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Competition between China and the United States in the Korean Food Market

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Abstract: Korea, a large net-food importing country, is rapidly opening its doors to agricultural trade. In this study, we investigate the nature and extent of competition between two major exporters, China and the United States, to the Korean food market. We first employ the un-centered correlation distance approach to investigate the similarities in the export structures of major exporters to the Korean market. Results show that the United States, traditionally a large food exporter to Korea, is facing serious competition from Chinese exports. The similar export structures of China and America have made the latter vulnerable to competition. Furthermore, the geographic proximity of China to Korean markets confers the former two-fold advantages: similar food products and varieties, and lower transport costs. Secondly, the concept of competitive threat is used to determine which exporter faces threats from which competitor. We show that China poses a threat to the United States in virtually every agricultural product exported to Korea. The complexity of trade patterns and competition is likely to increase given the impending Korea-United States Free Trade Agreement and the ongoing negotiations for a Korea-China Free Trade Agreement.

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I. Introduction

Korea is a large importer of agricultural goods in the global economy, and is considered a significant market to numerous agricultural exporters. The Korean market for foreign agricultural goods is considered to be a growing opportunity, with the current trend of complete globalization in a politically intricate sector. The emergence of China's competitiveness has not only affected the world economy, but also the Korean food market. Since the mid-1950s, Korea's transformation into a leading economic power has coincided with dramatic growth in trade between the United States and Korea. Until early 1990s, the United States was the largest exporter of agricultural goods to Korea. In 1989 alone, U.S agricultural products accounted for about 60 percent of the Korean imported food. However, the emergence of the Chinese economy in the early 1990s has altered the close relationship between the Korean food market and the other global food exporters, especially the United States. Although Chinese agricultural products were also imported in previous years, the trade volume and scale was very limited and infrequent, which did not have much impact on the Korean market. Following the Amity Treaty of 1992, Chinese agricultural products began to have a significant impact on the Korean food market. Other external events, such as the obligations under the Uruguay Round, China's accession into the World Trade Organization (WTO), and the surge of the Chinese agricultural sector, have accelerated the inflow of Chinese products into the Korean market. Other than the obvious price advantage over other exporters, China possesses similar agricultural varieties and breeds that easily fulfill the needs of the Korean consumer, and also is geographically adjacent to the Korean peninsula, saving transport costs on bulky food products. The recent increase of Chinese food products in the Korean food market has been a major concern for other agricultural exporters, e.g., the United States.

While previous literature (Lall and Albaladejo, 2004; 2002) has focused on the competitive threat of China as a major player in the low-end manufacturing sector, and more recently in the cutting-edge technology sector, there is no previous study directly dealing with China's role on the Korean agricultural import market. The impending Korea-United States Free Trade Agreement is a boon to American agricultural producers, who will now be exempt from many trade barriers, and thus will have more access to the Korean consumers. The ongoing

negotiations on a possible Korea-China Free Trade Agreement may, however, nullify some of the advantages to U.S. producers. In this context, it is important to understand the nature of competition between China and the United States in the Korean food market. In this article, we estimate and verify the Chinese impact on the Korean food markets. The findings of the analyses will also help understand the changing relationship between Korea and other trade partners, especially the United States, given the surge of Chinese exports to Korea. In the larger trade-literature context, this study will identify the nature of trade substitution among major trading partners, with insights on factors contributing to competitiveness.

2. The United States and China in the Korean Food Market

Table 1 shows the total trade value for agricultural items that are under the coverage of the WTO's Agricultural negotiations, and are considered as significant items in the Korean imported food market. Throughout the study, these 33 items selected under the two-digit HS code will be our main categories for analysis. Several items that are included in non-agricultural categories were identified and discerned, and used in the analysis. It must be noted that these items were identified through the four-digit HS code, but are shown by their two-digit HS code. For instance, acyclic alcohols and their derivatives, which fall under the four-digit code 2905, is the only item selected in this study, and therefore is the sole representative of the organic chemicals category (HS29.) Therefore the value for category HS29 is, in fact, the value for HS2905.

As seen in Figure 1, other than the steady decline of HS52 (Cotton), the imports of Korea are increasing steadily over the course of time. There exists a slight decline between the second and third time frame, most likely due to the financial crisis of the East Asian region during the late 1990s HS-10 (Cereal) stands out as the largest imported item in the Korean food market, followed by the distant second HS-02, which indicates Meat and Edible Meat Offal. HS-29 (organic chemicals), the third ranking item in terms of import value during 2002-2005 is actually an assessment of a single category of acyclic alcohols and their derivatives. This steady growth, along with the increasing demand for foreign foods in the domestic Korean market, places Korea as a good opportunity for exporters.

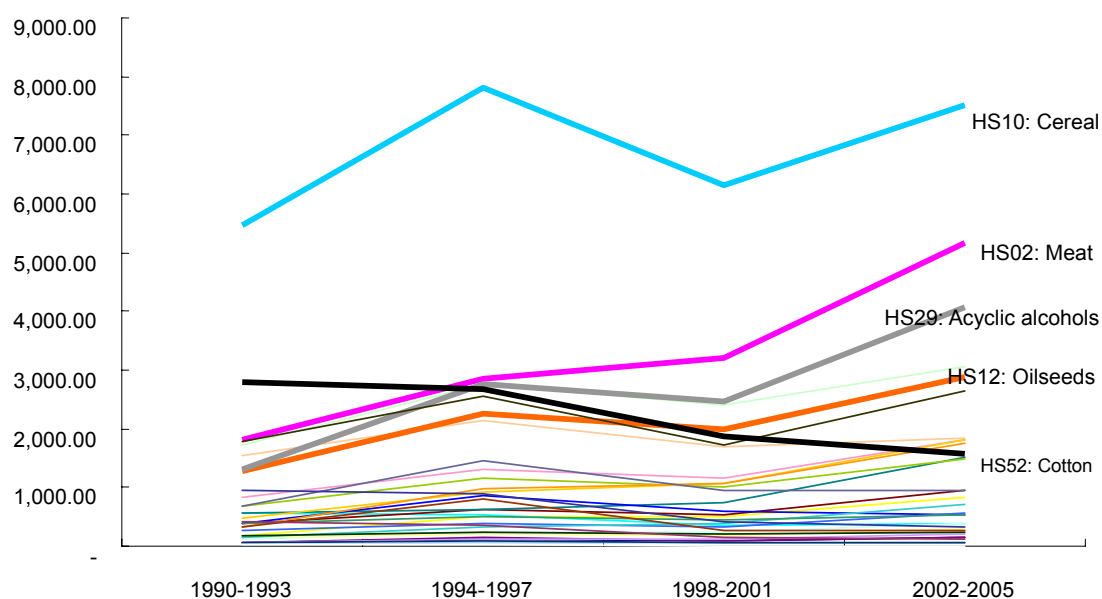
Figure 2 and Table 2 show the rapidly increasing trade value of Chinese exports to the world. Exponential growths are seen in the last 5 years, especially in HS codes 07 (Edible vegetables), 10 (Cereal), and 12 (Oil seed, etc), which coincidentally are the top 3 items exported to Korea.

Table 1. Korean agricultural import values (in millions of USD)

| HS Code | 1990-1993 | 1994-1997 | 1998-2001 | 2002-2005 |
|-------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|
| 01 - Live animals | 68.99 | 127.38 | 78.71 | 139.25 |
| 02 - Meat and edible meat offal | 1,815.92 | 2,843.54 | 3,200.16 | 5,180.09 |
| 04 - Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included | 164.54 | 497.43 | 518.19 | 819.19 |
| 05 - Products of animal origin, not elsewhere specified or included | 556.15 | 539.4 | 353.78 | 390.38 |
| 06 - Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage | 59.79 | 140.11 | 95.6 | 158.08 |
| 07 - Edible vegetables and certain roots and tubers | 379.55 | 634.29 | 545.72 | 936.96 |
| 08 - Edible fruit and nuts; peel of citrus fruit or melons | 550.07 | 630.55 | 729.55 | 1,515.85 |
| 09 - Coffee, tea, maté and spices | 371.98 | 869.19 | 608.67 | 545.62 |
| 10 - Cereals | 5,451.25 | 7,810.09 | 6,141.22 | 7,508.63 |
| 11 - Products of the milling industry; malt; starches; inulin; wheat gluten | 116.93 | 239.37 | 232.18 | 390.3 |
| 12 - Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder | 1,725.18 | 2,774.37 | 2,399.77 | 3,065.68 |
| 13 - Lac; gums, resins and other vegetable saps and extracts | 160.26 | 204.03 | 184.85 | 297.87 |
| 14 - Vegetable plaiting materials; vegetable products not elsewhere specified or included | 33.12 | 59.13 | 53.71 | 54.32 |
| 15 - Animal or vegetable fats and oils and their cleavage products ; prepared edible fats; animal or vegetable waxes | 843.89 | 1,306.48 | 1,144.94 | 1,802.24 |
| 16 - Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates | 68.61 | 109.84 | 123.04 | 196.38 |
| 17 - Sugars and sugar confectionery | 1,546.84 | 2,142.79 | 1,696.32 | 1,855.64 |
| 18 - Cocoa and cocoa preparations | 265.13 | 375.91 | 332.11 | 555.19 |
| 19 - Preparations of cereals, flour, starch or milk; pastrycooks' products | 158.22 | 322.28 | 380.25 | 722.01 |
| 20 - Preparations of vegetables, fruit, nuts or other parts of plants | 686.92 | 1,158.20 | 1,007.02 | 1,473.16 |
| 21 - Miscellaneous edible preparations | 476.06 | 917.38 | 1,054.67 | 1,813.33 |
| 22 - Beverages, spirits and vinegar | 340.07 | 987.11 | 1,055.14 | 1,753.14 |
| 23 - Residues and waste from the food industries; prepared animal fodder | 1,264.61 | 2,255.26 | 2,003.09 | 2,886.84 |
| 24 - Tobacco and manufactured tobacco substitutes | 685.03 | 1,443.22 | 947.62 | 955.59 |
| 29 - Organic chemicals | 1,313.96 | 2,756.09 | 2,465.79 | 4,057.32 |
| 33 - Essential oils and resinoids; perfumery, cosmetic or toilet preparations | 66.83 | 74.58 | 49.3 | 57.44 |
| 35 - Albuminoidal substances; modified starches; glues; enzymes | 392.26 | 514.98 | 438.77 | 538.38 |
| 38 - Miscellaneous chemical products | 179.63 | 227.76 | 209.98 | 239.05 |
| 40 - Rubber and articles thereof | 1,771.03 | 2,548.06 | 1,713.65 | 2,629.59 |
| 43 - Furskins and artificial fur; manufactures thereof | 332.79 | 800.61 | 270.74 | 281.13 |
| 50 - Silk | 427.04 | 349.08 | 163.28 | 122.77 |
| 51 - Wool, fine or coarse animal hair; horsehair yarn and woven fabric | 940.98 | 898.11 | 421.19 | 332.09 |
| 52 - Cotton | 2,786.48 | 2,665.99 | 1,869.18 | 1,569.39 |
| 53 - Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn | 20.38 | 24.04 | 13.55 | 7.91 |

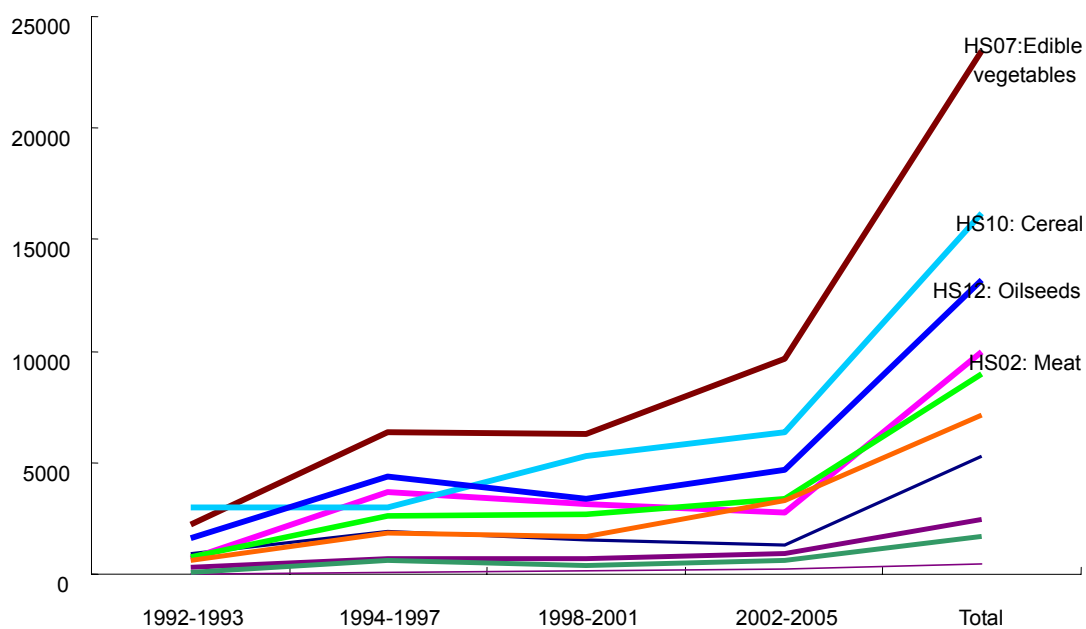
(Source: United Nations Statistics Division, Commodity Trade Database (COMTRADE))

Figure 1. Trend of Korean agricultural import values (in millions of USD)



(Source: United Nations Statistics Division, Commodity Trade Database (COMTRADE))

Figure 2. Trend of Chinese agricultural export values to the World (in millions of USD)



(Source: United Nations Statistics Division, Commodity Trade Database (COMTRADE))

