EFFECTIVENESS OF U.S. DAIRY EXPORT PROMOTION PROGRAMS IN SELECTED COUNTRIES

By

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CHAPTER 1

INTRODUCTION

Background

The United States is a net importer of dairy products and its exports of most products account for only a small percentage of total production. Its dairy trade deficit was $250 to $500 million from the late 1972 through the early 1990s and which has been growing, approaching $1 billion by 2002 (Jesse, 2003). Nevertheless, the U.S. exports have been on the increase in recent years with the U.S. becoming a significant player in the global dairy trade; competing with other countries such as the European Union (EU), Australia, and New Zealand.

During the 2000 – 05 periods, the United States accounted for an average of 19, 20 and 30 percents of total global cow fluid milk, non fat dry milk (NFDM), and cheese supplies, respectively (USDA/FAS[a]). During these periods, the United States exported five (5) and 16 percents of total global cheese and NFDM respectively (Figure 1 and 2). The United States' export share in the global dry whey market from 2000 to 2005 was 14.5 percent (Figure 3). In 2005, over $1.6 billion worth of dairy products were exported, an increase of 46% over the 2003 export value of about $1.1 billion (USDA/FAS[b]). Nonfat dry milk (NFDM) is the largest U.S. dairy product exported, with exports accounting for about 41 percent of total production while whey products are the second largest U.S. dairy export product; and dry whey accounted for a major part of the U.S. whey exports (55 % in 2005).

Although the U.S. is a net importer of dairy products; it is a net exporter of nonfat dry milk (NFDM), whey products, and lactose. In 2005, NFDM accounted for about 34 percent while whey products and cheese accounted for about 13 and 12 percents respectively of U.S. total dairy export value (USDA/FAS[b]). “Other dairy products” comprising of food preparations not containing cocoa powder, or containing less than 10 percent by weight of cocoa powder, and preparations for infant use put up for retail sale, among others accounted for about 29 percent of U.S. total dairy export value (Figure 4). The primary export markets for the U.S. dairy products are Mexico, Canada, and Japan, and its secondary markets consist of China, South America, South East Asia, and Korea.

As the dairy market has become more liberalized, and faced with growing competition at the global dairy markets, the U.S. dairy industry has used various export promotion programs in order to increase market shares and sales. The U.S. dairy producers and processors have joined forces with the federal government to implement export market development programs. The United States Export Dairy Council (USDEC), the export promotion arm of the National Dairy Board, has been at the core of the export promotion endeavors. As the “export market development organization”, of the U.S. dairy industry, the U.S. Dairy Export Council (USDEC) receives support for marketing activities from private industry as well as programs administered by the Foreign Agricultural Services (FAS) of the U.S. Department of Agriculture. Dairy promotions have involved a substantial outlay of resources by the United States government, and the dairy industry. Therefore, decision makers need to understand the dairy trade and policy of United States and its trading partners, and the promotion programs to make appropriate policy choices.

The Foreign Agricultural Service (FAS) of the U.S. Department of Agriculture coordinate the Foreign Market Development Program (FMDP) and the Market Access Program (MAP) which are non price promotion programs. From 1998 to 2005 about $5.8 million was received by USDEC under FMDP while approximately $15.2 million was expended under MAP for dairy export promotion by USDEC (Table 1).

In a bid to address the decline in farm-level milk prices, associated with imbalances in milk supply and demand; a farmer-led and farmer-funded national program was established in July 2003. This program, Cooperatives Working Together (CWT) is operated within the structure of the National Milk Producers Federation. CWT has a herd retirement, and an export assistance program; and is opened to all cooperatives and independent farmers (CWT, 2008).

A variety of studies have been conducted on the U.S. dairy industry, but these are limited to the impact of dairy domestic and trade policies on the industry and not the effectiveness of dairy export promotion expenditures (Dobson, 2003; Manchester and Blayney, 2001; Bailey, 2005[a]). The effectiveness of promotion expenditures on domestic dairy products (Kaiser, 1998; Kaiser and Chung, 2000), and on export sales of various agricultural commodities have also been the focus of many studies in the literature. The impact of the Dairy Export Incentive Program (DEIP) and its prospect under the GATT Agreement was conducted by Dobson and Knapp (1994). Export promotion activities of the USDEC in some of these countries have also been reported, but this did not involve any empirical studies (USDA/AMS, 2004). Nevertheless, a review of literature shows ample studies on the effectiveness of U.S. non-price export promotion programs for non-dairy farm and food products (Halliburton and Henneberry, 1995; Henneberry and Lu, 2000). Despite the various dairy market development programs aimed at promoting U.S. dairy exports, and the funding by the U.S. government and the dairy industry's stakeholders, the impacts of dairy export promotion programs have not been adequately addressed in the existing literature.

