguay (3.32), Canada (3.30), Argentina (2.07), and Ukraine (1.256). A CAaA score of more than one indicates that these countries have an export amount greater than the global average during a particular year. Croatia was removed from the list due to its decline of 43.5% in exports, from US$101 million in 2017 to US$ 57 million in 2018. The same occurred for Uruguay, whose export of soy dropped by 56.7% from US$ 1.2 billion in 2017 to US$ 0.52 billion in 2018, causing its CAaA score to drop from 1.98 to 0.787.

Moreover, the CAaA can provide an advantage comparison of two exporting countries by dividing their CAaA scores. For example, in 2018, dividing CAaA score of Brazil (43.533) with the CAaA score of Paraguay (3.326) shows that Brazil exported 13 times more than Paraguay did. However, the CAaA is still

not good enough in measuring the competitive advantage as desired by buyers and potential competitors. Buyers may want to see a comparison of the supplying capabilities and prices other than the comparative advantage. Exporters who can offer a larger volume with a lower price will gain a better position in the world market. Hence, this country would have a better competitive advantage in exports.

EXPORT COMPETITIVE ADVANTAGE (XCA)

The export competitive advantage (XCA) aims to examine the competitiveness of an export in terms of its supplying capacity (kilogram) with the supplying cost. Lower prices or larger export quantities will lead to higher XCA scores and vise-versa. Table 3 shows the XCA analysis results of soy for 2018 among exporter countries and the export market dependency of exporters toward China with the Export Market Dependency (IMD) index.

Table 3: Export Competitive Advantage XCA and Export Market Dependency (China) Analysis.

Country	2018 Exports KG	2018 Price/ kg	2018 XCA	EMD China Market Depend.	2017 Exports KG	2017 Price/ kg	2017 XCA	EMD China Market Depend.
Brazil	83,594,236,466	0.436	278.49	82.4%	68,147,694,823	0.377	173.16	78.9%
USA	46,196,399,876	0.369	181.67	17.8%	55,277,517,131	0.388	136.48	57.3%
Paraguay	6,023,844,275	0.365	23.94	0.0%	6,123,048,830	0.348	16.86	0.0%
Canada	5,443,410,989	0.401	19.71	64.5%	4,557,490,429	0.41	10.67	43.0%
Argentina	3,519,021,300	0.389	13.13	96.4%	7,379,981,430	0.368	19.21	89.5%
Ukraine	2,240,942,838	0.371	8.78	1%	2,866,462,772	0.37	7.44	0.5%
Uruguay	1,354,294,742	0.385	5.11	40%	3,246,197,995	0.367	8.47	42.0%
Russian	958,396,193	0.302	4.62	89%	517,941,349	0.323	1.54	87.1%
Netherlands	977,929,210	0.439	3.23	0%	958,232,748	0.441	2.08	0.0%
Belgium	273,086,353	0.463	0.86	0%	NA	NA	NA	0.0%
France	161,163,182	0.443	0.53	0%	84,938,015	0.524	0.16	0.0%
Germany	158,916,904	0.441	0.52	0%	135,270,973	0.405	0.32	0.0%
Croatia	140,473,024	0.408	0.50	0%	NA	NA	NA	0.0%
India	198,775,861	0.584	0.49	0%	288,767,544	0.569	0.49	0.0%
Romania	138,313,010	0.422	0.48	0%	273,125,028	0.426	0.61	0.0%
China	133,787,779	0.744	0.26	NA	112,103,579	0.81	0.13	NA

Serbia	67,548,159	0.419	0.23	0%	112,138,592	0.421	0.26	0.0%
Slovakia	47,858,457	0.464	0.15	0%	53,314,540	0.442	0.12	0.0%
Hungary	38,325,653	0.444	0.13	0%	117,291,446	0.442	0.25	0.0%
Austria	55,508,724	0.731	0.11	0%	53,911,264	0.736	0.07	0.0%
Kazakhstan	32,927,538	0.454	0.11	53%	16,836,520	0.41307	0.04	41.8%
Belarus	29,071,500	0.426	0.10	0%	NA	NA	NA	0.0%
Turkey	21,057,980	0.560	0.05	0%	80,933,190	0.539	0.14	0.0%
Zambia	8,623,242	0.388	0.03	0%	60,320,072	0.514	0.11	0.0%