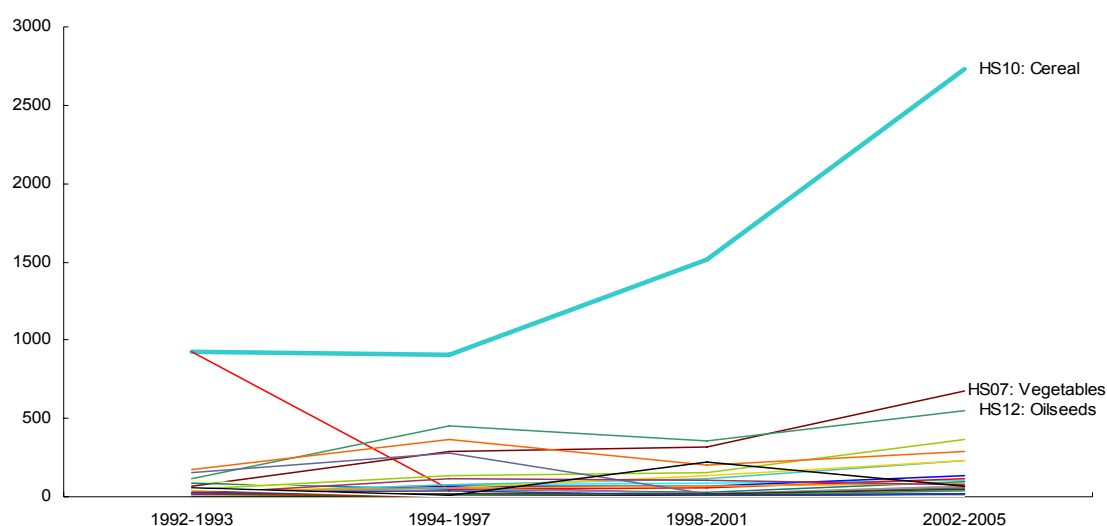
Table 2. Chinese agricultural export values to World (in millions of USD)

| Commodity Code | 1992-1993 | 1994-1997 | 1998-2001 | 2001-2005 |
|----------------|-----------|-----------|-----------|-----------|
| 01 | 931.873 | 1933.063 | 1555.465 | 1329.472 |
| 02 | 718.957 | 3711.471 | 3125.052 | 2760.058 |
| 04 | 302.161 | 679.111 | 718.544 | 917.057 |
| 05 | 768.758 | 2593.419 | 2680.171 | 3377.893 |
| 06 | 34.173 | 113.073 | 127.224 | 233.795 |
| 07 | 2186.917 | 6355.517 | 6291.944 | 9652.193 |
| 08 | 627.755 | 1819.296 | 1712.207 | 3290.058 |
| 09 | 927.609 | 1964.655 | 2057.161 | 2967.365 |
| 10 | 2958.228 | 2971.803 | 5306.676 | 6391.689 |
| 11 | 110.922 | 585.151 | 385.756 | 630.219 |
| 12 | 1646.891 | 4375.109 | 3347.372 | 4643.811 |
| 13 | 61.998 | 189.777 | 214.240 | 336.243 |
| 14 | 96.266 | 216.148 | 170.445 | 182.659 |
| 15 | 342.929 | 2018.533 | 713.080 | 676.844 |
| 16 | 502.481 | 1256.594 | 1773.734 | 3537.268 |
| 17 | 1325.830 | 1095.127 | 651.321 | 1093.084 |
| 18 | 81.097 | 182.040 | 139.776 | 270.098 |
| 19 | 249.300 | 882.643 | 1325.217 | 2393.448 |
| 20 | 1371.159 | 3991.030 | 4967.943 | 9597.703 |
| 21 | 233.344 | 930.920 | 1424.236 | 2334.822 |
| 22 | 628.047 | 1630.227 | 1967.447 | 2681.000 |
| 23 | 935.811 | 1410.910 | 951.235 | 1771.475 |
| 24 | 1081.608 | 3318.656 | 1602.398 | 1976.570 |
| 29 | 30.267 | 195.431 | 191.422 | 635.133 |
| 33 | 149.585 | 343.427 | 253.496 | 292.792 |
| 35 | 19.429 | 90.816 | 148.557 | 653.748 |
| 38 | 9.042 | 56.440 | 167.323 | 280.674 |
| 40 | 37.624 | 210.750 | 197.351 | 476.774 |
| 43 | 19.281 | 26.082 | 22.079 | 26.277 |
| 50 | 569.258 | 1382.368 | 1144.077 | 1018.275 |
| 51 | 2.122 | 6.876 | 6.476 | 13.700 |
| 51 | 221.326 | 332.002 | 80.719 | 160.490 |
| 52 | 440.468 | 228.589 | 733.662 | 333.469 |
| 53 | 11.276 | 21.188 | 19.267 | 10.931 |

(Source: United Nations Statistics Division, Commodity Trade Database (COMTRADE))

Figure 3 and Table 3 show the growth of Chinese exports over the years and what items that seem to be the strongest in China's wide spectrum of products, in the Korean market. They also show that the strongest exporting items of China are also consistently being imported in the Korean market. HS10 (Cereal) has been not only the largest item imported in the Korean market, but also the fastest growing. The low costs, similar breeds of crop, and geographical intimacy are thought to be the main reason for this cereal influx. The largest export of China, vegetables, is the second-most imported good in the Korean market, which is steadily growing after a major decline during 1994-1997. Oilseeds, one of China's strongest export items as well, are in the top three imports in the food market.

Figure 3. Trend of Chinese agricultural exports to Korea (in millions of USD)



The United States' exports to the world is shown in Table 4 and Figure 4. The US shows similar strengths with China, as its largest exports are cereal, meat and oilseeds. The gradual increase of agricultural exports is probably a result of increased industrialization in the farming sector, as well as the government's efforts to cultivate and develop foreign markets. Although the growth rate of agricultural goods is not as dramatic as that of China, the total value for agricultural exports is more than twice of that of China.

As seen in Figure 5, the trend of US agricultural exports to the Korean market is the opposite of China. In cereal alone, China is enjoying exponential growth while US exports to the Korean market have declined. Additionally, since 1994, China has been successful with cereal not only in the Korean market, but also in the world market. The simultaneous occurrence of the Chinese

surge and American decline imply that the competition between the two countries has been favorable to the former in the Korean market.

Table 3. Chinese agricultural exports to the Korean market (in millions of USD)

| Commodity Code | 1992-1993 | 1994-1997 | 1998-2001 | 2002-2005 |
|----------------|-----------|-----------|-----------|-----------|
| 01 | 1.18 | 3.77 | 0.96 | 1.86 |
| 02 | 6.58 | 69.60 | 21.28 | 21.54 |
| 04 | 8.24 | 10.29 | 7.89 | 16.23 |
| 05 | 16.53 | 76.61 | 82.44 | 107.53 |
| 06 | 14.10 | 2.92 | 4.41 | 18.25 |
| 07 | 71.55 | 291.77 | 317.94 | 674.97 |
| 08 | 83.39 | 47.50 | 33.20 | 93.67 |
| 09 | 21.37 | 63.96 | 67.99 | 137.20 |
| 10 | 925.70 | 907.67 | 1513.10 | 2733.11 |
| 11 | 924.52 | 51.51 | 59.77 | 111.01 |
| 12 | 115.12 | 453.68 | 359.04 | 546.70 |
| 13 | 108.82 | 10.18 | 13.18 | 23.48 |
| 14 | 9.31 | 18.66 | 5.09 | 7.55 |
| 15 | 14.87 | 22.63 | 21.30 | 69.93 |
| 16 | 9.68 | 10.62 | 8.12 | 71.44 |
| 17 | 4.06 | 2.94 | 18.47 | 55.81 |
| 18 | 2.11 | 0.42 | 3.22 | 21.23 |
| 19 | 22.25 | 80.48 | 114.88 | 235.44 |
| 20 | 44.56 | 137.99 | 155.65 | 368.12 |
| 21 | 28.10 | 61.57 | 130.45 | 232.96 |
| 22 | 34.04 | 60.62 | 63.58 | 86.22 |
| 23 | 170.63 | 369.41 | 202.37 | 285.01 |
| 24 | 154.58 | 282.80 | 19.67 | 57.09 |
| 29 | 16.90 | 62.59 | 19.98 | 70.95 |
| 33 | 4.25 | 0.31 | 0.45 | 1.75 |
| 35 | 0.16 | 5.25 | 8.03 | 34.33 |
| 38 | 0.32 | 1.47 | 9.47 | 20.53 |
| 40 | 14.75 | 14.63 | 21.57 | 45.45 |
| 43 | 15.11 | 0.67 | 0.25 | 0.06 |
| 50 | 19.95 | 115.51 | 103.22 | 81.86 |
| 51 | 31.20 | 34.90 | 13.89 | 17.79 |
| 52 | 56.77 | 9.90 | 217.50 | 66.90 |
| 53 | 45.10 | 0.96 | 0.34 | 0.54 |

(Source: United Nations Statistics Division, Commodity Trade Database (COMTRADE))

Table 4. American agricultural exports to the World (in millions of USD)

| Commodity Code | 1991-1993 | 1994-1997 | 1998-2001 | 2001-2005 |
|----------------|-----------|-----------|-----------|-----------|
| 01 | 1852.642 | 2364.014 | 3103.025 | 2623.827 |
| 02 | 11463.130 | 23888.852 | 25709.840 | 23514.282 |
| 04 | 1771.310 | 2716.161 | 3030.764 | 3959.620 |
| 05 | 955.752 | 1556.446 | 1773.578 | 2460.563 |
| 06 | 684.034 | 1006.849 | 1176.455 | 1210.510 |
| 07 | 4320.673 | 6831.061 | 7425.106 | 8557.512 |
| 08 | 9451.042 | 15840.560 | 15499.900 | 20758.800 |
| 09 | 648.419 | 1634.417 | 1671.000 | 1687.251 |
| 10 | 32138.093 | 53366.553 | 39938.160 | 45425.062 |
| 11 | 1308.089 | 2021.332 | 1944.744 | 2728.748 |
| 12 | 16083.746 | 29904.821 | 26066.151 | 34047.898 |
| 13 | 529.619 | 760.190 | 1001.070 | 1258.692 |
| 14 | 63.995 | 136.952 | 115.997 | 111.255 |
| 15 | 4131.117 | 8335.143 | 7535.593 | 7804.881 |
| 16 | 812.627 | 1800.423 | 2067.712 | 2353.409 |
| 17 | 1406.842 | 2377.645 | 2681.559 | 2899.229 |
| 18 | 1061.118 | 1817.411 | 2275.885 | 2992.646 |
| 19 | 2460.198 | 4434.164 | 5594.145 | 6782.095 |
| 20 | 4786.699 | 8059.322 | 8752.911 | 8851.793 |
| 21 | 4180.000 | 8540.639 | 10244.475 | 13237.928 |
| 22 | 3051.942 | 6801.652 | 6869.589 | 8324.467 |
| 23 | 9948.722 | 15282.771 | 15086.315 | 14429.772 |
| 24 | 17788.659 | 26659.961 | 20817.065 | 10934.867 |
| 29 | 1884.640 | 3750.101 | 3601.446 | 5614.939 |
| 33 | 586.877 | 1050.810 | 1166.569 | 1286.827 |
| 35 | 833.720 | 2067.089 | 3077.450 | 3037.016 |
| 38 | 341.349 | 837.682 | 989.635 | 1119.587 |
| 40 | 2850.912 | 4945.014 | 5188.067 | 7151.484 |
| 43 | 307.258 | 620.557 | 584.047 | 642.463 |
| 50 | 3.651 | 3.686 | 7.253 | 10.285 |
| 51 | 67.923 | 146.736 | 95.720 | 132.851 |
| 52 | 6153.157 | 11950.576 | 7795.469 | 13880.157 |
| 53 | 4.705 | 3.833 | 3.090 | 7.208 |

Figure 4. Trend of American agricultural exports to the World (in millions of USD)

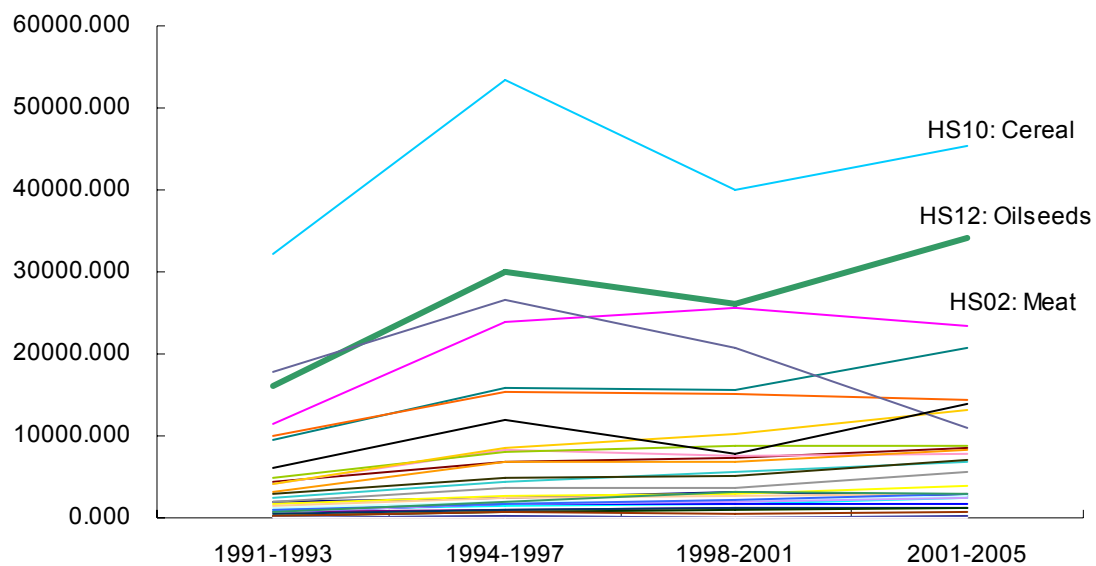
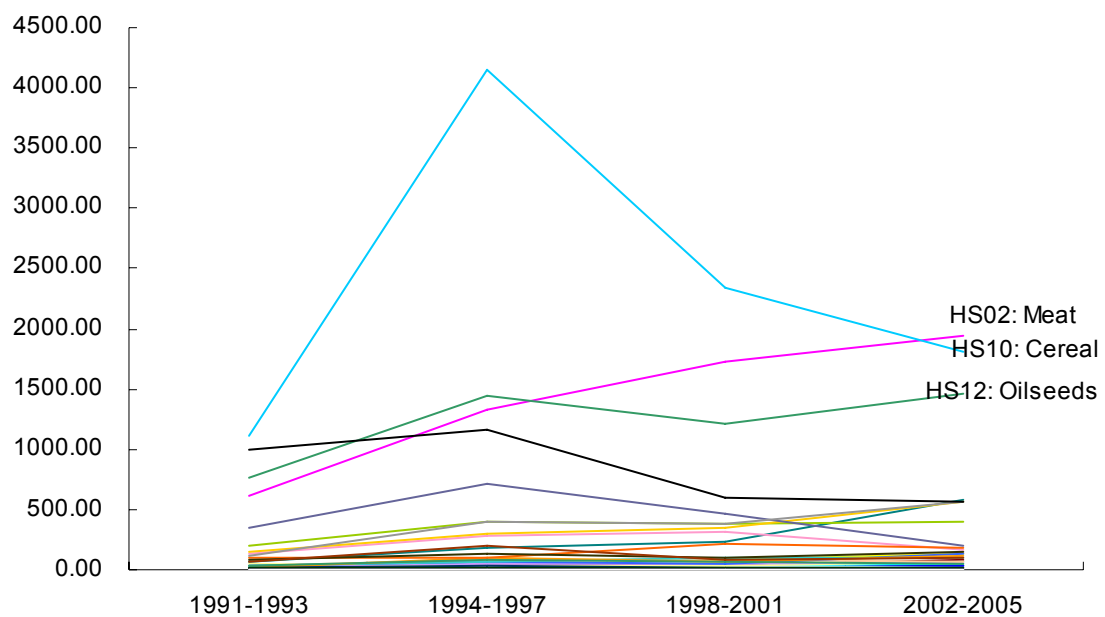


