ANALYSIS OF OILSEED TRADE PATTERNS AND TRANSPORTATION COSTS: AN APPLICATION OF GRAVITY MODELS

by

YING XIA

(Under the Direction of Jack E. Houston)

ABSTRACT

The aim of this paper is to build a comprehensive trade framework of oilseeds and oilseeds oil. The impacts of transportation costs and policy changes on oilseeds and derived oils are estimated using gravity models. We describe and analyze export and import markets of oilseeds and derived vegetable oils. Trade of the oilseeds is relatively unrestricted by tariffs and other border measures, but oilseed meals, and particularly vegetable oils, have had higher tariffs. In addition to tariffs, both exporters and importers have used other trade-distorting policies. A naïve gravity model and McCallum gravity model are applied on the analysis of oilseed trade. A Baier and Berstrand method, using a Taylor-series expansion, reveals a theoretical relationship between incomes, trade flows and trade costs by a reduced-form gravity equation, Distance between two countries and border trade barriers have significant impacts on the trade value of oilseeds.

INDEX WORDS: Oilseeds, Transportation cost, International trade, Gravity model, Trade policy

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DEDICATION

Dedicated to My daughter, Isabella, My husband, Jun and My parents

For Their Love and Endless Supports

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CHAPTER 1

INTRODUCTION

1.1 Background Information

The oilseed sector is relatively complex in several respects. Oilseeds can be processed to use as edible products or crushed to produce oil and meal, and there are multiple final uses for each product in the food feed and associated industries. Oilseeds include cottonseeds, soybeans, peanuts, rapeseeds/canola, sunflower seeds, mustard seeds, flaxseeds, copra, and palm kernel. The five major oilseeds will be analyzed in this study, including: soybeans, peanuts, cottonseeds, rapeseeds/canola and sunflower seeds.

Oilseeds and oil products are crucial commodities in international trade. Production has rapidly expanded in recent years under the yield growth and demand characteristics linked to more income-elastic products (USDA, 2010). The total production of oilseeds reached 449.33 MMT in 2010. The United States is the world's largest producer in major oilseeds production, followed by Brazil, China Argentina and India. Among oilseeds, soybeans production with 261.97 million metric tons (MMT), accounts for about 60% in 2010. The production of rapeseeds, cottonseeds, peanuts and sunflower seeds account for 13%, 9%, 7% and 6%, respectively. China is the largest country in consuming oilseed oil and oilseed meal in the world, followed by EU-27, India, The United States and Brazil.

1.2 Problem Statement

The amount of exports and imports in oilseeds is very large in the world, and reached 110.96 and 107 MMT in 2010, respectively (USDA, 05/2011). China and EU-27 are the two primary importers of major oilseeds in the world in 2010, with 55.95 and 17.37 MMT, respectively. The three main exporters of major oilseeds are The United States, Brazil and Argentina. The United States accounts for about 40% exports of major oilseeds in 2010. But U.S. soybean exports in 2010/11 decreased, due to a slowing pace in shipments and a slowdown in demand from China. Argentina's and Brazil combined soybean exports are declined 2.0 MMT to 9.5 MMT and to 32.3 MMT, respectively, primarily due to slowing demand from China (USDA, 05/2011). China banned soybean oil imports from Argentina in 2010, which resulted in a buying opportunity for India. India stepped in, buying larger quantities of discounted oil from Argentina last year (USDA, 03/2011).

Transportation cost has significant impacts on international trade. But this is not a relative research focus on how transportation costs affect the international trade of oilseeds. In this study, we use the distance between two countries to estimate the shipping cost because the shipping cost for international trade is almost impossible to obtain consistently. Compared with trade in other agricultural commodities, oilseeds trade is relatively unrestricted by tariffs and other border measures, particularly soybeans. But oilseed meals, and particularly vegetable oils, have seen higher tariffs. In addition to tariffs, both exporters and importers have used other trade-distorting policies. For example, Argentina and Brazil put on differential export taxes prior to 1996; the EU has production subsidies; and India often poses prohibitive barriers on the imports of oilseeds. These policies create incentives to boost domestic oilseed production or encourage exports of processed products (USDA, 2010).

1.3 Objectives

The aim of this study is to construct a simple but comprehensive trade framework of oilseeds and oilseeds oils. The impacts of transportation costs, border barriers, policy changes, and Gross Domestic Product (GDP) on internationally traded oilseeds and derived oils are estimated using gravity models. Specifically, the objectives are:

- To describe the production and consumption patterns in the world;
- To describe the international market and trade for oilseeds and oilseed oils;
- To identify the issues that affect the export and import of oilseeds in the world;
- To build gravity models to analyze the relationships between trade values for oilseeds, transportation costs and policies.

1.4 Organization

The thesis will be organized as follows. In Chapter two, we will provide a foundation for the following chapter's analysis of oilseeds and oilseed oil export and import markets and trade costs in international trade. This will be accomplished by providing a description of world total oilseed production and five major oilseeds productions, respectively. Chapter three will focus on describing and analyzing export and import markets of oilseeds and oilseed oil. It will also describe the impacts of policy factors on costs of international trade. In Chapter four, we will focus on describing the framework of international trade and providing reviews on gravity models. Chapter five will focus on discussing the analytical model and data analysis and reporting the empirical results. The final Chapter will provide the summary, discussion of conclusions and implications and suggestions for future research.

CHAPTER 2

WORLD OILSEEDS PRODUCTION AND CONSUMPTION

2.1 World Oilseeds Production Pattern

Oilseeds and oil products are crucial commodities in international trade. Production has rapidly expanded in recent years under the yield growth and demand characteristics linked to more income-elastic products (USDA, 2010). There are five major oilseeds produced in the world: soybeans, cottonseeds, rapeseeds/canola, peanuts and sunflower seeds. The United States is the world's largest producer in oilseeds production, followed by Brazil, China and Argentina.

As illustrated in figure 2.1, the production area of the five major oilseeds was 159.4 million hectares in 1996. It increased by 39.31 million hectares to 198.71 million supported by the increase of demand in 2006, and dropped to 192.76 million hectares one year later. The total production of the five major oilseeds was relatively stable between 1996 and 2003, with a lower production in 1996 and with a higher production in 2003. After 2003, production increased by 67.95 MMT to 389.02 million in 2006; but then production was cut back by 14.25 MMT to 374.77 MMT in 2007. We see from figure 2.1 that the rate of yield growth was not as rapid as the area of production growth.

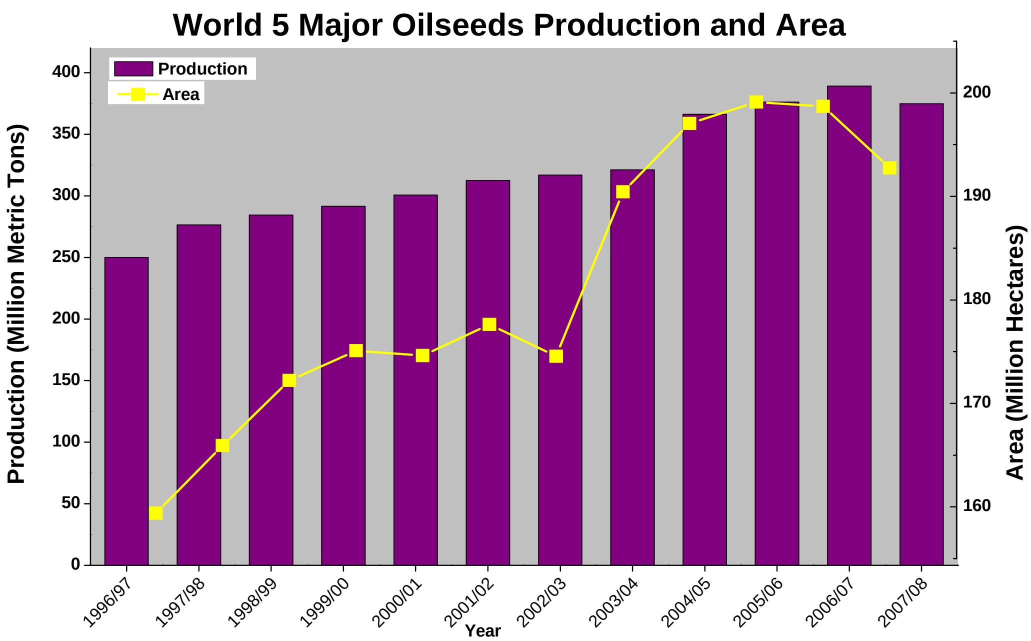


Figure 2.1 World 5 Major Oilseeds Production and Area

Data Source: "World Agricultural Production", Foreign Agricultural Service, USDA

Oilseeds are produced in many countries, but, according to the Foreign Agricultural Service of the U.S. Department of Agriculture (USDA/FAS), the United States has been the leader in oilseeds production. China was in the second place before 2002. After 2002, Brazil replaced China in the order of oilseeds production, then followed by Argentina, India, EU-27 and Canada. Figure 2.2 presents major oilseeds production by country in 2008. The United States accounted for about one-fourth of world total production of major oilseeds in 2008. The production of Brazil accounted for 15.8%, which is just higher than China's production (15.3%). The United States, Brazil and China accounted for 64% of total major oilseeds production in the world in 2008.

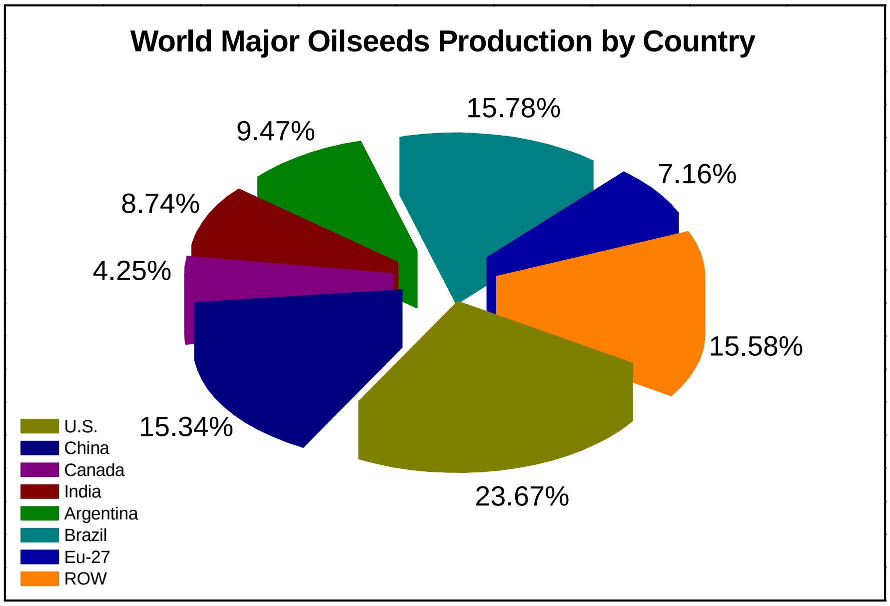


Figure 2.2 World Major Oilseeds Production by Country in 2008

Data Source: "World Agricultural Production", Foreign Agricultural Service, USDA

World Soybean Production Pattern

Soybean production in South America has rapidly expanded since the early 1970s. The United States became the world's largest producer of soybeans. Soybeans are the dominant oilseeds in the United States and account for about 90 percent of production of U.S. oilseeds. More than 80 percent of the U.S. soybean growing region is concentrated in the upper Midwest (USDA, 2008).

Now Brazil trails only the United States in the production of soybeans after expanding the farmland in the south that is relatively near the major ports, as well as in center-west states. Brazilian soybean producers have proven to be competitive, due to relative production costs, and the average soybean yields of Brazil has exceeded the United States in some years (Ash, et al., 2006). In 2009, Brazil's soybean area increased because of higher soybeans price and soybean profit margins comparing to corn. However, insufficient transportation infrastructure still limits the expansion of soybean production. Also, according to Brazil's agricultural groups, there are 90 million hectares available in Brazil, but agricultural policy limits the development of soybean production in the future.

Argentina was the world third-largest producer of soybeans. Argentina's soybean growing regions are located near the major ports. The USDA estimates the production of Argentina will be up 66 percent from last year's 32 MMT to 53.0 MMT in 2009 (USDA, 11/2009). China is the forth largest producer of soybeans in the world. Chinese soybean growing regions used to be concentrated in northeast part, especially Heilongjiang, which accounts for about 40 percent of soybean output. Chinese 2009/10 soybean production is estimated to be down six percent, or 10 MMT, from last year due to the unseasonably hot and dry weather in Heilongjiang in May (USDA, 10/2009). Indian soybean growing area is in the central state of Madhya Pradesh. Although yields of soybeans are among the world poorest, the production of India has been increased in the last decade (USDA, 2010).

As presented in figure 2.3, the United States is the world largest producer of soybeans. The total production of U.S. soybean reached the highest record with 86.77 MMT in 2007. After 2007, soybean production dropped 13.91 MMT to 72.86 MMT. The production of Brazil's soybeans has rapidly increased in the last decade. The yield of Brazilian soybean production reached the highest record with 2.84 metric tons per hectare in 2008. China, India, Canada and Eu-27 have been relatively stable during these years comparing to the United States, Brazil and Argentina.