Objectives

The general objective of this study is to evaluate the impact of dairy export promotion expenditures on selected U.S. dairy products' exports. Specifically, this study will:

1. Specify and estimate the foreign demand for source differentiated whey, cheese, and nonfat dry milk in selected countries.
2. Estimate the impact of dairy export promotion expenditures and determine the impacts of other factors affecting import demand for source differentiated whey, cheese, and nonfat dry milk in selected countries.
3. Evaluate the returns to U.S. dairy promotion expenditures.

This paper focuses on dairy policies of major exporting and importing countries, the U.S. dairy sector, the U.S. dairy export markets, dairy export promotion programs of the U.S., a review of literature on the effectiveness of promotion expenditures on domestic dairy products and on export sales of various agricultural commodities, and an empirical study on the effectiveness of U.S. dairy export promotion expenditures on import demand for whey, cheese, and NFDM in select countries.

Global Major Dairy Exporters' and Importer' Policies

Major dairy exporters are the EU, Australia, and New Zealand while the world's major dairy importers include the United States, the EU, Mexico, Japan, and a few other Asian countries. The global dairy markets are highly protected by various policies of major importing and exporting countries. However, in a bid to liberalize the market, members agreed to reduce trade-distorting domestic support, import barriers, and export subsidies. Dairy policies in the EU have their origins in the Common Agriculture Policy (CAP) provisions of the 1957 Treaty of Rome established by the then European Community. The policies consist of dairy import restrictions, export subsidies for domestic dairy surpluses, a domestic dairy price support program, and a production quota for milk. The import restriction policy restricts dairy imports (with the exception of preferential access granted to butter imports from New Zealand) prior to the implementation of the Uruguay Round General Agreement on Tariffs and Trade (UR GATT) in mid-1995 through the use of variable levies. However under the UR GATT, this has been replaced with the tariff rate quota, which provides for low tariffs for in-quota imports and higher tariffs (that will gradually reduce), for over-quota imports (Dobson, 1996). Price support program begins with the intervention system and it provides a safety net for minimum prices of butter and skim milk powder. Apart from intervention program, the EU also provides for consumption subsidies on butter used in pastry and ice cream, and skim milk for calf feed (Bailey, 2005[b]). The 2003 reforms made provision for a cut of 25 percent in butter prices over a 4-year period beginning in

2005; and 5 percent in milk powder prices over a 3-year period beginning in 2005; and limits intervention purchases of butter to 30,000 MT annually (Blayney et al., 2006).

Export subsidies is an important outlet for EU excess dairy production and an important supplement to domestic disposal programs, (Dobson, 1996). Milk production quota was adopted in 1984 by the EU with the aim of keeping costs of the dairy intervention and export subsidies program manageable (Dobson, 1996); with the global quota effectively set in butterfat terms rather than crude milk delivery totals. These trade-distorting policies have proven to be very expensive, costing roughly $2 billion euros for the dairy portion of CAP in 2003. To reduce the cost of CAP and to better position itself in the current WTO round, efforts are made by the EU to implement major reforms in their dairy policy and has agreed in the WTO negotiations to lower domestic support prices and to eventually eliminate all export refunds (Bailey, 2005[b]).

New Zealand has an almost deregulated agricultural sector since 1984. The New Zealand Dairy Board (NZDB) is exclusively funded by the dairy producers (Haumann and Wattiaux, 1999). NZDB is a monopoly exporter and owned by export dairy processing companies, which are in turn owned by farmers who supply the raw milk. The NZDB was however merged with the New Zealand Dairy Group and Kiwi Cooperative to form Fonterra in October 2001 (Armentano et al., 2004). The dairy sector receives almost no support from the government, although Fonterra (the exporting firm) has retained full or partial quota rights to the U.S. and EU dairy markets for 10 years. Fonterra is the world's largest exporter of dairy products, and it is involved in the manufacturing and marketing of dairy products. New Zealand and Australia have had a Closer Economic Relations Agreement since 1983, which allows for free-trade between the two countries (Armentano et al., 2004). New Zealand also uses very low tariff rates which will be phased out in the near future for dairy products imports (Haumann and Wattiaux, 1999).

