AN EMPIRICAL ANALYSIS OF U.S. FOREIGN DIRECT INVESTMENT AND EXPORTS OF PROCESSED FOOD INDUSTRIES

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AN EMPIRICAL ANALYSIS OF U.S. FOREIGN DIRECT INVESTMENT

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

MASTER OF SCIENCE

ABSTRACT

Haque, Mohua; M.S.; Department of Agribusiness and Applied Economics; College of Agriculture, Food Systems, and Natural Resources; North Dakota State University; November 2006. An Empirical Analysis of U.S. Foreign Direct Investment and Exports of Processed Food Industries. Major Professor: Dr. Won W. Koo.

This study examined the determinants of U.S. foreign direct investment (FDI) and exports of processed food. This study also examined the impact of U.S. FDI on U.S. exports on processed food. FDI and export models used for estimation in this study were based on the cost-minimizing production function. The analysis focused on ten countries for the period of 1989-2004. Four of them were Asian countries: India, Japan, South Korea, and Thailand. Six of them were European countries: Belgium, France, Germany, Italy, Spain, and the United Kingdom. The model was estimated using the two-way error component three-stage least squares (EC3SLS) method.

Results from this study show that U.S. FDI and U.S. exports of processed food are complements. Major factors affecting U.S. FDI in the processing industry are GDP, GDP per capita, exchange rate, tariff rate, labor compensation cost, interest rate, and distance. Major factors affecting U.S. exports in the processed food industry are GDP, distance, and GDP from the agri-sector.

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DEDICATION

This thesis is dedicated to my grandmother, the late Rawshan Ara. The person I miss a lot.

M.H.

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CHAPTER 1. INTRODUCTION, PROBLEM, OBJECTIVES, AND SCOPE OF THE STUDY

1.1. Introduction

The processed food industries of U.S. are one of the major manufacturing sectors in the United States. The U.S. processed food industries are the major foreign direct investor and exporter in the world. The U.S. processed food industry accounted for over 10% of all manufacturing. "More than a third of the world's top 50 food and beverage processing firms are headquartered in the United States" (U.S. Department of Commerce, Office of Health and Consumer Goods, 2005, pg # 8). Meat products, other food/grain/oilseed milling, and dairy products are the major sectors of the U.S. food processing industry. The dairy products, other food, grain/oilseed milling, and meat products accounted for 66% of total industry shipment values in 2004. Five sectors comprise the balance of the shipment values; fruit/vegetable preserving/specialty food manufacturing accounted for 10% of the total industry; bakeries/tortilla manufacturing accounted for 10%; animal food manufacturing accounted for almost 6%; sugar/confectionery product manufacturing accounted for 5%; and seafood products accounted for 2% (U.S. Department of Commerce, Office of Health and Consumer Goods, 2005).

1.2. Problem Statement

The U.S. processed food sector has faced stable growth from year 1997-2003. In 2000, U.S. processed food exports increased to $26 billion. In 2003, export of processed food increased to $28 billion, which is a 13% increase from 1998, but food trade experienced a trade deficit. In 2003, the values of shipments were $461.6 billion, which is a 9% increase from 1997 (U.S. Department of Commerce, Office of Health and Consumer Goods, 2005). Recently, in 2004, exports of processed food experienced a minor decline.

As shown in Figure 1, the U.S. processed food sector exported $25.9 billion of processed food in 2004. On the other hand, this sector imported $27.7 billion of processed food in 2004. The processed food industry's trade surplus has been reducing over the last few years and changed to a trade deficit in 2004 of $1.8 billion. This can be due to few reasons. First, foreign direct investment (FDI) is growing faster than trade. Second, slow growth in processed food export is due to increased competition in the global food industry. Third, due to comparatively high tariffs on processed food products, there is a slow growth in processed food exports. Fourth, imports of processed food products increase from other countries.

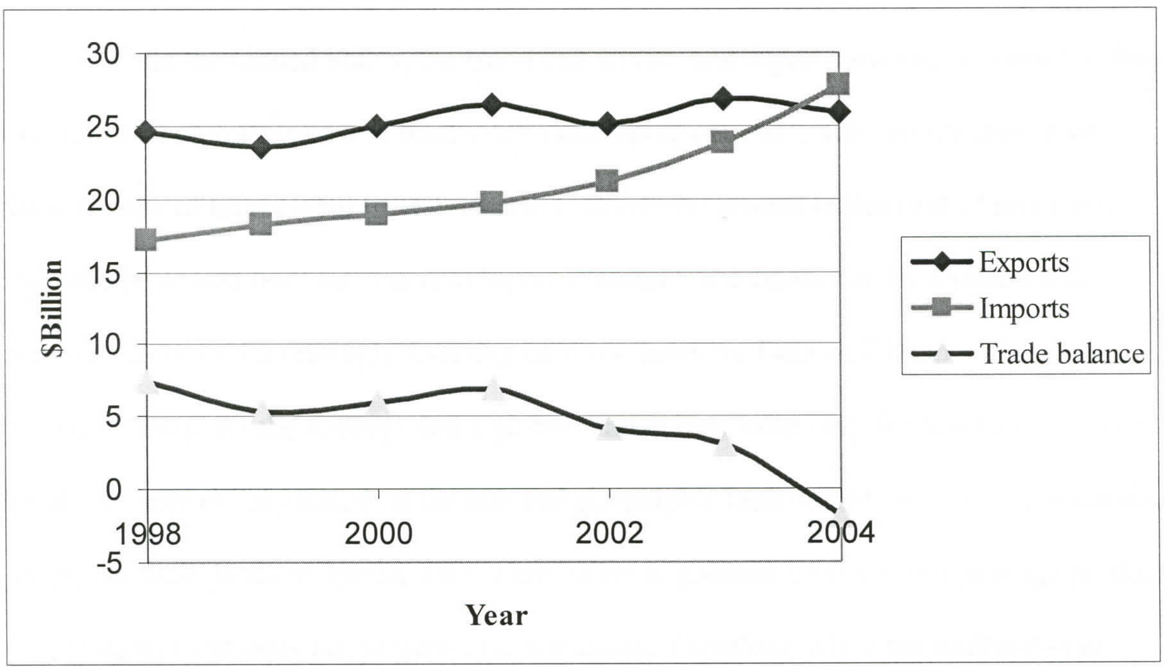

Figure 1. U.S. Trade in Processed Food. Source: U.S. Department of Commerce, International Trade Administration (2006).

On the other hand, U.S. direct investment abroad continues to increase. U.S. FDI in food manufacturing increased 24% from 2002 to 2003 and 15% from 2003 to 2004, which is 42% increase from 2001 to 2004 (Table 1). The new and advanced technology for manufacturing food allows food processing industries to establish their industry in foreign countries.

Table 1. U.S. Direct Investment in Food Manufacturing, 2001-2004

	Billions of Dollars			
Country	2001	2002	2003	2004
World	21.33	18.34	22.72	26.02
Europe	10.85	9.15	11.32	14.01
Asia and Pacific	2.56	2.50	3.04	3.29

Source: U.S. Department of Commerce, Bureau of Economic Analysis (2006).

While the United States, the European Union, and Japan currently account for about two-thirds of global processed food sales, developing countries account for more than three-fourths of total global food consumers. Given the growth in demand of processed food and projected food sales in developing countries, multinational food sellers and manufacturers are increasingly focusing on those markets. Data on FDI in the processed food sector support the concept that a global market may exist only for few food products. Food preferences vary based on income and geographic location. Moreover, manufacturing processed food products locally allows producers to process, prepare, and package products according to local demand, preferences, and tastes. Therefore, while the multinational companies operate across different countries, growth in the food trade may not keep pace with growth in global food demand. In that case, U.S. FDI in processed food industry may decrease exports of U.S. processed food to those countries. A decrease in U.S. exports also decreases the U.S. balance of trade.

1.3. Objectives

The purpose of this research is to identify the causes that influence the U.S. processed food industry to locate their plants in foreign countries and to evaluate the impact of FDI on U.S. exports of processed food. The objectives are

1) To determine the factors that influence U.S. exports and FDI levels in selected European and Asian countries.

2) To analyze the impact of U.S. FDI in selected European and Asian countries on U.S. exports.

Past studies indicate that economic factors of the host countries influence FDI and trade flows (Marchant, Cornell and Koo, 2002). The determinants of U.S. outward investment vary according to the country of destination. In some cases, FDI may benefit from host country's available natural resources or low relative costs; while for other locations, the skills and technology available in the host country may be the main factor behind direct investment as opposed to exports. In previous studies, GDP, interest rate, and exchange rate are important variables that influence the U.S. FDI to host country (Marchant, Cornel, and Koo, 2002). One of the primary motives behind FDI is tariff-jumping. Since tariffs increase the cost of exporting, foreign firms choose to jump over the tariff and start production within the protected market. U.S. FDI and exports to Asian and European host countries are not uniform. As a result, this study will focus on the factors of host countries that will attract U.S. FDI, as well as, exports in processed food industries.

The relationship between FDI and trade has been reported in the literature during the past few years. The share of world FDI to export volume is increasing. Both trade and FDI have advantageous effects on economic growth. A large amount of literature supports the idea that both FDI and trade can be beneficial for economic development and growth. As a result, the important issue for policy makers to understand is that the relationship between FDI and trade can be described as a substitute relationship or a complementary relationship. A substitute relationship indicates that an increase in FDI will decrease exports to host countries, while a complementary relationship indicates that an increase in FDI will increase exports to host countries. Here, one of the objectives in this study is to analyze U.S. FDI and export relationships in processed food industries for one developed Asian country, three developing Asian countries and six developed European countries. [1]

1.4 Scope of the Study

This research will focus on U.S. FDI and exports in the processed food industry with four Asia and six European developed and developing countries, including India, Japan, South Korea, Thailand, Belgium, France, Germany, Italy, Spain, and the United Kingdom. General economic and non-economic statistics of these fourteen countries are given in Table 2.

Japan is the second most technologically dominant country in the world after the* United States, based on the purchasing power parity (PPP) basis (U.S. Central Agency, 2006). From 2000 to 2003, governmental efforts to stimulate economic growth met with

[1] According to the International Monetary Fund (IMF) and United Nations Statistics Division (2006), even though there is no established convention for the designation of "developed" and "developing" countries, Japan is considered a developed country while all other Asian countries are developing countries. According to organizations such as the World Bank, the IMF, and the U.S. Central Intelligence Agency (CIA), all European countries are considered as developed nations.

modest success and were further hampered by the slowing of the U.S., European, and Asian economies. But in 2004 and 2005, growth improved rapidly. In 2003 the growth of Thai economy was 6.9% where in 2004 the growth was 6.1% even with a slow-moving global economy. On the other hand, in 2005 the GDP growth in India was 7.6%, which was caused by significant expansion of the manufacturing sector (U.S. Central Intelligence Agency, 2006).

Table 2. General Statistics of 10 Asian and European Countries for the Year 2004

Countries	Total Population (Million)	GDP- Per Capita ($)	GDP growth rate (Annual %)
Belgium	10	31096	3
France	60	29300	2
Germany	83	28303	2
India	1080	3139	7
Italy	58	28180	1
Japan	128	29251	3
Korea, Rep.	48	20499	5
Spain	43	25047	3
Thailand	64	8090	6
UK	60	30821	3

Source: World Bank (2006).

The European Union (EU) tried to minimize trade barriers within member countries, agreed to use a common currency in between member countries, and move toward the meeting of living standards. Internationally, the EU continues to strengthen Europe's economic power as well as its political situation. The EU's industrial base is the world's largest and most technologically advanced sector, it includes metal products, petroleum, coal, cement, chemicals, industrial equipment, and food/beverage processing. Belgium, France, Germany, Italy, Spain, and the United Kingdom are the members of the

European Union. France and Germany are the technologically powerful economies. The United Kingdom economy is one of the strongest economy in Europe (U.S. Central Intelligence Agency, 2006).

Over the past two decades, the intra-European FDI has grown faster than its counterpart in any other region of the developed world. European countries also are the leading destination for the U.S. FDI as well. In 2004, the United States direct investment abroad position increased in six countries in Europe. Germany, France, Switzerland, Ireland, the UK, and the Netherlands accounted for almost four-fifths of the increase in Europe. In 2004, FDI in Denmark accounted for $581 million; Finland accounted for $47 million; Norway accounted for $322 million; Sweden accounted for $301.45 million; and Switzerland accounted for $286.27 million (LCCOmotnitor, 2006). The U.S. was the top most investor in all seven countries. According to the USDA, the recent increase in the U.S. FDI to Europe is mostly from the acquisitions of European-based food companies. In case of U.S. processed food export to Europe, the European Union accounted for the major share within Europe (Figure 2).

European countries such as the United Kingdom, Germany, and France accounted for the largest share of the world's FDI outflow and inflow. In 2004, Belgium accounted for $2.67 billion, France accounted for $2.91 billion, Germany accounted for $6.71 billion, Italy accounted $3.43 billion, and Spain accounted for $7.92 billion. The United Kingdom received huge FDI inflows in 2004 which is almost four times higher than they received in 2003 (United Nations Conference on Trade and Development (UNCTAD), World Investment Report 2005). France, the Netherlands, and the United Kingdom accounted for more than half of U.S. FDI in Europe. In the United Kingdom, the U.S. foreign direct investment abroad (USDIA) position was $302.5 billion (Koncz and Yorgason, 2005) in 2004. Canada accounted for $216.6 billion (11%) and the position in the Netherlands was $201.9 billion (10%).