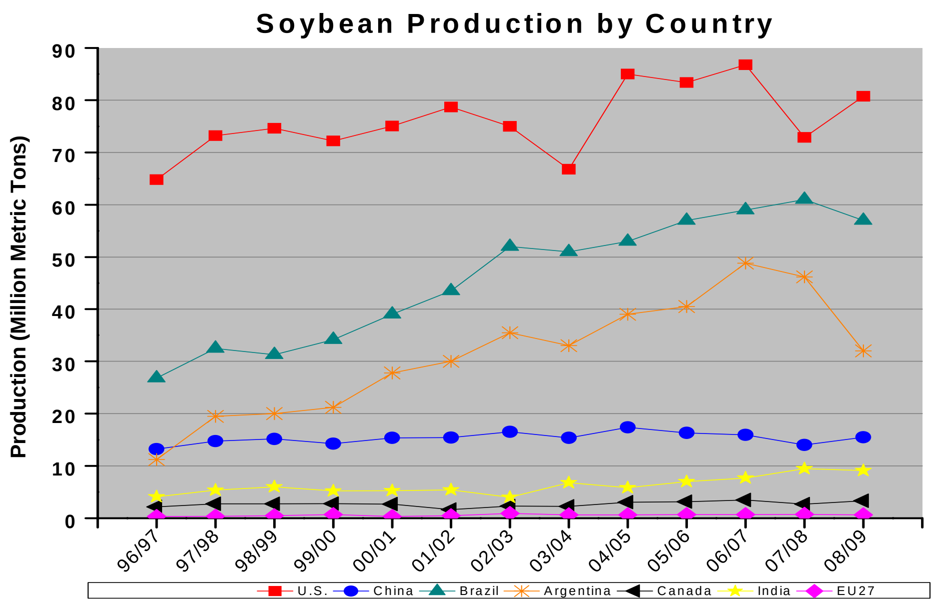


Figure 2.3 Soybeans Production by Top Producing Countries 1996-2008

Data Source: "World Agricultural Production", Foreign Agricultural Service, USDA

World Cottonseed Production Pattern

China is the world's leading producer of cottonseed in the last decade. The production of Chinese cottonseed expanded rapidly from 1996 to 2008. China's major growing region is concentrated in Xinjiang province in Northwest of China and Shandong province. As presented in figure 2.4, the cottonseed production of the United States was larger than that of India before 2003. After 2003, the production of Indian cottonseed exceeded U.S. and was the second largest producer in the world. Cottonseed production in Brazil, EU-27, Mexico and Argentina has been relatively stable between 1996 and 2008.

The production of Chinese cottonseed is estimated to be decreased in 2009, due to the high production costs, serious labor shortages, high government subsides to grain, disappointing cotton prices and weak global demand for textiles at the end of 2008 (USDA, 11/2009). Indian cottonseed production is estimated to be reduced by bad weather in August, 2009, that lowered the yield prospect in some major cotton producing areas.

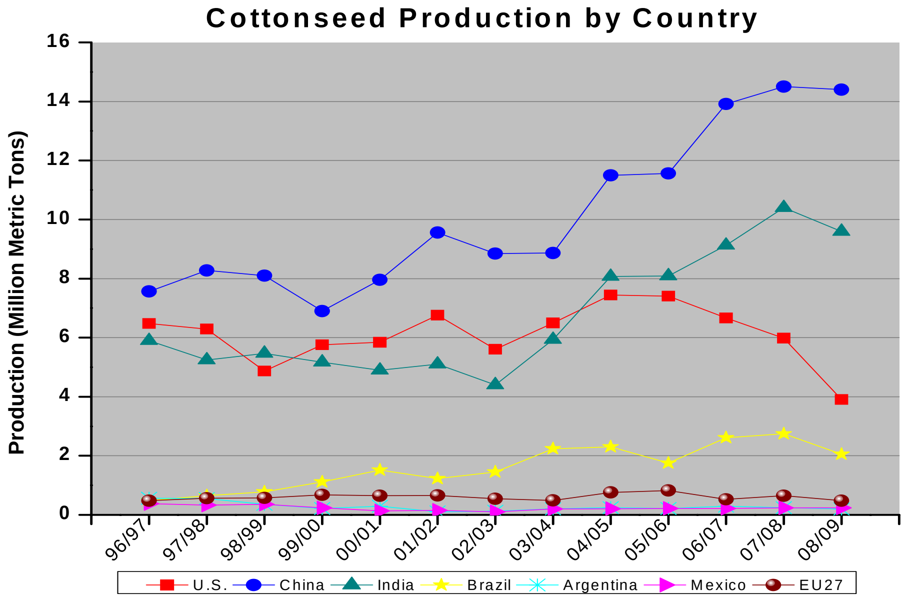


Figure 2.4 World Production of Cottonseed by Top Producing Countries 1996-2008

Data Source: "World Agricultural Production", Foreign Agricultural Service, USDA

World Peanut Production Pattern

Figure 2.5 presents the world production of peanuts by top producing countries between 1996 and 2008. China is the world leading producer of peanut, and peanuts historically accounted for about 48% of total oilseed production in China. The key growing regions are concentrated in Shangdong, Henan, Liaoning and Anhui. Production has been steadily increasing since 1996. The total production of peanut of China reached 14.3 MMT in 2008. India trails only China in production of peanuts with higher production of 9.02 MMT in 1996 and with lower production of 5.2 MMT in 2002. The production of the United States was in the third place in the world, with most of U.S. growing area distributed in the Southern region, including Alabama, Florida and Georgia. Peanut production of the United States, Argentina, Nigeria and Indonesia were relatively stable between 1996 and 2008.

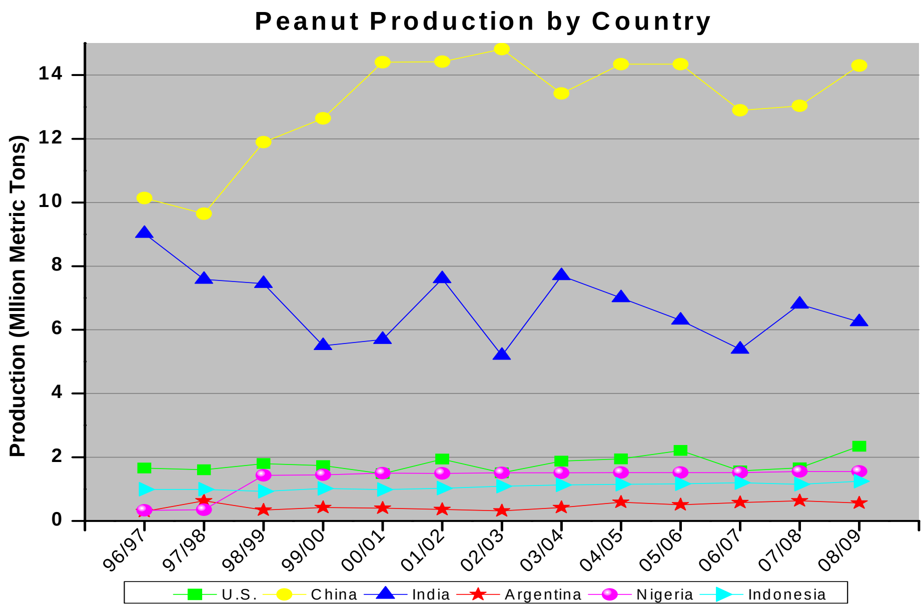


Figure 2.5 World Production of Peanut by Top Producing Countries 1996-2008

Data Source: "World Agricultural Production", Foreign Agricultural Service, USDA

World Sunflower seed Production Pattern

Figure 2.6 presents the sunflower seed production in top producing countries between 1996 and 2008. Argentina was the world's largest producer of sunflower seed before 1999. It shrank quickly to 3.05 MMT from the highest record of 7.1 MMT as a result of lower harvested area. After that year, Russia took the place of Argentina and became the largest producer of sunflower seed. Ukraine is one of topping sunflower seed production countries. In 2008, its production reached the highest record with 4.2 MMT. The sunflower seed production of EU-27 has been relatively stable before 2006 and was rapidly increased in 2007 and 2008. The sunflower seed productions of China, the United States and India have been relatively stable from 1996 to 2008.

Argentina's sunflower seed is declined due to lower planting area as a result of dry conditions in 2009. But the production increased for Ukraine and EU-27 in this year.

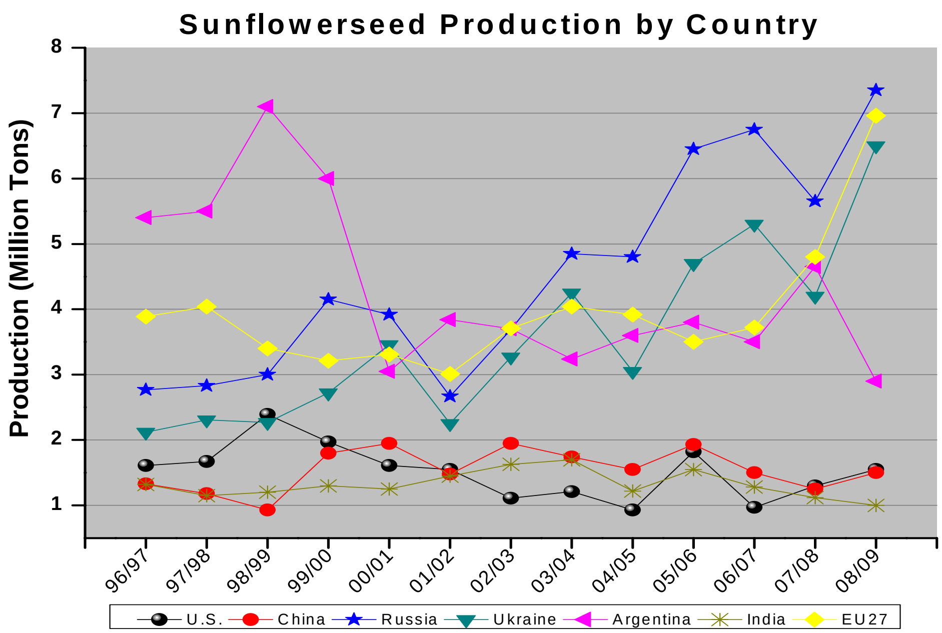


Figure 2.6 World Production of Sunflower seed by Top Producing Countries

Data Source: "World Agricultural Production", Foreign Agricultural Service, USDA

World Rapeseed Production Pattern

The top three rapeseed producing countries are EU-27, China and India. As presented in figure 2.7, the EU-27 has been the leader for the last decade. Rapeseed is the dominant oilseed grown in EU-27, outpacing soybean, cottonseed, peanut and sunflower seed (USDA, 05/2009). Germany and France were two major countries to produce rapeseed among the EU-27. China was the second largest producing country in the world. The main rapeseed growing regions are concentrated in Central and Southern China, and those areas normally accounted for about 42 percent of Chinese total oilseed crop. Production has been relatively stable between 1996 and 2008, with a lower production in 1998 and a higher production in 2004. The rapeseed production of Canada has been through a rapid increase after dropping to 4.18 MMT in 2002. India is one of main producers in the world. The key rapeseed growing regions of India are distributed in Rajasthan, Utter Pradesh, and Haryana. In 2008, Indian rapeseed production increased rapidly, due to farmers continued response to the strong Minimum Support Price (MSP) policy (USDA, 04/2009). The productions of Australia and the United States were relatively stable from 1996 to 2008.

World rapeseed production increases are mainly, due to the increases on the production of EU-27 in 2009. The production of EU-27 is estimated to be the highest records with 20.6 MMT (USDA, 10/2009). Estimated production in Germany, which is top producer in EU-27, was raised 0.1 MMT, to a record of 6.3 MMT (USDA, 11/2009). The USDA estimates that 2009/10 Canada rapeseed production will be 10 MMT, down 21 percent from last year. The reduction in production is attributed chiefly to poor crop conditions in Alberta with dry and below-normal temperature (USDA, 09/2009). The rapeseed production of China is forecast at 12.7 MMT, based on increased planted area. In 2009/10, the rapeseed area was larger than previous year, especially in Heibei, Sichuan and Jiangxi (USDA and Report, 04/15/2009).

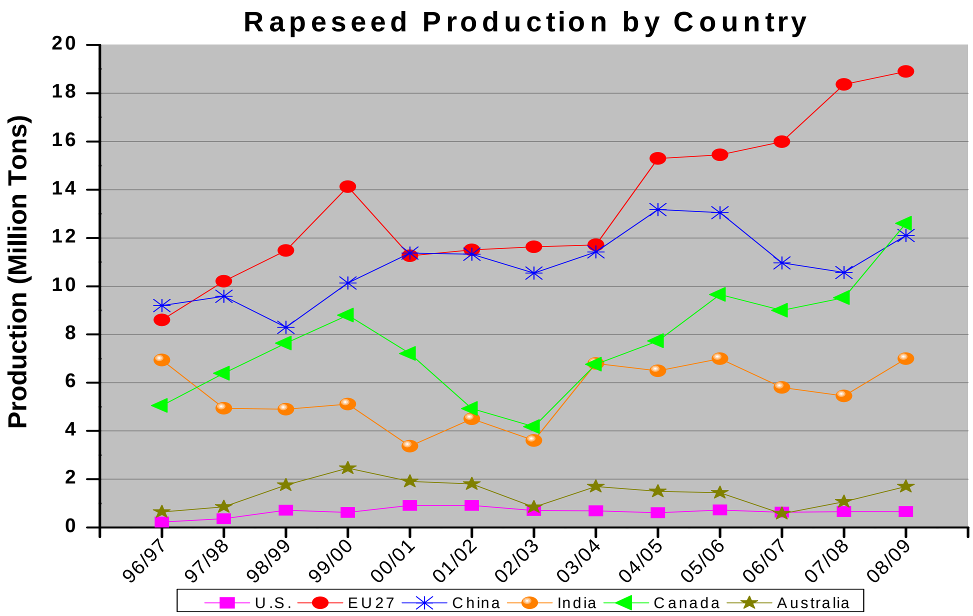


Figure 2.7 World Production of Rapeseed by Top Producing Countries

Data Source: "World Agricultural Production", Foreign Agricultural Service, USDA

2.2 World Oilseeds Consumption

Oilseeds consumption includes two parts: oilseed oil and oilseed meal. The major oilseed oils include soybean oil, peanut oil, rapeseed oil, cottonseed oil and sunflower seed oil.

World Major Oilseed Oil Consumption

China is the world largest country in major oilseed oil consumption. The total oilseed oil consumption of China reached 24.55 MMT and accounted for about 19% of total world consumption in 2008. EU-27 trailed only China in consumption of major oilseed oil. Its consumption is estimated to be up 0.58 MMT to 23.23 MMT in 2009 (USDA, 04/2009). After EU-27, the major countries of oilseed oil consumption are followed by India, U.S., Indonesia, Malaysia, Brazil, Japan, Mexico and Argentina.