Source: UNComtrade, EMD= Export Market Dependency

During 2017, Brazil's XCA score of 173.16 made that country the most competitive soy exporter in the world, with a total export volume of 68,147,694 at an average export price of US$0.377 per kilogram. Although five countries exported at a lower price compared to Brazil (Paraguay (US$ 0.348/kg), Argentina (US$ 0.368/kg), Ukraine (US$ 0.37/kg), Uruguay (US$ 0.367/kg), and Russia (US$ 0.323/kg)), their export volumes were much lower compared to those of Brazil. Argentina, with the second largest export volume of 3,519,021 tons, only had 10.8% of Brazil's soy export volume. This is revealed through the XCA score, where Argentina only scored 19.21, while Brazil scored 173.16, which is nine times higher. In 2017, nine countries had an XCA score greater than one, indicating that these countries are more competitive than the other countries that scored below one. These countries were Brazil (XCA=173.16), US (XCA=136.48), Paraguay (XCA=16.86), Canada (XCA=10.67), Argentina (XCA=19.21), Ukraine (XCA=7.44), Uruguay (XCA=8.47), Russia (XCA=1.54), and the Netherlands (XCA=2.08). Out of these nine countries, five of them relied on China in buying their soy: Brazil (EDI=78.9%), USA (EDI=57.3%), Canada (EDI=43%), Argentina (EDI=89.5%), and Russia (EDI=87.1%). We expect that China will expand its purchasing from Russia, whose price offer of US$0.323 is the lowest. As the export volume increases, Russia may achieve economies of scale in production and increase its comparative advantage, as described by Ricardo's approach. Increases of Russia's XCA score from 1.54 in 2017 to 4.62 in 2018 reflect this phenomenon. In 2018, the Russia soy export volume had increased by 85% from 517,941 tons in 2017 to 958,396 tons in 2018, while the average export price dropped by 6.5% from US$ 0.323 per kilogram to US$ 0.302 per kilogram. Russia is highly dependent on Chinese purchases for its soy. The dependency of Russia on the China market was 87.1% in 2017 and 89% in 2018 out of its total export volume. Russia made an additional US$ 105 million in soy export income during the first year of the US–China trade dispute by supplying an additional 405,887 tons of soy

to China. This additional amount comprised 92% of the increase in the total 440,455 tons of Russia soy exported.

In 2018, countries with an XCA score of more than 1 remained the same as those in 2017. Brazil remained the most competitive soy exporter with the highest XCA score of 278.49 and an export volume of 83,594,236 tons with an average export price of US$0.436 per kilogram in 2018. Eighty two percent of soy exported by Brazil was sold to China compared to 78.9% in 2017. Brazil earned US$ 7 billion more due to the US–China trade dispute in both price and volume increases in exports to China. US was the second most competitive country in exporting soy after Brazil with XCA scores of 136.48 in 2017 and 181.67 during 2018. The US–China trade dispute caused the US soy export to drop by 16.4% from 55,277,517 tons in 2017 to 46,196,399 tons during 2018. However, the reduction in the export price for American soy from US$ 0.388 per kilogram to US$ 0.369 per kilogram caused its XCA score to increase, as lower prices are more competitive in trade. Indeed, the US–China trade war led to US soy exports being reduced by US$ 4 billion (19%), from US$ 21 billion in 2017 to US$ 17 billion in 2018 (as reported by importer - China Custom).