Table 5. American Exports to the Korean Markets (in millions of USD)

| Commodity Code | 1991-1993 | 1994-1997 | 1998-2001 | 2002-2005 |
|----------------|-----------|-----------|-----------|-----------|
| 1 | 16.04 | 31.30 | 23.88 | 30.21 |
| 2 | 622.57 | 1324.84 | 1724.50 | 1941.23 |
| 4 | 19.07 | 85.05 | 85.24 | 137.22 |
| 5 | 38.68 | 43.62 | 36.14 | 56.99 |
| 6 | 0.70 | 1.15 | 1.25 | 3.47 |
| 7 | 13.56 | 55.13 | 28.41 | 84.50 |
| 8 | 72.34 | 184.41 | 228.26 | 586.52 |
| 9 | 12.62 | 34.62 | 21.12 | 25.30 |
| 10 | 1113.78 | 4153.16 | 2340.98 | 1805.77 |
| 11 | 6.44 | 19.30 | 30.82 | 12.74 |
| 12 | 759.26 | 1452.60 | 1210.06 | 1454.71 |
| 13 | 43.99 | 31.29 | 30.82 | 66.11 |
| 14 | 0.40 | 2.27 | 0.86 | 0.94 |
| 15 | 139.58 | 287.87 | 310.35 | 165.58 |
| 16 | 28.26 | 49.40 | 43.56 | 67.45 |
| 17 | 39.52 | 79.32 | 82.73 | 71.62 |
| 18 | 26.86 | 60.85 | 48.14 | 128.14 |
| 19 | 28.08 | 63.52 | 92.83 | 97.95 |
| 20 | 194.61 | 399.47 | 387.97 | 394.65 |
| 21 | 144.94 | 294.45 | 341.53 | 565.56 |
| 22 | 20.90 | 100.45 | 69.75 | 119.94 |
| 23 | 100.65 | 107.53 | 214.52 | 185.89 |
| 24 | 350.84 | 719.17 | 460.71 | 192.31 |
| 29 | 108.68 | 404.00 | 380.72 | 565.91 |
| 33 | 14.85 | 28.40 | 13.29 | 19.39 |
| 35 | 38.26 | 76.69 | 58.62 | 52.42 |
| 38 | 13.65 | 14.75 | 17.72 | 16.40 |
| 40 | 77.09 | 139.35 | 97.42 | 145.68 |
| 43 | 64.12 | 194.76 | 87.48 | 97.17 |
| 50 | 0.40 | 0.03 | 0.01 | 0.29 |
| 51 | 0.29 | 4.39 | 3.90 | 1.01 |
| 52 | 1003.42 | 1160.34 | 593.85 | 567.56 |
| 53 | 0.18 | 0.04 | 0.10 | 0.22 |

Figure 5. Trend of American agricultural exports to Korea (in millions of USD)



3. Similarities of Export Structures between China and USA

There is no unique method to measure the degree of competition for a third market between two exporters. The more similar the exporting structures of the two exporters, the stronger is the likely competition in the third market. We will, first, graphically compare the structural similarities between China, the United States, and other major exporting countries to the Korean market in order to better understand the underlying relationships that cause competition in exporting markets. Second, in order to gauge and verify the competition, a quantitative method will be used to compare and examine the similarities of the export structures of the United States, and other significant players in the market to our main interest, China.

The structure of Chinese agricultural exports to Korea is quite consistent from 1990 to 2005, showing similar patterns as times goes by in Figure 6. China steadily exported large amounts of cereal, which is 10 in the two-digit HS code, and is the largest agricultural category exported to Korea from China. Despite the relative weight of cereal being dominant, the relative portion is declining, as it also can be observed that categories under the two-digit HS code 05(products of animal origin), 23(residues, wastes of food industry) and other processed goods such as HS-code 50(silk), 51(wool, animal hair), 52(cotton) are showing diminishing percentage in the total amount of agricultural exports. Meanwhile, categories 19(cereal, flour, starch, milk preparations and products), 20(vegetable, fruit, nut and other food preparations), 21(miscellaneous edible preparations), and 22(beverages, spirits, and vinegar) are increasing in terms of percentage of total exports. Overall, exports are becoming increasingly diversified, with traditional products slowly diminishing and processed goods increasing.

Figure 7 is a comparison of the export structures of the United States and other competing exporters with China. The connected lines represent each of the exporting categories, which help understand the structure of each exporter. The height of the lines at each point indicate the percentage of the particular item in the total exports to Korea; meaning the higher the chart, the respective item is more strategically important to that exporter. The horizontal axis shows the selected agricultural category in two-digit HS codes. Through this figure, along with Figure 7, we can compare the importance of export item for different countries. The results show that there exists, in fact, heavy overlapping in exports in the same items, most notably cereal, in major exporters such as China, the United States and Australia.

Through this chart, it can be said that China is directly competing with the United States in categories 10(cereal), 12(Oil seed, etc), 20(vegetable preparations) and 21(miscellaneous

preparations), while they also face direct competition against Australia in cereal as well. This implies that the capital export items, which possess significant importance in exporting to Korea, are concentrated in few agricultural products, and will lead to competition in these categories. Empirical data from Korean domestic sources have confirmed the anticipated fierce competition among foreign exporters in the cereal sector. We have included Argentina for comparison to the big three exporters to the Korean market, and it is seen that Argentina has an export structure similar to that of China. Argentina, however, lacks trade volume compared to China, the United States, and Australia, and therefore in thought not be a major factor that increases competition in agricultural trade.

4. Similarity Index of Export Structures and Competition between the United States and China

The next step is to confirm these similarities of export structure with China through quantitative methods. Although several approaches for calculating the relative closeness of exporting structure between China and other countries are possible, the un-centered correlation distance approach proposed by Jaffe (1986) is adopted and modified in this paper. The approach originally captures the technological similarity between firms through the research area of common interests which can be measured by the correlation in R&D portfolio. We have modified the model to find the similarities of exports structures of each exporter to Korea.

In order to see the un-centered correlation distance approach, we first introduce the exporting commodity composition vector of each individual exporting country on the commodity space.

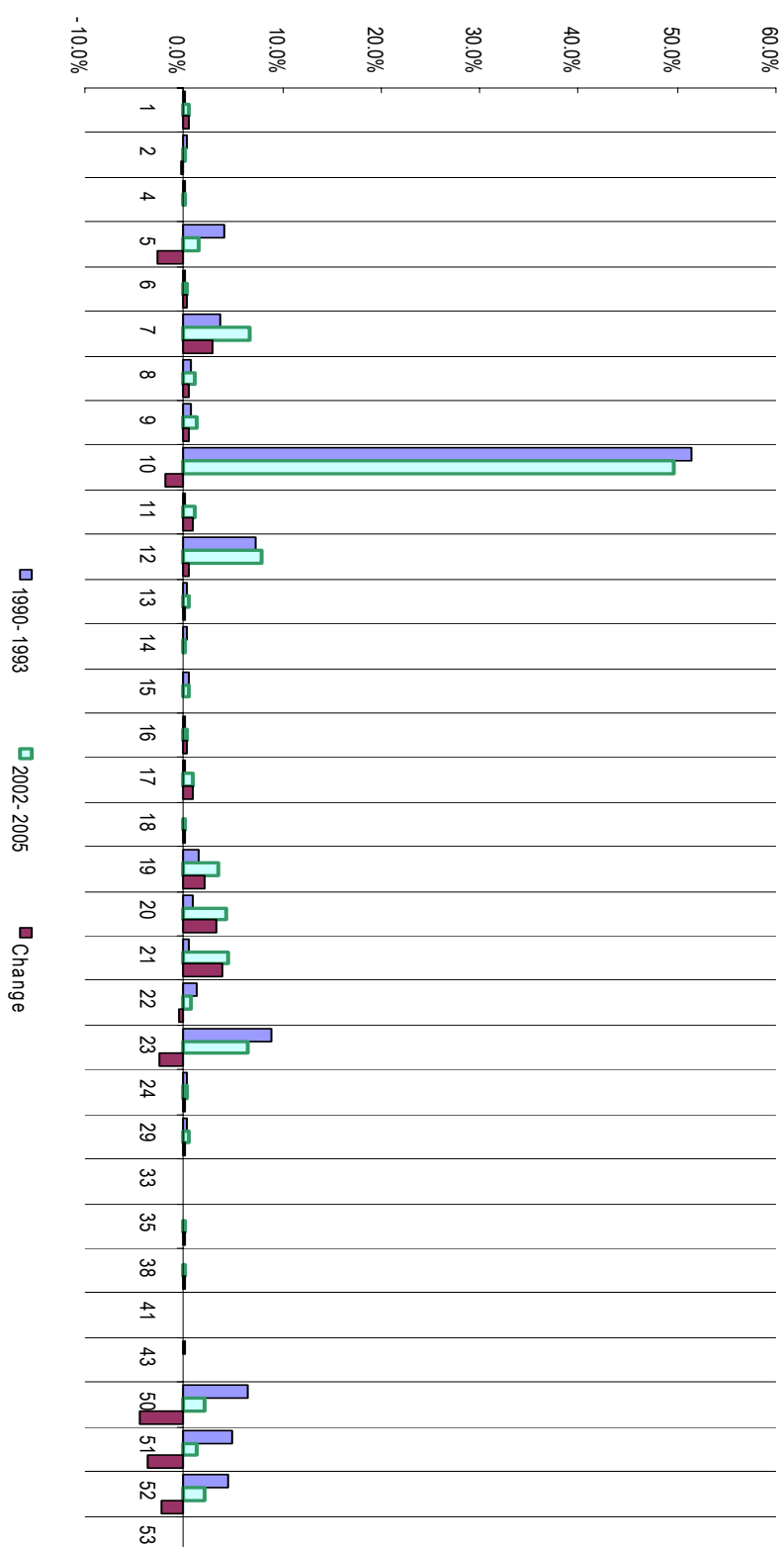
$$(1) \quad F_i = (F_{i1}, \dots, F_{ik})$$

In the equation (1), F_i is the exporting commodity composition vector of country i , and F_{ik} denotes the country i 's exporting value of commodity k to Korea. Equation (1) is rewritten in the form of equation (2) which represents the exporting location of country i on the commodity space.

$$(2) \quad f_i = (f_{i1}, \dots, f_{ik})$$

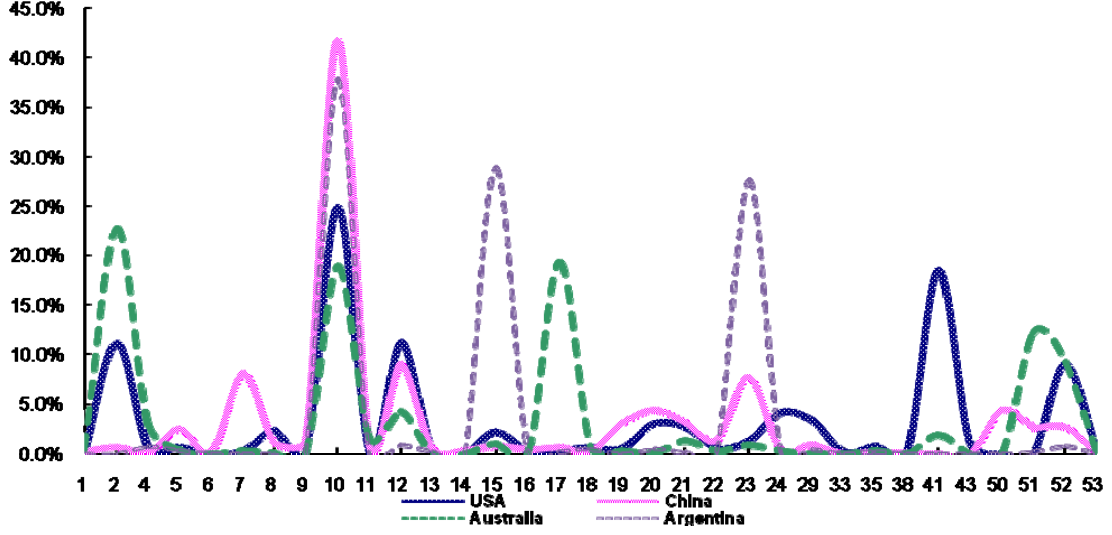
The value of f_{ik} implies the exporting ratio of the k - th commodity to total exports to Korean food markets for country i , and the sum of each ratio should sum up to one. ($\sum f_{ik} = 1$ for each i).

Figure 6. Structure of Chinese Agricultural Exports to Korea



(Source: United Nations Statistics Division, Commodity Trade Database (COMTRADE))

Figure 7. Export structure comparison of major exporters (1990-2005)



(Source: United Nations Statistics Division, Commodity Trade Database (COMTRADE))

Finally, with the exporting location vector in equation (2), the coefficient of un-centered correlation distance (ω_{ij}) can be defined as in equation (3), where the term $\|f\|$ indicates the vector norm.

$$(3) \quad \omega_{ij} = \frac{f_i \cdot f_j'}{\|f_i\| \cdot \|f_j\|}$$

If the location of country i coincides with that of country j on the commodity space, ω_{ij} will become one. If the two countries in comparison have a perfectly different exporting structure, that is, if they export perfectly different commodities, then ω_{ij} will become zero. The more similar the structures between the two countries are, the value of ω_{ij} will become closer to unity.

The exporters used in this analysis are defined by the top 20 exporters to Korea in the time frame from 1990 to 2005, which includes China. Since the range and scale of items used in the analysis will significantly affect the measurement of the Jaffe (1986) distance mentioned above, we have selected 211 essential items of the Korean food market, using four-digit HS codes, which is the second-lowest subdivision. That is, it becomes that $k = 1, \dots, 211$ in equation (2) above. Through making vectors of the ratio of total export value of a specific item to the total export value, using the CIF price in US dollars, we have calculated a similarity (closeness) index which compares the export structure for the 20 exporting countries over 16 years.