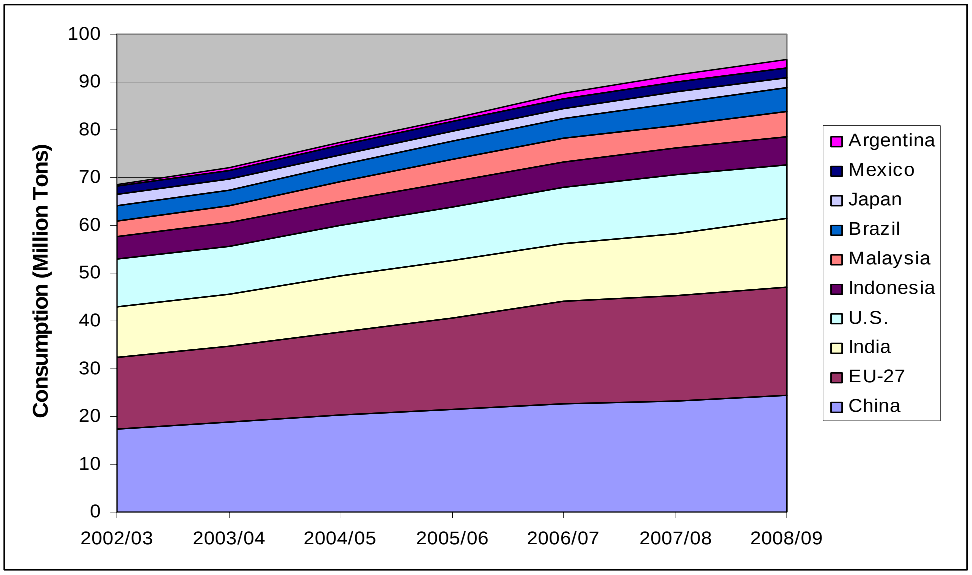


Figure 2.8 Major Oilseed Oil Consumption by Country

Source: "Oilseeds: World Markets and Trade", Foreign Agricultural Service, USDA

Table 2.1 shows that the oil consumption of five major consuming countries -- the U.S., Indonesia, Malaysia, Brazil, Japan, Mexico and Argentina – has been relatively stable between 2002 and 2008. The average rate of increase of the major five oilseed oil consumed for China and EU-27 are about 6.8% and 8.5% from 2002 to 2008, respectively.

Table 2.1 ─ Major Five Oilseed Oil Consumption by Country between 2002 and 2008

Year	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*
China	17.41	18.96	20.44	21.45	22.56	23.34	24.55
EU-27	14.98	15.60	17.22	19.13	21.70	22.03	22.63
India	10.67	11.03	11.81	12.1	11.99	12.94	14.23
U.S.	9.87	10.07	10.45	11.18	11.66	12.23	11.10
Indonesia	4.59	4.82	5.05	5.24	5.35	5.53	6.02
Malaysia	3.33	3.55	4.01	4.75	4.86	4.89	5.19
Brazil	3.35	3.43	3.56	3.66	4.23	4.72	5.03
Japan	2.22	2.28	2.25	2.19	2.19	2.23	2.16
Mexico	1.78	1.86	1.85	2.00	2.01	2.03	2.04
Argentina	0.41	0.52	0.72	0.80	1.00	1.40	1.68

Data Source: *"Oilseeds: World Markets and Trade", Foreign Agricultural Service, USDA*

Figure 2.9 presents that annual change in world oilseed and feed-quality wheat consumption. The change of soybean oil was about 5% in 2006. But the changes of rapeseed oil and sunflower seed oil were -0.2% and -0.1% in the same year, respectively. In 2007, the consumption of rapeseed oil increased by about 10%, changes in consumption of soybean oil and sunflower seeds dropped to 2% and -9%, respectively. In 2008, the consumption of soybean oil decreased while that of rapeseed oil and sunflower seeds increased greatly.

Soybean oil is widely used as edible oil, whereas its meal is mainly used in the industry of animal feed. World soybean consumption declines as dwindling supplies as a result of facing increased competition from other protein meals and feed-quality wheat. Meanwhile, a rebound in sunflower seeds in Europe and Ukraine along, with continued growth in world rapeseed production, provide ample supplies of less expensive feed ingredient alternatives (USDA, 04/2009).

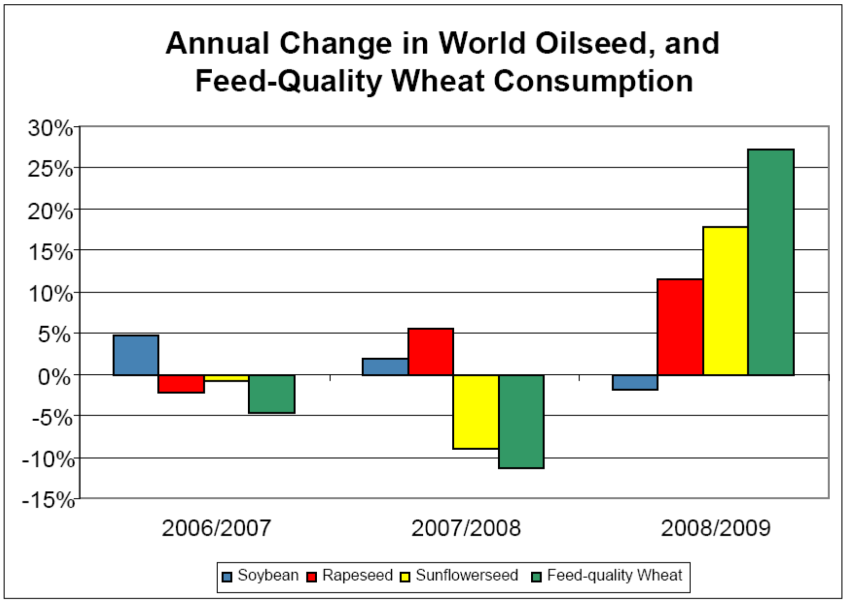


Figure 2.9 Annual Changes in World Oilseed, and Wheat Consumption

Source: "Oilseeds: World Markets and Trade", 04/2009, USDA

China Oilseed Oil Consumption

The consumption of oilseed oil is highest for China and, the trend is increasing year by year. There are five major oilseed oils consume in China, including soybean, rapeseed, peanut and sunflower seed oils. As presented in table 2.2, we see the largest amount of oilseed oil consumed in China is soybean oil, and that consumption is increasing rapidly in recent years due to the rapid development in the country's soybean processing industry. The consumption is followed by rapeseed oil, peanut oil, cottonseed oil and sunflower seed oil.

Table 2.2 — China Oilseed Oil Consumption between 2002 and 2009 (Thousands Metric Tons)

Oil Type	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Soybean Oil	6,389	7,174	7,214	8,546	8,670	9,693	9,486	10,210
Rapeseed Oil	3,658	4,363	4,756	4,549	4,343	4,139	4,853	5,368
Peanut Oil	2,242	2,100	2,172	2,200	2,007	2,016	2,184	2,219
Sunflowerseed Oil					329	129	439	403
Cottonseed Oil	1,009	1,024	1,284	1,159				

Data Source: (USDA, 12/2006) and (USDA, 07/2010)

EU-27 Oilseed Oil Consumption

The total consumption of oilseed oil for EU-27 is second in the world. Rapeseed oil consumption accounts for about 40% of total oilseed oil consumption. Also, its consumption has increased rapidly in recent years. Palm oil is still the main vegetable oil consumed and accounted for 20% for EU-27. The consumption in soybean oil has been stable in recent years, with a low in 2003 and with a higher in 2009. The consumption of sunflower seed oil has increased slowly year by year, the highest recorded in 2009.

Table 2.3 — EU-27 Oilseed Oil Consumption between 2002 and 2009 (Thousands Metric Tons)

Oil Type	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Rapeseed Oil	4,115	4,392	5,230	6,215	7,198	7,774	8,679	9,760
Palm Oil	2,905	3,306	3,857	3,980	4,256	4,761	4,993	5,012
Soybean Oil	2,281	2,086	2,138	2,785	3,368	3,377	2,779	2,280
Sunflower seed Oil	2,194	2,294	2,458	2,778	3,287	2,901	3,158	3,234
Others	3,489	3,518	3,533	3,372	3,595	3,619	3,465	3,487

Data Source: "Oilseeds: World Markets and Trade", 12/2006 and 07/2010, USDA

India Oilseed Oil Consumption

India is the third largest country in oilseed oil consumption, but its main consumption oil is palm oil, accounting for about 47 percent. The rate of increase of consumption in palm oil in India is high. It reached the highest level in 2009, with 7,350 thousands tons. The consumption of soybean oil, rapeseed oil, peanut oil, sunflower seed oil and cottonseed oil has been relatively stable between 2002 and 2009.

Table 2.4 — India Oilseed Oil Consumption between 2002 and 2009 (Thousands Metric Tons)

Oil Type	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Palm Oil	4,015	3,428	3,400	2,916	3,671	5,065	6,475	7,350
Soybean Oil	1,948	1,752	2,628	2,882	2,600	2,300	2,330	2,650
Rapeseed Oil	1,395	2,135	2,068	2,287	2,133	1,967	2,095	2,252
Peanut Oil	1,416	1,753	1,736	1,801	1,433	1,582	1,455	1,385
Sunflower seed Oil	633	625	407	553	600	398	731	852
Cottonseed Oil	507	613	775	895	947	1,054	1,038	1,049

Data Source: "Oilseeds: World Markets and Trade", 12/2006 and 07/2010, USDA

World Major Protein Meal Consumption

The EU-27 total protein meal consumption reached 52.13 MMT and accounted for about 23 percent of world total consumption in 2008. China trailed only the EU-27 in consumption of major protein meals. The major protein meal consumption for China was 33.7 MMT in 2002, but it was boosted to 49.53 MMT in 2008. After China, the major countries for consumption of protein meals are the U.S., Brazil, India, Japan and Mexico.

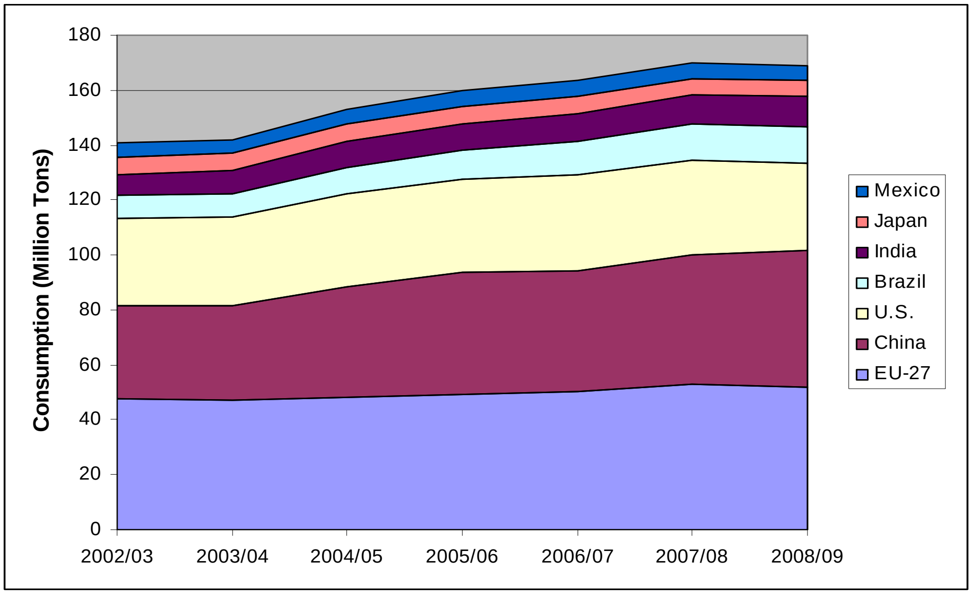


Figure 2.10 Major Protein Meals Consumption by Country

Data Source: "Oilseeds: World Markets and Trade", Foreign Agricultural Service, USDA

As presented in table 2.5, the U.S., Japan and Mexico have had relatively stable consumption of protein meals between 2002 and 2008. The consumption of U.S. reached to a maximum of 34.9 MMT in 2006. After that year, consumption of major protein for U.S dropped to 31.74 MMT; that is less than the amount in 2002. The consumption of Brazil increased between 2002 and 2008. It was 8.71 MMT in 2002 and reached 13.49 MMT in 2008. The major protein meals consumption for India has also increased since 2002, peaking at 10.76 MMT in 2008.

Soybean meal consumption is the one of the largest in protein meals. It has become the world's main protein source, and it is generally the highest in protein quality and highest in overall nutrient content of the commonly used plant proteins. Soybean meal has become a staple in poultry diets. In the U.S., the poultry industry is the biggest user of soybean meal, consuming about 54 percent of all U.S. soybean meal.

Table 2.5 ─ Major Protein Meal Consumption by Country between 2002 and 2008

Year	EU-27	China	U.S.	Brazil	India	Japan	Mexico
2002/03	47.58	33.7	31.92	8.71	7.35	6.37	4.99
2003/04	47.16	34.36	32.08	8.61	8.44	6.21	4.85
2004/05	47.96	40.24	33.90	9.82	9.62	6.00	5.32
2005/06	49.41	44.48	33.86	10.37	9.83	5.86	5.99
2006/07	50.45	43.95	34.9	12.27	10.03	5.99	6.04
2007/08	52.9	47.26	34.22	13.5	10.21	5.97	5.64
2008/09	52.13	49.53	31.74	13.49	10.76	5.76	5.34

Data Source: "Oilseeds: World Markets and Trade", FAS, USDA

China Major Protein Meal Consumption

There are two main major protein meals in China. The most popular one is soybean meal, accounting for about 60 percent of total protein meal consumption. And the trend is increasing rapidly. In 2002, the amount was 20,157 thousands metric tons. It increased by 15,000 thousands metric tons in 2009. Another major protein meal is rapeseed, which has been increased relatively stable between 2002 and 2009, with a low level of 6,123 thousand metric tons in 2002 and with a high level of 9,255 thousand metric tons in 2009.