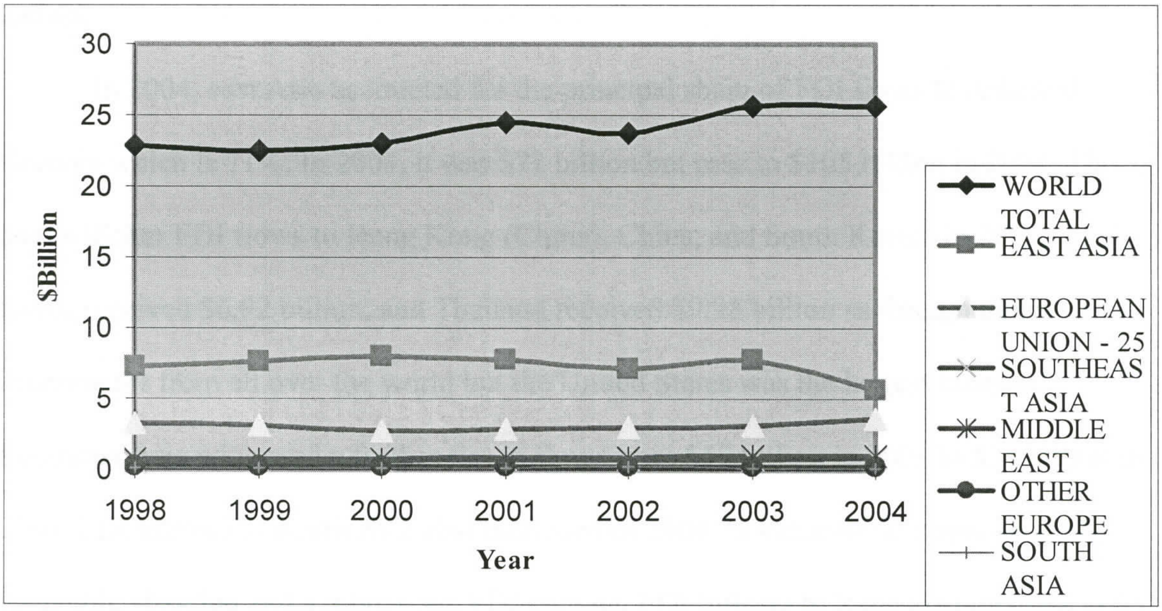

Figure 2. U.S. Processed Food Export to European and Asian Regions. Source: U.S. Department of Agriculture, USDA-ERS (2006) and U.S. Department of Commerce, International Trade Administration (2006).

On the other hand, FDI inflows to Asia and Oceania reached $148 billion in 2004, the largest increase ever. There is increase in the above region's share of FDI inflows worldwide from 16% in 2003 to 23% in 2004. In 2004, overall most of the parts of Asia and Oceania received higher flows compare to 2003. In 2004, FDI flows to Asia and Oceania increased by 46%. Compare to 2003, 34 out of 54 economies received higher flows in 2004 in this regions. However, they remain concentrated in few countries. The top 10 host countries accounted for 92% of total FDI inflows to this region. China, India, South Korea, Bangladesh, Macao (China), Mongolia, Pakistan, Qatar, Singapore, the Syrian Arab

Republic, and Vietnam received huge levels of FDI flows. Among all developing countries worldwide, China was the major recipient of FDI flows as before. China accounted for $61 billion (United Nations Conference on Trade and Development (UNCTAD), World Investment Report 2005). The United States was the largest investor in China among all nations.

In 2004, east Asia accounted for the principal share of FDI flows to Asia and Oceania which is 71%. In 2003, it was $72 billion but rose to $105 billion in 2004. This is due to higher FDI flows to Hong Kong (China), China, and South Korea. In 2004, South Korea received $6.92 billion, and Thailand received $9.98 billion as foreign direct investments from all over the world but the United States was the largest investor. Southeast Asia witnessed a further rise in flows from $17 billion in 2003 to $26 billion in 2004. FDI inflows to South Asia also increased in 2004. Because of an improving economic situation and a more open FDI climate, FDI inflows to India also increase to $5 billion.

Because an emerging middle class in Asian countries is causing rapid urbanization and an increasing demand for imported processed food, the United States is probably in a better position to capture the largest share of that market. Asia Pacific is the third largest frozen processed food market in the worldwide, which imports 85% of its processed food requirements from the world. Currently, Japan leads the imports of processed food in between Asia. On the other hand, research by the World Trade Organization shows that the largest shifts of processed agricultural products were going towards developing countries like Malaysia, China, Indonesia, and Thailand. Asia has a huge population, even a small change in market entree in Asia is a better business scope for the U.S. (Pattnaik, 2005).

1.5. Organization of Thesis

Chapter 2 summarizes the overall global and U.S. FDI and trade from 1990 to 2004. This chapter will also give an overview of U.S. FDI and the trade of processed food industries. Chapter 3 will consist of two parts: 1) a brief overview of existing theoretical and empirical literature on the relation between FDI and exports and 2) a review of the existing theoretical and empirical literature concerning the determinants of FDI and exports. Chapter 4 develops the hypotheses that were tested in this study and also gives an overall description of the existing theoretical model used to complete the empirical analysis. This chapter describes an existing theoretical FDI model using cost- minimizing theory. This chapter also discusses data collection. Chapter 5 presents empirical findings of the analysis for U.S. processed food industries in selected European and Asian countries and the implications for the United States. Finally, Chapter 6 provides a short summary of the problem, hypothesis, empirical findings, contributions, and a brief conclusion. It will also discuss some of the limitations of the study and recommendations for further study.

CHAPTER 2. FDI AND EXPORT TRENDS

This chapter provides an outline of global and U.S. trends in FDI and exports from 1990-2004, especially U.S. FDI and exports on processed food industries. This chapter also highlights U.S. FDI and exports to Asian and European countries.

2.1. Worldwide FDI: Developed and Developing Countries

FDI increased rapidly between 1997 and 2000 before decreasing in 2002 (Figure 3). In 2004, FDI outflows increased from the 2002 level by 18% to $730 billion but did not return to the 2000 level. FDI outflow from developed countries was more in comparison to developing countries in 2004. In 2004, developed countries provided $637 billion of the world's FDI while the developing countries provided only $83 billion. Almost half of world outward FDI originated from two sources: the United Kingdom, and the United States. While FDI outflows from Europe declined by 20% to $80 billion in 2004, those from most other developed countries increased in 2004.

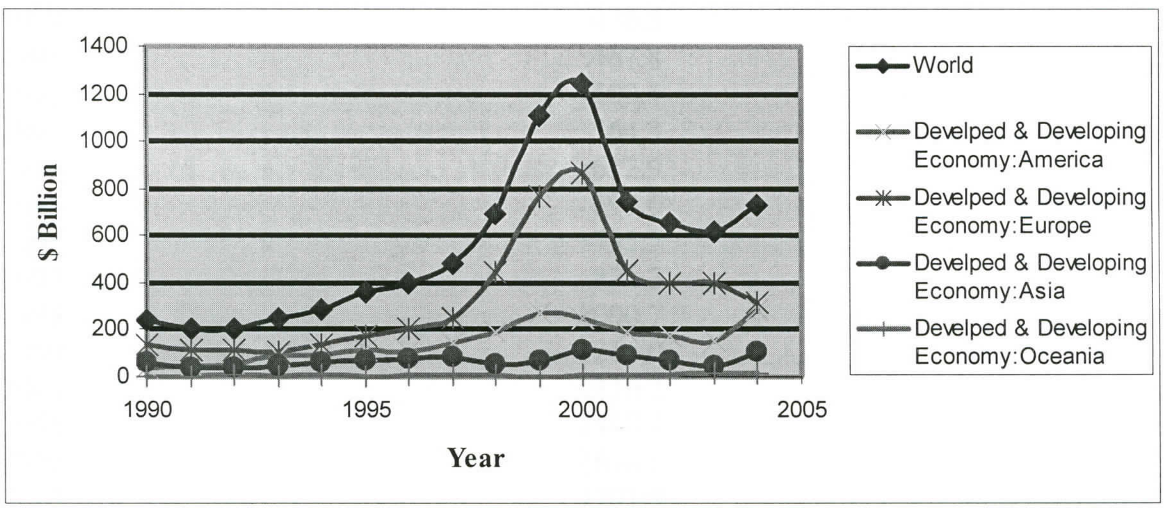

Figure 3. Outflow of Foreign Direct Investment. Source: United Nations Conference (2006) on Trade and Development (UNCTAD).

FDI outflows from the United States increased by 90% in 2004 to $229 billion, the highest amount since the previous year. FDI outflows from Canada and Switzerland increased by 121% to $47 billion and by 67% to $25 billion, respectively, in 2004. While developed countries remain the key source of FDI. On the other hand, outflows from developing countries have also risen to $83 billion in 2004 (United Nations Conference on Trade and Development (UNCTAD), World Investment Report 2005).

2.1.1. U.S. FDI Position Abroad

Since 1995, the U.S FDI abroad grew significantly (Table 3). In 1990, the U.S. FDI growth rate was 12%. In 1991 and 1992, the increase slowed to 8.7% and 7.3%, respectively; in 2004, the historical-cost position of U.S. direct investment abroad (USDIA) grew 15% after growing 11% in 2003. The 15% increase in 2004 was the largest increase since 1999. The annual average growth rate was 13% from 1994 to 2003.

Table 3. U.S. FDI Positions on a Historical Cost Basis, 1990-2004

Year	U.S. Direct Investment Abroad (Billions of Dollars)
1990	430.5
1991	467.8
1992	502.1
1993	564.3
1994	612.9
1995	699.0
1996	795.2
1997	871.3
1998	1000.7
1999	1216.0
2000	1316.2
2001	1460.4
2002	1616.5
2003	1791.9
2004	2064.0

Source: U.S. Department of Commerce, Bureau of Economic Analysis (2006).

Koncz and Yorgason (2005) mentioned that three main host countries (the United Kingdom, Canada, and the Netherlands) accounted for more than a third of the total FDI, but the shares of each has declined since 2003. The U.S. FDI position in the United Kingdom was $302.5 billion, which is 15% of the total position (Table 4), while the position in Canada was $216.6 billion (11%), and the position in the Netherlands, $201.9 billion (10%). In 2004, the USDIA position increased by $272.1 billion, which was the largest dollar increase since 1994 (Koncz and Yorgason, 2005).

Table 4. U.S. Foreign Direct Investment Abroad by Host Country in 2004

Countries	Percent
Germany	3.9
Japan	3.9
Switzerland	4.9
Netherlands	9.8
Canada	10.5
United Kingdom	14.7
Other	52.4

Source: U.S. Department of Commerce, Bureau of Economic Analysis (2006).

2.1.2. U.S. Direct Investment Abroad: Changes by Area

The U.S. Direct Investment Abroad (USDIA) position increased in each of the main geographic areas (Table 5). Other than Latin America and other Western Hemisphere nations, U.S. direct investment increased in almost all areas, Europe, Canada, Africa, and the Middle East. In Asia and the Pacific it grew by 38% and by more than 10% in the other areas.

In Asia and the Pacific, the U.S. foreign direct abroad position grew by $107.7 billion, which is 38% of the total USDIA, the largest amount and percentage increase of the main geographic areas. The increase in the position was due to the restructuring of a large Australian media company. Increases in Japan, Korea, Singapore, Hong Kong, and China were all significant. In Japan and Singapore, U.S. investment increased in finance and insurance and also in holding companies, which accounted for much of the increases. Also in Hong Kong, the U.S. FDI position increased in finance and insurance except for depository institutions. In Korea, the position increased mainly in depository institutions, as equity capital increases were considerable.

Table 5. Change in the USDIA Position by Country of Foreign Affiliate (2003-2004)

Countries	Billions of dollars	Percent
All countries	272.1	15
Europe	107.2	11
Asia and Pacific	107.7	38
Canada	26.8	14
Latin America and other	25.2	8
Africa	3.3	17
Middle East	1.9	11

Source: Koncz and Yorgason (2005).

On the other hand, in 2004, the USDIA position increased in Europe mostly in reinvested earnings. The United Kingdom, the Netherlands, Switzerland, Germany, France, and Ireland are the major six countries accounting for almost four-fifths of the increase in Europe. In the United Kingdom, U.S. investment mainly increased in finance and insurance, and in several manufacturing industries among others. The Netherlands' and Switzerland's FDI increased because of reinvested earnings of affiliates in holding companies. The increase in Ireland was in chemicals and holding companies.

2.1.3. U.S. Direct Investment Abroad: Industry Detail

In 2001, there were some differences in the sectoral diversification of U.S. investments. The U.S. FDI has experienced an overall decrease in the manufacturing sector in 2001 and 2002. In 2000, U.S. investments amounted to $344 billion in the manufacturing sector but decreased through 2002 (Table 6). Some of the industries within the manufacturing sector that have contributed to this decrease are food, textiles, apparel, leather products, fabricated metal products, computers, and electronic products. In contrast to the manufacturing sector, FDI in the utility and mining sector has achieved an overall increase.