The calculations imply that from 1990 to 2001, China has gradually transformed into a similar export structure to that of the United States. The similarity index, however, drops in period 4, which means that a certain exporting replacement occurred, or some deviation in the export structure has been made between the two exporting giants. According to Figure 3 and 5, cereal seems to have played an important role for this outcome. Cereal has been a dominant product for the United States and China, in terms of both export value and percentage in total exports. Thus, any change in export quantities of cereal will have much more weighted affect on the similarity index. Since the export trend for cereal for China and the United States show opposite trends, it is understandable that the similarity index drops significantly. It is seen that even in period 4, American cereal is losing its long-standing position as the top exported item to Korea, while the Chinese cereal increases its market share, increasing the distance between the second-most import, vegetables. However, USA still has relatively high similarity index in period 4 compared with other countries except Brazil and Argentina. It must be noted that although Brazil and Argentina have much higher similarity indexes than the United States their market shares are more than negligible, which exempts them from having significant impact in the analysis.

The figure also implies that China will, if not already, focus on exporting items to the Korean market which the United States are also selling to the Korean consumers. Hence, we can assume that there exists intense competition between the United States and China in certain categories in the Korean food market, and these Chinese products may substitute American exported products in Korea in the near future.

The similarity index for Canada and Australia are relatively insignificant, as they show very low numerical values. This once again supports the thesis that China will mainly compete with America in the Korean imported food market. As for other exporters, Brazil shows growing similarity to China in the 1994-1997 timeframe, and becomes more identical to China at an accelerating rate after 1998. Argentina also follows this trend, although at a different rate. The reason, however, why South American countries show these patterns in similarity indexes has not been identified yet. India, shows opposite drifts of export structure from that of China. From 1990-1997, the similarity indexes incline from 0.13 to 0.23, but drops significantly in the following years, which confirms the significant difference of export structures.

Table 6. Similarity index of agricultural export structures compared with China

| Top-20 Exporters To Korea | 1990-2005 | 1990-1993 | 1994-1997 | 1998-2001 | 2002-2005 |
|----------------------------------|------------------|------------------|------------------|------------------|------------------|
| USA | 0.54 | 0.37 | 0.60 | 0.57 | 0.18 |
| Australia | 0.05 | 0.03 | 0.02 | 0.08 | 0.08 |
| Canada | 0.05 | 0.01 | 0.05 | 0.03 | 0.03 |
| Brazil | 0.39 | 0.05 | 0.14 | 0.36 | 0.71 |
| Japan | 0.04 | 0.01 | 0.05 | 0.03 | 0.04 |
| United Kingdom | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Thailand | 0.05 | 0.00 | 0.01 | 0.02 | 0.02 |
| Netherlands | 0.03 | 0.00 | 0.01 | 0.07 | 0.02 |
| India | 0.13 | 0.13 | 0.23 | 0.03 | 0.07 |
| Philippines | 0.04 | 0.02 | 0.08 | 0.04 | 0.02 |
| Malaysia | 0.01 | 0.00 | 0.02 | 0.02 | 0.01 |
| Germany | 0.03 | 0.01 | 0.04 | 0.03 | 0.03 |
| Indonesia | 0.05 | 0.02 | 0.07 | 0.04 | 0.04 |
| France | 0.03 | 0.01 | 0.05 | 0.02 | 0.02 |
| Argentina | 0.68 | 0.08 | 0.88 | 0.73 | 0.87 |
| Guatemala | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 |
| Spain | 0.02 | 0.00 | 0.02 | 0.03 | 0.03 |
| Viet Nam | 0.04 | 0.08 | 0.06 | 0.02 | 0.02 |
| South Africa | - | - | - | 0.06 | 0.01 |

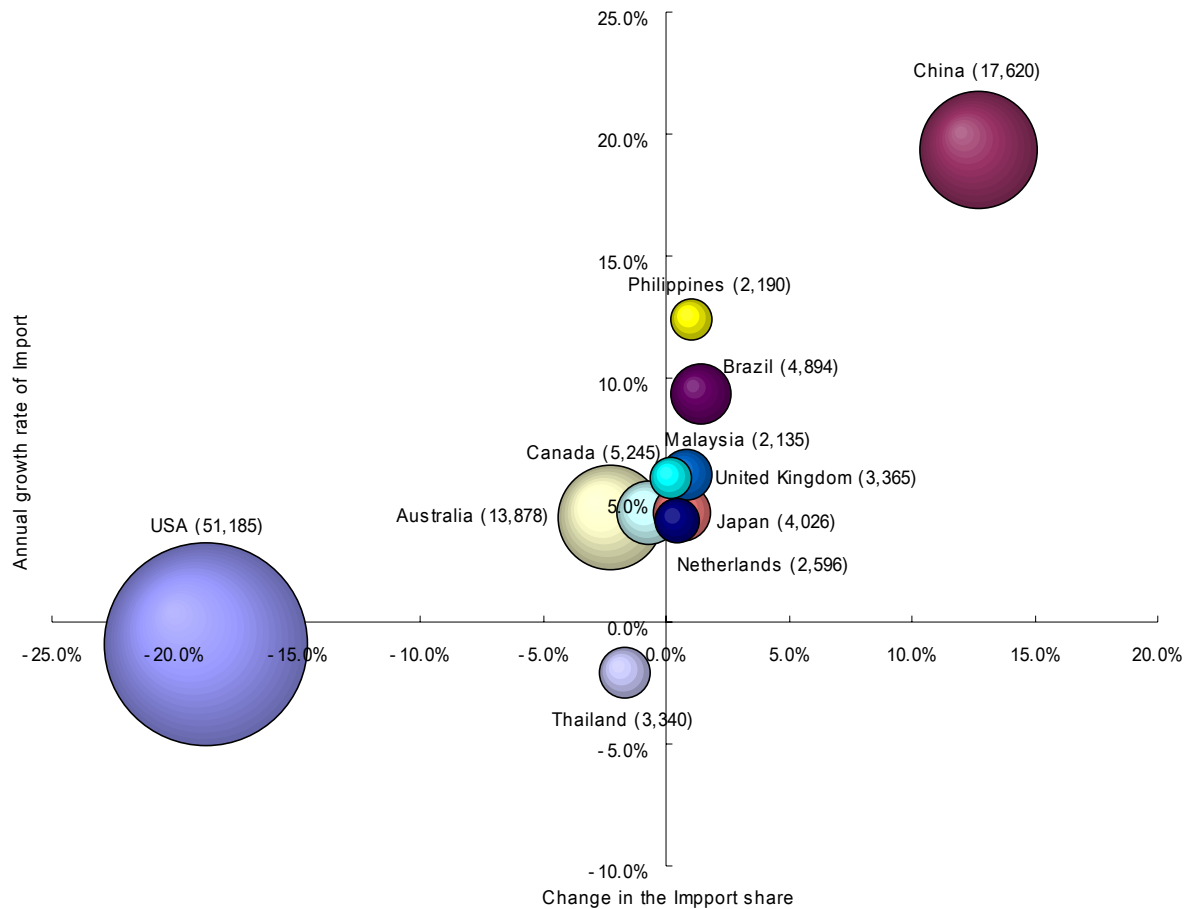
5. Relative Market Shares of Exports to Korea

In Table 7 and Figure 8, which is a graphic representation of the table 7, China and the United States are at the antipode of each other. The horizontal axis represents changes in export share, while the vertical axis denotes annual growth rate of exports for that particular country. The radius of each ball that represents each country's export volume: therefore the larger the ball, the larger the total trade value of exports. If the country is plotted in the north-east side (1st quadrant), it implies that the country is enjoying both increasing market share in the Korean market and annual export growth in the economy. On the other hand, if the country is plotted on the south-west corner (3rd quadrant) the country will face diminishing market share and negative export growth.

Table 7. Performances of Agricultural Exports to Korea (1990-2005)

| Top-20 Exporters | Export Value (US\$ million) | Change in Export Share | Annual growth rate of Export |
|------------------|-----------------------------|------------------------|------------------------------|
| | 1990-2005 | 1990-2005 | 1990-2005 |
| USA | 51,185 | -18.73% | -0.88% |
| China | 17,620 | 12.70% | 19.38% |
| Australia | 13,878 | -2.27% | 4.28% |
| Canada | 5,245 | -0.74% | 4.47% |
| Brazil | 4,894 | 1.39% | 9.36% |
| Japan | 4,026 | 0.61% | 4.45% |
| United Kingdom | 3,365 | 0.84% | 6.06% |
| Thailand | 3,340 | -1.70% | -2.08% |
| Netherlands | 2,596 | 0.46% | 4.15% |
| India | 2,491 | 1.06% | 6.60% |
| Philippines | 2,190 | 1.05% | 12.40% |
| Malaysia | 2,135 | 0.17% | 5.93% |
| Germany | 1,894 | 1.55% | 118.01% |
| Indonesia | 1,894 | 0.45% | 6.41% |
| France | 1,642 | 0.78% | 12.55% |
| Argentina | 1,542 | 0.88% | 16.31% |
| Guatemala | 632 | 0.46% | 20.07% |
| Spain | 626 | 0.31% | 16.66% |
| Viet Nam | 591 | 0.48% | 0.00% |
| South Africa | 299 | 0.24% | 110.66% |

Figure 8. The change of market share in the Korean import market, and annual export growth



Although smaller in volume (the radius of the ball), China is shows high marks in both import share and growth rate, while their American counterparts are shown that they are not only stalling in growth, but also losing share in the Korean food market. From 1990 to 2005, the United States has lost about 19% of market share in the Korean import market, while China has obtained roughly 13% in the same time period. Also, the American exports are generally on the decline, while Chinese exports are exponentially increasing. This substitution process can be re-affirmed in Figure 9. The chart shows that the export share of China is increasing , at the cost of a steeply declining American export share.

Figure 9. Trends of Total Export Share

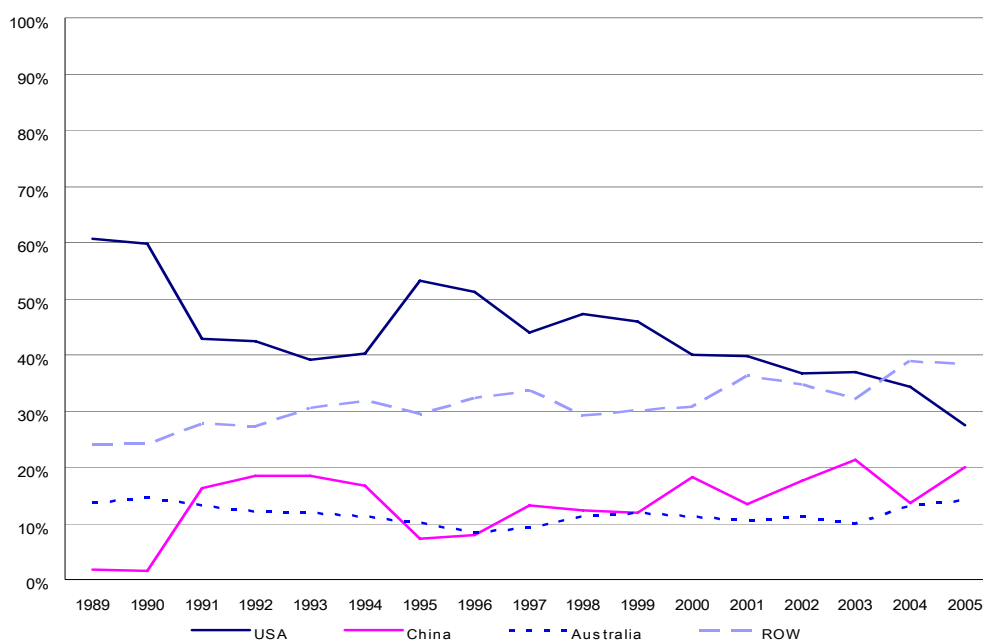


Table 8 depicts the change in market share of the Korean import market, and annual growth rates by the period of every 3-year. As seen in the table, from 1990-1993, China has shown increasing success in the Korean market, with annual growth rates over 63%, and obtaining over 12% of market share. In the 1994-1997 periods, Chinese products showed a 150% growth rate, but have recorded a 3% loss of market share. This is seen as a result of increased competitiveness of American agricultural products, which showed a 64% growth rate in the same timeframe. The fierce competition during this period must have led to the ironical situation of lost market share by the China, despite extraordinary export growth. The United States, on the

other hand, loses over 15% of market share from 1990 to 1993, and rebounds slightly in the 1994-1997 timeframe, but only returns to gradual decline of market share.