In Australia, the dairy industry was fully deregulated in mid-2000, and a free trade agreement exists with the United States that will allow its dairy exporters a modest increase in access to the U.S. dairy market (Armentano et al., 2004). Prior to deregulation, the dairy sector in Australia was protected by the Domestic Market Support Scheme (DMSS) and the State Milk Pricing Regulations (SMPR). Introduced in 1995, DMSS was a federal program administered by the Australian Dairy Corporation. It provided support for producers of manufacturing milk, through levies on all market milk sold domestically and all milk used in the production of dairy products sold in Australia's domestic market; while exempting milk used in producing finished dairy products destined for export markets from levies. The SMPR employed a milk discrimination device which paid higher prices to Australian farmers for market milk than for milk used to produce manufactured dairy products (Dobson and Wagner, 2003).

Japan is the world's third-largest dairy product importer, by value; after the United States and the EU, and it utilizes a complex network of domestic and trade policies. These include supply control; subsidies for milk, cheese, and cream production; a government/producer joint emergency fund; strict and compulsory labeling; price stabilization; subsidies for environmental improvements; subsidies to consumption; insurance subsidies; tariff-rate quotas (TRQs); and other tariffs (Obara, Dyck, and Stout, 2005). Both the supply control and subsidies for milk, cheese, and cream production are voluntary. The supply control policy covers milk for most manufacturing purposes and is subject to a formal, voluntary quota system administered by the Ministry of Agriculture, Forestry and Fisheries. Farmers who participate in the program receive a direct payment, and this system replaced the previous deficiency payment system in April 2001. The Japanese government also has a program that provides subsidy to farmers who produce milk used in the production of natural cheese and cream (Obara, Dyck, and Stout, 2005). The joint emergency fund compensates farmers when prices fall. A fall in the current year average price below the moving average of the previous three years allows the fund to pay 80 percent of the difference in price to participating farmers. In Japan, the subsidies for environmental improvement programs pays the “extra cost” necessary for dairy farmers to carry out appropriate environmental management of manure and payments are related to the size of pasture and forage fields that are part of a dairy farm, and support use of manure that does not pollute the environment. The subsidies to consumption policy provides for subsidization of fluid milk sales in elementary and junior high school lunches. Japan’s dairy trade policies consist of tariff-rate quotas (TRQs) and tariff (Obara, Dyck, and Stout, 2005).

Korea uses TRQs for skim milk powder, whole milk powder, and other milk and cream and these are allocated according to the highest-price bidders at quota auctions. It also makes deficiency payments to its milk producers, thereby assuring them prices higher than the world milk prices. Other East Asian Countries such as China, India, Indonesia, the Philippines, Malaysia, and Singapore also protect their dairy markets through TRQs and high tariffs (Cox and Zhu, 2005).

Following the North American Free Trade Agreement (NAFTA) in 1994, Mexico’s tariffs on most dairy imports from the United States were phased out over a 10-

year period. However, for milk powders, there is a 15-year transition period, with tariffs being reduced to zero in 2008 (Dobson, 2003). Trade under NAFTA is subject to rules of origin. Goods from the United States or Mexico must be produced or significantly transformed or processed in one of those countries to be eligible for preferential treatment under the terms of NAFTA. For example, cheese imports into the United States from a third country but passing though Mexico with no additional processing would remain subject to tariffs.

Trade barriers have been used by the U.S. to limit dairy product imports to less than 6% of the U.S. consumption, which allows the domestic price of milk and dairy products to remain above the world price (Sumner and Balagtas, 2002). In 1995, a tariff-rate quota (TRQ) system replaced the dairy import quotas first imposed in 1951 (USDA-FAS[c]). The TRQ is a two-tier system whereby a low-tier tariff rate is applied to a specified quantity of imports, and a high-tier rate is applied to any import quantity in excess of the specified quantity. The United States uses the Harmonized Tariff Schedule, Sanitary and Phytosanitary measures, and the Food and Agricultural Import Regulations and Standards Report for foreign import procedures of food and agricultural products, including dairy products. Two-tiered TRQs apply to most but not all dairy products imported into the United States. Milk protein concentrate, casein products and some varieties of cheese are examples of products without TRQs. Also, some TRQs are being phased out under bi-lateral agreements.

Effects of liberalization of dairy policies on exporting countries' global market shares have been simulated. The results show the EU's market shares in the global butter and NFDM exports will decline, while its share in the cheese market will be maintained.