Table 6. Sectoral Composition of U.S. FDI Abroad

	Billions of Dollars				
Industries	2000	2001	2002	2003	2004
All industries total	1316.25	1460.35	1616.55	1769.61	2051.20
Manufacturing	343.90	328.03	337.74	371.08	414.35

Source: U.S. Department of Commerce, Bureau of Economic Analysis (2006).

After 2002, there was an overall increase in FDI for the manufacturing sector. In 2004, the U.S. investment in the manufacturing sector increased by $414 billion. Other sectors like depository institution saw continuous increases from 2000. But overall, there was a decrease in other industries from 2003, except in the mining sector.

2.2. World Trade Pattern: Developed and Developing Countries

During 2004, there was a rapid increase in world trade (Table 7). In 2001, world exports decreased $267 billion and imports decreased $242 billion, but since then world trade has increased. In 2004, total world exports were $9,191 billion, and imports were $9,545 billion. Developed countries produced most of the world exports and imports.

Table 7. Total Merchandise Trade

Countries	2000	2001	2002	2003	2004
	Billions of Dollars				
World exports	6451	6184	6484	7572	9191
World Imports	6724	6482	6734	7855	9545

Source: World Trade Organization (2006).

2.2.1. U.S. Trade Position Abroad by Year

The U.S. is not only one of the leading sources of the world FDI but also a leader in world trade. The U.S. accounts for almost 15% of world exports and 23% of world imports. Between 2000 and 2002, U.S. exports and imports declined, but since 2003, U.S. trade has increased (Table 8). In 2004, U.S. exported $818.78 billions of dollars and imported $1525.52 billions of dollars.

Table 8. U.S. Total Merchandise Trade

Countries	2000	2001	2002	2003	2004
	Billions of Dollars				
U.S. exports	781.92	729.10	693.10	724.77	818.78
U.S. imports	1259.30	1179.18	1200.23	1303.05	1525.52

Source: World Trade Organization (2006).

2.2.2. U.S. Trade in Goods and Services: Sectoral Distribution

The sectoral composition of U.S. exports has been consistent since 2000 with the goods sector accounting for around 70% and the remainder by the service sector (Table 9). U.S. imports are slightly more concentrated in the goods sector, averaging about 80% of total imports since 2000. In 2004, exports of manufactured goods accounted for almost 87% of total goods sector while agricultural products amounted to only 7%. Imports of manufactured goods accounted for 80% of the total goods sector, while imports of agricultural products accounted for only 4%.

Table 9. U.S. International Trade in Goods and Services

	Billions of Dollars					
	Exports			Imports		
Year	Total	Goods	Services	Total	Goods	Services
2000	1070.1	772.0	298.1	1445.4	1224.4	221.0
2001	1006.7	718.7	287.9	1369.3	1145.9	223.4
2002	975.9	681.8	294.1	1397.7	1164.7	232.9
2003	1020.5	713.1	307.4	1517.0	1260.7	256.3
2004	1146.1	807.6	338.6	1763.9	1473.8	290.1

Source: U.S. Department of Commerce, International Trade Administration (2006).

2.2.3. U.S. Trade in Goods and Services: Regional Distribution of U.S. Trade

The geographical distribution of U.S. trade is divided among Europe, Asia, and countries included in North American Free Trade Agreement (NAFTA), each accounting for around 25-35% of U.S. exports in 2004 (Tables 10 and 11). In Asian countries, Japan's imports accounted for almost 30% and Association of Southeast Asian Nations (ASEAN) countries amounted to almost 21% of U.S. exports to Asia.

Table 10. U.S. Total Exports from Individual Countries, 2000-2004

	Billions of dollars				
Continent	2000	2001	2002	2003	2004
Europe	187.45	181.53	163.67	173.06	193.14
Asia	218.80	198.93	193.51	206.39	233.10
South America	36.93	36.43	28.86	27.40	35.38
NAFTA	290.29	264.72	258.39	267.33	300.94

Source: U.S. Department of Commerce, International Trade Administration (2006).

On the other hand, U.S. imports from Asia are more concentrated, which accounted for almost 45% of imports in 2004. For Asian countries, Japan exported almost 33% and China 19% of U.S. imports from Asia. ASEAN countries exported almost 20% of U.S. imports from Asia. U.S. trade with countries under NAFTA and with Europe have risen significantly during 2004. Trade with other Central and South American countries continues to be less than 10% of total trade.

Table 11. U.S. Total Imports from Individual Countries, 2000-2004

	Billions of Dollars				
Continent	2000	2001	2002	2003	2004
Europe	256.77	253.77	260.81	284.67	322.09
Central America	12.16	11.47	12.24	12.82	13.60
South America	50.86	46.50	48.18	54.19	71.04
Asia	484.65	437.75	456.09	492.81	580.46
NAFTA	366.77	347.61	343.70	359.66	411.77

Source: U.S. Department of Commerce, International Trade Administration (2006).

2.3. U.S. FDI in the Processed Food Industries

Processed food and developing countries are the most important growth markets for U.S. exports. FDI has become even more important than exports to accessing foreign markets. The U.S. firms in the processed food sector buy and sell almost a trillion dollars in the world market. This section reviews the patterns and trends that developed during 2001-2004 in U.S. FDI and trade in processed food.

Table 12 gives an overview of the relative size of the outbound FDI as reflected by affiliate sales for the entire food processing sector and for the major industries within the sector. Although food manufacturing comprised a large share of the total U.S. FDI of food industry in the past, the composition of the U.S. FDI is changing. The investments in retailing and food services are increasing. In fact, FDI growth in food retail and services has experienced constant growth, unlike FDI in food manufacturing, which tends to rise in cycles. FDI in retailing and food services is important for foreign market growth activities of U.S. companies and has fueled the expansion of global markets.

Table 12. U.S.-owned Food Marketing Affiliates Abroad by Industry

	Billions of Dollars			
Industry	2001	2002	2003	2004
Food manufacturing	11.57	17.66	20.78	27.02
Food retail and services	10.94	12.58	13.50	13.96

Source: U.S. Department of Commerce, Bureau of Economic Analysis (2006).

The U.S. beverage industry accounts for the major share of the U.S. FDI in food manufacturing. With U.S. technology and management expertise, grain/oilseed milling accounts for the next largest share of U.S. FDI in food manufacturing. The dairy sector, one of the main food sectors in the United States, has been less successful in gaining a foothold overseas, and accounts for 2% of U.S. FDI in food manufacturing. In fact, investments by foreign firms in the U.S. dairy sector have exceeded similar U.S. foreign direct investment abroad. Foreign firms have brought product and technological innovations to the U.S. dairy market and merged with U.S. firms to produce and export dairy products (Henderson, Handy, and Neff, 1997). In 2004, food-manufacturing affiliates accounted for $27.02 billion sales of U.S. food-marketing affiliates abroad. The food-retailing affiliates abroad accounted for only $13.96 billion of total affiliate sales abroad in 2004. But both sectors have continued to increase during the period 2001-2004.

2.3.1. Regional Composition of U.S. FDI in Food Manufacturing Industry

U.S. FDI is concentrated in developed countries (Table 13). Europe continues to be the leading destination of U.S. FDI. But Canada, Mexico, and Asia are also important markets. Recent increase in U.S. FDI to Europe is mostly from the acquisitions of European-based food companies. The United Kingdom, the Netherlands, and France account for more than half of the U.S. FDI in Europe. U.S. investments in developing countries increase because of the market expansion of processed food. Therefore, a large share of the FDI in these countries is directed toward increasing processing capacity to meet growing consumer demand.

Table 13. Regional Composition of U.S. FDI in Food Manufacturing Industry

	Billions of Dollars			
Region	2001	2002	2003	2004
Europe	10.85	9.15	11.32	14.01
Asia	2.56	2.50	3.03	3.29
South America	2.62	1.89	1.90	2.14
Central America	1.44	1.14	1.89	2.53
North America	4.67	4.33	5.94	6.05

Source: U.S. Department of Commerce, Bureau of Economic Analysis (2006).

In 2004, European countries accounted for $14.01 billion of the total U.S. affiliate sales abroad. Within Europe, the United Kingdom was by far the largest recipient of U.S. FDI followed by Germany, the Netherlands, France, and Italy until 2003, but in 2004, the Netherlands became the largest recipient of U.S. FDI followed by the United Kingdom, Italy, and France. Adding Canada and Japan to the European countries brings the share of U.S. affiliate sales to about 69%. Sales from U.S. affiliates declined in South, North, and Central America in 2002 compare to 2001, but they have grown rapidly since then. From 2001 to 2004, sales from U.S. affiliates in South America doubled and sales from U.S. affiliates in Mexico increased to $2.29 billion.

In 2004, Asia and the Pacific accounted for $3.29 billion of the total U.S. affiliate sales abroad. Within Asia, South Korea is the largest recipient of U.S. FDI followed by China, the Philippines, and Japan. From 2001 to 2004, sales from U.S. affiliates in South Korea, China, Japan, and the Philippines have continuously increased in the manufacturing food industry.

2.4. U.S. Trade in Processed Foods

The U.S. processed food industry is a major foreign direct investor and exporter in the world. Firms in the U.S. processed food sector trade almost a trillion dollars in the worldwide market. This section looks at the trends and patterns developed in U.S. trade in the processed food sector during 2001-2004.

2.4.1. Background

In 1991, the U.S. processed food sector reached its highest trade surplus. Yearly deficits of approximately $5 billion in the mid-1980s had been decreased to $2 billion by the end of the decade. These deficits decreased mostly because of increase exports in processed food (97% between 1985 and 1991). On the other hand, imports were growing at a slower pace, increased only 26% between 1985 and 1991. Deficit reduced mostly because of meat products. Between 1985 and 1991, other major contributors to the positive trade balance included grain mill products, which averaged a $2.4 billion trade surplus and fats and oils, which averaged $1.7 billion trade surplus. Meat products industry is the leading export industry. In 1994 meat products accounted for 26.5% of the total value of all exports. Other important export industries: the miscellaneous category accounted for $4.5 billion and grain mill products accounted for $3.7 billion in same period. Five industries (meat products, soybean oil, fresh seafood, and poultry products) each averaged more than $1 billion per year in export income between 1990 and 1994. Together, these five industries accounted for more than half of total U.S. exports of processed food and beverages which is 50.1%. Meatpacking accounted for 20.2% which is $22.4 billion (Henderson, Handy, and Neff, 1997).

2.4.2. Regional Composition of U.S. Trade in Processed Foods

The United States exports processed food products to near every country in the worldwide. But, very few countries account for the huge part of the trade. The United States exported an average of $26 billion in manufacturing foods to different countries in the world during 2001-2004. Five countries (Japan, Canada, Mexico, Korea, and China) bought more than $14 to $16 billion per year in manufacturing foods from the U.S. (Table 14). During this period, these 5 countries accounted for almost 60% of the total U.S. exports of processed food and beverages. Canada accounted for 23%, Mexico for 18%, Japan for 12%, Korea for 3%, and China for 4% of total U.S. exports of manufactured food in 2004. Japan, at $4.13 billion annually, bought 12% of all food manufacturing exports. Almost two-thirds of the U.S. exports of processed food to Japan in 2004 were from five industries: meat products, fruit/vegetables, grain/oilseed products, and bread/bakery products, and sugar/confectionery product/snack foods, which accounted for 9% of the total export of this sector. Canada was the largest destination for U.S. processed food at

$5.85 billion. Like Japan, meat products, dairy products, fruit/vegetables, grain/oilseed products, and bread/bakery products were the important export industries to Canada. The top 10 countries accounted for over 71% of the total U.S. manufactured food exports. Three of the top ten countries were Korea, Hong Kong, and Taiwan. These three countries are newly industrialized countries in east Asia (Henderson, Handy, and Neff, 1997).

Table 14. Export Destination for U.S. Food Manufacturing Product

	Billions of Dollars			
Country	2001	2002	2003	2004
Canada	4.88	5.12	5.56	5.85
Japan	4.75	3.84	4.13	3.08
Mexico	3.73	3.59	4.05	4.60
Korea	1.51	1.74	1.86	0.89
UK	0.47	0.44	0.44	0.47

Source: U.S. Department of Commerce, International Trade Administration (2006).

Small, less-developed, and developing countries are the important destinations for U.S. processed food exports. Most of them are Asian countries. Between 2001 and 2004 the United States exported at least $2 billion of goods to the Philippines, Turkey, Indonesia, Thailand, Guatemala, Cuba, Colombia, Malaysia, and Egypt. The Philippines imported $318 million from the United States in 2004, which is a 17% increase from 2003. Turkey imported $276 million in 2004, a 7% increase, while Thailand's imports increased 5%, from $186 million in 2003 to $202 million in 2004. Indonesia's imports decreased, 18% in 2004 from 2003. Currently, U.S. exports in a number of categories are mostly going to a few countries. Canada exported 29% of meat product and 33% of animal fats/oils, Meat products (Canada alone had 29%), 16% of dairy products, 42% of fruits/vegetables, and 62% of snack food combined with Mexico and Japan. Mexico exported 28% of dairy product. Japan exported 12% of fruits and vegetables. Canada was the important destination for fruits/vegetables, grain/oil seeds, and bread/bakery products, Mexico lead in Dairy and animal fat products.