Table 8. Changes in market share in the Korean Agricultural Market

| Top-20 Exporters | Change Export Share | | | | Annual growth rate of Export | | | |
|---------------------|---------------------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|
| | 1990-1993 | 1994-1997 | 1998-2001 | 2002-2005 | 1990-1993 | 1994-1997 | 1998-2001 | 2002-2005 |
| USA | -15.12% | 2.06% | -4.71% | -6.26% | -6.92% | 64.37% | -5.81% | -2.96% |
| China | 12.38% | -3.19% | 3.21% | 3.51% | 63.31% | 150.4% | -3.05% | 16.58% |
| Australia | -0.80% | -3.22% | 1.60% | -0.11% | 0.53% | 5.95% | 0.14% | 13.42% |
| Canada | -0.68% | 0.60% | -1.14% | -0.28% | 8.54% | -2.10% | -8.91% | 14.07% |
| Brazil | -0.37% | 1.27% | -0.06% | 1.78% | 0.60% | 11.96% | 4.51% | 9.46% |
| Japan | 0.47% | 0.55% | -0.40% | -0.22% | 10.84% | -6.03% | -3.34% | 2.35% |
| UK | 0.08% | 0.63% | 0.28% | 1.80% | 2.42% | 13.50% | 1.80% | -1.15% |
| Thailand | -0.13% | -1.22% | -1.19% | 0.02% | -1.01% | 47.05% | -12.01% | -3.22% |
| Netherlands | 1.20% | -0.54% | -0.27% | -0.72% | 23.95% | 44.86% | -14.40% | 9.14% |
| India | 0.63% | 0.34% | 0.05% | 0.39% | 26.33% | 65.88% | 0.22% | -4.26% |
| Philippines | 0.88% | -0.21% | 0.46% | -0.09% | 23.55% | 12.57% | 4.17% | 15.72% |
| Malaysia | 0.14% | 0.09% | -0.12% | -0.28% | 6.60% | 15.50% | -11.40% | 17.30% |
| Germany | 0.91% | 0.90% | -0.12% | 0.13% | 451.41% | -19.13% | -3.23% | 7.85% |
| Indonesia | -0.10% | 0.70% | 0.06% | -0.27% | 4.34% | 6.41% | -14.95% | 14.65% |
| France | 0.25% | 0.26% | 0.43% | -0.14% | 15.25% | 13.51% | 4.82% | 16.07% |
| Argentina | 0.02% | 0.64% | 0.26% | 0.68% | -42.76% | 143.96% | 0.85% | 9.55% |
| Guatemala | -0.03% | 0.02% | 1.00% | 0.21% | -43.55% | -16.61% | 63.65% | -15.59% |
| Spain | 0.12% | 0.06% | 0.01% | 0.00% | 17.84% | 2.29% | -6.16% | 39.69% |
| Vietnam | 0.17% | 0.27% | 0.23% | -0.21% | 420.10% | 0.51% | 3.92% | 8.08% |
| South Africa | 0.00% | 0.00% | 0.44% | 0.06% | 0.00% | 0.00% | 454.07% | -11.43% |

6. Index of Chinese Competitive Threat to USA and other exporting countries

The next step is to derive an index which represents the pattern of competitive threat from China to USA, and other exporters based on the relative market share of each exporter in Korean market. The analysis of the pattern of competitive threat after 1990 will follow the conceptual framework of Lall and Albaladejo (2004). For an in-depth evaluation, we have categorized the threat of China into 5 types: Direct Threat, Partial Threat, No Threat, China under threat, and Mutual Withdrawal. The definitions of each type are as follows.

- (a) Direct Threat (5): China gains market share while its competing country loses their market share in the Korean food market, implying that China is overtaking the market share from its competitor.
- (b) Partial Threat (4): Both China and its competitor gain market share, but China shows higher growth rate.
- (c) No Threat (3): Both China and its competitor gain market share, but China shows lower growth rate.

- (d) China under threat (2): China loses market share, while the competing country shows growth in the Korean market.
- (e) Mutual Withdrawal (1): The competitor and China both lose market share, which implies that both countries have lost their competitiveness as a whole in the Korean market.
- (f) No export (0): No exports exist for this country.

Table 9. Competitive Threat of China to top-20 exporters in Korea by Periods

| Period | USA | Australia | Canada | Brazil | Japan | UK | Thailand | Netherlands | India | Malaysia |
|-----------|---------|-----------|--------|-----------|-----------|-------|----------|--------------|-------------|----------|
| 1990-1993 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 4 |
| 1994-1997 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 4 |
| 1998-2001 | 5 | 3 | 5 | 0 | 5 | 3 | 5 | 5 | 3 | 5 |
| 2002-2005 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 5 | 4 | 5 |
| 1990-2005 | 5 | 5 | 5 | 4 | 4 | 4 | 5 | 4 | 4 | 4 |
| Period | Germany | Indonesia | France | Argentina | Guatemala | Spain | Vietnam | South Africa | Philippines | |
| 1990-1993 | 3 | 5 | 4 | 4 | 5 | 4 | 3 | 0 | 4 | |
| 1994-1997 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 0 | 1 | |
| 1998-2001 | 5 | 4 | 3 | 3 | 3 | 4 | 3 | 0 | 3 | |
| 2002-2005 | 4 | 5 | 5 | 4 | 4 | 3 | 5 | 4 | 5 | |
| 1990-2005 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 4 | |

0: No export/1: Mutual Withdrawal/2: China under threat

3: No Threat/4: Partial Threat/5: Direct Threat

The United States of America along with Australia, Canada and Thailand falls under the Direct Threat category. With the exemption of Germany, Guatemala, and the Republic of South Africa, it is shown that a total of 16 countries have received either direct or indirect threat in the Korean market after the Chinese inflow of agricultural products. Although there are some different interpretations in the time series analysis, the results generally show that China has been a threat in most, if not all, major agricultural exporters to Korea.

The results of the in-depth examination through four-digit HS codes show that products of the US are shown to be the most affected by Chinese growth, where over 80% of American exports have been affected by their Chinese counterparts, either directly or partially. The exact measurements of each country by item are in the appendix for reference. In Table 10, we can see that 91 items out of 173 exporting items (52.6%) fall under the Direct Threat category.

Table 10. Number of Products by Types of Chinese Threat (Four-digit HS Code, 1990-2005)

| Top-20 Exporters | Direct Threat | Partial Threat | No Threat | China under threat | Mutual Withdrawal | Total |
|------------------|---------------|----------------|-----------|--------------------|-------------------|---------|
| USA | 91 | 54 | 25 | 0 | 3 | 173 |
| | 52.60% | 31.20% | 14.50% | 0.00% | 1.70% | 100.00% |
| Australia | 24 | 71 | 51 | 12 | 5 | 163 |
| | 14.70% | 43.60% | 31.30% | 7.40% | 3.10% | 100.00% |
| Canada | 30 | 55 | 40 | 12 | 2 | 139 |
| | 21.60% | 39.60% | 28.80% | 8.60% | 1.40% | 100.00% |
| Brazil | 16 | 39 | 24 | 4 | 1 | 84 |
| | 19.00% | 46.40% | 28.60% | 4.80% | 1.20% | 100.00% |
| Japan | 83 | 53 | 19 | 11 | 8 | 174 |
| | 47.70% | 30.50% | 10.90% | 6.30% | 4.60% | 100.00% |
| United Kingdom | 35 | 63 | 20 | 0 | 5 | 123 |
| | 28.50% | 51.20% | 16.30% | 0.00% | 4.10% | 100.00% |
| Thailand | 35 | 49 | 31 | 0 | 3 | 118 |
| | 29.70% | 41.50% | 26.30% | 0.00% | 2.50% | 100.00% |
| Netherlands | 41 | 53 | 34 | 7 | 7 | 142 |
| | 28.90% | 37.30% | 23.90% | 4.90% | 4.90% | 100.00% |
| India | 19 | 55 | 26 | 4 | 2 | 106 |
| | 17.90% | 51.90% | 24.50% | 3.80% | 1.90% | 100.00% |
| Philippines | 26 | 36 | 19 | 0 | 0 | 81 |
| | 32.10% | 44.40% | 23.50% | 0.00% | 0.00% | 100.00% |
| Malaysia | 14 | 48 | 29 | 10 | 1 | 102 |
| | 13.70% | 47.10% | 28.40% | 9.80% | 1.00% | 100.00% |
| Germany | 0 | 69 | 55 | 17 | 0 | 141 |
| | 0.00% | 48.90% | 39.00% | 12.10% | 0.00% | 100.00% |
| Indonesia | 24 | 53 | 32 | 8 | 1 | 118 |
| | 20.30% | 44.90% | 27.10% | 6.80% | 0.80% | 100.00% |
| France | 31 | 70 | 37 | 10 | 6 | 154 |
| | 20.10% | 45.50% | 24.00% | 6.50% | 3.90% | 100.00% |
| Argentina | 4 | 40 | 19 | 7 | 3 | 73 |
| | 5.50% | 54.80% | 26.00% | 9.60% | 4.10% | 100.00% |
| Guatemala | 2 | 5 | 5 | 2 | 0 | 14 |
| | 14.30% | 35.70% | 35.70% | 14.30% | 0.00% | 100.00% |
| Spain | 10 | 50 | 26 | 0 | 4 | 90 |
| | 11.10% | 55.60% | 28.90% | 0.00% | 4.40% | 100.00% |
| Viet Nam | 0 | 92 | 4 | 0 | 0 | 96 |
| | 0.00% | 95.80% | 4.20% | 0.00% | 0.00% | 100.00% |
| South Africa | 0 | 27 | 22 | 0 | 0 | 49 |
| | 0.00% | 55.10% | 44.90% | 0.00% | 0.00% | 100.00% |

Cereal is a highly competitive market, with China, the United States, and Australia as major players. Identical analysis on sub-items within the category using four-digit HS codes show that the United States has been directly threatened by China in all cereal categories with the exemption of 1003 (Barley) and 1008 (Buckwheat, Millet, Canary Seed and other cereals.) This quintessentially means that American products are increasingly substituted by Chinese products in the most competitive cereal sector.

Table 11. Competitive Threat of China in HS 10 (Cereal) 1990-2005

| Top-20 Exporters | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 |
|---------------------|------|------|------|------|------|------|------|------|
| USA | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 4 |
| Australia | 4 | 3 | 4 | 4 | 3 | 4 | 3 | 5 |
| Canada | 4 | 5 | 5 | 5 | 4 | 0 | 4 | 4 |
| Brazil | 0 | 4 | 0 | 0 | 3 | 0 | 0 | 0 |
| Japan | 0 | 0 | 0 | 4 | 5 | 4 | 5 | 4 |
| U.K. | 4 | 4 | 4 | 0 | 4 | 0 | 0 | 0 |
| Thailand | 5 | 0 | 0 | 0 | 5 | 5 | 0 | 5 |
| Netherlands | 4 | 4 | 4 | 0 | 4 | 4 | 0 | 0 |
| India | 4 | 4 | 0 | 0 | 4 | 5 | 4 | 0 |
| Philippines | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 |
| Malaysia | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 |
| Germany | 4 | 4 | 4 | 0 | 0 | 4 | 0 | 0 |
| Indonesia | 3 | 0 | 0 | 0 | 4 | 0 | 0 | 0 |
| France | 4 | 4 | 0 | 0 | 4 | 0 | 0 | 0 |
| Argentina | 4 | 0 | 0 | 0 | 3 | 0 | 4 | 5 |
| Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spain | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vietnam | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 4 |
| South Africa | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 |

7. Conclusion

Korea, a large net-food importing country, is rapidly opening its doors to the world. The recent Free Trade Agreements with Chile and Singapore are expected to increase the openness of the economy and the competition in Korean food markets. Moreover, these agreements are acting as a strong signal to other major players in the global economy that Korea, once regarded as one of the most closed economies in terms of agriculture, is striving to transform itself into an open agricultural economy. Therefore, Korea is likely a highly-targeted market for agricultural

exporters. In the coming years, the Korean food market will face more competition.

This research has largely followed two conceptual frameworks. The first is the un-centered correlation distance approach proposed by Jaffe (1986) which helped uncover the similarities in the export structures of different exporters. The second framework is the concept of competitive threat used by Lall and Albaladejo (2004). Through this method, we have determined the relationship between any two exporters, by comparing their growth rate of exports to Korea. And by combining these two concepts, we have investigated the changing roles of China, the United States, and other exporting countries in the imported food market in Korea.

The results show that the United States, traditionally a large food exporter to Korea, is facing serious competition from Chinese exports. The similar export structures of China and the United States have made the latter vulnerable to competition. Furthermore, the geographic proximity of China to Korean markets confers the former two-fold advantages: similar food products and varieties, and lower transport costs. This is especially visible in cereal markets, where both countries have increased exports to the world, but show opposite trends in the Korean market. The market share of U.S. products has rapidly declined while that of China has witnessed exponential growth.

Using the concept of threat, we show that China poses a threat to the United States in virtually every agricultural product exported to Korea. Among 173 items exported to Korea, 91 items are directly threatened by Chinese products, and 54 items face a partial threat. This means roughly 80 percent of U.S. products are closely competing with Chinese exports.

With the recently signed Korea-United States Free Trade Agreement waiting for congress approval in both countries, it would be interesting to see how the elimination of trade barriers will affect the U.S. position in the Korean market. Additional research will be needed to assess the effects of trade and non-trade barriers, which immediately favor U.S. products, as well as the importance of factors such as low costs, similar breeds of crop, and geographical proximity, which favor Chinese products. Furthermore, the possibility of a Korea-China Free Trade Agreement increases the complexity of trade patterns and competition, which will remain as an important topic for future research.

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Appendix

1. Competitive Interaction with China (1993-2005)

| Exporter HS code | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 29 | 33 | 35 | 38 | 41 | 43 | 50 | 51 | 52 | 53 |
|------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| USA | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 5 | 3 | 5 | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 0 | 4 | 3 | 0 | 4 | 5 | 4 | 3 | 4 | 3 | 3 | 0 |
| Australia | 4 | 4 | 3 | 3 | 5 | 0 | 0 | 0 | 4 | 4 | 3 | 3 | 0 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 3 | 1 | 3 | 5 | 2 | 5 | 0 | 4 | 4 | 3 | 4 | 3 | 0 |
| Canada | 4 | 3 | 3 | 3 | 0 | 4 | 0 | 5 | 4 | 4 | 4 | 3 | 5 | 5 | 4 | 4 | 5 | 0 | 5 | 4 | 3 | 2 | 4 | 4 | 2 | 3 | 4 | 4 | 3 | 0 | 0 | 0 | 0 |
| Brazil | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 2 | 3 | 4 | 2 | 4 | 3 | 4 | 0 | 4 | 0 | 3 | 0 |
| Japan | 0 | 5 | 0 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 1 | 5 | 5 | 1 | 5 | 5 | 5 | 4 | 4 | 4 | 3 | 4 |
| United Kingdom | 4 | 3 | 3 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 1 | 3 | 0 | 0 | 5 | 5 | 4 | 3 | 4 | 3 | 4 | 4 |
| Thailand | 3 | 4 | 5 | 3 | 0 | 3 | 3 | 4 | 3 | 5 | 4 | 5 | 3 | 5 | 4 | 4 | 5 | 0 | 4 | 5 | 5 | 1 | 5 | 0 | 1 | 5 | 5 | 5 | 0 | 4 | 3 | 3 | 4 |
| Netherlands | 5 | 3 | 4 | 0 | 4 | 5 | 0 | 5 | 5 | 5 | 5 | 0 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 1 | 3 | 4 | 1 | 4 | 4 | 4 | 4 | 5 | 5 | 0 | 5 |
| India | 4 | 5 | 3 | 4 | 0 | 0 | 3 | 5 | 4 | 5 | 5 | 4 | 0 | 4 | 5 | 0 | 4 | 0 | 0 | 4 | 3 | 2 | 3 | 0 | 2 | 0 | 4 | 4 | 0 | 4 | 0 | 3 | 5 |
| Philippines | 5 | 5 | 0 | 5 | 4 | 0 | 3 | 5 | 5 | 5 | 5 | 3 | 3 | 4 | 5 | 5 | 5 | 3 | 4 | 5 | 5 | 1 | 4 | 3 | 1 | 5 | 5 | 5 | 0 | 4 | 0 | 5 | 0 |
| Malaysia | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | 4 | 0 | 5 | 4 | 3 | 4 | 4 | 3 | 2 | 3 | 3 | 2 | 4 | 3 | 0 | 0 | 4 | 4 | 3 | 0 |
| Germany | 3 | 3 | 3 | 0 | 3 | 0 | 3 | 0 | 4 | 4 | 0 | 3 | 3 | 0 | 5 | 3 | 4 | 3 | 0 | 3 | 3 | 1 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 5 | 3 | 3 | 4 |
| Indonesia | 3 | 4 | 3 | 4 | 4 | 4 | 5 | 4 | 3 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 5 | 3 | 0 | 4 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 4 | 0 | 5 | 0 | 3 | 0 |
| France | 5 | 3 | 4 | 3 | 4 | 5 | 3 | 4 | 4 | 5 | 5 | 5 | 3 | 4 | 4 | 5 | 4 | 3 | 3 | 4 | 4 | 1 | 4 | 4 | 1 | 5 | 4 | 5 | 5 | 5 | 4 | 3 | 5 |
| Argentina | 3 | 4 | 3 | 5 | 4 | 4 | 0 | 3 | 4 | 4 | 3 | 4 | 0 | 3 | 5 | 3 | 4 | 4 | 3 | 4 | 3 | 1 | 3 | 3 | 0 | 4 | 3 | 4 | 0 | 0 | 5 | 5 | 0 |
| Guatemala | 5 | 5 | 0 | 5 | 4 | 5 | 5 | 5 | 0 | 4 | 0 | 0 | 0 | 4 | 5 | 3 | 0 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 3 | 0 |
| Spain | 3 | 3 | 5 | 5 | 4 | 3 | 4 | 5 | 0 | 0 | 4 | 5 | 3 | 3 | 4 | 5 | 4 | 0 | 5 | 5 | 4 | 1 | 0 | 4 | 1 | 3 | 5 | 4 | 3 | 4 | 4 | 3 | 0 |
| Vietnam | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 1 | 5 | 5 | 0 | 5 | 4 | 5 | 5 | 4 | 0 | 4 | 4 |
| South Africa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 5 | 0 | 0 | 0 | 1 | 5 | 0 | 1 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