While Australia’s and New Zealand’s export shares in the butter and NFDM will increase, Australia’s share of other dairy products will fall. The United States will however maintain its position in most markets, and gain slightly in the NFDM market (Langley, Somwaru, and Normile, 2006).

U.S. Dairy Program

Government supports of the agricultural sector in most countries at the domestic and international levels have been an important issue. These have been made in an attempt to protect domestic producers, and/or consumers, to raise farm incomes and to ensure adequate supplies of milk; or to increase government revenues. In the U.S., agricultural commodity policy was developed in the 1930s, in response to the economic conditions of the great depression. The Federal Dairy Price Support Program (DPSP), Federal and State Marketing Orders and border measures are dairy policies which have been used in the U.S. dairy program (Sumner and Balagtas, 2002). Other domestic dairy programs include the Milk Income Loss Contract program (Bailey, 2005[a]), the Dairy Board Programs and the Fluid Milk Board Programs. Also, federal support of U.S. agricultural exports include credit guarantee programs, market development, food aid programs, and price subsidies programs (Henneberry and Ackerman, 1990). Furthermore, market promotion programs have been funded by private sources, primarily through producer assessments.

In terms of domestic policy on dairy, the U.S. Federal Government has been supporting milk farm prices by purchasing manufactured dairy products, as far back as 1935. The Agricultural Act of 1949 mandates the USDA to support the farm price of milk through the purchase of butter, cheese and non fat dry milk from processors at administratively determined prices (Sumner and Balagtas, 2002). These purchases are done through the Commodity Credit Corporation of the USDA and the program allows a floor for these commodity prices by effectively setting a floor for the manufacturing value for milk (Bailey, 2005[a]).

Milk Marketing Orders regulate the pricing of almost all of the milk produced in the U.S., using price discrimination. Since January 2000, regulation of the sale of 70 percent of milk produced in the U.S. is done by 11 federal marketing orders. California regulates the sales of 19 percent of the country's milk, using its own state marketing orders, while other state marketing orders which comprise Maine, Montana, Nevada and Virginia regulates most of the remainder, with a small portion not being regulated by any marketing orders (Sumner and Balagtas, 2002). Price discrimination is used by setting minimum prices that processors must pay producers for Grade A milk according to its end-use, by distinguishing between four end-use 'classes' which are fluid products; soft and frozen products; cheese, and butter; and dry milk under the federal orders. The minimum price set for milk used in fluid products is set at a premium over the minimum price set for milk used for manufactured dairy products.

The Dairy Forward Pricing Pilot Program was mandated by a 1999 amendment to the 1937 Agricultural marketing Agreement Act, with a termination date of December, 31, 2004. Using forward contracts, it allows proprietary milk handlers regulated under the Federal Milk order program to contract for future deliveries of milk from milk producers or their cooperative associations, at prices exempt from minimum federal milk marketing order blend prices (USDA-AMS, 2002).The program allows producers to sell futures contracts which enables a price floor being established for their milk, as producers are able to lock in prices, and as a result of this, risks associated with price and income volatility are reduced.

The Milk Income Loss Contract (MILC) Program is a program authorized by the Federal Farm Security and Rural Investment Act of 2002. It financially compensates dairy producers when domestic milk prices fall below a specified level. It is meant for dairy producers who, beginning December 1, 2001, through September 30, 2005, commercially produce and market cow milk in the U.S. or produce milk in the U.S. and commercially market the milk outside the U.S. (USDA-FSA, 2006). Payments are made on a monthly basis when the Boston Class 1 milk price falls below $16.94 per hundredweight. However, when the Boston price is greater than $16.94, no payments will be made to the dairy operator, and production for that month will not count towards the operator's maximum eligible production. Furthermore, payments are made up to a maximum of 2.4 million pounds of milk produced and marketed by the operator in a fiscal year. However, the Agricultural Reconciliation Act of 2005 has reauthorized the program through Sept. 30, 2007, with the extended program period being called MILCX (USDA-FSA, 2006).

The National Fluid Milk Processor Promotion Program (NFMPPP) is a national program for fluid milk promotion and education and it was authorized by the Fluid Milk Promotion Act of 1990 (Fluid Milk Act). It is funded by fluid milk processors and designed to educate Americans about the benefits of milk, increase fluid milk consumption, maintain and expand markets and uses for fluid milk products in the contiguous 48 states and D.C. (USDA/AMS, 2004).