Table 2.6 ─ China Major Protein Meal Consumption between 2002 and 2009 (Thousands Metric Tons)

Meal Type	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Soybean	20,157	30,849	31,673	35,817	27,630	30,849	31,673	35,817
Rapeseed	6,123	7,068	8,093	8,320	7,479	7,069	8,317	9,255
Others	7,422	8340	8,711	8,387	8,843	9,340	9,597	8,996

Data Source: "Oilseeds: World Markets and Trade", 12/2006 and 07/2010, USDA

EU-27 Major Protein Meal Consumption

The total major protein meal consumption of EU-27 is the largest in the world. The main protein meal consumed in EU-27 is still soybean meal. The consumption has been stable between 2002 and 2009. Another major protein meal is rapeseed meal. Its consumption is increased rapidly, with a low of 6,106 thousand metric tons in 2002 and a high of 13,088 thousand metric tons in 2009.

Table 2.7 — EU-27 Major Protein Meal Consumption between 2002 and 2009 (Thousands Metric Tons)

Meal Type	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Soybean	33,026	32,464	32,191	32,611	33,228	35,169	31,579	31,442
Rapeseed	6,106	6,100	7,482	8,290	9,100	10,413	11,759	13,088
Others	8,446	8,591	8,287	8,511	8,118	7,318	8,287	8,950

Data Source: "Oilseeds: World Markets and Trade", 12/2006 and 07/2010, USDA

India Major Protein Meal Consumption

As shown as in table 2.8, we see that there is not much difference in consumption of cottonseed meal, peanut meal, rapeseed meal and soybean meal in India in 2002. After that, consumption of cottonseed meal increased rapidly compared to other types. But the consumption of peanut meal and sunflower seed meal has been decreasing.

Table 2.8 ─ India Major Protein Meal Consumption between 2002 and 2009 (Thousands Metric Tons)

Meal Type	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*	*2007/08*	*2008/09*	*2009/10*
Cottonseed	1,599	2,031	2,771	2,793	3,084	3,473	3,373	3,424
Peanut	1,606	1,964	1,980	1,990	1,468	1,843	1,777	1,400
Rapeseed	1,674	2,350	2,747	3,015	2,804	1,990	2,550	2,775
Soybean	1,502	1,122	1,310	1,405	1,852	2,056	2,383	2,854
Sunflowerseed	667	681	474	542	558	481	424	339
Others	298	293	337	342	257	274	303	302

Data Source: "Oilseeds: World Markets and Trade", 12/2006 and 07/2010, USDA

CHAPTER 3

INTERNATIONAL TRADE FOR OILSEEDS AND POLICY ISSUES

3.1 World Oilseed Exports

With the increase of oilseeds production and consumption noted in the previous section, oilseeds trade has become one of the largest sectors in international trade. The total production for major oilseeds was 394.45 MMT in 2008, and the major three producers in the world were United States, Brazil and China, producing 88.98, 59.47 and 57.93 MMT, respectively. These three countries accounted for almost 50 percent of world production.

With the increase of the production in five major oilseeds, the total exports have been rising. Figure 3.1 presents the world major oilseed exports by commodity view. The amount of soybeans exported is the largest one in five major oilseed exports. The export of soybeans was boosted between 1999 and 2009, with a low of 45.55 MMT in 1999 and with a high of 79.52 MMT in 2009. Since the consumption of soybean oil and soybean meal accounts for a large proportion for many countries, including China and EU-27, there is a high demand for export of soybean from major production countries. The exports of rapeseed, cottonseed, peanuts and sunflower seed have been relatively stable between 1999 and 2008. The export of rapeseed was the second largest export in the world oilseeds market, with lows of 4.11 MMT in 2002 and with the high export at 11.91 MMT in 2008.

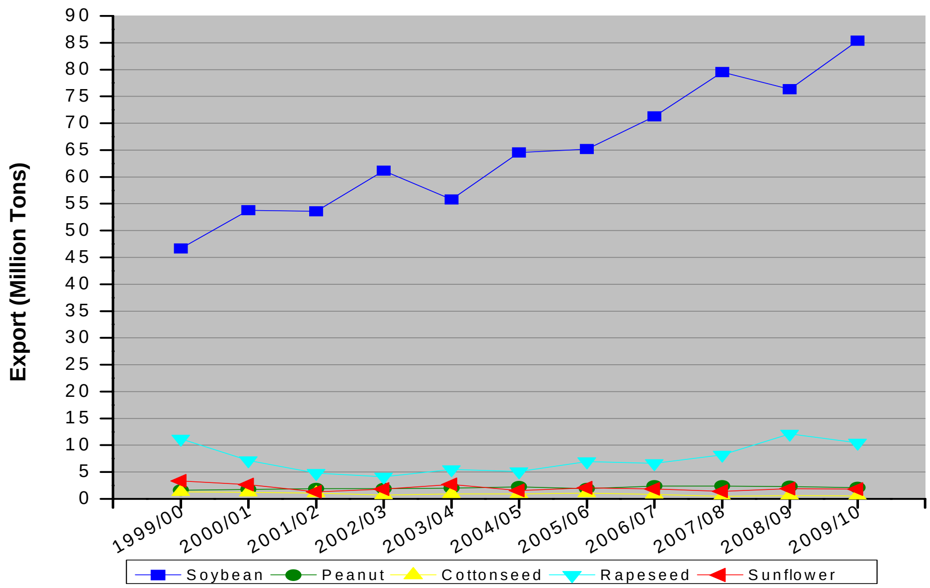


Figure 3.1 World Major Oilseed Export Distributions

Data Source: "Oilseeds: World Markets and Trade", FAS, USDA

The United States is the biggest exporter of oilseeds in the past several years, followed by Brazil, Canada and Argentina. In 2008, the total quantity trade export by United States reached 35.31 MMT, while Brazil increased to 27.88 MMT because of the strong demand for oilseeds. The total percentages of exports for the United States and Brazil were 38 percent and 32 percent, respectively (figure 3.2). The third major exporting country, Canada, reached 9.46 MMT in exports of major oilseeds in 2008. But the quantity of trade for Argentina dropped to 6.52 MMT from 14.43 MMT in 2007, since the production of Argentina declined from 51.71 MMT to 35.66 MMT at that time. The exports of Canada, Paraguay, Ukraine and China have been relatively stable between 2002 and 2008. The export of major oilseeds for China was a low, compared to the imports.

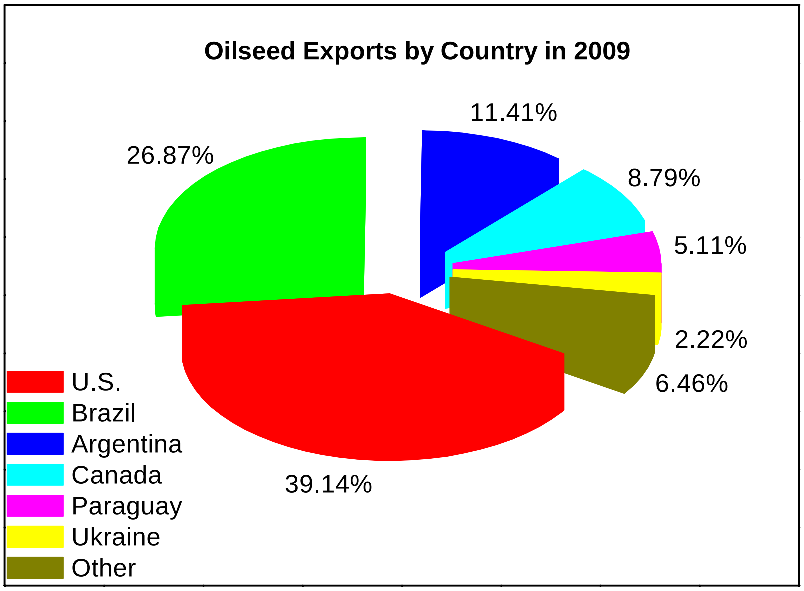


Figure 3.2 Oilseed Exports by Country in 2009

Data Source: "Oilseeds: World Markets and Trade", FAS, USDA

U.S. Major Oilseed Export Market

Despite substantial growth in the production of oilseed in the past 25 years and recent gains in export volume, the U.S. share of global exports has steadily decreased. The United States dominated world trade in unprocessed oilseeds in the mid to late 1970s, with a global market share of more than 70 percent. Recently, however, it has fallen below 50 percent (USDA, 2010).

The main export markets for the United States are China, Mexico, Canada and Japan. China is the major and most important export market, due to its large demand for soybean products. Soybean exports account for about 99 percent of five major oilseed exports from the United States to China.

Brazil's Major Oilseed Export Market

Soybean export is the most important and largest sector of oilseed exports from Brazil. It still stays in the position in 2010 as the second largest world soybean exporter behind the United States. China continues to import a large percentage of Brazil's exports (USDA and Report, 05/27/2008). Following China, the main destinations are Netherlands, Spain, Italy and Germany.

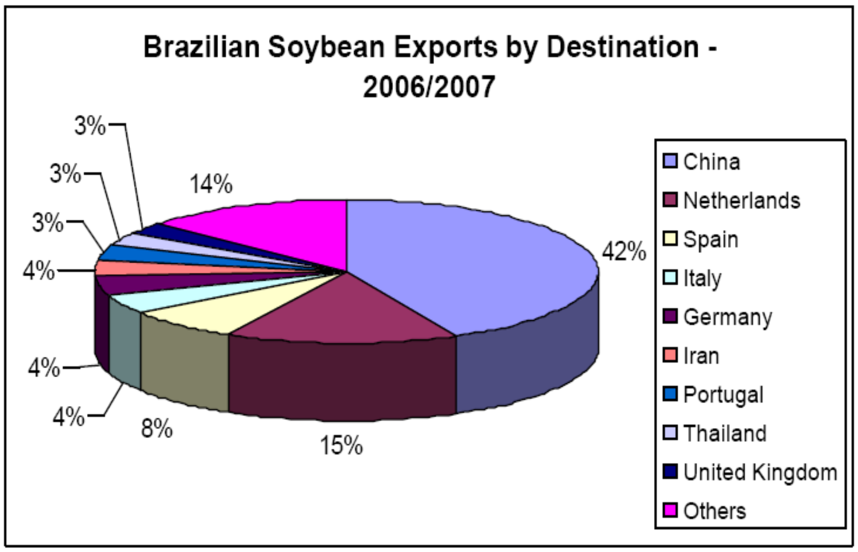


Figure 3.3 Brazil Soybean Exports by Destination

Source: (USDA and Report, 05/01/2007)

Argentina's Major Oilseed Export Markets

Soybean exports from Argentina in 2008 were reduced to 10 MMT as a result of extreme drought and a tighter supply. Sunflower seeds and oil exports are expected to increase strongly as the result of high international prices and increased production in 2007. In Argentina, the export tax on processed commodities is lower than on unprocessed commodities, which favors the export of soybean oil and meal from Argentina.

Most of Argentina's peanut production is exported for the confectionary market. The main export market is Europe. Its peanut meal exports are relatively small and stable (USDA and Report, 04/03/2008).

Canada's Major Oilseed Export Market

The main oilseed exports for Canada are rapeseed and soybeans. Canada has a large oilseed processing industry and exports not only the oilseeds but also the oilseed oils and meals resulting from their crush. Also, there is an important market in Asian countries for Special Quality White Hylum Soybeans from Canada, which comprise special premium varieties for the production of human food such as tofu, tempe, miso, etc. (AAC, 03/2010). The main export destinations for oilseeds and oilseed outputs are Japan and Mexico for rapeseed, and Japan, the European Union and Iran for soybeans.

Canadian sunflower seeds are mainly marketed to the birdseed industry of North America. The economic slowdown is expected to result in a lower demand. As a result, exports decreased from 85 thousand MT in 2008/2009 to 80 thousand MT in 2009/2010 (USDA and Report, 4/20/2009).

China's Major Oilseed Export Market

China's soybean exports are forecast at 500 thousand metric tons in 2010. Comparing to its soybean consumption, export volume remains small. Exports are destined to their traditional markets, including Korea and Japan (USDA, 05/2010).

3.2 World Oilseed Imports

Among the five major oilseed imports, soybean imports account for about 65 percent. The increase in the amount of total imports is very rapid between calendar years 1999 and 2009, with a low level of 45.99 MMT in 1999 and with a high level of 85.15 MMT in 2009. The second largest import is Rapeseed, with a record of 12.13 MMT in 2008/09. But the imports of peanuts, cottonseed and sunflower seed are really stable during these 10 years.

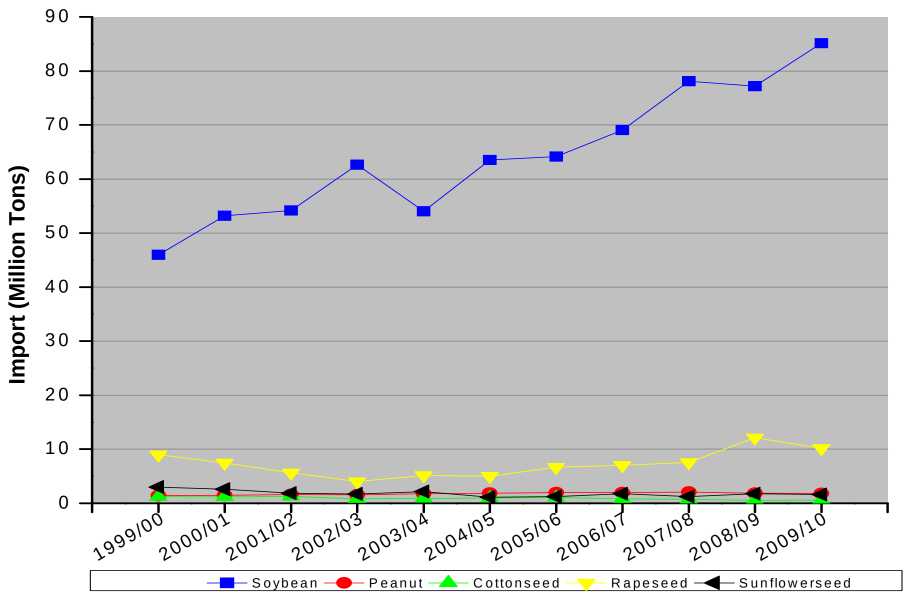


Figure 3.4 World Major Oilseed Import Distribution

Data Source: "Oilseeds: World Markets and Trade", FAS, USDA

China, as the world's largest oilseed importer, accounted for 52.5 percent of total oilseed imports in 2009, which is more than half of the total amount. The following importing entity is the EU-27, which accounted for 16.3 percent. Japan was the third largest import country in the world oilseed market, with 6.2 percent of the total amount, and Mexico, Turkey and Thailand together accounted for about 10 percent in 2009.