Paraguay had the third highest XCA score, with XCA scores of 16.86 in 2017 and 23.94 during 2018. Paraguay achieved an increase in its competitive advantage, although its average export price increased from US$0.348 to US$0.365 while its export quantity dropped from 6,123,048 tons to 6,023,844 tons between 2017and 2018. Compared to Canada, Argentina, Ukraine, and Uruguay, Paraguay had a higher export quantity and a cheaper price during 2018. Argentina had a better competitive advantage (XCA=19.21) than Paraguay (XCA=16.86) in 2017, as the export volume of Argentina was 20.5% higher than that of Paraguay. In 2017, Argentina was the third most competitive country in exporting soy after Brazil and USA. Canada fifth place in terms of its competitiveness in soy exporting during 2017, with an XCA score of 10.67, to fourth place in 2018, with an XCA score of 19.71, showing an increase of 19.4% (885,920 ton) in export volume. China expanded its soy purchasing from Canada from 1,961,714 tons in 2017 to 3,510,861 tons in 2018, marking an increase of 78.9% (1,549,147 ton). This is why Canada's export dependency on China increased from 43% in 2017 to 64.5% in 2018.

On the other hand, a decrease in the XCA score reveals a decrease in export volume or an increase in supply price. The countries with XCA score drops were Argentina, Uruguay, Romania, Serbia, and Hungary. Countries with XCA scores less than 0.01 are not presented in this paper, as their export volumes are relatively small and not significant in the world soy trade. Soy exporters

who earned an XCA score more than 1 exported more than 95% of the world's soy supply, with 97% in 2017 and 99% in 2018 being most notable. Hence, the XCA can significantly and precisely evaluate the competitiveness of exporters.

DISCUSSION

China imported US$ 125.9 billion, or 10.7% of global agricultural commodities, during 2017 (Yanmei, 2018). Among them, 29 commodities were more demanded than others and had import volumes greater than US$1 billion. Soy was the most desired agricultural commodity, with a US$ 38 billion import value, comprising 62% of the world's total supply volume of US$ 54 billion. China's top three soy suppliers were Brazil, the US, and Argentina, who supported more than 90% of the Chinese soy import volume. Brazil and the US are the world's top soy exporters and supply 80% of the world's soy export. Three approaches were employed to study the comparative advantage and competitiveness of world soy exporters in this research: Revealed comparative advantage (RCA), Comparative Advantage above Average (CAaA), and Export Competitive Advantage (XCA). A score of more than 1 in these analyses reveals that a country had a better comparative advantage or competitive advantage. Countries who scored well in competitiveness and had a high comparative advantage in exporting soy under all three analysis were Brazil, US, Argentina, Canada, Paraguay, Uruguay, and the Ukraine. Meanwhile, Croatia and Benin showed good comparative advantage, with scores of more than one in the RCA analysis, but Benin was removed from the list in the CAaA analysis because its score was less than 1, and Croatia was eliminated in the XCA analysis due to also having a score less than 1. This happened because Benin and Croatia had relatively higher prices and low export volumes compared to the other top exporters, while Russia and the Netherlands showed great potential, as their export volumes were significant, and their exports had lower prices, as shown in the XCA analyses. At the same time, this study discovered the weaknesses and biases of the RCA approach in evaluating international trade phenomena. Therefore, two new approaches—Comparative Advantage above Average (CAaA) and Export Competitive Advantage (XCA)—were introduced to complement the outcomes of the RCA evaluation. International competitive analysis is one of the key factors that needs to be evaluated by scholars and government officers in planning or proposing new agricultural industry development blue prints for their countries. The CAaA and XCA are more precise and are practically useful in revealing who has a better comparative or competitive advantage in the world market.