The Cooperatives Working Together (CWT) is a producer-funded, voluntary, national dairy program. It was developed by the National Milk Producers Federation (NMPF) with the aim of strengthening and stabilizing milk prices by balancing supply with demand through its herd retirement, and export assistance programs. The herd retirement program is a program through which farmers voluntarily bid to opt out of dairy business and have their cows permanently removed from milk production if the bid is selected. CWT makes payment to such farmers upon receipts of documentations of sales of cows. The export assistance program is designed to financially assist CWT member cooperatives to compete in the global market through a bid process, by paying an export bonus on accepted bids. Eligible products under this program must have been exclusively manufactured from milk or other dairy products of U.S. origin. These include butterfat, cheese, and whole milk powder; while nonfat dry milk powder, and whey powders are not eligible to receive assistance. CWT was originally funded with a five-cent per hundredweight assessment on participating farmers but this was increased to ten-cent per hundredweight in July 2006.; and is opened to all cooperatives and independent farmers. CWT has carried out four herd retirements since its first herd retirement in 2003, resulting in the removal of 200,000 cows from the national herds. Its export assistance program has also assisted members in exporting over 97 million pounds of cheese, butter, anhydrous milk fat and whole milk powder to 51 countries (CWT, 2008).

The U.S. Dairy Export Market Development Programs

The agricultural sector in general and the dairy sector in particular, have been supported by the governments of most producing countries at the domestic and international levels. Despite the liberalization efforts by multilateral and regional agreements in the global dairy market, it is still one of the most protected agricultural sectors (Langley, Somwaru, and Normile, 2006). In a liberalized dairy market, the reduced trade barriers and removal of the export subsidies on dairy products calls for the U.S. having to compete with other exporting countries in order to maintain or expand its market shares for its dairy products. Although the United States is not a big user of export subsidies, in order to comply with any Doha Round Agreement, the use of export subsidies under the Dairy Export Incentive Program ends in 2007 according to the 2002 Farm Bill. This will have its greatest impact on U.S. NFDM exports (Dobson, 2006). In a liberalized dairy market, export promotion can therefore help position the United States' dairy products. Emphasis on non-price market development programs becomes important as export subsidies are reduced. The United States' market development efforts have been targeted at major export markets such as Mexico, Asian, Caribbean, and Latin Americans countries, among others in the form of market research, consumer promotion, trade servicing and technical assistance activities among others.

In the United States, one of the programs that is the cornerstone of dairy promotion is the Producer Dairy Promotion Program (PDPP), which is funded by the dairy farmers. The PDPP was authorized by the Dairy Production Stabilization Act of 1983, as amended (the Dairy Act) and is administered by the dairy farmers through the National Dairy Promotion and Research Board (the Dairy Board). According to the Dairy Act, dairy farmers must contribute 15 cents per hundredweight for promotion and research on all milk produced in the contiguous 48 states that is marketed commercially (USDA/AMS, 2004). At least 5 cents of the 15 cents must be submitted to the National

Dairy Promotion and Research Board. A dairy farmer can get credit for up to 10 cents of the 15 cent federal assessment if he contributes to one or more of the 59 qualified State or regional dairy promotion programs.

The Dairy Board Programs are managed by Dairy Management Incorporated (DMI), which has been a joint undertaking since 1995 between the Dairy Board and the United Dairy Industry Association (UDIA)[1], both of which provide funds for DMI .The DMI's export enhancement program is implemented by the USDEC. This Council is a non-profit independent membership organization formed by the DMI in 1995, and it represents the interests of U.S. milk producers, dairy cooperatives, proprietary processors, exporters, and industry suppliers. The USDEC receives funding primarily from three sources: DMI, FAS, and membership dues and other. In 2005, DMI contributed 49% of the USDEC available fund of $15.4 million while USDA/FAS contributed about $6.5 million (43%), with membership dues and funds from other sources accounting for 8% (USDEC[a]). Approximately $5.6 million (62%) of 2005 funds was spent on market development activities by USDEC.

The U.S. government's involvement in dairy export market development programs include: the Foreign Market Development Program (FMDP), the Market Access Program (MAP), the Emerging Markets Program (EMP), the Quality Samples Program (QSP), the Export Credit Guarantee Program (ECGP), the Supplier Credit Guarantee Program (SCGP), the Dairy Export Incentive Program (DEIP), and foreign donation programs.