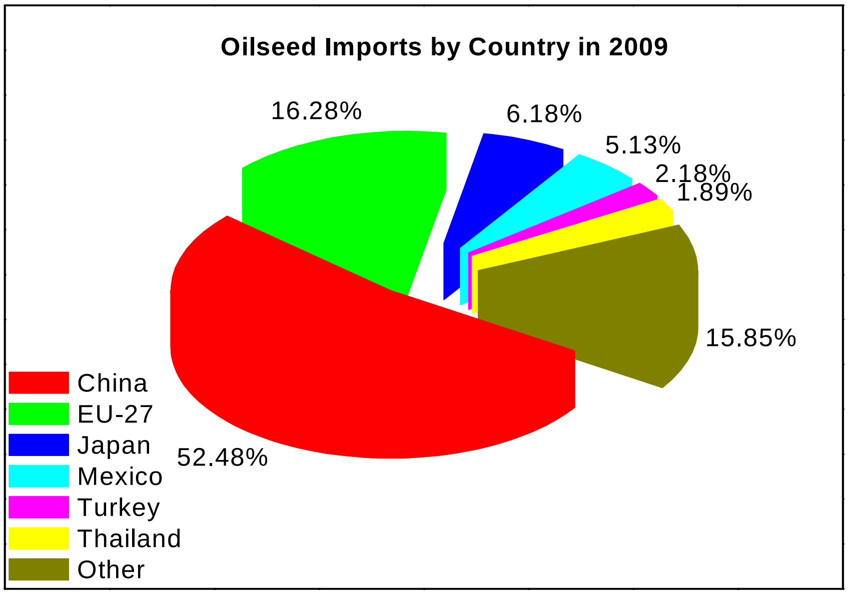


Figure 3.5 Oilseed Imports by Country in 2009

Data Source: "Oilseeds: World Markets and Trade", FAS, USDA

China's Major Oilseed Imports

China's soybean imports from the United States accounted for 36 percent of the market share, with 13.7 MMT in 2007. But the United States continues to face a challenge from South American countries to remain as the largest soybean supplier to China in 2009 (USDA and Report, 04/15/2009).

Table 3.1 — China's Soybean Imports by Country of Origin from 06/07 to 08/09

Country	**MY06/07**		**MY07/08**		**MY08/09**	
	MMT	Share	MMT	Share	MMT	Share
United States	11.5	40%	13.7	36%	5.1	58%
Brazil	10.7	37%	12.5	29%	2.4	27%
Argentina	6.2	21%	10.9	33%	1.3	15%
Others	0.3	1%	0.7	2%	0	0%
Total	28.7	100%	37.8	100%	8.7	100%

Source: GAIN Report, China, 04/2009, FAS, USDA

Soybean imports declined in 2009 because of the widely anticipated slowdown of economic growth and a relatively large domestic production in oilseeds. Soybean imports are forecasted to reach 38 MMT in 2010. The greater imports forecasted reflect a moderate recovery and continued growth in demand of soybean meal with strong economic growth. Since there is a strong and growing demand for protein meal by the rapidly developing animal industry, many industry sources forecast that soybean demand will remain strong in the future. There are other important factors, such as the increasing consolidation in the livestock and aquaculture sectors and the increased use of soybean-meal-rich commercial animal feeds among operators of all sizes (USDA and Report, 2/23/2010).

Rapeseed imports are predicted at 1.6 MMT in 10/11, which is similar to the estimated imports of 1.5 MMT imports in MY09/10. Canada remained the primary supplier, accounting for 97 percent of China's imports (USDA and Report, 2/23/2010).

EU-27 Major Oilseed Imports

Rapeseed is the most important oilseed grown in the EU-27, followed by sunflower seeds, soybeans and cottonseeds. However, the EU-27 position is a net importer of rapeseed. In 2007, over 95 percent of rapeseed oil imports were destined for technical use. Main suppliers were Canada, the United States, and the United Arab Emirates. In 2008, imports were reduced as a result of the growing EU-27 domestic rapeseed oil production (USDA and Report, 05/03/2008). In 2009, imports grew faster than domestic production due to the increase of demand.

EU-27 soybean imports are up 0.4 MMT to 13.0 million on improved demand for crushing soybeans in 2010/2011(USDA, 09/2010). For food use, the United States continues to be the stable exporter of sunflower seeds to EU-27. Another main supplier has been Argentina. But there is a restriction on exports of sunflower seeds by the Argentine government.

Canada's Major Oilseed Imports

Climatic conditions constrain peanut production in Canada. So, Canada is a net importer of peanuts, with the United States and China being the top two suppliers. Imports are forecast at 128,000 tons and 131,000 tons in 2009/10 and 2010/11, respectively, The United States is expected to retain a market share close to 80 percent (USDA and Report, 4/15/2010). Also, the United States is the primary supplier for rapeseed. In 2009, Canada imported 77,284 metric tons rapeseed from the United States.

Mexico's Major Oilseed Imports

Mexico's total imports of soybeans remain unchanged in 2009 because of the economic recession and the lower purchasing power. The weakening of the Mexican peso relative to the U.S. dollar affects soybean imports. Many end users, such as the animal feed industry, are afraid the peso will continue to weaken in 2010. As a result, oilseed and soybean buyers don't purchase based on their short-term requirements (USDA and Report, 04/08/2009). However, expected lower prices and an increasing consumer preference for canola oil improve the increase in rapeseed imports in 2009. The favorite import supplier for Mexico continues to be Canada.

The import of sunflower seeds declined in 2009 as a result of domestic demands. The peanut imports have been revised upward in 2007 and 2008. The market share of the United States declined in 2008 and 2009 as the result of increasing Mexico's import duties. The increased import tariffs are in retaliation over the dissolution of the projected U.S.-Mexico Cross-Border Trucking Demonstration (USDA and Report, 04/08/2009). So, the exports from the United States to Mexico are estimated to continue to decrease.

Japan's Major Oilseed Imports

The U.S. supplies 74 percent of Japan's total soybean import market, followed by Brazil and Canada. Canada continues to be the dominant rapeseed exporter to Japan. Also, Australia is a stable exporter to Japan, accounting for about 20 percent of the total rapeseed market.

The Japanese cottonseed market continued to be dominated by Australia. In recent years, the U.S. has been a negligible exporter of cottonseed to Japan. China has been a leading exporter of peanuts to Japan. Total imports of raw peanuts and processed peanuts together amount to around 100,000 metric tons (USDA and Report, 05/19/2006).

3.3 Analysis the Impacts of Tariffs, Quotas and Exchange Rates on Oilseeds Trade

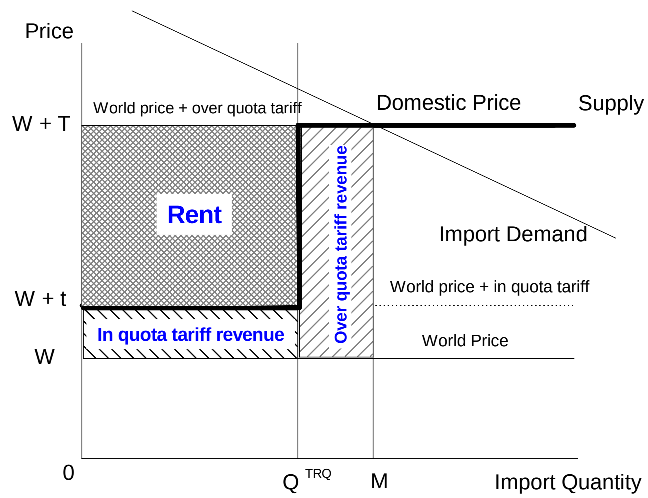
Compared with trade in other agricultural commodities, trade of the oilseeds is relatively unrestricted by tariffs and other border measures, particularly soybeans. But oilseed meals, and particularly vegetable oils, have higher tariffs. In addition to tariffs, both exporters and importers have used other trade-distorting policies. For example, Argentina and Brazil put on differential export taxes prior to 1996; the EU has production subsidies; and India often imposes prohibitive barriers on the imports of oilseeds. These policies create incentives to boost domestic oilseed production or encourage exports of processed products. However, these policies also tend to displace U.S. oilseed exports. Also, these policies shift the composition of U.S. exports towards whole oilseeds and away from higher, value-added oilseed meals and vegetable oils (USDA, 2010).

In 2001, the Doha round of WTO negotiations began and is still ongoing. Negotiations are focusing on issues that were previously addressed by the Uruguay Round Agreement on Agriculture (URAA), such as limits on tariff and non-tariff barriers to trade, export subsidies, and the type and level of spending by countries on domestic agricultural support programs. These provisions could limit member countries' use of trade-distorting policies (USDA, 2010).

U.S. Oilseed Policy Analysis

Under the North American Free Trade Agreement (NAFTA), Mexico phased out its tariff on soybeans and canola by 2003. With reforms in Mexico's domestic crop support programs, nearly all imports come from the United States, which has virtually displaced domestic soybean production. Soybean exports from the United States to Mexico have more than doubled since 1993 (USDA, 2010). Also, Canada imposes no duty on the exports of the United States under the NAFTA.

U.S. Tariff-Rate Quotas for Peanuts have shown significant impacts on U.S. peanut imports in the past, particularly prior to the elimination of the peanut marketing quota system (Skully, 1999).



Source: Skully, Economic Research Service, USDA

Figure 3.6 Tariff-Rate Quotas

The objectives of future negotiations for the United States are further reducing tariffs and improving market access, eliminating the use of export subsidies, and further limiting trade-distorting domestic programs (USDA, 2010).

China Oilseed Policy Analysis

A “biotech-free” soybean production policy exists in China because domestic soybeans are increasingly consumed directly as food, such as tofu, and the government of China still regards genetically modified food as a sensitive issue. Moreover, this policy ensures China could export with a substantial premium to Asian and European markets. This policy becomes the industry marketing strategy and an effective government supported market segregation tool (USDA and Report, 03/01/2007). This trade-related biotech policy remains unchanged.

The government of China reduced the import tariff rate for soybeans to one percent from three percent for three months, which was effective October 1st, 2007. The one percent rate was extended twice to the end of September 2008. In late 2008, industry sources widely speculated that the government of China might increase the soybean import duty over the WTO bound rate of three percent, due to the sharply decreased global soybean price that reduces farmers' income and interest. However, the three percent import duty remained, despite a record of soybean imports in MY08/09. In general, it appears the government of China will continue raising duties for oilseed imports, mainly due to the continuous growth of domestic demand for oilseed products and China's WTO-bound three percent duty for soybean imports (USDA and Report, 04/15/2009).

The China-ASEAN Free Trade Agreement (CAFTA) was enacted on January 1, 2010. According to the Agreement, the import duties for more than 90 percent of goods imported to China from ASEAN were eliminated. The implementation of CAFTA will have limited immediate impact on the oilseed and vegetable oil trade between China and other ASEAN countries (USDA and Report, 2/23/2010).

EU-27 Oilseed Policy Analysis

The 1992 Blair House Agreement (BHA) between the United States and the EU was contained in the EU WTO schedule of commitments and over EU domestic support programs, which impaired access to the EU oilseeds market. Under the BHA, EU oilseed plantings, mainly rapeseeds, sunflower seeds, and soybeans, for food/feed purposes were limited to an adjusted

Maximum Guaranteed Area (MGA) for producers benefiting from crop specific oilseed payments. This limited the oilseeds production area and penalized overproduction for EU (USDA and Report, 04/07/2011).

Brazil Oilseed Policy Analysis

The Brazilian Government recently lowered the import tariffs on oilseeds and products by 1.5 percent, which is contained in the MERCOSUL Common External Tariff schedule (TEC). Also Argentina, Uruguay and Paraguay are members of the MERCOSUL trade pact. Venezuela was also given member status in 2007. Bolivia and Chile are associate members of TEC and shown in table 3.2 (USDA and Report, 05/27/2008).

The weakening of the Mexico peso relative to the U.S. dollar played an important part in that. Many end users, such as the animal feed industry, were afraid the peso would continue to weaken in 2010. As a result, oilseed and soybean buyers didn’t purchase based on their short term requirements (USDA and Report, 04/08/2009). Definitely, Mexican currency will continue to impact the trade between Mexico and other export countries

Table 3.2 MERCOSUL Common External Tariffs

MERCOSUL Common External Tariffs			
Tariff Code		Description	%
1201		Soybeans	
	.00.10	Seed for planting	0
	.00.90	Other	8
1207		Cotton	
	.20.10	Seed for planting	0
	.20.90	Cottonseed	8
1507		Soybean oil, not chemically modified	
	.10.00	Crude	10
	0.9	Other	
	.90.10	Refined	12
	.90.90	Other	10
1512		Cottonseed oil	
	.21.00	Crude	10
	0.29	Other	
	.29.10	Refined	10
	.29.90	Other	10
1208		Oilseed flour	
	.10.00	Soybean	10
	.90.00	Other	10
2304		Meals resulted from extraction of soybean oil	
	.00.10	Meals & pellets	6
	.00.90	Other	6
2306		Meals resulted from extraction of vegetable oil	
	.10.00	Cotoonseed meal	6
Source: Brazilian Government - Aduaneiras Tarifa Externa Comum (TEC)			

Source: GAIN Report: BR8612, FAS, USDA

Argentina Oilseed Policy Analysis

Argentina began to promote alternative fuels, when the Argentine Congress approved the “Biofuels Law” on April 19th, 2006. This law promotes, through different tax incentives, the production of biofuels, which are derived from soybeans, sunflower, cotton and other agricultural products. Also, the legislation will require that all oil companies incorporate 5 percent volume of biofuels to regular gasoline and to diesel within a four-year period of the implementation of the law (USDA and Report, 05/02/2006).

The impact of higher international prices is expected to be largely offset by increased export taxes. On March 12th 2008, the government of Argentina modified its agricultural export tax regime by implementing a sliding tax, which is based on FOB prices. The new tax scheme will be in place for four years in Argentina. The government of Argentina will collect an additional US$1 billion (0.4 percent of GDP) in revenue under current market conditions. This change increased taxes for soybeans and Sunflower seeds, while corn and wheat were slightly reduced (USDA and Report, 04/03/2008).