U.S. imports of processed food are to a great extent widely diversified (Table 15). Canada was the leading exporter to the United States of processed food, commanding a 30.7% market share during 2001-2004. On the other hand, Mexico, the second largest source for U.S. processed food, had only a 6.7% share. Less developed countries like Thailand, Mexico, and Brazil were among the 10 leading exporter to the U.S. The United States imported an average of $12 billion per year in processed food during 2001-2004 from seven countries: Canada, Thailand, Mexico, Australia, China, New Zealand, and Italy. In 2004, the five top countries of Canada, Australia, New Zealand, Denmark, and Brazil accounted for 85% of meat products. Australia and Canada combined had 69%.

Table 15. Import Destination for U.S. Processed Foods

	Billions of Dollars			
Country	2001	2002	2003	2004
Canada	6.32	6.70	7.32	8.51
Mexico	1.26	1.41	1.55	1.87
China	0.59	0.74	1.00	1.28
Australia	1.21	1.29	1.38	1.63
New Zealand	1.06	1.02	1.10	1.34
Italy	0.84	0.92	1.07	1.24
Thailand	0.73	0.78	0.93	1.05

Source: U.S. Department of Commerce, International Trade Administration (2006).

On the other hand, Canada, New Zealand, China, Brazil, and Australia accounted for 84% of animal fats/oil with Canada at 28%. Five countries accounted for the bulk of four categories: 60% of dairy products with New Zealand, Italy, and Canada providing 43%; 57% of fruits/vegetables with China, Mexico, and Spain providing 39%; 65% of grain/oilseed with Canada providing 33%; and 72% of snack food products with Canada providing 33%. Overall, Canada was the leading nation in five categories, and it was among the top five sources of U.S. imports in three other categories.

2.5. Summary

This chapter summarized some of the trends and patterns of the FDI and trade of the United States. The investment and trade pattern showed that U.S. investments were mainly concentrated in Europe in the past, but now shifting to Asian countries, so, trade partners are more diversified. Today, Asian, European, and North American countries are all important trade partners. The sectoral composition of the U.S. FDI and trade indicates that both are concentrated in the manufacturing sector. This chapter also summarized trends of the FDI and trade of the U.S. processed food industry. Trade in the U.S. processed food sector has increased dramatically. Increased imports have brought a greater variety of food choices to U.S. consumers, while the expansion of exports, has grown faster especially exports to east Asia. The United States is a major trading nation in food and agricultural products world wide.

CHAPTER 3. REVIEW OF LITERATURE: THEORETICAL AND EMPIRICAL EVIDENCE

This chapter presents an overview of existing theoretical and empirical evidence on the nature of the relationship between FDI and exports. Relationships can be either complementary or substitute. A substitute relationship indicates that increased FDI will decrease exports for host countries and, on the other hand, a complementary relationship indicates exports will not decrease for host countries if FDI increase. This review shows many previous studies indicated complementary between FDI and export and few find a substitutability relationship between FDI and exports. In addition, this chapter will present an empirical analysis of the determinants of FDI and exports in various developed and developing countries.

3.1. Substitutability and Complementarity Between FDI and Trade

Fontagne (1999) provided an analytical foundation for the FDI-trade relationship to determine complementarity or substitutability. According to the author, there are three approaches to analyzing the relationship between FDI and international trade: 1) the microeconomic or firm level, 2) the macroeconomic or economy-wide level, and 3) the sectoral or industry level. Fontagne hypothesized that the complementary and substitutability of FDI and trade are impossible to determine by theoretical analysis. He believed that only empirical analysis could provide a solution. The countries studied were France, the United Kingdom, and the United States at the industry level. Fontagne found that the UK evidenced a complementary relationship between FDI and trade. For France, outward and inward FDI flows were positively related with trade. In the United States, there was a strong complementary relationship between FDI and trade; the short-run impact of FDI on trade was negative while the long-run impact was positive. After combining results from the micro, macro, and industry level, Fontagne found that the FDI and trade relationship is not steady but was influenced by various situations.

Marchant, Saghaian, and Vickner (1999) used a two-stage least squares method to estimate the relationship between U.S. FDI and exports for processed food products to China. Their objective was to determine whether U.S. FDI and exports are substitutes or complements and to identify management strategies to improve competitiveness for U.S. agro-food firms. A simultaneous equation system was used to model export and FDI strategies employed by U.S. agro-food firms for the Chinese processed food market. They collected annual data for the period 1982 to 1997. They found a strong complementary relationship between U.S. exports and FDI into China. They concluded that market access decisions heavily depend on the export-FDI relationship. Given the complementarity relationship between exports and FDI in their study, the suitable organization policy for U.S. agro-food firms is to increase the overall trade activity in both FDI and exports to China to access the Chinese processed food market. According to the authors, these empirical results can help entrepreneurs of U.S. agro-food firms to choose the right strategy to ensure competitiveness.

Graham (2000) investigated whether outward FDI and international trade were substitutes or complements. The author mentioned that mainly previous studies overlooked the probable effects of simultaneous determination of FDI and exports that can cause a spurious correlation between them, which lead to an erroneous interpretation of complementarity. Graham used a gravity model to test the determinants of FDI and exports for two countries, the United States and Japan. The empirical results showed that U.S. outward direct investment and U.S. exports in manufacturing are complements. However, U.S. FDI and exports were not complementary with countries in western hemisphere nations. The author concluded that, as FDI expands, the affiliates created by this FDI of both U.S. and Japanese multinationals face a huge demand for goods produced in the home countries. As a result, expansion of FDI in host countries is related with increased export possibilities.

Uusivuori and Craig (2001) examined the role of FDI in the forest sector. By using two equation models, they investigated two questions: whether the exports of forest products and FDI by forest industries were substitutes or complements, and to what extent FDI is affected by changes in exchange rate and related risks by using two equations model. Their model was characterized by a dynamic system with two endogenous or dependent variables (FDI and exports) and two exogenous variables (exchange rate and exchange rate variability). They used data for FDI and exports of forest industries from the United States, Finland, and Sweden. The results for the U.S. forest industries showed that FDI and exports of forest products were full substitutes in the 1990s. In the case of the Finnish and Swedish forest industries, exports negatively affected the investments abroad, although FDI did not affect exports in the long run. Dollar variability could not affect both the FDI and exports by the U.S. forest industries.

Hejazi and Safarian (2001) posited that the presence of FDI stock facilitates the flow of intra firm information on a wide front, decreasing the cost of conducting business and leading to increases in international trade. Within a gravity model framework, their paper proved that trade and FDI are complementary, using trade and FDI stock data between the United States and 51 other countries over the period 1982 to 1994. They determined that both outward and inward FDI stocks simulate U.S. exports and imports, but the overall impact of FDI on exports exceeds that of imports. They concluded that their findings were similar to other research which estimated that trade and FDI are complementary, so, any results that come from aggregate regressions of FDI and trade should be extensively qualified.

Koo and Uhm (2001) investigated the major factor affecting FDI using a log linear functional form and a two-stage least squares estimator. They found that the relationship between FDI and trade flows is important. They also evaluated the effects of NAFTA on U.S. exports of manufactured food products and U.S. FDI in Canada and Mexico. They used co-variance technique to process the panel data of 35 major importing countries of the United States for the years 1989 to 1995. The results supported the argument that developing countries were the major destinations of U.S. FDI, and the authors also found a complementary relationship between FDI and exports. They found significant results and a positive sign for NAFTA. They concluded that the relationship between U.S. exports of manufactured foods and FDI are complementary and that the NAFTA agreement contributed to increased U.S. exports to Canada and Mexico.

Bajo-Rubio and Montero-Munoz (2001) investigated the empirical relationship between outward FDI and exports from a macroeconomic standpoint. They used Spanish data for the period 1977–1998. Granger causality tests were used by the authors to find out FDI and trade relationship. Granger causality tests are performed in a co-integration setting, so they can differentiate between short-run and long-run Granger causality. From the empirical results, they found a positive and statistically significant relationship between exports and outward FDI, with Granger causality running in the short run from outward FDI to exports, and bilateral Granger causality in the long run. The authors concluded that the relationship of complementarity found between outward FDI and exports would suggest that an increase in outward FDI is not the cause of deindustrialization or unemployment in the home country. Increased capital outflows may often create higher exports.

According to Fontagne and Pajot (2002), the determination of whether trade and FDI flows are complements or substitutes is mainly dependent on the category of data used on the research. In this article, the authors tried to demonstrate the reasons why and the extent to which trade and FDI are complements. They focused on the United States and France, which provides the bilateral FDI data. Bilateral export equations were estimated using panel data for 21 countries in the Organization for Economic Co-operation and Development (OECD). The result showed that outward FDI is slightly complementary to trade flows in Britain and France, but a strong complementary relationship was found in the United States between outward U.S. FDI and trade. The authors concluded that in the long run, there must be a positive impact of FDI on trade flows in European countries.

Marchant, Cornell, and Koo (2002) conducted a research to analyze the relationship between U.S. FDI and exports. The authors also tried to find out the determinants of U.S. FDI and exports. Their study included east Asian countries for testing the hypothesis regarding export and FDI relationship with U.S. on processed food industry. They developed a simultaneous equation for exports and FDI. This simultaneous-equation system was estimated with cross-section and time series data (panel data for five east Asian countries over the period 1989-98). The two-stage least squares method was used to determine factors affecting FDI and exports. The empirical results support the argument that there is a complementarity exists between FDI and exports US and east Asian countries. In addition, they also found that interest rate, exchange rate, and GDP are important variables that influence U.S. FDI. GDP, export prices, and exchange rate are important variables that influence U.S. exports to east Asian countries. They concluded that their findings support previous studies that had suggested a complementary relationship exists between FDI and exports in developing countries.

The overall objective of Marchant, Manukyan, and Koo's (2002) research, was to determine whether U.S. FDI and exports for processed food products in the countries of the Free Trade Area of the Americas (FTAA) are substitutes or complements. They estimated an unknown structural parameter in their simultaneous equations system by using the full-information maximum likelihood (FIML) method with pooled, cross-section, time-series data. They collected data from two countries, Canada and Mexico, over 10 years (1989-1998) and one country, Brazil, over 6 years (1993-1998) to empirically determine factors affecting FDI and exports in FTAA countries. Empirical results appear to support the argument that there is a bidirectional complementary relationship between FDI and exports to the FTAA countries, Canada, Mexico, and Brazil. They also found that GDP and exchange rate are important determinants for U.S. FDI and exports to FTAA countries.

Pantulu and Poon (2003) investigated whether FDI creates or displaces trade based on evidence from the United States and Japan. The authors developed a theoretical model based on the spatial gravity model. This study included 32 countries for the United States and 29 countries for Japan and covers the period from 1996 to 1999. The empirical results for the United States indicated that FDI stocks (past and cumulative FDI) had a positive and significant influence on U.S. exports and imports. Finally, the authors concluded that the relationship between FDI and trade is complementary for U.S. in terms of division of labor, scale economics, and shifting comparative advantages. Their results for Japan indicated that both FDI flows and stocks is positively related to Japanese exports.

Camarero and Tamarit (2003) examined the export and import demand for manufactured goods. They tried to determine the main explanatory variables, (i.e., FDI other than traditional factors). They also examined the empirical relationship between exports and imports in terms of inbound and outbound FDI by extending the classical analysis of export and import functions by including outward and inward FDI. They used panel data of OECD countries by applying panel cointegration techniques that combine time-series and cross-section data. The authors found a complementary relationship between FDI and trade for the OECD area. They also found that traditional variables such as income and relative prices are the main determinants of export and import demand, but they do not satisfactorily explain the nature of trade in OECD countries.

Pradhan (2003) investigated the relationship between the outward investment and export activities of Indian enterprises by using Tobit estimation. The Amemiya generalized least squares method was used to analyze the data. Initially, he collected data on Indian direct investment at the firm level between 1975 and March 2001. In the second phase, he collected data on financial variables at the firm level over 1990-91 to 2000-01. In the final phase, both datasets were merged together. Results showed that outward FDI (O-FDI) by Indian firms played an instrumental role in their export performance. In addition, he found that firm size, technological efforts, and labor productivity are the important determinants for exports. Finally, the complementary effect of O-FDI more than offset its substitution effect in the case of India. Finally, they concluded that continuing the improvement of the regulatory policy towards O-FDI, provision of information, provision of finance and insurance, and provision of support services are the policy options available to India for encouraging O-FDI.

Head and Ries (2004) outlined alternative theories of the multinational companies (MNC) to identify the economic mechanisms linking FDI and exports and to determine whether exports and FDI are substitutes or complements. They began with the simplest model and concluded that exports and FDI are two different ways of multinational companies for serving foreign markets. To explain why exports and FDI can coexist in equilibrium, they extended the simple model of exports and FDI, and they outlined three situations where exporters and investors coexist in equilibrium. They first considered representative firms and secondly they consider the exogenously heterogeneous firms. The third situation comes when firms manufacture more than one good. The authors concluded that there is no convincing theory to invalidate that standard theory which explained a substitutive relationship for firms.