2. Similarity Index Matrix for export structures by Periods

| 1990-1993 | ARG | AUS | BRA | CAN | CHI | FRA | GER | GTM | IND | IDN | JAP | MYS | NED | PHL | RSA | ESP | THA | UK | USA | VNM |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Argentina | 1 | 0.1 | 0.2 | 0 | 0.1 | 0 | 0 | 0.1 | 0.7 | 0.3 | 0 | 0 | 0 | 0 | n/a | 0 | 0 | 0 | 0.1 | 0 |
| Australia | 0.1 | 1 | 0 | 0.4 | 0 | 0.1 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0 | 0.1 | 0 | n/a | 0 | 0.4 | 0.2 | 0.4 | 0.1 |
| Brazil | 0.2 | 0 | 1 | 0 | 0.1 | 0.1 | 0.1 | 0.3 | 0.1 | 0.2 | 0.1 | 0 | 0 | 0 | n/a | 0 | 0.1 | 0 | 0.1 | 0.1 |
| Canada | 0 | 0.4 | 0 | 1 | 0 | 0.4 | 0.4 | 0 | 0 | 0 | 0.3 | 0 | 0.3 | 0 | n/a | 0 | 0 | 0.4 | 0.5 | 0 |
| China | 0.1 | 0 | 0.1 | 0 | 1 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | n/a | 0 | 0 | 0 | 0.4 | 0.1 |
| France | 0 | 0.1 | 0.1 | 0.4 | 0 | 1 | 0.6 | 0 | 0 | 0 | 0.6 | 0.1 | 0.3 | 0 | n/a | 0.2 | 0 | 0.2 | 0.2 | 0.1 |
| Germany | 0 | 0.1 | 0.1 | 0.4 | 0 | 0.6 | 1 | 0 | 0 | 0 | 0.9 | 0.1 | 0.2 | 0 | n/a | 0.1 | 0 | 0.1 | 0.1 | 0 |
| Guatemala | 0.1 | 0.1 | 0.3 | 0 | 0 | 0 | 0 | 1 | 0.2 | 0.4 | 0 | 0 | 0 | 0 | n/a | 0 | 0 | 0 | 0.2 | 0.1 |
| India | 0.7 | 0.1 | 0.1 | 0 | 0.1 | 0 | 0 | 0.2 | 1 | 0 | 0 | 0 | 0 | 0 | n/a | 0 | 0 | 0 | 0.1 | 0 |
| Indonesia | 0.3 | 0 | 0.2 | 0 | 0 | 0 | 0 | 0.4 | 0 | 1 | 0 | 0 | 0 | 0.1 | n/a | 0.1 | 0.1 | 0 | 0 | 0.2 |
| Japan | 0 | 0 | 0.1 | 0.3 | 0 | 0.6 | 0.9 | 0 | 0 | 0 | 1 | 0.1 | 0.2 | 0 | n/a | 0.1 | 0 | 0.1 | 0.1 | 0 |
| Malaysia | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.1 | 0 | 0 | 0 | 0.1 | 1 | 0 | 0 | n/a | 0 | 0 | 0 | 0 | 0 |
| Netherlands | 0 | 0.1 | 0 | 0.3 | 0 | 0.3 | 0.2 | 0 | 0 | 0 | 0.2 | 0 | 1 | 0 | n/a | 0 | 0 | 0.5 | 0.7 | 0 |
| Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 1 | n/a | 0 | 0 | 0 | 0 | 0.4 |
| South Africa | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | |
| Spain | 0 | 0 | 0 | 0 | 0 | 0.2 | 0.1 | 0 | 0 | 0.1 | 0.1 | 0 | 0 | 0 | n/a | 1 | 0 | 0.1 | 0 | 0 |
| Thailand | 0 | 0.4 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | n/a | 0 | 1 | 0 | 0 | 0.3 |
| United Kingdom | 0 | 0.2 | 0 | 0.4 | 0 | 0.2 | 0.1 | 0 | 0 | 0 | 0.1 | 0 | 0.5 | 0 | n/a | 0.1 | 0 | 1 | 0.5 | 0 |
| USA | 0.1 | 0.4 | 0.1 | 0.5 | 0.4 | 0.2 | 0.1 | 0.2 | 0.1 | 0 | 0.1 | 0 | 0.7 | 0 | n/a | 0 | 0 | 0.5 | 1 | 0 |
| Viet Nam | 0 | 0.1 | 0.1 | 0 | 0.1 | 0.1 | 0 | 0.1 | 0 | 0.2 | 0 | 0 | 0 | 0.4 | n/a | 0 | 0.3 | 0 | 0 | 1 |

| 1994-1997 | ARG | AUS | BRA | CAN | CHI | FRA | GER | GTM | IND | IDN | JAP | MYS | NED | PHL | RSA | ESP | THA | UK | USA | VNM |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|------|------|------|------|------|
| Argentina | 1 | 0.06 | 0.15 | 0.12 | 0.88 | 0.01 | 0.01 | 0 | 0.18 | 0.06 | 0.01 | 0 | 0 | 0.02 | n/a | 0 | 0 | 0 | 0.68 | 0 |
| Australia | 0.06 | 1 | 0.01 | 0.4 | 0.02 | 0.04 | 0.01 | 0 | 0.1 | 0 | 0.02 | 0.03 | 0.04 | 0.06 | n/a | 0.01 | 0.61 | 0.02 | 0.25 | 0 |
| Brazil | 0.15 | 0.01 | 1 | 0.05 | 0.14 | 0.04 | 0.06 | 0.15 | 0.57 | 0.1 | 0.07 | 0.01 | 0.03 | 0.01 | n/a | 0.13 | 0.04 | 0 | 0.11 | 0.16 |
| Canada | 0.12 | 0.4 | 0.05 | 1 | 0.05 | 0.24 | 0.26 | 0 | 0.21 | 0.06 | 0.31 | 0.05 | 0.2 | 0.02 | n/a | 0.04 | 0 | 0.06 | 0.34 | 0 |
| China | 0.88 | 0.02 | 0.14 | 0.05 | 1 | 0.05 | 0.04 | 0 | 0.23 | 0.07 | 0.05 | 0.02 | 0.01 | 0.08 | n/a | 0.02 | 0.01 | 0.01 | 0.6 | 0.06 |
| France | 0.01 | 0.04 | 0.04 | 0.24 | 0.05 | 1 | 0.34 | 0 | 0.02 | 0.03 | 0.26 | 0.04 | 0.39 | 0.01 | n/a | 0.2 | 0.01 | 0.37 | 0.12 | 0.01 |
| Germany | 0.01 | 0.01 | 0.06 | 0.26 | 0.04 | 0.34 | 1 | 0.02 | 0.01 | 0.04 | 0.5 | 0.04 | 0.29 | 0.01 | n/a | 0.12 | 0.01 | 0.03 | 0.13 | 0.02 |
| Guatemala | 0 | 0 | 0.15 | 0 | 0 | 0 | 0.02 | 1 | 0.05 | 0.57 | 0 | 0 | 0 | 0.03 | n/a | 0.35 | 0.16 | 0 | 0 | 0.69 |
| India | 0.18 | 0.1 | 0.57 | 0.21 | 0.23 | 0.02 | 0.01 | 0.05 | 1 | 0.21 | 0.01 | 0.05 | 0 | 0.21 | n/a | 0.03 | 0.01 | 0.01 | 0.06 | 0.02 |
| Indonesia | 0.06 | 0 | 0.1 | 0.06 | 0.07 | 0.03 | 0.04 | 0.57 | 0.21 | 1 | 0.04 | 0.07 | 0.01 | 0.16 | n/a | 0.21 | 0.14 | 0 | 0.01 | 0.51 |
| Japan | 0.01 | 0.02 | 0.07 | 0.31 | 0.05 | 0.26 | 0.5 | 0 | 0.01 | 0.04 | 1 | 0.05 | 0.17 | 0.01 | n/a | 0.09 | 0.01 | 0.07 | 0.2 | 0.01 |
| Malaysia | 0 | 0.03 | 0.01 | 0.05 | 0.02 | 0.04 | 0.04 | 0 | 0.05 | 0.07 | 0.05 | 1 | 0.01 | 0.03 | n/a | 0.01 | 0 | 0 | 0.01 | 0 |
| Netherlands | 0 | 0.04 | 0.03 | 0.2 | 0.01 | 0.39 | 0.29 | 0 | 0 | 0.01 | 0.17 | 0.01 | 1 | 0.01 | n/a | 0.06 | 0 | 0.14 | 0.48 | 0 |
| Philippines | 0.02 | 0.06 | 0.01 | 0.02 | 0.08 | 0.01 | 0.01 | 0.03 | 0.21 | 0.16 | 0.01 | 0.03 | 0.01 | 1 | n/a | 0.02 | 0.11 | 0 | 0.01 | 0.08 |
| South Africa | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Spain | 0 | 0.01 | 0.13 | 0.04 | 0.02 | 0.2 | 0.12 | 0.35 | 0.03 | 0.21 | 0.09 | 0.01 | 0.06 | 0.02 | n/a | 1 | 0.06 | 0.02 | 0.03 | 0.35 |
| Thailand | 0 | 0.61 | 0.04 | 0 | 0.01 | 0.01 | 0.01 | 0.16 | 0.01 | 0.14 | 0.01 | 0 | 0 | 0.11 | n/a | 0.06 | 1 | 0 | 0 | 0.18 |
| United Kingdom | 0 | 0.02 | 0 | 0.06 | 0.01 | 0.37 | 0.03 | 0 | 0.01 | 0 | 0.07 | 0 | 0.14 | 0 | n/a | 0.02 | 0 | 1 | 0.09 | 0 |
| USA | 0.68 | 0.25 | 0.11 | 0.34 | 0.6 | 0.12 | 0.13 | 0 | 0.06 | 0.01 | 0.2 | 0.01 | 0.48 | 0.01 | n/a | 0.03 | 0 | 0.09 | 1 | 0.01 |
| Viet Nam | 0 | 0 | 0.16 | 0 | 0.06 | 0.01 | 0.02 | 0.69 | 0.02 | 0.51 | 0.01 | 0 | 0 | 0.08 | n/a | 0.35 | 0.18 | 0 | 0.01 | 1 |