Differential export taxes were slightly modified, and they continue to create incentives to process primary products. Producers have to re-evaluate the profitability of continually expanding soybean acreage, and they have apparent incentives to increase production of grain crops. However, the overall effect will reduce the profitability for producers (USDA and Report, 04/03/2008). As presented as the table 3.3 below, we see the taxes on soybeans and sunflower seeds have risen after implementing export taxes for FOB prices over 401 USD/ton.

Table 3.3 Argentina Summary Effects of Sliding Export Tax

Commodity	Average FOB Price Feb.'08	New sliding export tax (Avg. FOB price for Feb.'08)	FOB Price	Old tax	New tax rate
	(in USD)		(USD/ton)		
Soybeans	515	44.10%	0-200	35%	23.50%
			201-300	35%	From 23.5% to 28%
			301-400	35%	From 28% to 36%
			401-500	35%	From 36% to 43%
			501-600	35%	From 43% to 49%
			More than 600	35%	49%
Sunflower	569	39.10%	0-200	32%	23.50%
			201-300	32%	From 23.5% to 25%
			301-400	32%	From 25% to 31%
			401-500	32%	From 31% to 37%
			501-600	32%	From 37% to 45%
			More than 600	32%	45%

Source: GAIN Report: AR8013, FAS, USDA

Japan Oilseed Policy Analysis

Japan had maintained an emergency soybean stock reserve amounting to 50,000 metric tons from 1974 to 2003. The reserve volume was equal to about 5 percent of annual demand for food soybeans in Japan. Since 2003, Japan revised the stock program every year. The target stock amount in 2003 was reduced to 43,000 metric tons from 50,000 metric tons in 2005, which led to eleven crushing plants of five private oil crushers holding the emergency stocks.

Japan had a quota system on raw peanuts by the end of 1994, with a minimum annual quantity of 75,000 metric tons. However, the quota system was replaced by a tariff quota system under the Uruguay Round Agreement. Under this new system, 10 percent of the tariff is maintained within a quantity stipulated each year. The quota system uses 75,000 metric tons as a basis and is adjusted such that it depends on other considerations, including the quantity of prospective domestic production and the international market situation. The quota was 75,000 metric tons in 2006. The initial tariff was set at 726 yen per kilogram and was reduced to 617 yen in 2000. Raw peanut imports of Japan were around 41,000 metric tons in recent years. So, the 75,000 metric tons quota amount has not been filled. The tariff on processed peanuts was also reduced from 25 percent in 1995 to 21.3 percent (USDA and Report, 05/19/2006). As presented in table 3.4 below, we can see there are no tariffs on soybeans, rapeseed and cottonseed imports.

Table 3.4 Japan's Tariff on Major Oilseeds

HS Code	Commodity	Duty
1201.00-000	Soybeans	0
1205.10-000 1205.90-000	Rapeseed	0
1207.20-000	Cottonseed	0
1202.10-010 1202.20-010	Raw peanuts for oil extraction	0
1202.10-091 1202.20-091	Raw Peanuts within TRQ	10 percent (Primary Tariff Rate)
1202.10-099 1202.20-099	Raw Peanuts outside of TRQ	617 yen/kg (Secondary Tariff Rate)
2008.11-291 2008.11-292 2008.11-299	Processed Peanuts	21.3 percent

Source: Japan Tariff Association

Canada Oilseed Policy Analysis

Under the NAFTA, there is no duty on the trade of oilseeds between the United States, Canada and Mexico.

Russian Federation Oilseed Policy Analysis

Exports of oilseeds for the Russian Federation are limited by high export duties: for soybeans – 20 percent, but not less than 35 Euro per MT; for sunflower seeds, 20 percent of customs value, but not less than 30 Euro per MT; and for rapeseeds – 15 percent, but not less than 30 Euro per MT. The import duty on soybean meal remains at 5 percent and all meal exports are duty free. Vegetable oils are exported duty free. However, Import tariffs on vegetable oil vary for different oils (USDA and Report, 04/01/2011).

Egypt Oilseed Policy Analysis

Cottonseed imports are prohibited in Egypt. In the past three years, Egypt has not imported any sunflower seeds, and is not expected to import any next year. The current tariff rate for soybeans and sunflower seeds is zero. Oilseed meal and cake that are extracted from vegetable oilseeds are subjected to an import duty of 5 percent, plus 2 percent port charges. There are two different tariffs on imported seed oils. The import tariffs on bulk crude and refined soybean, sunflower seed, and cottonseed oil are zero. Tariffs on packed, refined soybean, sunflower, and cotton are varying between 2 and 5 percent (USDA and Report, 04/28/2011).

South Africa Oilseed Policy Analysis

The oilseed trade is mainly directed to the imports of oil and protein meal in South Africa. However, South Africa has become a net exporter of soybeans with the increase in the production of soybeans and limited processing facilities. South Africa exported 122,814 tons of soybeans in the 2010-marketing year. South Africa exported soybeans in 2010 mainly to three countries, Malaysia (66,022 tons), Indonesia (53,609 tons) and China (2,300 tons). Current import tariffs for oilseeds and oilseed products are summarized as below (USDA and Report, 03/30/2011):

Table 3.5 South Africa's Tariff on Major Oilseeds

Product	General rate of duty	EU and South Africa Development Community (SADC)
Sunflower seeds	9.40%	Free
Soybeans	8%	Free
Peanuts	10%	Free
Soybean meal	6.60%	Free
Sunflower meal	6.60%	Free
Soybean oil	10%	Free
Sunflower oil	10%	Free

Source: South Africa Grain Information Services (SAGIS)

Thailand Oilseed Trade Policy Analysis

Under the Agreement on Agriculture, Thailand has a tariff rate quota (TRQ) of 10,922 tons and 20 percent tariff rate. However, Thailand usually improves on its TRQ commitment due to the lack of domestic supplies. The Thai Cabinet approved unlimited quota for soybeans imported from WTO member countries from 2011-2013 subject to zero tariff on November 25, 2010. Also, imports of soybean oil (crude and refined) are subject to TRQ system under the WTO agreement. In 2010, the TRQ for soybean oil amounted to 2,281 tons, which are subjected to a 20 percent tariff rate. The tariff rate for out-of-quota imports is prohibitively high, subject to a 146 percent tariff. This has resulted in no imports in recent years. The slow domestic growth, an increase in production, and the fact that Thailand can enjoy a zero tariff and quota schedule in ASEAN countries caused the exports of soybean oil to increase significantly, from 3,106 tons in 2009 to 19,899 tons in 2010 (USDA and Report, 04/01/2011).

CHAPTER 4

ECONOMIC MODEL FOR OILSEEDS INTERNATIONAL TRADE AND TRADE COST ANALYSIS

4.1 Economic Theoretical Framework

A market is any structure that allows a number of buyers and sellers to exchange any kinds of products, service or information. Buyers and sellers are the two main roles in market. Along with buyers and sellers, there are two sides of exchange, called demand and supply. The definition of demand is the desire to own anything and the ability to purchase. Consumers are willing to pay for goods or services at a given price. The willingness to pay for goods or services is determined by the price of substitute commodities and complementary commodities, preference and taste, and income, in addition to the commodity own price. A simplified demand function can be specified as below:

$$Q_d = f(P_g, P_{sc}, \Pr, I) \tag{4.1}$$

Where Q_d is the quantity demanded of commodity, P_g is the price of commodity, P_{sc} is the price of substitute commodity or complementary commodity, Pr is the preference and taste by consumers, and I is the income earned by consumers (Feenstra, 2004, Guerrero, 2008).

The inverse demand function maps the quantity of commodity demanded to the market price for that commodity. It is very useful, since typically economists place quantity on the horizontal axis and price on the vertical axis. The function can be specified as:

$$P = D(Q) \tag{4.2}$$

where P is price of commodity demanded, and Q is the quantity of commodity.

Supply is the quantity of commodities or services available for purchase at any specified price. The supply is determined by selling price of commodity (producers try to sell the commodity at the highest price, whereas consumers try to purchase it at its lowest price, finally setting up a equilibrium price where demand and supply are equal), cost of inputs, the price of other commodities and technical factor. A simplified supply function is:

$$Q_s = f(P_g, C_i, P_o, Te) \tag{4.3}$$

where P_g is the equilibrium price, C_i is the cost of input, P_o is prices of other commodities, and Te is the technique (Feenstra, 2004, Guerrero, 2008).

4.2 Excess Demand and Excess Supply Theory

Excess demand and excess supply are very important to the theoretical analyze the international trade. Excess demand is the situation that quantity demanded is more than quantity supplied.

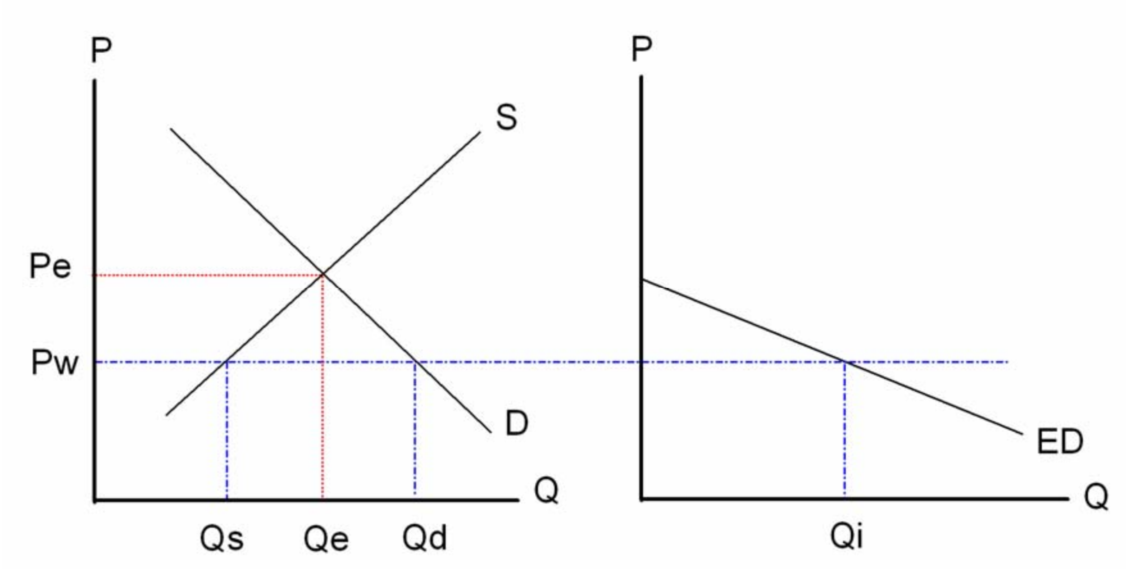


Figure 4.1 Excess Demand Curve

Source: Michael R. Reed, International Trade in Agricultural Products

From above figure of excess demand curve (ED), we can see the quantity of import at a given price (P_w). The excess demand curve is derived from domestic supply and demand curves. At autarkic price (P_e), excess demand for this good is zero, because quantity of domestic demand is exactly same as quantity of domestic supply. When price goes down to P_w, domestic demand goes up to Q_d. But domestic supply goes down to Q_s at price P_w. So, the difference between Q_d and Q_s is the excess demand for domestic consumers. Excess demand is equal to Q_i as shown on the above right figure (Feenstra, 2004, Guerrero, 2008).

Excess supply (ES) is the quantity that consumers are willing to buy at a higher price, above the autarkic price, which is less than the quantity that producers are willing to sell of that price.

Figure 4.2 presents the excess supply curve. From the left figure we can see excess supply is same as the excess demand at autarkic price (P_e). When price goes up to P_w, the supply goes up to Q_s and demand goes down to Q_d . The difference between Q_s and Q_d is the excess supply. Excess supply is equal to Q_{ex} as showed in right figure(Feenstra, 2004, Guerrero, 2008).

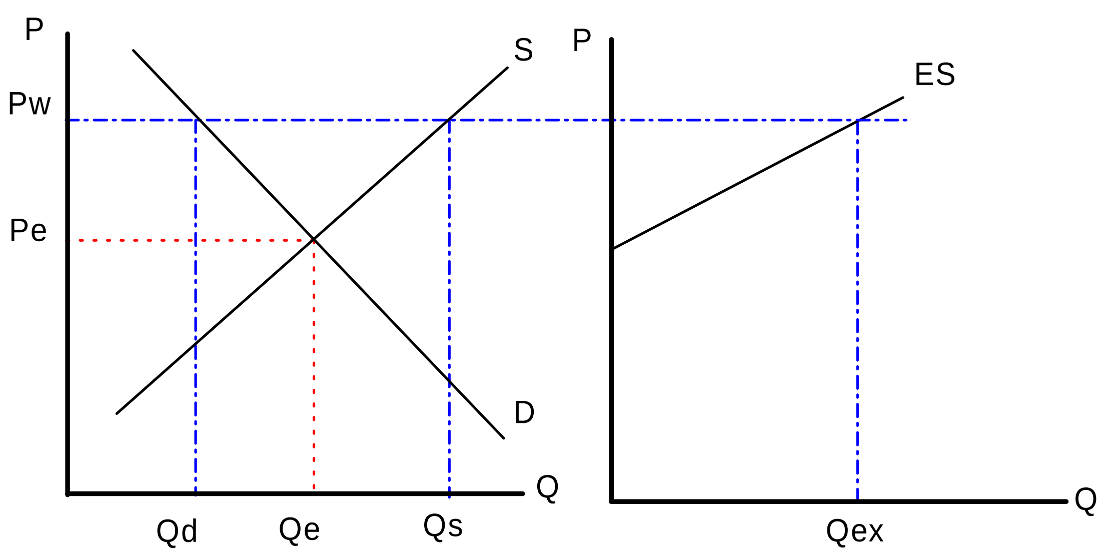


Figure 4.2 Excess Supply Curve

Source: Michael R. Reed, International Trade in Agricultural Products

4.3 International Trade Theory

International trade is the exchange of goods, capital and services for information between different countries. International trade is the main source of economic revenue for any countries. Without international trade, countries could only produce commodities within their own borders, and consumers could only consume the commodities and services produced within their own countries.