Zarotiadis and Mylonidis (2005) conducted a research to find the relationship between FDI and trade between the United Kingdom and its primary investors by using the generalized least squares method with cross-section weights. The authors used data from the United Kingdom for the period 1992-2003. The authors also used data corresponding to manufacturing, industry, and total FDI to measure the effects of trade flows on a particular product groups. Finally, the results provided support for complementary effects of FDI on trade.

3.2. Determinants of Foreign Direct Investment and Export

Beer and Cory (1996) investigated U.S. FDI in all European Union (EU) countries by using Generalized Least Square (GLS). They measured the effects infrastructure and taxes which are the locational determinants of FDI. The authors collected data for 11 of the 12 European Union countries for 13 successive years from 1977 to 1989. Results indicated that U.S. investment is mostly located in France, Germany, the United Kingdom, and the Netherlands. Some EU countries received more FDI than other countries. Results also indicate that the U.S. FDI entered the EU because of foreign market shares and cultural similarities. Relative interest rate differences are important for controlling huge FDI flows. Finally, the findings showed that fast growing market is not suitable for U.S. investors and that U.S. FDI in the EU is not inspired by the industrial atmosphere.

Maniam and Chatterjee (1998) used different ordinary least squares (OLS) method to find the determinant of U.S. FDI in India. The also tried to determined the causes of recent movement of U.S. FDI towards India and its implication on Indian economy. A comprehensive model was used to test the major macroeconomic variables for a 33-year period from 1962 to 1994. Results showed that local market size, growth rate of market size, trade balance, and exchange rate were the important determinants for U.S. FDI in India. Results also indicate that U.S. FDI towards India has been increasing over time.

Nakamura and Oyama (1998) used a three-stage least squares method to determine the macroeconomic determinants of FDI. They considered FDI from Japan and the United States into east Asian countries. They also examined the relationship between FDI and trade. In the panel regression, they used gross-base real FDI from Japan and the United States as a dependent variable to the eight east Asian countries. Results showed that changes in real bilateral exchange rate affects FDI from Japan into east Asian region but FDI from the U.S. is not affected by changes in exchange rate. Finally, they concluded that primarily because of the depreciation of the yen against the U.S. dollar, FDI from Japan stay same for some period. This may cause a reduction of trade between Japan and east Asian countries.

Narula and Wakelin (1998) investigated the significance of a country's characteristics in explaining FDI and exports of developing and industrialized countries based on a neo-Schumpeterian approach. The estimations were made for 40 countries with the data pooled across four years (1975, 1979, 1984, and 1988) using ordinary least squares (OLS). Results showed that inward investment shares, outward investment shares, and export shares were very similar. In addition, the model is efficient in explaining both exports and FDI, although there is significant difference between developing and developed (industrialized) countries. In particular, the authors mentioned that technology is a common factor in explaining both export shares and shares of FDI. Finally, they concluded that country determinants are efficient in explaining both trade and FDI.

Fung, Iizaka, Lee, and Parker (1999) examined the determinants of U.S. and Japanese FDI in China using the data set from 1991 to 1997. To analyze data, the authors used ordinary least squares (OLS) method. Their results showed some similarities and differences in the importance and the degree of the determinants of FDI among three FDI sources. This study found that the absolute level of GDP, the quality of infrastructure, and the lagged GDP significantly influence the inflow of FDI. Labor quality is also an important determinant of both U.S. and Japanese FDI. Finally, the study concluded that there are similarities as well as differences in determinants of Japanese and U.S. FDI in China.

Lall, Norman, and Featherstone (2003) examined the factors and their relationships with U.S. FDI in Caribbean countries. The separate least square model was utilized to determine U.S. short and long-run FDI in the Caribbean over the period of 1983 to 1994. They included eight Caribbean countries (Belize, Guyana, Barbados, Jamaica, Trinidad/Tobago, Haiti, Grenada, and the Dominican Republic) and 14 Latin American countries (Argentina, Brazil, Chile, Columbia, Ecuador, Venezuela, Paraguay, Uruguay, Mexico, Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua). The results indicated that the authors could not find any major differences for both long-run and short-run variables. But it is clear that long-run FDI has a much stronger impact compare to short-run FDI.

Uttama (2005) used a panel data set for the period 1983-2003 to analyze how U.S. MNEs are attracted to ASEAN country's characteristics which contribute to investment environments by applying the gravity equation approach on the Knowledge-capital (KC) model. The author used the ordinary least square (OLS) method and the fixed effects technique in the estimation. The authors used U.S. as a home country and Malaysia, Philippines, Singapore, and Thailand as host countries in the analysis. The sample consisted of 84 location decisions of U.S. MNEs into ASEAN member countries from 1983 to 2003. Results showed that variables affecting FDI include trade cost, sum of GDPs, relative endowment differences, squared GDP differences, investment cost, and distance. Additionally, they found that the motivations of U.S. MNEs to ASEAN countries increase according to their similarity of size, joint market size, and relative factor endowments. Finally, the author concluded that this finding discards the vertical model and approves the horizontal model in favor of the KC model.

Skripnitchenko and Koo (2005) examined the determinants of U.S. foreign direct investment (FDI) in food processing industries in Latin American countries using a dynamic cost minimization model. They used data gathered 1983 to 2000 from nine Latin American countries: Argentina, Brazil, Chile, Columbia, Ecuador, Mexico, Panama, Peru, and Venezuela from the year 1983 to 2000. The first order condition (Euler equation) was estimated by using a consistent rational expectation assumption. This estimation showed that the dynamic structure explains the investment process in food processing industries in a good manner. They also quantified short and long-run effects exogenous variables on FDI position. The results indicated that demand in a host country and labor cost are the important determinants of U.S. FDI in food processing industries. They concluded that the explanatory power of taxes and FDI openness greatly affects the timing of FDI in food processing.

Botric and Skuflic (2006) employed the GLS method to analyze determinants of FDI in the South Eastern European Countries (SEEC).They used data on FDI inflows of seven SEEC countries (Macedonia, Serbia/Montenegro, Romania, Croatia, Bulgaria, Bosnia/Herzegovina, and Albania) during the period 1996-2002. The results showed that GDP, GDP per capita, population, and openness are the major determinants of FDI in the SEEC-7. In addition, the shares of the private sector and large scale privatization also have significant effects on the FDI. They concluded that the increasing trade with other countries will help SEEC to build a strong integration in the province.

CHAPTER 4. METHODOLOGY

4.1. Introduction

This chapter describes a theoretical model of FDI and exports, which will be a foundation for the empirical model for this study. Section 4.2 describes the theoretical model. Section 4.3 describes the hypothesis for this study. Section 4.4 discusses the Empirical Model for FDI and exports, and Section 4.5 discusses the nature of the data used and data sources.

FDI is a strategy by multinational companies to penetrate foreign markets. With growing economic globalization, multinational corporations (MNCs) have increased their FDI by establishing or obtaining production facilities in other countries. FDI by multinational company not only influences international trade patterns but also reduces the costs of conducting business. Rapid increase in outward FDI has raised some concern among policy-makers and researchers, primarily about the impact of outward FDI on the domestic economy. FDI in a particular industry largely affect trade flows of products produced in the industry, particularly on the exports of the products produce in a home country. Theoretical arguments concerning relationship between FDI and exports have been made that the FDI and exports are complement or substitute each other. But still the relationship between FDI and trade needs empirical investigation.

From the literature review in Chapter 3, it is apparent that the relationship between FDI and exports can be studied by using different approaches. Bajo-Rubio and Sosvilla-Rivero (1994) used the cost minimization theory for developing FDI model. On the other hand, Barrell and Pain (1996) developed a FDI model based on a profit maximization theory. Bajo-Rubio and Montero-Munoz (2001) used a causality analysis to describe the relationship between FDI and trade while Pantulu and Poon (2003) used the spatial affinities gravity model to examine whether FDI substitutes or complements trade. Based on the theoretical model of Bajo-Rubio and Sosvilla-Rivero (1994), this study tries to determine the FDI flow and analyze the relationship between FDI and exports.

4.2. Model Description

The decision of investing capital in a foreign country by multinational firms depends on several factors which include the host country's availability of resources, trade policies, skill levels and production cost, and the market size of the host country (Al Nasser, 2007). It also depends on the cost structure of the firm's production process, the cost of inputs used for the production and the demand for the good in the domestic and foreign markets. "There is the presumption that foreign investment reflects attempts by highly competitive, profit-maximizing firms to minimize their cost of production." (Ray, 1977, pg # 284). Using cost minimization approach Bajo-Rubio and Sosvilla-Rivero (1994) developed a FDI model. This section describes a theoretical model of FDI determinants closely following the Bajo-Rubio and Sosvilla-Rivero (1994) and Marchant, Cornell, and Koo (2002).

The theoretical model described below (Bajo-Rubio and Sosvilla-Rivero, 1994; Marchant, Cornell, and Koo, 2002) considers the decisions made by a firm contemplating international production, or an increase in its level of such production. The model assumes that the producer must first decide the appropriate level of foreign production (if any), and then select the appropriate input mix for this level of foreign production. The total costs function of the firm could be represented as follows:

$$C = c_d(QT_d)QT_d + c_f(QT_f)QT_f \qquad (1)$$

where C is the firm's total cost, c_d is the unit cost for a domestic plant, and c_f is the the unit cost for a plant in foreign country, and finally QT_d is the level of output in domestic firm and QT_f is the level of output in foreign plants. The unit costs of domestic plants are a function of total quantity produced in local plants and the unit costs of foreign plants are a function of the total quantity produced in abroad plants. The firm's total cost includes production costs of domestic and foreign firms. Firm's objective is to minimize total cost for a given level of output. Total output from the firm is the sum of output produced from local plants and output produced from foreign plants and equal total demand for the commodity ($\bar{D}$):

$$QT_d + QT_f = \bar{D}. \tag{2}$$

According to Bajo-Rubio and Sosvilla-Rivero (1994); Marchant, Cornell, and Koo (2002), to minimize the total cost (equation 1) subject to the total demand (equation 2) a lagrangian function is developed as follows:

$$£ = c_d (QT_d) QT_d + c_f (QT_f) QT_f + \lambda (\bar{D} - QT_d + QT_f) \tag{3}$$

Differentiating the lagrangian function with respect to QT_d, QT_f and λ (Lagrangean multiplier) gives functions 4, 5, and 6 as follows:

$$\partial £ / \partial QT_d = c_d^{'} QT_d + c_d (QT_d) - \lambda \tag{4}$$

$$\partial £ / \partial QT_f = c_f^{'} QT_f + c_f (QT_f) - \lambda \tag{5}$$

$$\partial £ / \partial \lambda = \bar{D} - QT_d + QT_f \tag{6}$$

In equation (4), $c_d^{'}$ represents the marginal cost for domestic production (dc_d / dQT_d) and in equation (5) $c_f^{'}$ represents the marginal cost for foreign production (dc_f / dQT_f). After setting above equations (equation 4, 5 and 6) equal to zero and solving for QT_f gives the equation as follows:

$$QT_f = \mu_1 \bar{D} + \mu_2 (c_d - c_f) \tag{7}$$

where $\mu_1 = c_d^{'} /(c_d^{'} - c_f^{'})$ and $\mu_2 = 1/(c_d^{'} + c_f^{'})$. Assuming that μ_1 and μ_2 are positive (Bajo-Rubio and Sosvilla-Rivero, 1994), equation (7) shows that the relationship between the output produced at the foreign plant and the total demand is positive and that between output to be produced at the foreign plant and the unit cost in the plant is negative. This implies that multinational companies will choose to produce a good in foreign plant if the total demand for the good in foreign country increases and unit cost in domestic plant is higher than that of foreign plant.