The FMDP's goal is to develop and maintain long-term access to commercial markets through cost-sharing assistance to eligible non-profit agricultural trade

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[1] 18 of the 59 qualified State or regional programs are members of UDIA.

organizations (Halliburton, Karen, and Henneberry, 1993). The MAP; formerly known as the Market Promotion Program (MPP), which had replaced the Target Export Assistance (TEA) program, is a public-private sector cooperative program. The MAP is aimed at developing, maintaining, and expanding foreign markets for U.S. agricultural commodities. Activities eligible for funding include consumer promotions, market research, trade shows and trade servicing. The USDEC was allocated $3.8 million in MAP funds and $1 million in FMDP funds in 2005, which represented 2.7 and 2.9 percents of total MAP and FMDP allocations for the year (USDA/FAS[d]). Both the MAP and FMDP are reimbursable non price promotion programs of the U.S. government The FMDP does not provide brand promotion assistance to cooperators, while the MAP provides brand and generic promotions. For dairy, the U.S. cooperator under both programs is the USDEC.

The EMP was authorized by the Food, Agriculture, Conservation and Trade Act of 1990, as amended; and is intended to foster growth in the U.S. agricultural exports to low-and middle-income countries that offer viable growth market. It assists public and private organizations in providing technical assistance in promoting market development, improving market access, or assisting the development of emerging market economies. In FY 2005, the USDEC received EMP funding of $20,000, which accounted for 0.2 percent of the total EMP allocation for the year. The QSP was established in 1999 to help U.S. agricultural trade organizations provide samples of their products to potential importers in foreign markets. In FY 2005, the USDEC did not receive any QSP funding; however, in 2004, dairy was awarded $12,000 under QSP, representing 0.6 percent of the year’s total allocations but the proposed project was not carried out (Wolf, 2006).

The ECGP and the SCGP are commercial export credit guarantee programs. The ECGP was established with the primary goal of expediting the commercial sales of U.S. agricultural products. While its GSM-102 covers private credit extended to U.S. exporters up to 3 years, its GSM-103 covers a financing period of more that 3 years and up to 10 years[2]. Although dairy was allocated $240,000 in FY 2004 in GSM-102 funds, there were no allocations in 2005 (USDA/FAS[d]). The SCGP has the objective of expanding, maintaining, or developing markets for U.S. agricultural products in areas where commercial financing may not be available without a Commodity Credit Corporation (CCC) payment guarantee. It enables U.S. exporters to become more competitive by providing direct short-term credit to their foreign buyers (USDA/FAS[e]). The USDA's CCC guarantees a large portion of payments due from importers under financing arrangement of up to 180 days, thereby reducing the financial risk to exporters. Although dairy products are eligible for coverage under SCGP, allocation credit limits are very small ($80,000 in FY 2005).

Another significant dairy market support program, the Dairy Export Incentive Program (DEIP), was established with the original goal of developing markets for dairy products where U.S. products were not competitive due to the presence of subsidized foreign products. Originally authorized in 1985, it remained unused for a number of years. When it was first funded; during the negotiations for the Uruguay Round of General Agreement on Tariffs and Trade (UR - GATT), export subsidies were targeted at

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[2] Beginning July 1, 2005, the CCC no longer accepts applications for payment guarantees under the GSM-103 program, in response to the decision by the World Trade Organization that export credit programs must be risk-based. Any remaining country and regional amounts from the $19 million originally allocated for GSM-103 in FY 2005 were reallocated to the GSM-102 program for that country or region. No sales were registered under GSM-103 in FY 2005 (USDA/FAS[c]).

countries where the EU was competing. Under this program, the USDA could pay cash as bonuses to exporters of dairy products, allowing them to sell certain U.S. dairy products at prices lower than the costs at which the U.S. exporters acquired them. However export subsidies by commodity are subject to a ceiling that is determined by UR – GATT funding limits. Both subsidized export quantities and subsidies have decreased during the past decade and have now reached the new lower maximums set by WTO. Therefore; the objective of DEIP has emerged into moving dairy surpluses to the global markets to positively impact domestic farm dairy prices. The DEIP is extended to 2007 by the 2002 Farm Bill (USDA/ERS)[3].