The major objective of international trade is to maximize the gains from trade for countries that are involved in exchanging commodities, service or information. International and domestic trades have the same underlying behavior and motivation. The difference between them is that international trade is much more costly than domestic trade. Factors impact costs include tariffs, quotas, exchange rate, language and different culture among others (Feenstra, 2004).

A simplified equilibrium market for a two-country world (an importing country and an exporting country) is illustrated in a three-panel diagram. As shown as in figure 4.3, without transportation cost and trade barriers, P_w will be world price for export and import countries in world market. From the left figure, we see excess supply in export country is ($Q_{se} - Q_{de}$). The excess demand in import country is ($Q_{di} - Q_{si}$) as shown in the right figure. In the world, the total quantity traded between export and import countries is Q_t, which is same as ($Q_{se} - Q_{de}$) and ($Q_{di} - Q_{si}$). Then, it arrives to the situation of trade equilibrium.

World welfare from international trade is equal to the area of adc. The welfare of area abd goes to import country and area bcd goes to export country (Feenstra, 2004, Guerrero, 2008).

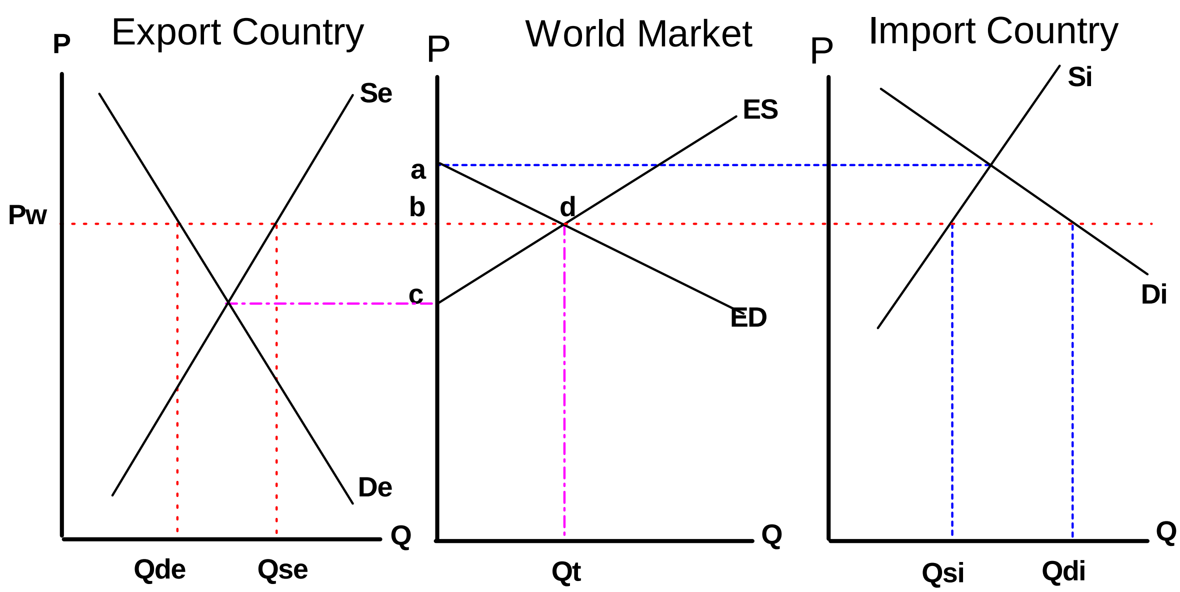


Figure 4.3 Trade Equilibrium in Export Country, Import Country and World

Source: Michael R. Reed, International Trade in Agricultural Products

where:

D_e = demand curve for export country

S_e = supply curve for export country

D_i = demand curve for import country

S_i = supply curve for import country

Q_{de} = quantity demanded by export country

Q_{se} = quantity supplied by export country

Q_{di} = quantity demanded by import country

Q_{si} = quantity supplied by import country

ES = excess supply curve

ED= excess demand curve

Q_t = quantity trade between two countries

P_w = price trade in world market

4.4 Review of Literature on Gravity Models

A successful empirical trade impact estimation method is the gravity equation. Gravity models can produce a good fit for goods traded between different countries. In 1979, Anderson first proposed and derived a gravity model by taking into account the effect of price (Anderson, 1979). Helpman (1987) applied the gravity model and gave an alternative characterization of the gravity model on the role of size of different countries. He tested the model on several OECD countries. The goal of his test was to graph the relationship between the dispersion index and the volume of trade related to GDP for OECD countries. He obtained two important results. One is that both variables are increasing over time. Another result is that trade is growing under the condition that countries become more similar in value of trade (Anderson, 1979, Feenstra, 2004, Helpman, 1987) .

Three approaches to measure the price effects followe. The first approach uses price indexes to measure the price effects in gravity models. Bergstrand (1985) generalized the microeconomic foundations of the gravity model, and later on, he extended them to introduce relative factor endowment differences and non-homothetic tastes (Bergstrand, 1989). Baier and Bergstrand (2001) estimated the effects of income convergence, income growth, transportation cost reductions and tariff declines on bilateral trade flows in OECD countries (Baier and Bergstrand, 2001). The second approach uses estimated border effects to measure price effects, as done by Anderson and van Wincoop (2003). The third approach uses fixed effects to explain price effects, as Rose and van Wincoop (2001) (Anderson and van Wincoop, 2003, Baier and Bergstrand, 2001, Bergstrand, 1989, Bergstrand, 1985, Feenstra, 2004, Rose and van Wincoop, 2001).

Gravity models can be used to test international trade patterns, including the impacts on preferential trade blocks. McCallum (1995) used 1988 Canada merchandise trade data and applied them through a gravity model to analyze the relationship between distance and the economic size of trade partners between Canadian provinces and US states. The methodology of that paper derived from the literature, including studies of Tinbergen (1962), Linneman (1966), Frankel (1993), and others (Frankel and Wei, 1993, Linnemann, 1966, McCallum, 1995, Tinbergen, 1962). The conclusion is that border of Canada and U.S. has effect on continental trade countries.

McCallum (1995) estimated the gravity equation:

$$\ln x_{ij} = a_1 + a_2 \ln y_i + a_3 \ln y_j + a_4 \ln d_{ij} + a_5 \delta_{ij} + \varepsilon_{ij} \ , \qquad (4.4)$$

where x_{ij} is exports from country i to country j; y_i and y_j are gross domestic production in country i and j; d_{ij} is the distance between country i and j; and δ_{ij} is a dummy variable equal to one for interprovincial trade and zero for state-province trade. McCallum estimated this model using data for all 10 provinces and for 30 U.S. states.

The significant implication of the theoretical gravity model is that trade between countries is determined by relative trade barriers. There are three general-equilibrium comparative implications below.

- Trade barriers reduce trade volume between large countries proportionately more than between small countries.

- Trade barriers increase trade volume within small countries proportionately more than within large countries.
- Trade barriers increase the ratio of trade within country 1 relative to size-adjusted trade volume between countries 1 and 2 by more the smaller is country 1 and the larger is country 2 (Anderson and van Wincoop, 2003, McCallum, 1995).

Based on the work of McCallum (1995), Helliwell (1996) updated and extended his analysis, and he used revised and additional data to assess the importance of this new research for Quebec. Then he tested the extent that trade patterns of Quebec's interprovincial and U.S. flows to support the revised national results. Finally, he discussed the implications of new results for the economic consequences of possible Quebec separation and for trade theory and policy (Helliwell, 1996, McCallum, 1995).

Anderson and van Wincoop (2003) found that estimated gravity models do not have a sound theoretical foundation. The lack of theoretical foundation of gravity models means that estimation suffers from omitted variables bias and comparative statics analysis is unfounded. So, in order to solve such problems, they developed a method that efficiently and consistently estimates a theoretical gravity equation, and they used the estimated general equilibrium gravity model to conduct comparative statics and apply the theoretical gravity model to resolve the border puzzle. Also, to compare their method to the results of McCallum, they apply their method to the border puzzle raised by McCallum (Anderson and van Wincoop, 2003).

The drawback of using the method of Anderson and van Wincoop is the custom programming requirement to get standard errors. This strategy is to use fixed effects to take account of the unobserved price indexes. The authors who have used the fixed effect method include Hummels (1999), Redding and Rose and van Wincoop (2001) (Feenstra, 2004, Rose and van Wincoop, 2001). Hummels (1999) used a multi-sector model to introduce an additional channel through which trade barriers affect trade volumes (Hummels, 1999, Hummels, 09/2001).

Baier and Bergstrand (2009) suggest a method for "approximating" the Multiple Resistance (MR) term based on theory. They use a first-order, log-linear Taylor-series expansion of the MR terms to obtain a reduced-form gravity equation. Then they use OLS to estimate this gravity equation (Baier and Bergstrand, 2009).

Gravity models have become a key tool in analysis of international trade. Baier and Berstrand (B-B) (2009) developed a new method using gravity equations for approximating international trade-cost effects. Using a Taylor-series expansion, they reveal a theoretical relationship between income, trade flow and trade cost by a reduced-form gravity equation, which is based on the model of Anderson and van Wincoop (2003) (Anderson and van Wincoop, 2003, Baier and Bergstrand, 2009). The Anderson and van Wincoop (A-vW) model solves the demand for trade from country i to country j by maximizing the utility function subject to budget constraint. There are three assumptions. The first assumption is a world with N regions and N goods, each good differentiated by origin. The second assumes consumers in each region have identical constant-elasticity-of-substitution (CES) preferences. The third assumption is market clearing (Baier and Bergstrand, 2009). Under three assumptions, the demand function is below:

$$X_{ij} = (\frac{Y_i Y_j}{Y^T})(\frac{t_{ij}}{\prod_i P_j})^{1-\sigma}$$

Where $\prod_i = \left[\sum_{j=1}^{N} (\theta_j / t_{ij}^{\sigma-1}) P_j^{\sigma-1} \right]^{1/1-\sigma}$ and

$$P_j = \left[\sum_{j=1}^{N} (\theta_i / t_{ij}^{\sigma-1}) \prod_i^{\sigma-1} \right]^{1/(1-\sigma)} .$$

(Anderson and van Wincoop, 2003)

Baier and Berstrand (2009) apply a first-order, log-linear Taylor-series expansion to the above equations of $\prod_i$ and P_j to obtain a reduced-form gravity equation. They then use OLS to estimate the reduced-form equation.

The reduced form of gravity equation they derive is below:

$$\ln x_{ij} = \beta_0^{'} - \rho(\sigma-1)\ln DIS_{ij} - \alpha(\sigma-1)BORDER_{ij} + \rho(\sigma-1)MRDIS_{ij} + \alpha(\sigma-1)MRBORDER_{ij} + \varepsilon_{ij} \tag{4.5}$$

where MR terms are:

$$MRDIS_{ij} = \left[(\sum_{k=1}^{N} \theta_k \ln DIS_{ik}) + (\sum_{m=1}^{N} \theta_m \ln DIS_{mj}) - (\sum_{k=1}^{N} \sum_{m=1}^{N} \theta_k \theta_m \ln DIS_{km}) \right]$$

$$MRBORDER_{\mathrm{ij}} = \left[(\sum_{k=1}^{N} \theta_k BORDER_{ik}) + (\sum_{m=1}^{N} \theta_m BORDER_{mj}) - (\sum_{k=1}^{N} \sum_{m=1}^{N} \theta_k \theta_m BORDER_{km}) \right]$$

and $x_{ij} = X_{ij} / GDP_i GDP_j$ (Baier and Bergstrand, 2009).

To confirm their theory, the coefficient estimates for lnDIS and MRDIS are restricted by B-B to have identical but oppositely-signed coefficient values. This method can estimate parameters of reduced-form gravity equation by the use of OLS.

Also, a Monte Carlo method is applied to yield estimates of border and distance coefficient estimates, which is virtually identical with the nonlinear least squares (NLS) method. Third, their method can calculate comparative static effects of key trade cost variables, if economic conditions under their approximation method hold (Baier and Bergstrand, 2009).

CHAPTER 5

DATA, ESTIMATION MODELS AND RESULTS

5.1 Data

Trade value data on oilseeds for 2009 were obtained from the United Nations Commodity Trade Statistics Database (UN comtrade) http://comtrade.un.org/db/.

Standard International Trade Classification (SITC) continues to be used by many countries and organizations, and for this study, we used SITC Revision 3 in the category oilseeds.

To compare the different specifications, we focus on trade patterns for a set of 22 countries for 2009. There are potentially 22*21=462 individual trade flows between the 22 countries of origin (exporters) and the 22 countries of destination (importers). We use oilseed trade value expressed in US dollars as an indicator of the bilateral trade volume, such that each pair of countries yields two observations, each country being both an exporter and an importer. We use reported exports rather than reported imports, as the former provides better coverage (Burger, et al., 2009). The 22 primary trade countries including in this study are US, Canada, China, Argentina, Brazil, EU-27, India, Japan, Mexico Australia, Colombia, Egypt, Indonesia, Malaysia, New Zealand, Pakistan, Russian Federation, Singapore, South Africa, Spain, Thailand and Turkey.

Despite the rapid growth in world trade of oilseeds, barriers of physical distance, institutional frameworks, culture and economic policies still yield considerable costs to international trade (Anderson and van Wincoop, 2004). Gross Domestic Product (GDP) data were obtained from the IMF 2010 List of Countries http://www.imf.org/external/. Since the transportation costs included shipping price, packing prices for international trade are almost impossible to obtain consistently. We generally use the distance between two countries to estimate the transportation cost. Data on distance directly to destination (minimum distance between two ports) were obtained from the website of Free Map Tools http://www.freemaptools.com/how-far-is-it-between.htm.

In previous studies, the most common strategies to circumvent the 'zero problem' in the analysis of trade flows involved arbitrarily adding a small positive number (usually 0.5 or 1) to all trade values or omit all zero-valued trade flows in order to ensure that the logarithm is well defined (Burger, et al., 2009). In this study, we add one to all zero trade values to ensure the logarithm is well defined.