Once multinational companies decide to produce a good in foreign plant, their next step is to optimize allocation of input factors to produce a given amount in foreign plant (Bajo-Rubio and Sosvilla-Rivero, 1994; Marchant, Cornell, and Koo, 2002). Assume that the firm employs two inputs, labor (L) and capital (K). The total cost function for the foreign plant is given as follows:

$$C_f = w_f L_f + r_f K_f \tag{8}$$

where L_f and K_f represent labor and capital in foreign country, respectively. w denotes the cost of labor, and r denotes cost of capital. Assume that Cobb-Douglas production function represents total output in foreign plant as:

$$QT_f = L_f^{\alpha} K_f^{\beta} . \tag{9}$$

Since the firm minimizes its production cost (equation 8) subject to the total output to be produced (equation 9), the lagrangian function is developed as follows:

$$£ = w_f L_f + r_f K_f + \lambda(QT_f - L_f^{\alpha} K_f^{\beta}). \tag{10}$$

Differentiating equation (10) with respect to L_f, K_f, and λ yields:

$$\partial £ / \partial L_f = w_f - \lambda\alpha(QT_f / L_f) \tag{11}$$

$$\partial £ / \partial K_f = r_f - \lambda\beta(QT_f / K_f) \tag{12}$$

$$\partial £ / \partial \lambda = QT_f - L_f^{\alpha} K_f^{\beta}. \tag{13}$$

Setting the first-order condition equal to zero and solving for K_f gives the function as follows:

$$K_f = [(\beta/\alpha)(w_f / r_f)]^{\alpha/(\alpha+\beta)} QT_f^{1/(\alpha+\beta)}. \tag{14}$$

Substituting $TQ_f = \mu_1 \bar{D} + \mu_2 (c_d - c_f)$ from equation (7) in equation (14) yields:

$$K_f = [(\beta/\alpha)(w_f / r_f)]^{\alpha/(\alpha+\beta)} \{\gamma_1 \bar{D} + \gamma_2 (c_d - c_f)\}^{1/(\alpha+\beta)}. \tag{15}$$

K_f has a positive relation with total demand for the commodities and has negative a relation to the foreign plant's unit costs compare to those of the domestic plant (Bajo-Rubio and Sosvilla-Rivero, 1994; Marchant, Cornell, and Koo, 2002). It is also noticeable that if there is strong substitution between labor and capital, unit cost in both domestic and foreign plants depends on the amounts of labor and capital used. As a result, as wage increases it can also lead to a higher capital stock.

Bajo-Rubio and Sosvilla-Rivero extended the above equation (15) by adding the effect of tariff barriers imposed by host countries (TR) in the firm's cost function. Firms will increase FDI in a host country if there are high tariff barriers. FDI will help firms to overcome those barriers, indicating that trade barriers have a positive relationship with K_f.

Therefore, FDI is measured on the basis of capital stock. As a result, finally, Bajo-Rubio and Sosvilla-Rivero described FDI can be written as follows:

$$\text{FDI} = f(AD, U, TR). \tag{16}$$

The equation (16) is revised by adding other variables like differences in per capita GDP between home and host country (GDPPCD) and the geographic distance from the United States to the host country (DIST). Lall, Norman, and Featherstone (2003) found physical distance between the host country and the investing country has an important locational influence on FDI in Carribean countries. Grosse and Trevino (1996) also included geographical distance from home to host country in their study. The authors mentioned distance between home country to host country always gives proper explanation of the amount of FDI in that country. Another relevant variable as determinants of FDI used in this study is exchange rate. Marchant, Cornell, and Koo (2002) included exchange rate and export, and they also divided unit cost in to two parts: labor compensation cost and capital cost (interest rate). Following Marchant, Cornell, and Koo (2002) and on the basis of above discussion the FDI model for this study is specified as follows:

$$FDI_{it} = f(GDP_{it}, LC_{it}, IR_{it}, TB_{it}, EXR_{it}, EX_{it}, DIST_{it}, GDPPCD_{it}), \tag{17}$$

where GDP reflects the market size, LC is the host country's labor compensation cost relative to the U.S. labor compensation cost, IR represents the host country's interest rate relative to the United States, TB is the tariff barrier, EXR is the exchange rate, EX represents U.S. exports to importing countries, GDPPCD is the difference between per capita income of the United States and the host country, DIST is the geographical distance between the United States and other host countries, and host country is represented by i and time by t. The host countries included in the study are India, Japan, South Korea, Thailand, Belgium, France, Germany, Italy, Spain, and the United Kingdom.

In theory, FDI and exports are inter-related to each other, indicating that exports are endogenous (Marchant, Cornell, and Koo, 2002; Uusivuori and Craig, 2001). Following Marchant et al. (2002); Uusivuori and Craig (2001) export equation is specified as follows:

$$EX_{it} = f(GDP_{it}, XP_{it}, EXR_{it}, FDI_{it}\ AGDP_{it}, DIST_{it},), \quad (18)$$

where, i denotes importing country, t denotes time period, EX is U.S. export to foreign countries, XP denotes the U.S. export price for processed food in foreign countries, EXR represents exchange rate, FDI is foreign direct investment, and AGDP represents GDP from agri-sector in foreign country i.

4.3. Hypothesis

From the above theoretical background and empirical finding this study tries to develop three hypotheses for testing. The first hypothesis is developed to answer the question regarding determinants of U.S. FDI to Asian and European countries. Second hypothesis is based on the question regarding the determinants of U.S. exports to the Asian and European countries for processed food industries, and the third hypothesis focuses on the FDI and export relationship between U.S. with Asian and European countries.

4.3.1. Determinants of FDI

Multinational company's decision for investment to different countries depends on a broad range of macro-economic variables. This includes the availability of cheap labor in foreign countries, market size of host countries, and host countries trade policies. This study developed the empirical model based on the above variables. FDI outflow from U.S. to host countries (Asian and European countries) will increase if host countries GDP increases. As income increases, the demand for consumer goods in host countries also increases. The increased demand gives a strong incentive to multinational companies to invest in the country. In addition, if there is high level of foreign protection such as a tariff in host countries, a MNC will prefer to invest and produce in the host countries instead of exporting there to avoid import tariff (tariff-jumping). It is expected that U.S. FDI is positively related with host countries exchange rate. An appreciation of the U.S. dollar causes an increase in U.S. FDI in foreign countries because it is cheaper to buy foreign assets for U.S. firms and build plants overseas. Distance (DIST) denotes the geographical distance between home and host country, which is used as the proxy for transportation cost and trade cost. Uttama (2005) described "Because distance is a composite of both costs, the expected sign of distance is ambiguous." U.S. MNCs will invest more to the country where labor cost is less, which will decrease the production cost of the MNC. Same in the case of interest rate (IR). A lower capital cost will increase U.S. FDI to that country. Differences in GDP per capita between home and host country (GDPPCD) are expected to be negative. As a result, the hypothesis to be tested for this study

Hypothesis 1: U.S. FDI is positively related to a host country's GDP, trade barrier, and exchange rate and negatively related to host country's labor compensation cost, interest rate, and differences in GDP per capita with U.S.

4.3.2. Determinants of Exports

It is expected that host country's GDP is positively related to U.S. exports. If the host countries' GDP increases, U.S. exports will also increase to meet the increased demand of the host countries. Also, the appreciation of the U.S. dollar will make it more expensive for foreign consumers to purchase U.S. products. As a result, it is expected that

U.S. export is negatively related with host country's exchange rate. Also, U.S. export is negatively related to distance between host countries and the U.S. If transportation cost is high, it will be very expensive for U.S. firms to export products. Export prices (XP) are negatively related to exports. If there is a decrease in export price, the quantity of export will increase. Gross domestic product from the agricultural sector of host country (AGDP) is expected to be negative in relation to U.S. exports. If host country's local production capacity increases, the countries will produce more agricultural processed food and import less from the U. S.

Hypothesis 2: U.S. exports are positively related to host country's GDP and negatively related to host country's bilateral exchange rate, distance between U.S. and host countries, export prices, and gross domestic product of the agri-sector in importing country.

4.3.3. FDI and Export Relationship

This research addresses whether U.S. FDI complements or substitutes for U.S. exports to the host countries. Based on literature review in Chapter 3, it is expected that FDI complements exports. Past evidence supporting FDI as a substitute of exports is limited. As a result, based on above discussion, FDI from U.S. to Asian and European countries is expected to have positive influence on U.S. exports to those countries. As U.S. FDI increases to host country, U.S. exports also increase to that country. On the other hand, a negative sign means that FDI is a substitute for exports. As U.S. investment increases to host countries, U.S. exports will decrease. Based on the mixed results in the literature, the relationship between FDI and exports for hosting/importing countries is difficult to predict.

Hypothesis 3: U.S. FDI in the processed food industry has a positive relationship with U.S. exports of processed food.

4.4. Empirical Model

This section will present the empirical model for FDI and exports derived from equations (17) and (18). The following empirical model is used to study the relationship between U.S. FDI and exports for processed food in Asian and European countries.

Assuming a linear relationship between dependent and independent variables, the system of simultaneous equations is given as follows:

$$FDI_{it} = \alpha_1 + \alpha_2 GDP_{it} + \alpha_3 LC_{it} + \alpha_4 IR_{it} + \alpha_5 TB_{it} + \alpha_6 EXR_{it} + \alpha_7 EX_{it} + \alpha_8 GDPPCD_{it} + \alpha_9 DIST_{it} + U_{it}, \quad (19)$$

$$EX_{it} = \beta_1 + \beta_2 GDP_{it} + \beta_3 XP_{it} + \beta_4 EXR_{it} + \beta_5 FDI_{it} + \beta_6 AGDP_{it} + \beta_7 DIST_{it} + V_{it}, \quad (20)$$

where t represents years and i represents a foreign country,, FDI is U.S. foreign direct investment in food processing industries in each foreign country, EX is U.S. exports of processed food to selected Asian and European countries, GDP is the real gross domestic product in the foreign country, LC is the labor compensation cost of foreign country, IR is the cost of capital, TB is trade barriers in foreign countries, EXR is the exchange rate measured as foreign currency per U.S. dollar, DIST is a dummy variable for the distance from the United States to the importing country (dummy = 0 if near-up to 10,091 kilometers from the United States, and =1 otherwise), GDPPCD is the difference of per capita real GDP between home and host countries, XP is the export price for processed food, AGDP is the production capacity of agricultural processed food of foreign countries, α_j and β_k are parameter estimates (j=0 ,....., n and k= 0........,m), and U and V represent the unobservable individual effect and the error component that varies by the country and time in both equations.

4.5. Data Description

The panel data were collected from different sources for the period of 1989-2004 (Table 16). This analysis covers four Asian and six European countries for the U.S. FDI and exports model. The panel data set used in the analysis is shown in Table 16.

Table 16. Panel Data Use in Regression Analysis

Host Country	Home Countries	Year	Number of Observations
U.S.A.	4 Asian countries (India, Japan, South Korea, Thailand)	1989-2004	64
	6 European Countries (Belgium, France, Germany, UK, Spain, Italy)	1989-2004	96
Total Observations			160

This research focused on U.S. FDI and exports in the processed food industry in four Asian countries (India, Japan, South Korea, and Thailand) and six European countries (Belgium, France, Germany, Italy, Spain, and the United Kingdom). Among all Asian countries, these four countries accounted for most of the U.S. exports as well as FDI in processed food industries. On the other hand, Europe is the largest destination for U.S. FDI in the processed food industry and exports of processed food. In the case of U.S. processed food exports and FDI to Europe, the European Union accounted for the major share. The countries in this study are all part of the European Union. Tables 17 and 18 shows average estimations of U.S. FDI of processed food industries to selected Asian and European countries covering the period of 2001-2004.

The EU accounted for almost 92% of U.S. FDI in Europe. Belgium, France, Germany, Italy, Spain, and the United Kingdom accounted for 63% of U.S. FDI in Europe and 67% in the EU. The Netherlands with 20.56% has the largest share of U.S. FDI in Europe. However, the Netherlands was not included in this study because data was too difficult to obtain.

Table 17. U.S. FDI to Selected European Countries on Average (2001-2004)

Countries	U.S. FDI (%)
European Union	91.42
United Kingdom	30.45
Italy	11.64
France	9.87
Spain	4.87
Germany	3.33
Belgium	2.84

As shown in Table 18, South Korea, Japan, Thailand, and India accounted for almost 47% of U.S. FDI to Asia in the processed food industries. However, China and the Philippines were the largest recipients of U.S. FDI to Asia, accounting for 28.12% and 13.08%, respectively. Together with China and the Philippines, the four selected countries accounted for almost 88% of U.S FDI in processed food to Asia. Data for China and the Philippines were limited compared to the other selected countries. As a result, this study did not include China and the Philippines.

Table 18. U.S. FDI to Selected Asian Countries on Average (2001-2004)

Countries	U.S. FDI (%)
South Korea	30.96
Japan	11.91
India	2.34
Thailand	1.33

The main data sources and description of variables are as follows:

1) FDI: U.S. Direct Investment Abroad on a historical cost basis is collected from the U.S. Bureau of Economics Analysis, U.S. Department of Commerce (http://www.bea.gov). Processed food data were collected using the Standard Industrial Classification (SIC) level of aggregation for "Food and Kindred Products." This major SIC group includes manufactured or processed food/beverages for human consumption and certain related products such as manufactured ice, chewing gum, vegetable/animal fats/oils, candy, canned fruits, cookies, prepared feeds for animals/fowls, and other processed food (U.S. Bureau of Economics Analysis, U.S. Department of Commerce). Data used are in billions of U.S. dollars. The data were converted to real terms by using the GDP deflator of the corresponding country.

2) EXP and EXPPR: Data for U.S. exports of agricultural processed food to Asian countries were collected from the United States Department of Agriculture, Foreign Agricultural Service (http://www.fas.usda.gov) based on the Bulk, Intermediate, and Consumer-Oriented (BICO) classification. This classification aggregates particular 10-digit codes representing processed food products in Schedule B of the U. S. Harmonized Trade System, under which all U.S. trade data are originally collected by the Census Bureau of the U.S. Department of Commerce. Processed food products and ingredients are assigned

to 15 categories within the BICO. Each category has at least five and as many as 14 subcategories of products that can be examined. This processed food groups include dry beverages (such as tea and coffee), liquids (such as milk, beer, wine, and juice), breakfast cereal, consumer-ready packaged products (such as soup, baby food, prepared red meat, prepared poultry, etc.), frozen foods (such as frozen vegetables, frozen juice , frozen bakery products, etc.), fruit, meat/poultry, snack foods, vegetables, and other processed food. Data used are in billions of U.S. dollars. Export price data were also collected from the above site. These data were in different measurement units (kilograms. liters, and metric tons). The export prices were calculated in three steps: 1) converting all export quantity data to metric tons, 2) calculating prices from total exports and quantity, and 3) converting data into real terms.