| 1998-2001 | ARG | AUS | BRA | CAN | CHI | FRA | GER | GTM | IND | IDN | JAP | MYS | NED | PHL | RSA | ESP | THA | UK | USA | VNM |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Argentina | 1 | 0.03 | 0.76 | 0.03 | 0.73 | 0.01 | 0.01 | 0 | 0.58 | 0.05 | 0.01 | 0.01 | 0.05 | 0.02 | 0.04 | 0.01 | 0 | 0 | 0.46 | 0 |
| Australia | 0.03 | 1 | 0.01 | 0.34 | 0.08 | 0.08 | 0.02 | 0.57 | 0.06 | 0.01 | 0.04 | 0.01 | 0.17 | 0.01 | 0.57 | 0.01 | 0.48 | 0.03 | 0.36 | 0 |
| Brazil | 0.76 | 0.01 | 1 | 0.09 | 0.36 | 0.02 | 0.08 | 0.02 | 0.81 | 0.1 | 0.07 | 0.01 | 0.05 | 0 | 0.05 | 0.22 | 0.03 | 0 | 0.31 | 0.09 |
| Canada | 0.03 | 0.34 | 0.09 | 1 | 0.03 | 0.38 | 0.55 | 0 | 0.05 | 0.4 | 0.51 | 0.06 | 0.49 | 0.03 | 0 | 0.02 | 0.01 | 0.03 | 0.43 | 0 |
| China | 0.73 | 0.08 | 0.36 | 0.03 | 1 | 0.02 | 0.03 | 0 | 0.03 | 0.04 | 0.03 | 0.02 | 0.07 | 0.04 | 0.06 | 0.03 | 0.02 | 0.01 | 0.57 | 0.02 |
| France | 0.01 | 0.08 | 0.02 | 0.38 | 0.02 | 1 | 0.25 | 0 | 0.02 | 0.1 | 0.18 | 0.02 | 0.67 | 0.01 | 0 | 0.07 | 0.02 | 0.31 | 0.1 | 0 |
| Germany | 0.01 | 0.02 | 0.08 | 0.55 | 0.03 | 0.25 | 1 | 0 | 0.02 | 0.33 | 0.8 | 0.05 | 0.4 | 0.01 | 0 | 0.18 | 0.03 | 0.07 | 0.26 | 0.04 |
| Guatemala | 0 | 0.57 | 0.02 | 0 | 0 | 0 | 0 | 1 | 0 | 0.01 | 0 | 0 | 0 | 0 | 1 | 0.01 | 0.84 | 0 | 0 | 0.02 |
| India | 0.58 | 0.06 | 0.81 | 0.05 | 0.03 | 0.02 | 0.02 | 0 | 1 | 0.07 | 0.01 | 0.02 | 0.03 | 0.05 | 0.01 | 0.02 | 0.02 | 0.01 | 0.06 | 0.02 |
| Indonesia | 0.05 | 0.01 | 0.1 | 0.4 | 0.04 | 0.1 | 0.33 | 0.01 | 0.07 | 1 | 0.31 | 0.13 | 0.12 | 0.13 | 0 | 0.17 | 0.1 | 0 | 0.07 | 0.38 |
| Japan | 0.01 | 0.04 | 0.07 | 0.51 | 0.03 | 0.18 | 0.8 | 0 | 0.01 | 0.31 | 1 | 0.05 | 0.28 | 0.01 | 0 | 0.17 | 0.02 | 0.1 | 0.19 | 0 |
| Malaysia | 0.01 | 0.01 | 0.01 | 0.06 | 0.02 | 0.02 | 0.05 | 0 | 0.02 | 0.13 | 0.05 | 1 | 0.02 | 0.04 | 0 | 0 | 0.01 | 0 | 0.01 | 0.01 |
| Netherlands | 0.05 | 0.17 | 0.05 | 0.49 | 0.07 | 0.67 | 0.4 | 0 | 0.03 | 0.12 | 0.28 | 0.02 | 1 | 0.01 | 0 | 0.05 | 0.03 | 0.05 | 0.44 | 0 |
| Philippines | 0.02 | 0.01 | 0 | 0.03 | 0.04 | 0.01 | 0.01 | 0 | 0.05 | 0.13 | 0.01 | 0.04 | 0.01 | 1 | 0.01 | 0.03 | 0.05 | 0 | 0.01 | 0.01 |
| South Africa | 0.04 | 0.57 | 0.05 | 0 | 0.06 | 0 | 0 | 1 | 0.01 | 0 | 0 | 0 | 0 | 0.01 | 1 | 0.01 | 0.84 | 0 | 0.03 | 0 |
| Spain | 0.01 | 0.01 | 0.22 | 0.02 | 0.03 | 0.07 | 0.18 | 0.01 | 0.02 | 0.17 | 0.17 | 0 | 0.05 | 0.03 | 0.01 | 1 | 0.06 | 0.02 | 0.05 | 0.25 |
| Thailand | 0 | 0.48 | 0.03 | 0.01 | 0.02 | 0.02 | 0.03 | 0.84 | 0.02 | 0.1 | 0.02 | 0.01 | 0.03 | 0.05 | 0.84 | 0.06 | 1 | 0 | 0.02 | 0.21 |
| United Kingdom | 0 | 0.03 | 0 | 0.03 | 0.01 | 0.31 | 0.07 | 0 | 0.01 | 0 | 0.1 | 0 | 0.05 | 0 | 0 | 0.02 | 0 | 1 | 0.04 | 0 |
| USA | 0.46 | 0.36 | 0.31 | 0.43 | 0.57 | 0.1 | 0.26 | 0 | 0.06 | 0.07 | 0.19 | 0.01 | 0.44 | 0.01 | 0.03 | 0.05 | 0.02 | 0.04 | 1 | 0 |
| Viet Nam | 0 | 0 | 0.09 | 0 | 0.02 | 0 | 0.04 | 0.02 | 0.02 | 0.38 | 0 | 0.01 | 0 | 0.01 | 0 | 0.25 | 0.21 | 0 | 0 | 1 |

| 2002-2005 | ARG | AUS | BRA | CAN | CHI | FRA | GER | GTM | IND | IDN | JAP | MYS | NED | PHL | RSA | ESP | THA | UK | USA | VNM |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Argentina | 1 | 0.01 | 0.73 | 0 | 0.87 | 0 | 0 | 0 | 0.17 | 0.01 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0.13 | 0 |
| Australia | 0.01 | 1 | 0.02 | 0.3 | 0.08 | 0.04 | 0.03 | 0.39 | 0.13 | 0 | 0.05 | 0 | 0.06 | 0 | 0.4 | 0.02 | 0.16 | 0 | 0.58 | 0 |
| Brazil | 0.73 | 0.02 | 1 | 0.01 | 0.71 | 0.01 | 0.02 | 0.03 | 0.58 | 0.03 | 0.01 | 0 | 0.01 | 0 | 0.06 | 0.08 | 0.02 | 0 | 0.18 | 0.03 |
| Canada | 0 | 0.3 | 0.01 | 1 | 0.03 | 0.18 | 0.54 | 0 | 0.05 | 0.4 | 0.47 | 0.05 | 0.32 | 0.02 | 0.01 | 0.04 | 0.02 | 0.01 | 0.51 | 0 |
| China | 0.87 | 0.08 | 0.71 | 0.03 | 1 | 0.02 | 0.03 | 0 | 0.07 | 0.04 | 0.04 | 0.01 | 0.02 | 0.02 | 0.01 | 0.03 | 0.02 | 0.01 | 0.18 | 0.02 |
| France | 0 | 0.04 | 0.01 | 0.18 | 0.02 | 1 | 0.29 | 0 | 0.01 | 0.1 | 0.22 | 0.02 | 0.33 | 0.01 | 0.01 | 0.18 | 0.04 | 0.62 | 0.07 | 0.01 |
| Germany | 0 | 0.03 | 0.02 | 0.54 | 0.03 | 0.29 | 1 | 0 | 0.02 | 0.34 | 0.8 | 0.04 | 0.41 | 0.01 | 0.01 | 0.21 | 0.05 | 0.21 | 0.25 | 0.03 |
| Guatemala | 0 | 0.39 | 0.03 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.99 | 0 | 0.38 | 0 | 0 | 0 |
| India | 0.17 | 0.13 | 0.58 | 0.05 | 0.07 | 0.01 | 0.02 | 0 | 1 | 0.17 | 0.01 | 0.03 | 0.01 | 0.05 | 0.01 | 0.02 | 0.02 | 0 | 0.07 | 0.01 |
| Indonesia | 0.01 | 0 | 0.03 | 0.4 | 0.04 | 0.1 | 0.34 | 0 | 0.17 | 1 | 0.29 | 0.23 | 0.14 | 0.14 | 0.01 | 0.14 | 0.06 | 0 | 0.06 | 0.17 |
| Japan | 0 | 0.05 | 0.01 | 0.47 | 0.04 | 0.22 | 0.8 | 0 | 0.01 | 0.29 | 1 | 0.04 | 0.43 | 0.01 | 0.02 | 0.19 | 0.05 | 0.27 | 0.22 | 0.01 |
| Malaysia | 0.01 | 0 | 0 | 0.05 | 0.01 | 0.02 | 0.04 | 0 | 0.03 | 0.23 | 0.04 | 1 | 0.04 | 0.03 | 0 | 0 | 0 | 0 | 0.01 | 0 |
| Netherlands | 0 | 0.06 | 0.01 | 0.32 | 0.02 | 0.33 | 0.41 | 0 | 0.01 | 0.14 | 0.43 | 0.04 | 1 | 0.01 | 0.01 | 0.09 | 0.08 | 0.07 | 0.12 | 0.01 |
| Philippines | 0 | 0 | 0 | 0.02 | 0.02 | 0.01 | 0.01 | 0 | 0.05 | 0.14 | 0.01 | 0.03 | 0.01 | 1 | 0.02 | 0.04 | 0.05 | 0 | 0.01 | 0.01 |
| South Africa | 0 | 0.4 | 0.06 | 0.01 | 0.01 | 0.01 | 0.01 | 0.99 | 0.01 | 0.01 | 0.02 | 0 | 0.01 | 0.02 | 1 | 0.03 | 0.39 | 0 | 0.01 | 0 |
| Spain | 0 | 0.02 | 0.08 | 0.04 | 0.03 | 0.18 | 0.21 | 0 | 0.02 | 0.14 | 0.19 | 0 | 0.09 | 0.04 | 0.03 | 1 | 0.05 | 0.04 | 0.07 | 0.11 |
| Thailand | 0 | 0.16 | 0.02 | 0.02 | 0.02 | 0.04 | 0.05 | 0.38 | 0.02 | 0.06 | 0.05 | 0 | 0.08 | 0.05 | 0.39 | 0.05 | 1 | 0 | 0.06 | 0.04 |
| United Kingdom | 0 | 0 | 0 | 0.01 | 0.01 | 0.62 | 0.21 | 0 | 0 | 0 | 0.27 | 0 | 0.07 | 0 | 0 | 0.04 | 0 | 1 | 0.04 | 0 |
| USA | 0.13 | 0.58 | 0.18 | 0.51 | 0.18 | 0.07 | 0.25 | 0 | 0.07 | 0.06 | 0.22 | 0.01 | 0.12 | 0.01 | 0.01 | 0.07 | 0.06 | 0.04 | 1 | 0.01 |
| Viet Nam | 0 | 0 | 0.03 | 0 | 0.02 | 0.01 | 0.03 | 0 | 0.01 | 0.17 | 0.01 | 0 | 0.01 | 0.01 | 0 | 0.11 | 0.04 | 0 | 0.01 | 1 |

| 1990-2005 | ARG | AUS | BRA | CAN | CHI | FRA | GER | GTM | IND | IDN | JAP | MYS | NED | PHL | RSA | ESP | THA | UK | USA | VNM |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Argentina | 1 | 0.03 | 0.63 | 0.04 | 0.68 | 0.01 | 0.01 | 0 | 0.45 | 0.06 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.03 | 0 | 0.39 | 0.01 |
| Australia | 0.03 | 1 | 0.02 | 0.42 | 0.05 | 0.06 | 0.03 | 0.53 | 0.09 | 0.01 | 0.03 | 0.01 | 0.08 | 0.02 | 0.53 | 0.01 | 0.5 | 0.03 | 0.4 | 0.01 |
| Brazil | 0.63 | 0.02 | 1 | 0.05 | 0.39 | 0.03 | 0.07 | 0.02 | 0.7 | 0.09 | 0.06 | 0.01 | 0.03 | 0 | 0.04 | 0.11 | 0.04 | 0 | 0.33 | 0.12 |
| Canada | 0.04 | 0.42 | 0.05 | 1 | 0.05 | 0.33 | 0.46 | 0 | 0.12 | 0.24 | 0.44 | 0.08 | 0.33 | 0.02 | 0.04 | 0.03 | 0 | 0.06 | 0.42 | 0 |
| China | 0.68 | 0.05 | 0.39 | 0.05 | 1 | 0.03 | 0.03 | 0 | 0.13 | 0.05 | 0.04 | 0.01 | 0.03 | 0.04 | 0.04 | 0.02 | 0.05 | 0.01 | 0.54 | 0.04 |
| France | 0.01 | 0.06 | 0.03 | 0.33 | 0.03 | 1 | 0.36 | 0 | 0.02 | 0.1 | 0.27 | 0.04 | 0.42 | 0.01 | 0.02 | 0.17 | 0.03 | 0.4 | 0.11 | 0.01 |
| Germany | 0.01 | 0.03 | 0.07 | 0.46 | 0.03 | 0.36 | 1 | 0 | 0.02 | 0.26 | 0.76 | 0.08 | 0.37 | 0.01 | 0.04 | 0.13 | 0.02 | 0.05 | 0.2 | 0.03 |
| Guatemala | 0 | 0.53 | 0.02 | 0 | 0 | 0 | 0 | 1 | 0 | 0.02 | 0 | 0 | 0 | 0.03 | 0.99 | 0.01 | 0.95 | 0 | 0 | 0.04 |
| India | 0.45 | 0.09 | 0.7 | 0.12 | 0.13 | 0.02 | 0.02 | 0 | 1 | 0.2 | 0.02 | 0.04 | 0.01 | 0.1 | 0.01 | 0.02 | 0.01 | 0.01 | 0.08 | 0.02 |
| Indonesia | 0.06 | 0.01 | 0.09 | 0.24 | 0.05 | 0.1 | 0.26 | 0.02 | 0.2 | 1 | 0.24 | 0.13 | 0.06 | 0.15 | 0.02 | 0.11 | 0.12 | 0 | 0.04 | 0.4 |
| Japan | 0.01 | 0.03 | 0.06 | 0.44 | 0.04 | 0.27 | 0.76 | 0 | 0.02 | 0.24 | 1 | 0.09 | 0.26 | 0.01 | 0.04 | 0.1 | 0.01 | 0.1 | 0.19 | 0.01 |
| Malaysia | 0.01 | 0.01 | 0.01 | 0.08 | 0.01 | 0.04 | 0.08 | 0 | 0.04 | 0.13 | 0.09 | 1 | 0.03 | 0.03 | 0.01 | 0.01 | 0 | 0 | 0.02 | 0 |
| Netherlands | 0.01 | 0.08 | 0.03 | 0.33 | 0.03 | 0.42 | 0.37 | 0 | 0.01 | 0.06 | 0.26 | 0.03 | 1 | 0.01 | 0.01 | 0.07 | 0.02 | 0.1 | 0.53 | 0 |
| Philippines | 0.01 | 0.02 | 0 | 0.02 | 0.04 | 0.01 | 0.01 | 0.03 | 0.1 | 0.15 | 0.01 | 0.03 | 0.01 | 1 | 0.05 | 0.02 | 0.06 | 0 | 0.01 | 0.04 |
| South Africa | 0.02 | 0.53 | 0.04 | 0.04 | 0.04 | 0.02 | 0.04 | 0.99 | 0.01 | 0.02 | 0.04 | 0.01 | 0.01 | 0.05 | 1 | 0.01 | 0.94 | 0 | 0.03 | 0.02 |
| Spain | 0.01 | 0.01 | 0.11 | 0.03 | 0.02 | 0.17 | 0.13 | 0.01 | 0.02 | 0.11 | 0.1 | 0.01 | 0.07 | 0.02 | 0.01 | 1 | 0.03 | 0.01 | 0.03 | 0.15 |
| Thailand | 0.03 | 0.5 | 0.04 | 0 | 0.05 | 0.03 | 0.02 | 0.95 | 0.01 | 0.12 | 0.01 | 0 | 0.02 | 0.06 | 0.94 | 0.03 | 1 | 0 | 0.03 | 0.21 |
| United Kingdom | 0 | 0.03 | 0 | 0.06 | 0.01 | 0.4 | 0.05 | 0 | 0.01 | 0 | 0.1 | 0 | 0.1 | 0 | 0 | 0.01 | 0 | 1 | 0.08 | 0 |
| USA | 0.39 | 0.4 | 0.33 | 0.42 | 0.54 | 0.11 | 0.2 | 0 | 0.08 | 0.04 | 0.19 | 0.02 | 0.53 | 0.01 | 0.03 | 0.03 | 0.03 | 0.08 | 1 | 0.01 |
| Viet Nam | 0.01 | 0.01 | 0.12 | 0 | 0.04 | 0.01 | 0.03 | 0.04 | 0.02 | 0.4 | 0.01 | 0 | 0 | 0.04 | 0.02 | 0.15 | 0.21 | 0 | 0.01 | 1 |