CONCLUSION

Due to the decline of US$9 billion in US soy exports, Brazil experienced increases of US$7 billion in its exports. China, as the import buyer, paid a relatively higher price on this commodity , totally approximately US$ 1 billion extra. In total, US$3 billion of "wealth value" was lost due to switching soy imports from the US to Brazil. The US–China trade dispute reflects a wealth loss for both the US and China, as described in Adam Smith's international trade approach in 1776. The most obvious problem for international trade analysis are data availability and matching issues. Out of the 196 countries in the world, only 130 countries uploaded their 2018 import export trade records to the United Nations Comtrade database compared to 153 countries record in 2017 (as of 3rd March 2020). However, it is commonly believed that United Nations captures more than 90% of the world's trade data in commodities for international trade, as the remaining non-captured data are relatively small and may not significantly impact the analysis outcomes. At the same time, the world export total and import total figures are commonly disputed, as the overall exports reported by the 130 countries in 2018 totaled US$ 18,538 billion, while the imports reported totaled US$ 18,757 billion. Meanwhile, the import records of Chinese customs and the exports of American customs showed large discrepancies in 2018, as Chinese customs reported total import values from the US for soy (HS120190) of US$ 7,069,308,778 and 16,640,130,348 kg. However, America's customs report stated that their total exports to China were US$ 3,119,229,048, with 8,235,327,070 kg, indicating a difference of 126%. This may be due to many reasons, such as the export figure being captured by the exporter country but not by the importer country during the cargo's delivery, the sinking of ships during the delivery process, smuggling when reaching import countries, or changing the documents of delivery or the HS Code when reaching the importing countries, causing the importer country to not capture the import amount as reported by the exporter country. Therefore in this study, we used the export figures reported by each country for the competitive analysis, while for the import demand and purchasing price analyses, the figures reported by the importer country, China, were applied.

REFERENCES

Balassa (1965), Trade Liberalisation and Revealed Comparative Advantage, *The Manchester School,* 33, 99-123.

Balassa (1989), Revealed comparative advantage revisited, in B.Balassa(ed.), Comparative Advantage, trade policy and economic development, *New York University Press*, New York, pp.63-79.

18

Baliamoune-Lutz, M. (2011), Growth by destination (where you export matters): Trade with China and growth in African countries. *African Development Review*, *23*(2), 202-218.

BBC(2020), "A quick guide to the US-China trade war", available at"https://www.bbc.com/news/business-45899310"(accessed 18 February 2020).

Fernando Leibovici (2018), How Much Does the U.S. Trade with China, Canada and Maxico,*Federal Reserve Bank of St. Louis*, news release on Oct 9, 2018. Available at "https://www.stlouisfed.org/on-the-economy/2018/october/how-important-trade-china-canada-mexico" (accessed 1 April 2020).

Frankel, J.A. and A.K.Rose (1998), The Endogencity of the Optimum Currency after criteria {j}. *The economic journal,*108, pp1009-1025.

Garcia-Herrero, A., Ferchen, M.G. and Nigrinis, M. (2013), *"Evaluating Latin America's commodity dependence on China"*, BBVA Working Paper 13/05.

Helpman, E. (1989), Monopolistic competition in trade theory (No. 2123-2018-4869).

Herbert G. Grubel, & Peter J. Lloyd. (1975), Intra-industry trade: the theory and measurement of international trade in differentiated products. *The Economic Journal, 85*(339), 312-314.

Justin Choe, Alexander Hammer & Christopher Montgomery (2019), "U.S.Soy Exports to China Crushed Amid Rising Trade Tensions", *USITC Executive Briefing on Trade*, release on 25 December 2019, available at "https://qz.com/1775228/us-soys-exports-to-china-soar-as-partial-trade-deal-seems-like-ly/&ved=2ahUKEwjpj6uU9dnnAhWQwJQKHXucC7YQFjAMegQIBBAB&usg=AOvVaw0wnL1VC9Iq1jOjq6mQnzSt" (accessed 18 Feb 2020).

Krugman, P. (1980), Scale economies, product differentiation, and the pattern of trade. *The American Economic Review*, 70(5), 950-959.

Kunimoto,k. 1977. Typology of trade intensity indices. *Hitotsubashi Journal of Economics*, 17,pp15-32

Liu, T., & Woo, W. T. (2018). Understanding the US-China trade war. *China Economic Journal*, *11*(3), 319-340.

Li, M., Zhang, W., & Hart, C. (2018). What have we learned from China's past trade retaliation strategies?. *Choices*, *33*(2), 1-8.