3) GDP: Real GDP of host countries (current U.S. dollars) were collected from World Development Indicators, World Bank data base, 2006 (http://web.worldbank.org/). Data were converted into real terms by the GDP deflator collected from the same website. Data are in billions U.S. dollars.

4) LC: LC is the hourly labor compensation cost of each host country relative to the U.S. labor compensation cost in the manufacturing industry. Labor compensation cost in U.S. dollars for the United States, Japan, Belgium, France, United Kingdom, Spain, Germany, and Italy were obtained from the U.S. Department of Labor, Bureau of Labor Statistics (http://www.bls.gov/). Primary data for labor compensation costs of the manufacturing industries of other host countries (India, South Korea, and Thailand) were collected from the International Labour Organization's (ILO) online statistical database, LABORSTA

(http://laborsta.ilo.org/). The data were in different time periods (such as per month, per year, and per hour). All data were converted to hourly rates and then into real terms.

5) IR: The interest rate is measured as a ratio of the foreign interest rate relative to the U.S. interest rate. The real interest rate (percentage) for the United States and other host countries were collected from World Development Indicators, World Bank data base (http://web.worldbank.org/).

6) TB: In the analysis tariff rate of host countries used as proxies for the trade barriers. Because historical tariff rate for agricultural manufactured goods were unavailable, the study collected average applied import tariff rate on non-agricultural manufactured products from the United Nations Conference of Trade and Development (UNCTAD), Trade Analysis and Information System (TRAINS) database (http://r0.unctad.org/trains_new/database.shtm).

7) EX: Real exchange rate of host countries were collected (LCU per U.S. dollars, period average) from the USDA.

8) GDPPC: GDP per capita were collected from World Development Indicators, World Bank data base (http://web.worldbank.org/), and deflated to real terms by the GDP deflator of the United States and other host countries. The differences were calculated between GDP per capita of host and home countries in U.S. dollars.

9) DIST: The longitude and latitude of each country, including the United States, are available at the CIA-World Fact Book website, (https://www.cia.gov/), and their distances are calculated on the global distance calculator, website (http://export911.com/convert/distaCalc.htm). After calculating the distance between the United States and the other host countries, this study calculates the mean value of total

distances. Thus, zero to mean value is considered near the United States (up to 10,091 kilometers from the U.S.), and others are considered far from the United States.

10) AGDP: GDPs from the agricultural sectors of the host countries were collected (percentage of GDP) from World Development Indicators, World Bank database (http://web.worldbank.org/), and calculated from real GDP of each country (deflated by the GDP deflator). Data used are in billions of U.S. dollars.

CHAPTER 5. RESULTS AND DISCUSSION

5.1. Introduction

This chapter presents the results of the analysis that examined the relationship between U.S. FDI and the exports of processed food among four Asian and six European countries. The investigation also identified the factors that attract U.S. FDI and exports of processed food into those countries. Both FDI and export equations were estimated simultaneously using the two-way error component three-stage least squares method (EC3SLS) with TSP software using panel data from 1989 to 2004. The two endogenous variables in the simultaneous equation system are FDI and exports. Both the FDI and export equations are identified with respect to the order and rank conditions of identification. Each equation is exactly identified according to the order condition (i.e., the number of included endogenous variables less one equals the number of excluded exogenous variables), thus a solution exists for the system. Because both equations do not contain the same explanatory variables, rank identification is also satisfied, indicating that the solution to the system is unique.

5.2. Results of Unit Root Test

This Panel data analysis is a method of studying a particular subject within numerous sites, periodically observed over a defined time edge. While dealing with panel data, we need to check for stationarity. A stationary process is a stochastic process whose probability distribution at a position is the same for all positions. That is why parameters such as the mean and variances, if they exist, also does not change over position. The stationarity properties of variables were evaluated to analyze the evidence of spurious regression by using the Phillips-Perron unit root test. In the AR(1) process, we regress the value of Y at time t on the value at time (t-1) as follows:

$y_t = ax + by_{t-1} + \varepsilon_t$,

where y_t is the variable of interest at time t, b is the auto regressive coefficients, and ε_t is the error component. If $|b| = 1$, the stochastic variable y_t contains a unit root. The null hypotheses indicate the presence of the unit root process. Running regression with a non-stationary process can cause the spurious result, lacking a true relationship between two variables with high R-square value, which will have no economic meaning.

The results are presented in Table 19. The PP method estimates the non-augmented DF test equation and modifies the ratio of the coefficient. As a result, a serial correlation does not affect the asymptotic distribution of the test statistic. The PP test is based on the statistic in which the null hypothesis assumes individual unit root process.

Table 19. Results of Unit Root Test

Variables	Statistic	P-value
Foreign Direct Investment (FDI)	29.37	0.08
Export (EXP)	15.45	0.74
Gross Domestic Product (GDP)	5.75	0.99
Labor Compensation Cost (LC)	48.71	0.00
Interest Rate (IR)	22.96	0.29
Tariff Rate (TB)	54.27	0.00
Exchange Rate (ER)	7.80	0.99
GDP Per Capita (GDPPC)	29.40	0.08
Export Price (EXPPR)	46.30	0.01
GDP from Agri-Sector (AGDP)	32.40	0.03

The results of the unit root test indicated that the variables such as foreign direct investment, labor compensation cost, tariff rate, GDP per capita, export price, and GDP from the agriculture sector were found to be stationary at the 10% significance level. The other variables, such as export, GDP, interest rate, and exchange rate were found to be non-stationary for the selected time period (1989-2004). If these variables follow the non-stationary property, a regression of one against another can lead to spurious results. The first differencing method was used to correct this problem. The first difference of a time series is the series of changes from one period to the next. Suppose, Y(t) denotes the value of the time series Y at t, the first difference of Y at period t is equal to Y(t)-Y(t-1).

5.3. Hausman Test

In a panel analysis, the Hausman test was used to decide whether the panel estimation should be performed with fixed or random effects. Test results are summarized in Table 20. Results of the Hausman test indicated that the test statistic for the FDI and export equation was 18.63 and 4.22, respectively. The test for the export equation fails to reject the null hypothesis that there is no misspecification. The results revealed that estimation with random effects will be more suitable and efficient under these circumstances. On the other hand, the test for the FDI equation rejects the null hypothesis of random effects. Result revealed that estimation with fixed effects will be more suitable under this situation. This study used a random effects as an estimation procedure.

Table 20. Result of Hausman Test

Equation	Statistics	P-Value
Foreign Direct Investment	18.63	0.0094
Export	4.22	0.5178

The vital assumption in random effects estimation is that random effects are uncorrelated with the explanatory variables. As an efficient estimator, a random effects gives better P-values. Pindyck and Rubinfeld (1997) state (pg # 253),

> "But the most important reason is in the fixed effect model, the use of dummies does not directly identify what causes the regression line shift over time and over individuals and the dummy variable technique uses up a substantial number of degrees of freedom. On the other hand, the random-effects model uses up fewer degrees of freedom and has conceptual appeal as a broad characterization of the sources of errors in a large data set with substantial time-series and cross-section variation."

As a result, the random effects method will be more suitable and efficient under these circumstances.

5.4. Determinants of U.S. FDI and Export

The estimated results for the FDI equation (Table 21) indicated that the variables such as GDP, GDP per capita, interest rate, labor compensation cost, exchange rate, tariff rate, and distance were significantly affecting U.S. FDI in Asian and European countries.

Table 21. Parameter Estimates of Foreign Direct Investment

Variable	Coefficient	Statistic	Elasticity
Export	0.57214*	2.08	0.14
Gross Domestic Product (GDP)	0.00479**	26.73	4.24
Labor Compensation Cost	-2.36549**	-45.63	-1.94
Interest Rate	-0.28286**	-7.72	0.02
Tariff rate	0.01796**	13.46	0.22
Exchange Rate	0.00695**	9.06	0.81
GDP Per Capita	-0.00014**	-33.50	-1.93
Distance (Dummy)	-1.21478**	-22.04	-

** is 1% significance level; * is 5% significance level. This study estimated the elasticities corresponding to coefficient estimates of variables and mean values of the variables.

All the variables were significant, at least at the 5% level. Since the variables, of GDP per capita, interest rate, and labor compensation cost were statistically significant, the rank condition of the FDI equation was satisfied. In the export equation, AGDP was found significant, indicating that the rank condition was also satisfied in the export equation.

The estimated results for the export equation (Table 22) indicated that GDP, GDP from the agriculture sector, and distance were affecting the U.S. exports to Asian and European countries. The variables, except export price and exchange rate, were significant at 1% levels, indicating that they are the important U.S. determinants for exporting processed food to Asian and European countries.

Table 22. Parameter Estimates of Exports

Variable	Coefficient	Statistic	Elasticity
Foreign Direct investment	0.019485**	17.38	0.09
Gross Domestic Product	0.000419**	9.67	1.53
Export Price	-0.000003	-0.83	-1.72
Exchange Rate	0.000160	0.78	0.08
GDP from Agri-Sector	-0.000289**	-7.43	-0.04
Distance (dummy)	-0.038518**	-14.96	-

** is1% significance level; * is 5% significance level.

5.4.1. Empirical Results for FDI

The results of the simultaneous equation showed that the coefficient of GDP was highly significant at the 1% level. The results indicated that GDP has a positive effect and attracts the inflow of foreign capital. The results were consistent with the previous studies of Marchant, Cornell, and Koo (2002); Botric and Skuflic (2002); and Lall, Norman and Featherstone (2003). The elasticity of FDI with respect to the GDP of the processed food industries is 4.24, which indicated that a 1% increase in GDP in host countries led to a

4.24% increase in U.S. investment in processed food to those countries. The elasticity of FDI with respect to the GDP of the processed food industry is 4.24%, which is high compare to previous studies. This can be justified considering two points. First, A host country's GDP is used for its market size and reflects aggregate demand. This result implies that market size is an important consideration in attracting FDI. Growing markets, such as Japan, Germany, the United Kingdom, France, and South Korea, are likely to capture a higher percentage of FDI, indicating that the U.S. processed food industry is investing in those countries with have a larger market sizes. Second, this high elasticity indicates U.S. FDI is going to selected host countries not only because of their high market size, but also because U.S. multinational companies want to capture the host countries processed food markets in the near future. As a result, even a small change in a host country's GDP, cause a large increase in U.S. FDI to those countries.

The variable labor compensation cost was highly significant at a 1% level and has an expected negative sign with U.S. FDI. It is an important determinant for U.S. FDI, indicating that lower costs in the host country, relative to the United States, will be an incentive for the location of production overseas. U.S. multinational companies will choose countries with cheap labor. The elasticity indicates that a 1% increase in labor compensation cost led to a 1.94% decrease in U.S. FDI. The result is consistent with Narula and Wakelin (1997); Marchant, Cornell and Koo (2002); and Botric and Skuflic (2002). This result confirms that the United States is investing in countries like India, Thailand, Japan, South Korea, Spain, Italy, and Belgium because their labor compensation cost are lower than U.S. labor compensation cost.

The coefficient of interest rate variable was also significant at the 1% level and was negatively influencing the inflow of foreign capital. According to Ismail and Yussof (pg # 400), "Foreign investors may invest in a particular country using capital brought from the home country or may borrow from local financial institutions." This finding was consistent with our expectation that an interest rate increase causes a decrease in FDI overseas. The result was consistent with the findings of Gopinath, Pick, and Vasavada (1998); Marchant, Saghaian, and Vickner (1999); and Marchant, Cornell, and Koo (2002), which indicates that the interest rate is an important determinant for U.S. investment to those countries in the processed food industry. If the cost of investment is higher overseas, then U.S. investors will be discouraged from investing in those countries. Therefore, a 1% increase in the interest rate led to a 0.02% decrease in U.S. FDI in the food processing industry. Higher debt capital costs will lower net present value of the investments, and will discourage future investments.

Tariff rate, a proxy for tariff barriers, showed a positive relationship with the FDI inflow and was significant at the 1% level, indicating that U.S. food processing investors will invest in selected countries to overcome relatively high trade barriers, which can be viewed as tariff-jumping. When examining the tariff-jumping effect, the literature emphasizes the cost-induced effect, which states that a foreign firm has an incentive to jump over the tariff wall in order to locate in a foreign territory and, thereby, escape tariffs (Hwang and Mai, 2002). A similar result for the Spanish economy was obtained by Bajo-Rubio and Sosvilla-Rivero (1994). Elasticity of FDI with respect to tariff rate is 0.22, which indicated a 1% increase in tariff rate in selected industries in host countries led to a 0.22% increase in U.S. investment of processed food to those countries. The result revealed that the United States has an incentive to invest in selected countries because of their higher tariff rate on importing processed food.