The Foreign Market Development Program

Among other export market development programs by the U.S. government, the Foreign Market Development Program (FMDP) is one of two, through which dairy products receive much funding to conduct promotion activities in foreign markets. The FMDP is also known as the "Cooperator Program". First established under the authority of Public Law 480, the FMDP was re-authorized by Title VII of the Agricultural Trade Act of 1978 (USDA/FAS[f]). The goal of the FMDP is to develop and maintain long-term access to commercial markets through cost-sharing assistance to eligible non-profit agricultural trade organizations (Halliburton and Henneberry, 1995). Under this program, the FAS enters into a contract agreement with a nonprofit U.S. agricultural trade organization that has submitted a marketing strategy, describing acceptable market situations, budgets and activity plans. A cooperator may seek reimbursement for an

[3] No allocations under the DEIP were announced for FY 2005 – in 2004, $2.7 million allocations were made under DEIP (USDA/FAS[c]).

incurred expenditure for an approved activity that would not be reimbursed by any other source. Types of activities are trade shows, trade advertising etc. Consumer promotions are not eligible activities (USDA/FAS[g]). Preference is given to nonprofit U.S. agriculture and trade organization which can represent an entire industry or are nationwide in membership and scope. Incurred expenses of the cooperator are itemized and submitted to FAS for reimbursement during the market year. Commodity Credit Cooperation (CCC) funds partially reimburse Cooperators conducting approved overseas promotional activities. FMDP expenditure on dairy export promotion through the USDEC was about $5.8 million, and it has steadily grown over the years, since 1998 except for a slight decline in 2001 and 2004 (Table 1).

Market Access Program

The Market Access Program (MAP) is another of the U.S. government's export market development programs through which dairy as a product is promoted in overseas markets. The MAP is authorized by section 203 of the Agricultural Trace Act of 1978. It uses funds from the USDA's CCC for the goal of creating, expanding and maintaining foreign markets for U.S. agricultural products (USDA/FAS[h)]. The MAP; formerly known as the Market Promotion Program (MPP) in 1996, which in turn had replaced the Target Export Assistance (TEA) program in 1990, is a public-private sector cooperative program. The MAP is aimed at developing, maintaining, and expanding foreign markets for U.S. agricultural commodities. It is a cost – sharing program between USDA's CCC, and non-profit U.S. agricultural trade associations, U.S. agricultural cooperatives, non-profit state- regional trade groups or small U.S. businesses. Costs of overseas marketing and promotional activities such as consumer promotion, market research, trade shows, and trade servicing are shared. Under this program, funds from the USDA's CCC are used partially to reimburse program participants who are engaged in foreign market promotion activities. Individual companies must provide at least 50% of funding in respect of branded product promotion activities while for generic promotion activities, trade associations and others must provide a minimum 10% of funding. Promotion of branded products in a single country under MAP is limited to no more than 5 years. Activities for which reimbursement for an incurred expenditure may be granted include production and distributions of various types of adverts, in-store and food service promotions, product demonstrations, fees for participating in retail, trade and consumer exhibits and shows, among others. Reimbursement rates for branded promotion equal to the percentage of U.S. origin content of the promoted agricultural commodity or a rate of 50 percent, whichever is the lesser (USDA/FAS[i]). In 2004, the USDEC received about $3.4 million under the MAP for various dairy export promotional activities (Table 1).

U.S. Dairy Export Markets

The U.S. dairy exports to 143 countries of the world reached a record level of $1.69 billion in 2005, increasing by over 60% from about $1.1 billion in 2003. (USDA/FAS[b]). Some of the factors that have contributed to the rise in U.S. dairy exports included reduction of trade barriers through multilateral and regional agreements, market development efforts, and new uses for dairy components by food processors, foreign expansion of U.S. food service chains and growth in the consumer market for health-oriented products abroad. Whey proteins, lactose, milk fat and skim solids have emerged as important food ingredients, due to desirable taste, functional and nutritional characteristics and cost advantages (Miller and Blayney, 2006). Subsidized school milk programs, instituted in China and Thailand and aimed at boosting per capita consumption of dairy and impact child malnutrition have also contributed to increase U.S. export sales (USDEC[b]).

Mexico represents the largest market for all U.S. dairy products, followed by Canada in 2005. Dairy export value to the Mexican market was $510 million, while it was $270 million to the Canadian Market; accounting for 30.3 and 16 percents, respectively, of total U.S. dairy export value for the year (USDA/FAS[b]). From 1998-2005, the U.S. dairy exports to Mexico and Canada accounted for 23% and 19% respectively of total U.S. dairy export value of about $9.2 billion (Figure 5). The U.S. exports to Mexico and Canada have been on the rise since the implementation of the North American Free Trade Agreement (NAFTA).