Marchant, Mary A., H.Holly Wang (2018). "Theme Overview: U.S.-China Trade Dispute and Potential Impacts on Agriculture." *Choices*, 33, no.2 (2018):1-3. https:// www.jstor.org/stable/26487442, accessed February 17, 2020.

Muhammad, A., & Smith, S. A. (2020). The US-China Phase One Trade Agreement: Implications for US Agriculture (No. 2325-2020-437).

Rod Tyers, Zhou Yixiao (2019), The US-China Trade Dispute: A Macro Perspective (January 2019).*CAMA Working Paper* No. 11/2019. Available at SSRN: "https://ssrn.com/abstract=3328294" or http://dx.doi.org/10.2139/ssrn.3328294.

Ricardo, D. (1821). On the principles of political economy. London: J. Murray.

Smith, A. (2010). The Wealth of Nations: An inquiry into the nature and causes of the Wealth of Nations. *Harriman House Limited*.

Tyers, R., & Zhou, Y. (2019). The US-China trade dispute: a macro perspective.

Untong, A., Pongpatcharatorntep, D., &Kaosa-ard, M. (2010). Import demand for Thai rice and factors determining its price in modern trade market of China. *Applied Economics Journal*, *17*(2), 55-77.

USDA (2019), Soys accounted for the majority of U.S. and Brazil's agriculture exports to China in 2017, *United States Department of Agriculture- Economic Research Service*, Charts of Note, release on 25th July 2019, available at https://www.ers.usda.gov/data-products/charts-of-note/charts-of-note/?topicId=14900, accessed on 18 Feb 2020.

Vicki Needham, 2017. Trade with China important to US economy, report. *TheHill.com,* online press 1stOctorber 2018,available at "https://thehill.com/policy/finance/313658-trade-with-china-important-to-us-economy-report", accessed 1st April 2020

World Export and Import of Agriculture Product, *KNOEMA*, Available at: https://cn.knoema.com/cduhihd/world-exports-and-imports-of-agricultural-products(accessed 28 May 2020)

WTO (2019), " Global trade growth loses momentum as trade tensions persist", *World Trade Organization*, Press Release WTO Press/837 date 02 April 2019 available at "https://www.wto.org/english/news_e/pres19_e/pr837_e.htm", accessed on 18 Feb 2020.

WTO (2019), "WTO lowers trade forecast as tensions unsettle global economy", *World Trade Organization*, Press Release WTO Press/840 date 01 Oct 2019, available at " https://www.wto.org/english/news_e/pres19_e/pr840_e.htm", accessed on 18 Feb 2020.

Yamazawa, I 1970, Intensity analysis of world trade flow, *Hitotsubashi Journal of Economics*, vol.10, pp61-90, Tokyo, Japan

Yamei, 2018 ."Economic Watch: China increases agricultural imports to benefit itself, the world". *Xinhua news*, release 2018-05-24. Available at: http://www.xinhuanet.com/english/2018-05/24/c_137203328.htm (accessed 28 May 2020)

Zhou, Y., Baylis, K., Coppess, J., &Xie, Q. (2018). Evaluating Potential Long-Run Impacts of Chinese Tariff on US Soys. *farmdoc daily*, *8*.

AUTHOR'S BIOGRAPHY

Dr. Ting Jenn Ling, a PhD researcher at Northwest A&F University, China. He was a formal officer served at the Embassy of Malaysia in Beijing, China. He has wide range of knowledge and experience on regional trade agreements bilateral and international trade related matters. Dr. Ting had worked as General Manager for a private company with 48 chain outlets in Malaysia prior to working in Beijing. He is a multidisciplinary scholar as his Bachelor's degree was in accountancy and his Master's degree in agricultural business. His current research interests are in agricultural international trade, poverty alleviation, digital agriculture and organic farming. Meanwhile, Dr. Ting is running an organic fruit orchards and a vegetable plantation in Malaysia.