3. Chinese Threat to Competing Countries by Periods

| 1990-1993 | Direct Threat | Partial Threat | No Threat | China under threat | Mutual Withdrawal | Total |
|----------------|---------------|----------------|-----------|--------------------|-------------------|---------|
| USA | 83 | 30 | 27 | 15 | 8 | 163 |
| | 50.90% | 18.40% | 16.60% | 9.20% | 4.90% | 100.00% |
| Australia | 22 | 30 | 41 | 14 | 8 | 115 |
| | 19.10% | 26.10% | 35.70% | 12.20% | 7.00% | 100.00% |
| Canada | 27 | 26 | 19 | 9 | 5 | 86 |
| | 31.40% | 30.20% | 22.10% | 10.50% | 5.80% | 100.00% |
| Brazil | 15 | 12 | 11 | 2 | 3 | 43 |
| | 34.90% | 27.90% | 25.60% | 4.70% | 7.00% | 100.00% |
| Japan | 69 | 31 | 29 | 14 | 8 | 151 |
| | 45.70% | 20.50% | 19.20% | 9.30% | 5.30% | 100.00% |
| United Kingdom | 32 | 32 | 17 | 6 | 7 | 94 |
| | 34.00% | 34.00% | 18.10% | 6.40% | 7.40% | 100.00% |
| Thailand | 31 | 27 | 12 | 12 | 3 | 85 |
| | 36.50% | 31.80% | 14.10% | 14.10% | 3.50% | 100.00% |
| Netherlands | 30 | 26 | 24 | 8 | 9 | 97 |
| | 30.90% | 26.80% | 24.70% | 8.20% | 9.30% | 100.00% |
| India | 20 | 19 | 12 | 5 | 1 | 57 |
| | 35.10% | 33.30% | 21.10% | 8.80% | 1.80% | 100.00% |
| Philippines | 21 | 10 | 14 | 8 | 2 | 55 |
| | 38.20% | 18.20% | 25.50% | 14.50% | 3.60% | 100.00% |
| Malaysia | 19 | 15 | 11 | 8 | 4 | 57 |
| | 33.30% | 26.30% | 19.30% | 14.00% | 7.00% | 100.00% |
| Germany | 0 | 25 | 54 | 17 | 0 | 96 |
| | 0.00% | 26.00% | 56.30% | 17.70% | 0.00% | 100.00% |
| Indonesia | 25 | 21 | 15 | 7 | 4 | 72 |
| | 34.70% | 29.20% | 20.80% | 9.70% | 5.60% | 100.00% |
| France | 30 | 35 | 26 | 12 | 5 | 108 |
| | 27.80% | 32.40% | 24.10% | 11.10% | 4.60% | 100.00% |
| Argentina | 4 | 10 | 5 | 4 | 1 | 24 |
| | 16.70% | 41.70% | 20.80% | 16.70% | 4.20% | 100.00% |
| Guatemala | 1 | 2 | 1 | 1 | 0 | 5 |
| | 20.00% | 40.00% | 20.00% | 20.00% | 0.00% | 100.00% |
| Spain | 8 | 9 | 10 | 9 | 4 | 40 |
| | 20.00% | 22.50% | 25.00% | 22.50% | 10.00% | 100.00% |
| Viet Nam | 0 | 14 | 22 | 5 | 0 | 41 |
| | 0.00% | 34.10% | 53.70% | 12.20% | 0.00% | 100.00% |
| South Africa | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

| 1994-1997 | Direct Threat | Partial Threat | NO Threat | China under threat | Mutual Withdrawal | Total |
|----------------|---------------|----------------|-----------|--------------------|-------------------|---------|
| USA | 45 | 29 | 30 | 27 | 17 | 148 |
| | 30.40% | 19.60% | 20.30% | 18.20% | 11.50% | 100.00% |
| Australia | 29 | 27 | 33 | 26 | 10 | 125 |
| | 23.20% | 21.60% | 26.40% | 20.80% | 8.00% | 100.00% |
| Canada | 21 | 24 | 30 | 12 | 18 | 105 |
| | 20.00% | 22.90% | 28.60% | 11.40% | 17.10% | 100.00% |
| Brazil | 18 | 11 | 17 | 9 | 4 | 59 |
| | 30.50% | 18.60% | 28.80% | 15.30% | 6.80% | 100.00% |
| Japan | 65 | 20 | 19 | 15 | 25 | 144 |
| | 45.10% | 13.90% | 13.20% | 10.40% | 17.40% | 100.00% |
| United Kingdom | 26 | 24 | 21 | 14 | 16 | 101 |
| | 25.70% | 23.80% | 20.80% | 13.90% | 15.80% | 100.00% |
| Thailand | 39 | 13 | 13 | 11 | 9 | 85 |
| | 45.90% | 15.30% | 15.30% | 12.90% | 10.60% | 100.00% |
| Netherlands | 46 | 18 | 19 | 11 | 13 | 107 |
| | 43.00% | 16.80% | 17.80% | 10.30% | 12.10% | 100.00% |
| India | 22 | 11 | 22 | 7 | 7 | 69 |
| | 31.90% | 15.90% | 31.90% | 10.10% | 10.10% | 100.00% |
| Philippines | 17 | 13 | 15 | 9 | 8 | 62 |
| | 27.40% | 21.00% | 24.20% | 14.50% | 12.90% | 100.00% |
| Malaysia | 22 | 9 | 19 | 9 | 7 | 66 |
| | 33.30% | 13.60% | 28.80% | 13.60% | 10.60% | 100.00% |
| Germany | 34 | 22 | 29 | 12 | 14 | 111 |
| | 30.60% | 19.80% | 26.10% | 10.80% | 12.60% | 100.00% |
| Indonesia | 25 | 16 | 15 | 10 | 8 | 74 |
| | 33.80% | 21.60% | 20.30% | 13.50% | 10.80% | 100.00% |
| France | 40 | 20 | 30 | 12 | 15 | 117 |
| | 34.20% | 17.10% | 25.60% | 10.30% | 12.80% | 100.00% |
| Argentina | 8 | 4 | 13 | 8 | 7 | 40 |
| | 20.00% | 10.00% | 32.50% | 20.00% | 17.50% | 100.00% |
| Guatemala | 2 | 0 | 2 | 1 | 2 | 7 |
| | 28.60% | 0.00% | 28.60% | 14.30% | 28.60% | 100.00% |
| Spain | 12 | 15 | 17 | 4 | 6 | 54 |
| | 22.20% | 27.80% | 31.50% | 7.40% | 11.10% | 100.00% |
| Viet Nam | 19 | 9 | 22 | 4 | 5 | 59 |
| | 32.20% | 15.30% | 37.30% | 6.80% | 8.50% | 100.00% |
| South Africa | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

| 1998-2001 | Direct Threat | Partial Threat | NO Threat | China under threat | Mutual Withdrawal | Total |
|----------------|---------------|----------------|-----------|--------------------|-------------------|---------|
| USA | 57 | 28 | 23 | 38 | 30 | 176 |
| | 32.40% | 15.90% | 13.10% | 21.60% | 17.00% | 100.00% |
| Australia | 40 | 32 | 25 | 33 | 20 | 150 |
| | 26.70% | 21.30% | 16.70% | 22.00% | 13.30% | 100.00% |
| Canada | 25 | 19 | 22 | 26 | 16 | 108 |
| | 23.10% | 17.60% | 20.40% | 24.10% | 14.80% | 100.00% |
| Brazil | 15 | 5 | 11 | 9 | 12 | 52 |
| | 28.80% | 9.60% | 21.20% | 17.30% | 23.10% | 100.00% |
| Japan | 54 | 19 | 22 | 31 | 33 | 159 |
| | 34.00% | 11.90% | 13.80% | 19.50% | 20.80% | 100.00% |
| United Kingdom | 41 | 16 | 13 | 17 | 20 | 107 |
| | 38.30% | 15.00% | 12.10% | 15.90% | 18.70% | 100.00% |
| Thailand | 18 | 9 | 23 | 18 | 20 | 88 |
| | 20.50% | 10.20% | 26.10% | 20.50% | 22.70% | 100.00% |
| Netherlands | 39 | 19 | 18 | 23 | 13 | 112 |
| | 34.80% | 17.00% | 16.10% | 20.50% | 11.60% | 100.00% |
| India | 16 | 13 | 18 | 17 | 14 | 78 |
| | 20.50% | 16.70% | 23.10% | 21.80% | 17.90% | 100.00% |
| Philippines | 16 | 13 | 13 | 14 | 9 | 65 |
| | 24.60% | 20.00% | 20.00% | 21.50% | 13.80% | 100.00% |
| Malaysia | 16 | 11 | 20 | 18 | 12 | 77 |
| | 20.80% | 14.30% | 26.00% | 23.40% | 15.60% | 100.00% |
| Germany | 34 | 22 | 17 | 22 | 23 | 118 |
| | 28.80% | 18.60% | 14.40% | 18.60% | 19.50% | 100.00% |
| Indonesia | 16 | 17 | 19 | 24 | 14 | 90 |
| | 17.80% | 18.90% | 21.10% | 26.70% | 15.60% | 100.00% |
| France | 39 | 18 | 35 | 31 | 14 | 137 |
| | 28.50% | 13.10% | 25.50% | 22.60% | 10.20% | 100.00% |
| Argentina | 17 | 7 | 7 | 14 | 3 | 48 |
| | 35.40% | 14.60% | 14.60% | 29.20% | 6.30% | 100.00% |
| Guatemala | 1 | 0 | 3 | 3 | 2 | 9 |
| | 11.10% | 0.00% | 33.30% | 33.30% | 22.20% | 100.00% |
| Spain | 21 | 7 | 17 | 19 | 7 | 71 |
| | 29.60% | 9.90% | 23.90% | 26.80% | 9.90% | 100.00% |
| Viet Nam | 12 | 10 | 17 | 20 | 14 | 73 |
| | 16.40% | 13.70% | 23.30% | 27.40% | 19.20% | 100.00% |
| South Africa | 0 | 3 | 21 | 14 | 0 | 38 |
| | 0.00% | 7.90% | 55.30% | 36.80% | 0.00% | 100.00% |

| 2002-2005 | Direct Threat | Partial Threat | NO Threat | China under threat | Mutual Withdrawal | Total |
|----------------|---------------|----------------|-----------|--------------------|-------------------|---------|
| USA | 66 | 15 | 19 | 28 | 30 | 158 |
| | 41.80% | 9.50% | 12.00% | 17.70% | 19.00% | 100.00% |
| Australia | 42 | 27 | 12 | 29 | 21 | 131 |
| | 32.10% | 20.60% | 9.20% | 22.10% | 16.00% | 100.00% |
| Canada | 34 | 13 | 14 | 17 | 20 | 98 |
| | 34.70% | 13.30% | 14.30% | 17.30% | 20.40% | 100.00% |
| Brazil | 14 | 8 | 9 | 9 | 8 | 48 |
| | 29.20% | 16.70% | 18.80% | 18.80% | 16.70% | 100.00% |
| Japan | 54 | 21 | 17 | 16 | 34 | 142 |
| | 38.00% | 14.80% | 12.00% | 11.30% | 23.90% | 100.00% |
| United Kingdom | 26 | 16 | 5 | 11 | 20 | 78 |
| | 33.30% | 20.50% | 6.40% | 14.10% | 25.60% | 100.00% |
| Thailand | 15 | 16 | 16 | 11 | 16 | 74 |
| | 20.30% | 21.60% | 21.60% | 14.90% | 21.60% | 100.00% |
| Netherlands | 39 | 18 | 7 | 10 | 22 | 96 |
| | 40.60% | 18.80% | 7.30% | 10.40% | 22.90% | 100.00% |
| India | 14 | 13 | 14 | 11 | 16 | 68 |
| | 20.60% | 19.10% | 20.60% | 16.20% | 23.50% | 100.00% |
| Philippines | 16 | 12 | 12 | 5 | 12 | 57 |
| | 28.10% | 21.10% | 21.10% | 8.80% | 21.10% | 100.00% |
| Malaysia | 18 | 10 | 17 | 7 | 12 | 64 |
| | 28.10% | 15.60% | 26.60% | 10.90% | 18.80% | 100.00% |
| Germany | 31 | 17 | 18 | 21 | 18 | 105 |
| | 29.50% | 16.20% | 17.10% | 20.00% | 17.10% | 100.00% |
| Indonesia | 18 | 16 | 14 | 12 | 14 | 74 |
| | 24.30% | 21.60% | 18.90% | 16.20% | 18.90% | 100.00% |
| France | 32 | 29 | 19 | 20 | 24 | 124 |
| | 25.80% | 23.40% | 15.30% | 16.10% | 19.40% | 100.00% |
| Argentina | 11 | 5 | 4 | 2 | 10 | 32 |
| | 34.40% | 15.60% | 12.50% | 6.30% | 31.30% | 100.00% |
| Guatemala | 1 | 2 | 0 | 1 | 5 | 9 |
| | 11.10% | 22.20% | 0.00% | 11.10% | 55.60% | 100.00% |
| Spain | 21 | 11 | 12 | 12 | 12 | 68 |
| | 30.90% | 16.20% | 17.60% | 17.60% | 17.60% | 100.00% |
| Viet Nam | 12 | 9 | 15 | 14 | 13 | 63 |
| | 19.00% | 14.30% | 23.80% | 22.20% | 20.60% | 100.00% |
| South Africa | 11 | 8 | 9 | 14 | 2 | 44 |
| | 25.00% | 18.20% | 20.50% | 31.80% | 4.50% | 100.00% |