The coefficient of the exchange rate variable was also found significant at a 1% level, and was positively influencing the inflow of foreign capital. This reveals that U.S. FDI will increase to foreign countries as the U.S. dollar appreciates because it will be cheaper for them to invest. Our result is consistent with Gopinath, Pick, and Vasavada (1998) and Marchant, Cornell, and Koo (2002). The reason is that an appreciation of the U.S. dollar increases the capital of U.S. food processors relative to foreigners and will allow them to purchase foreign assets through FDI. Results showed that a 1% increase in exchange rate led to a 0.81% increase in U.S. FDI in the food processing industry.

The variable for the difference between per capita GDP of the U.S. and the host countries was found to be negative and significant at the 1% level. The result is consistent with the Uttama's study (2005) of ASEAN countries.

The distance variable, used as a proxy for transportation and trade costs, was found to be significant at the 1% level. The relation between U.S. FDI and distance was negative in this study, indicating that an increase in the distance between the host country and the United States was inversely correlated with the level of U.S. FDI. This result is similar to the previous studies of Grosse and Trevino (1996) and Lall, Norman and Featherstone (2003).

Since this research used interest rate and exchange rate as exogenous variables in the FDI equation, there could be a possibility of multicolinearity between these two variables. Multicolinearity can occur when there is a linear relationship between two or more independent variables. However, the literature review show's, these two variables were used in the previous study of Marchant, Cornell and Koo (2002), that indicated there was no multicolinearity between these variables. On the other hand, this present study used panel data that gives less colinearity among variables. Also, in the FDI equation, all variables were found to be significant, supporting that there is no linear relationship between exogenous variables.

5.4.2. Empirical Results for Exports

The empirical results for the export equation (Table 23) showed that the GDPs in the host countries were positively related to U.S. processed food exports and were highly significant at the 1% level. Results showed that a 1% increase in the GDP of the host country led to a 1.53% increase in the U.S. exports in the food processing industry to that country. This result is consistent with our hypothesis supporting that GDP is a determinant for U.S. exports in the processed food industry. This result supported the previous studies of Marchant, Cornell, and Koo (2002). Host countries' GDPs are used as proxies for market size aggregate demand. As a result, U.S. exports of processed food to Asian and European countries will increase if the market is large and has more demand for processed food.

The coefficient of AGDP, which represents the GDP from the agricultural sector of importing countries, was highly significant at the 1% level. The results indicated that AGDP had a negative effect on U.S. exports of agricultural processed food to that country. The results are supported by the previous studies of Koo and Uhm (2001). If local production capacity increases, importing countries will produce more agricultural processed food and import less from the United States. Elasticity indicates that a 1%

increase in AGDP led to a 0.04% decrease in the U.S. export of processed food to that country.

The distance variable was found to be significant at the 1% level. The relation between U.S. exports and distance was found to be negative in this study, indicating that an increase in the distance between the host country and the United States was inversely related to the level of U.S. exports in that country. This estimation result supported the previous study of Hejazi and Safarian (2001), which revealed that nearby neighbors tended to have more U.S. exports.

The export price variable is not significant but has a negative sign with U.S. exports, as we expected, implying that export price is not a major export-influencing variable. Even though the export price is lower, there will be more exports from the United States to an importing country. Export price is not an important variable in the case of U.S. processed food exports to those countries. The exchange rate is not significant. In this study, European countries, such as Germany, the United Kingdom, and France, and Asian countries, such as Japan, have high GDPs per capita compared to other countries. The consumers in the European and Asian countries have a high demand for U.S. processed food which are necessary for living. As the U.S. dollar appreciates, U.S. products become more expensive than before, but the levels of import do not change because of the consumers' high income and demand for food products.

5.5. U.S. FDI and Export Relationship

In the FDI equation, the export variable was found to be significant at the 5% level and positively related to FDI, indicating a complementary relationship between U.S. FDI and exports of processed food. The elasticity indicated that a 1% increase in exports led to a 0.14% increase in U.S. FDI of processed food, indicating a complementary relationship between U.S. FDI and exports for all four Asian countries (India, Japan, South Korea, and Thailand) and six European countries (Belgium, France, Italy, Germany, Spain, and the United Kingdom). Marchant, Cornell, and Koo (2002) found that U.S. FDI had a complementary relationship among five Asian countries (China, Japan, Singapore, South Korea, and Taiwan). This result was also consistent with the findings of Fontagne and Pajot (2000) that a complementary relationship exists between U.S. FDI and trade for British and French industries. In this way, the complementary relationship identified between outward FDI and exports suggested that increased outward FDI was not necessarily associated with deindustrialization and unemployment in the home country, as is often claimed. This outcome, in turn, would illustrate the potentially important role played by an increased FDI abroad as a useful tool to promote exports (Bajo-Rubio and Montero-Munoz, 2001).

In the export equation, the FDI variable was significant at the 1% level and had a positive relationship with U.S. exports of processed food. This result supported or reinforced the result from the FDI equation, indicating the same conclusion that U.S. exports and FDI had a complementary relationship and that U.S. FDI did not hamper U.S. exports. The result supported the empirical findings of Marchant, Manukyan, and Koo (2002). Thus, although a complementary relationship existed, exports appeared to stimulate FDI. However, the results indicated that the magnitude of U.S. export elasticity with respect to U.S. FDI of the processed food industry is 0.09, which indicated a highly inelastic response of FDI to exports.

5.6. Summary

This chapter summarized the results of FDI and export equations by using the EC3SLS method. Since both the rank and order conditions of the simultaneous equation were satisfied, the results obtained by using the EC3SLS method were unbiased and asymptocally consistent. The significant variables such as GDP per capita, compensation cost, interest rate, and tariff barrier satisfy the rank condition of the FDI equation. The variables in the export equation, such as agricultural GDP, were found statistically significant, and the rank condition of the equation was satisfied. The results revealed that there was a strong complementary relationship between U.S. exports and FDI. GDP, exchange rate, tariff rate, and exports positively affected U.S. FDI and were significant. Labor compensation cost, interest rate, distance, and per capita GDP negatively influenced U.S. FDI and were also significant. On the other hand, in the export equation, the real GDP of importing countries positively influenced U.S. exports and distance, and GDP from the agricultural sector were significant and negatively influenced U.S. exports.

CHAPTER 6. SUMMARY, CONCLUSION, CONRIBUTIONS, LIMITATIONS, AND RECOMMENDATIONS FOR FURTHER STUDY

6.1. Summary and Conclusion

This chapter presents a summary of the study and the conclusions, including a short overview of the U.S. trade and FDI in the processed food sector, and the methods employed in the study. Contributions and the limitations of the study are discussed in the next section. Finally, the need for further study is included.

The relationship between U.S. FDI and exports of processed food has gained special attention from agricultural economists. Recently U.S. exports of processed food recorded relatively slow growth; consequently, the U.S. experienced a trade deficit. As a result, the objectives of this study were to determine the factors that influenced U.S. exports and FDI levels of processed food and to determine whether the impact of U.S. FDI on U.S. exports in the processed food industry, was a complement or a substitute.

The processed food industries of U.S. are one of the major manufacturing sectors in the United States. The U.S. processed food industry is a major exporter and investor worldwide. U.S. investment was mainly concentrated in Europe in the past, but now these trends are shifting toward the Asian countries. Also, trading partners are more diversified. Today, Asian, European, and North American countries are all important trading partners. U.S. FDI and trade are concentrated in the manufacturing sector. Trade in the U.S. processed food sector has risen significantly. Increased imports have brought a greater variety of food choices to U.S. consumers, while the expansion of exports, especially led by exports to east Asia, has grown faster.

The model used for estimation in this study was based on a cost minimizing production function. The study analyzed the period from 1989-2004. The analysis focused on the four Asian countries of India, Japan, South Korea, and Thailand and on the six European countries of Belgium, France, Germany, Italy, Spain, and the United Kingdom. Variables such as GDP, GDP per capita, labor compensation cost, interest rate, tariff rate, export, FDI, export price, AGDP, distance, and exchange rate were used for the empirical analysis. Simultaneous equations were estimated using the two-way EC3SLS proposed by Baltagi (1981). The PP-Fisher test was used to check the stationarity of the data to avoid spurious regression. The Hausman test was conducted to choose the specification of the model. Estimation was conducted using the random effects model.

Empirical results for the FDI equation indicated that GDP, labor compensation cost, interest rate, tariff rate, GDP per capita, distance, and exchange rate were very important variables that influence U.S. FDI. GDP was found to positively influence U.S. FDI in Asian and European countries, which is consistent with the hypothesis that an increase in GDP causes an increase in U.S. FDI. Exchange rate were found to positively influence U.S. FDI, supporting our hypothesis that U.S. firms will invest more as the dollar appreciates because production costs are lower. Tariff rate were found to positively influence FDI, supporting our hypothesis that U.S. firms will invest more in countries with a high tariffs to avoid those tariffs, which is viewed as tariff-jumping. Labor compensation cost was found to negatively influence FDI because higher labor cost discouraged U.S. investors from investing in those countries. Interest rate was found to negatively influence FDI, indicating that an increase in interest rate (cost of capital) caused a decrease in investment. The difference in the GDPs per capita between the host and home country was found to negatively influence FDI. Distance was found to negatively influence FDI. A greater distance from the United States will discourage U.S. investors from investing in the processed food industry because of increased trade and transportation costs.

Empirical results for the export equation indicated that GDP, AGDP, and distance are very important variables that influenced U.S. exports of processed food. GDP was found to positively influenced U.S. exports to Asian and European countries, which is consistent with the hypothesis that demand for goods will increase if income increases. AGDP negatively influenced exports, indicating that a country will discourage U.S. exports of agricultural food if the production capacity of agricultural food is high. Distance was found to negatively influence U.S. exports, as long distance increased transportation costs of U.S. exports to that country.

In both the FDI and the export equations, the study found a positive relationship between U.S. FDI and exports of the processed food, indicating that U.S. FDI and exports are complements, not substitutes, to European and Asian countries. This finding implies that U.S. FDI positively influenced U.S. exports and that U.S. exports positively influenced U.S. FDI.

From the empirical results, the conclusion can be drawn that GDP, interest rate, labor compensation cost, exchange rate, tariff rate, GDP per capita, and distance were important determinants for U.S. firms investing in Asian and European countries. In this case, U.S. FDI captured the benefits of lower relative costs, lower relative interest rate, lower tariff rate, less distance, higher income, and higher exchange rate variations from Asian and European countries. On the other hand, it was determined that GDP, AGDP and distance all affected U.S. export levels. Finally, results showed that U.S. FDI was not hampering U.S. exports of processed food to Asian and European countries, as is often claimed, because a bidirectional complementary relationship existed between U.S. FDI and exports of processed food, not a substitute relationship.

The complementary FDI-export relationship showed that the performance of the economy attracted foreign investment to the host nation, along with exports. U.S. FDI of the processed food industry had a complementary effect on U.S. exports of processed food. Thereby, policy measures should be undertaken to keep the tariff rate low. Interest rate should be decreased to reduce the cost of capital and labor cost should be kept low to attract foreign direct investment.

6.2. Contributions

This present research contributes to the literature by developing an empirical model for FDI and exports of the agri-food process industry based on an existing theoretical FDI model (Bajo-Rubio and Sosvilla-Rivero, 1994; Marchant, Cornell, and Koo, 2002). In addition this study analyzes the relationship between FDI and exports as well as the determinants of export and FDI by means of a simultaneous equations system using the error component three-stage least squares method (EC3SLS), in which FDI and exports are the endogenous variables. This research also contributes to the literature using a panel data set that included 16 years of the most recent data up to 2004. The study involved four Asian countries and six European countries to explore the relationship between U.S. FDI and exports of processed food industries. While most of the past studies examined the U.S. FDI-export relationship by simultaneous equations with two-stage squares method using panel data, and the Granger causality tests in a cointegration framework using time series data. Most previous studies have been done in the context of developed or developing countries.

6.3. Limitations of the Study

The Philippines and China in Asia and the Netherlands in Europe are the largest destinations for U.S. FDI and export of processed food. However, these three countries were excluded from the study because of difficulties in obtaining data. Also, North American countries have been excluded from the study even though they have become important destinations for U.S. exports and FDI after the implementation of the North American Free Trade Agreement (NAFTA). Thus, the effect of the free trade agreement was not included in the model. Other important variables, such as political stability, infrastructure, and corruption in the host countries, were not included due to the unavailability of data.

6.4. Recommendations for Further Study

This study does not reach a conclusion regarding the individual effects of Asian and European countries on U.S. FDI and exports. This study estimates the U.S. FDI effects on U.S. exports on European and Asian countries as a whole. Individual effects of U.S. investment on U.S. exports to Asian countries or individual effects of U.S. FDI on U.S. exports to European countries provide an opportunity for further study. Also, in this study, the FDI outflow and its relationship with exports were studied from a home country's (the United States) point of view. Further studies could be done from the host country's standpoint regarding the opportunities of receiving investment and importing products from the same country.

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