5.2 Model Specification

We specified five gravity model systems to estimate coefficients and compare the results. Firstly, we used a naive gravity model, which includes a variety of explanatory variables in equation:

$$\ln X_{ij} = a_1 + a_2 \ln DIS_{ij} + a_3 \ln GDP_i + a_4 \ln GDP_j + a_5 Border + a_6 Lang + a_7 Hist + a_8 Agree + \varepsilon_{ij} \tag{5.1}$$

where

X_{ij} is export from country *i* to country *j*,

GDP_i and GDP_j are gross domestic production in exporter *i* and importer *j*,

DIS_{ij} is the distance between exporter *i* and importer *j*,

Border is a contiguity dummy variable,

Lang is a common language dummy variable, *Hist* is a common history dummy variable, and

Agree is a free trade agreement dummy variable.

For the second specification, we used a McCallum Gravity Equation proposed in 1995. According to our trade patterns, we revised this model and removed the dummy variable term that equals to one for interprovincial trade and zero for state-province trade, such that:

$$\ln X_{ij} = a_1 + a_2 \ln GDP_i + a_3 \ln GDP_j + a_4 \ln DIS_{ij} + \varepsilon_{ij} \tag{5.2}$$

The following gravity model specifications (B-B models) are used for comparison. These models were proposed by Baier and Bergstrand in 2009:

$$\ln x_{ij} = \beta_0^{'} - \rho(\sigma-1)\ln DIS_{ij} - \alpha(\sigma-1)BORDER_{ij} + \rho(\sigma-1)MRDIS_{ij} + \alpha(\sigma-1)MRBORDER_{ij} + \varepsilon_{ij} \tag{5.3}$$

where

$$MRDIS_{ij} = \left[(\sum_{k=1}^{N} \theta_k \ln DIS_{ik}) + (\sum_{m=1}^{N} \theta_m \ln DIS_{mj}) - (\sum_{k=1}^{N}\sum_{m=1}^{N} \theta_k \theta_m \ln DIS_{km}) \right]$$

$$MRBORDER_{\text{ij}} = \left[(\sum_{k=1}^{N} \theta_k BORDER_{ik}) + (\sum_{m=1}^{N} \theta_m BORDER_{mj}) - (\sum_{k=1}^{N}\sum_{m=1}^{N} \theta_k \theta_m BORDER_{km}) \right]$$

$$x_{ij} = X_{ij} / GDP_i GDP_j$$

Or $\ln x_{ij} = \ln X_{ij} - \ln GDP_i - \ln GDP_j$

In this gravity model, coefficient estimates for $\ln DIS_{ij}$ and MRDIS, BORDER and MRBORDER are first restricted to have identical but oppositely signed coefficient values. For comparing among alternative gravity models, we estimated this equation (5.3) with and without MRDIS and MRBORDER terms, as in the model below. Then we estimated this equation with and without restrictions.

$$\ln x_{ij} = \beta_0^{'} - \rho(\sigma - 1)\ln DIS_{ij} - \alpha(\sigma - 1)BORDER_{ij} + \varepsilon_{ij} \tag{5.4}$$

5.3 Estimation Results

After showing the summary statistics of the variables used in the gravity models in Table 5.1, estimated parameters are presented in tables 5.2 and 5.3. Next, we discuss a McCallum model without a dummy variable term. Estimated coefficients of the McCallum model are presented in table 5.4. Finally, we show results for the B-B model with and without MR terms or restrictions. Estimated parameters and the significance levels for the B-B models are presented in table 5.5.

Table 5.1 Summary Statistics of the Variables Used in the Gravity Models

Variables	**Mean**	**SD**	**Min.**	**Max**	**N**
Trade value (US dollars)	73834115.55	569477632	0	9225270856	462
Geographical distance (miles)	5921.169	2871.676	234.94	12359.07	462
GDP	2201892.91	3762417.78	125160	14119000	462
Common language dummy	0.1645022	0.3711325	0	1	462
Common history dummy	0.0735931	0.2613906	0	1	462
Agreement dummy	0.0954447	0.2941474	0	1	462
Border dummy	0.0541126	0.2264849	0	1	462

5.3.1 Naïve Gravity Models

In this section, we include zero trade values in the gravity models using different specifications. First we discuss a naive extension of log-normal model with and without zero trade flows.

Table 5.2 shows the results of the estimation of the log-normal model, in which the zero-values flows have been omitted from the data set. There are 306 observations used after omitting the zero-values trade volume. The GDP coefficients for exporters and importers have statistical significance at the 1 percent level. Common language dummy variable does not have the expected signs, but its estimated values are not significantly different from zero.

Table 5.2 Estimated Naive Model Omitting Zero-valued Flows of 2009

Variable	**Parameter**	**Standard Error**	**t-Value**	**Pr > |t|**
Intercept	-2.666	3.744	-0.710	0.477
Geographical distance (ln)	-0.126	0.358	-0.350	0.725
Border dummy	1.896	0.970	1.950	0.052*
GDP for Export Country (ln)	0.840	0.143	5.880	<.0001***
GDP for Import Country (ln)	0.385	0.140	2.740	0.0065***
Common language dummy	-0.295	0.520	-0.570	0.571
Common history dummy	0.460	0.814	0.570	0.572
Agreement dummy	1.034	0.748	1.380	0.168

*p<0.1, **p<0.05, ***p<0.01; N=306; R-Square=0.16

The coefficient estimate for Geographical distance (ln) in the naive gravity model (table 5.3) is statistically significant and carries a negative sign, as expected. That is an increase of transportation cost (or distance) reduces the trade values between countries by about 2.55 percent.

The coefficient estimate of Border dummy variable in the naive gravity model is weakly associated with trade value (at level 0.15) and has a negative sign, as expected, showing the tariff rates and non-tariff barriers tend to decrease the trade values between countries.

The coefficient estimates of GDP for import and export countries are statistically different from zero and with positive signs, as expected. A 1 percent increase in GDP of importing countries would increase oilseeds trade by 1.33 percent, which 1 percent increase in GDP of exporting countries would be accompanied by a 1.77 percent increase in oilseeds trade. The common language dummy variable is statistically significant at the 5 percent level and with expected positive sign. The coefficient estimates of common history and free trade agreement dummy variables have positive signs, as expected, but they are not statistically significant, demonstrating no influence on oilseeds trade in this model.

Table 5.3 Estimated Naive Gravity Model for Oilseeds Trade of 2009

Variable	**Parameter Estimate**	**Standard Error**	**t-Value**	**Pr > |t|**
Intercept	-11.816	5.940	-1.990	0.0473*
Geographical distance (ln)	-2.546	0.523	-4.860	<.0001**
Border dummy	-2.195	1.539	-1.430	0.155
GDP for Export Country (ln)	1.770	0.212	8.330	<.0001**
GDP for Import Country (ln)	1.329	0.214	6.220	<.0001**
Common language dummy	2.047	0.815	2.510	0.0124*
Common history dummy	0.530	1.323	0.400	0.689
Agreement dummy	1.152	1.205	0.960	0.340

*p<0.05, **p<0.01; N=462; R-Square=0.25

5.3.2 McCallum Gravity Model

The coefficient estimates of Geographical Distance (ln) in the naive model (table 5.3) and the McCallum model (table 5.4) are -2.546 and -2.501, respectively. The coefficients of GDP for import and export countries in both models (naïve and McCallum models) are similar. These three coefficients in the two models are statistically different from zero at the 1 percent level. The significance of the intercept indicates other important influences on oilseeds trade are likely, but omitted from this simplistic gravity specification.

Table 5.4 Estimated McCallum Gravity Model for Oilseeds Trade of 2009

Variable	Parameter Estimate	Standard Error	t-Value	Pr > |t|
Intercept	-11.544	5.657	-2.040	0.0419*
Geographical Distance (ln)	-2.501	0.450	-5.560	<.0001**
GDP for Export Country (ln)	1.762	0.211	8.370	<.0001**
GDP for Import Country (ln)	1.315	0.211	6.250	<.0001**

*p<0.05, **p<0.01; N=462; R-Square=0.23

5.3.3 Baier and Bergstrand Gravity Models

The coefficient estimate of Geographical Distance (ln) for column of the first B-B gravity model estimated without multilateral resistance (MR) terms (Table 5.4), which ignores these terms, is significantly different from zero at the 1 percent level. However, the coefficient estimate of the Border dummy variable is not significant.

Column (2) of table 5.5 represents the results of B-B gravity model with MR terms and without the restrictions that lnDIS and MRDIS, BORDER and MRBORDER are restricted to have identical but oppositely signed coefficient values. The coefficient estimate of Geographical

Distance (ln) again is statistically significant at the 1 percent level, but the coefficient of the border dummy variable has no statistical significance. The coefficient estimates of MRDIS and MRBORDER, the multilateral resistance adjustments, are significantly different from zero at the 1 percent level, indicating their importance to trade in terms of transportation costs and/or relationships with neighbors.

Column (3) represents the estimated B-B gravity model with the full set of above restrictions. The coefficient estimate of Geographical Distance is positive sign, as expected, but it is not significantly different from zero. The coefficient estimate of border dummy is statistically significant at the 1 percent level. Taken together, the inference from the B-B model is that border barriers overwhelm distance effects on bulk oilseed trade in those commodities where they exist.

Table 5.5 Estimated B-B Gravity Model for Oilseeds Trade of 2009

	(1)	(2)	(3)
Parameter	**B-B w/o MR terms**	**B-B w/o restrictions**	**B-B with MR terms**
Geographical Distance (ln)	-2.52182	-2.63807	-0.00913
	(<.0001)	(<.0001)	(0.9685)
Border dummy	-0.08183	-0.38109	4.18037
	(0.9548)	(0.7918)	(0.0003)
MRDIS		-0.78685	0.00913
		(0.0027)	(0.9685)
MRBORDER		-6.21255	-4.18037
		(0.0007)	(0.0003)
R-Square	0.06	0.10	0.03
No. of obs	462	462	462

*p<0.05, **p<0.01

The following chapter will summarize the study and conclusions and the implications that may be drawn from the use of such gravity models on commodity trades, specifically oilseeds. Questions on limitations of this study and future research and also discussed.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Summary

World oilseed trade consists of many closely substitutable commodities, including soybeans, rapeseeds, sunflower seeds, peanuts and cottonseeds. Countries trade oilseeds, oilseed oils and meals obtained from crushing oilseeds. Foreign import demand primarily depends on the difference between domestic oilseed output and consumption. This study started with the framework of oilseed production and consumption in the whole world. Among oilseeds, soybeans production, with 261.97 MMT, accounts for about 60 percent of total oilseeds trade in 2010. The United States is the world's largest producer and exporter of soybeans. Oilseed and oilseed product exports, particularly soybeans, represent a significant source of demand for U.S. producers and make a large contribution to the U.S. agricultural trade balance. Brazil, China, Argentina and India are also among the world's primary producers. The three main exporters of major oilseeds are The United States, Brazil and Argentina. China and EU-27 are the two primary importers.

Trade policies, such as tariffs, quotas, non-tariff barriers, have significant impacts on international trade of oilseeds and oilseed products. Argentina and Brazil put on differential export taxes prior to 1996. Under the North American Free Trade Agreement (NAFTA), Mexico phased out its tariff on soybeans and canola by 2003. EU has production subsidies, and India often poses prohibitive barriers on the imports of oilseeds. The China-ASEAN Free Trade Agreement (CAFTA) was enacted on January 1, 2010. The implementation of CAFTA will have limited immediate impact on the oilseed and vegetable oil trade between China and other ASEAN countries (USDA and Report, 2/23/2010).

This study analyzes fundamental variables in the international market with respect to their impacts on trade values of oilseeds. Gravity models are built to analyze and compare the impacts of transportation cost.

6.2 Conclusions

The application of various specifications of previously used gravity models leads us to considerable differences in coefficient estimates. Empirically, we compare coefficients leaving out the zero-valued flows and those estimated by replacing the zero by one. In our analysis, it confirms that seriously biased coefficients result from omitting zero-value trade volumes, and the sign of the common language dummy variable is not as expected. This is because the omitted zero trades are not randomly distributed across the exporters and importers. After replacing zero trades in oilseeds by a small constant one, we find that the values of coefficient estimates vary greatly. Most variables have the expected signs and have statistical significance. In the traditional specification, an increase in geographical distance by 1 percent associated with a decrease in value of trade in oilseeds by 2.54 percent. That is, the shipping cost/distance has a significant impact on the trade value of oilseeds. The variables that describe cultural and economic proximity of countries, including common language, common history and having a free trade agreement, all positively affect the bilateral trade of oilseeds. Other explanations of trade patterns, such as policy (tariffs, quota and non-tariff barriers) and GDP for exporter and importer countries, are also important for explaining trade patterns of oilseeds (Burger, et al., 2009).

All the variables for the McCallum Model specification have the expected signs and the estimated coefficients are statistically significant. The results of coefficient estimates of the McCallum model are very similar in magnitude to those of the naive model in which we replaced zero-valued oilseed trades by one.

This study also considered the use of the Baier and Berstrand (B-B) models using Taylor-series expansion to solve a simple reduced-form gravity model and revealing transparent theoretical relationship among bilateral trade flows and trade costs (Baier and Bergstrand, 2009). First, we estimated this model without multilateral resistance terms. Only one term of geographical distance has the expected sign and is statistically significant. Second, we added both MR terms, but no restriction that $\ln DIS_{ij}$ and MRDIS, BORDER and MRBORDER be limited to have identical but oppositely-signed coefficient values. Third, we examined the B-B model with MR terms and matrix restrictions. Coefficient estimates of both the geographical distance and border sharing have the expected signs. Contiguous countries have greater trade volumes of oilseeds than non-contiguous countries.

6.3 Limitation and Future Research

The major limitation of this study is data availability. The shipping cost for oilseeds was almost impossible to obtain consistently. Also, the bilateral trade values for some countries and for some years were not available. Possible potential changes to this study would be made in the future. This study used oilseeds trade value data for in 2009 only. We could use average yearly trade value for an extended period as an indicator of the bilateral trade volume to solve the data availability issues.

It is challenging to build a comprehensive framework of oilseeds sector, due to the complexity of oilseeds and oilseed oils production, consumption trade patterns and policy and time limitation. Future research would be improved by additional information related to trade and trade policy.

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