Next to the North American Markets, the Asian region represents a significant market for U.S. dairy exports. 32 percent of the U.S. dairy exports, valued at $541 million were shipped to Asia in 2005 (USDA/FAS[b]). U.S. dairy export was highest in Japan, followed by the Philippines, China and Indonesia. During the period 1998-2005, Japan imported about $814 million (representing about 9% of U.S. total dairy export value) dairy products from the U.S. (Figure 5). Next to Canada as the second largest export market for the U.S. dairy period during this period, the Asian markets ranked third to tenth. The introduction of a broad new menu of foods, which feature cheese or other dairy products by U.S. food service chains, and efforts to boost dairy consumption in the South East Asian countries, where dairy products have been largely absent from traditional diets seemed to have boosted U.S. dairy exports to this region (USDEC[c]). Innovations have also opened up new trade opportunities for some traditional milk products such as milk powder which are processed into functional products after importation to circumvent protection on finished products (Cox and Zhu, 2004). The United States' dairy exports to other parts of the world constituted 31 percent of its total export sales value from 1998 to 2005 (Figure 5).

In the export market for U.S. NFDM, whey products, and cheese; Mexico was the largest single market in 2005. The Mexican market absorbed about 40, 24, and 30 percents of U.S. NFDM, whey products, and cheese exports respectively. Canada was the second largest export market for the United States' whey products and cheese. The Asian markets are next to the North American markets as destinations for the U.S dairy products (USDA/FAS[b]). From 1998 to 2005, the U.S. exported about $1.26 billion cheese, $1.2biliion whey products, and $1.94 billion NFDM worldwide. The Mexican market remains the largest market for U.S. cheese and NFDM, and second largest for U.S. whey products. About $315 million of the U.S cheese and $836 million worth of U.S. NFDM were exported to Mexico, representing approximately 25% and 43% respectively (Figures 6, and 8).; while whey exports to this market totaled $195 million, accounting for 18% of total exports (Figures 7). Canada is the top destination for U.S. whey products and the second largest market for U.S. cheese from 1998 to 2005, accounting for 19% and 16% of U.S exports of whey and cheese respectively (Figures 6, and 7). The Asian market is a significant destination for U.S. whey products from 1998 to 2005, absorbing 48% of total exports for this period, with Japan being the largest export market (15%) for U.S. whey products in the region, the third largest in the world for this product. Japan also absorbs about 16% of total U.S. cheese exports (Figures 6, and 7). The Asian market shares in the U.S. export markets is based on the top ten destinations for these commodities exported by the U.S. hence, the Asian market absorbs more of these commodities from the U.S. than what has been discussed above.

Dairy Export Market Development: A Market and Product Analysis

Dairy non-price market development activities of the USDEC under the MAP included consumer promotions, promotions in bakery sector, and food service promotion, trade servicing, trade missions, technical support for use of products, seminars and workshops, and research (market and product) studies. FMDP market development activities included trade shows and the above activities under MAP with the exception of "promotion activities". While retail promotional activities features prominently under MAP, it is excluded from the FMDP. Although MAP allows for branded promotional activities, USDEC does not conduct branded product promotions (Barbara Wolf, 2006). Trade servicing activities informs importers and dealers with the attributes of U.S agricultural products, and helps them procure U.S. products, while technical assistance teaches prospective customers about specific uses for U.S. commodities. Consumer promotions include store demonstrations, and display, media advertising, recipes and nutrition information, and event sponsorships. Consumer promotion activities are aimed at expanding overseas retail demand for U.S. agricultural products (Henneberry, Ackerman, and Eshleman, 1992). Market research provides information and guidance for U.S. exporters by helping them focus their efforts, thereby reducing exporters' threshold for entry and/or expansion. Product research activities of the USDEC guide U.S. dairy suppliers in developing products that specifically address the needs of overseas buyers. USDEC market development activities also include updated and accurate information on import tariffs, documentation, and labeling requirements; and provision of overseas offices which provides liaison and assistance to buyers searching for U.S. suppliers (Suber, 2007). These activities are supported by combined funds from the dairy check-off and FAS through the MAP and FMDP. USDEC is also involved in trade policy initiatives that maximize the effectiveness of various bilateral and multi-lateral agreements in providing greater access for U.S. products as well as reducing the policies, such as export subsidies that weakens U.S. competitiveness. However, this trade policy initiative is exclusive of FAS funds (Suber, 2007).

The Foreign Agricultural Services (FAS) expenditures on dairy export promotion for market development in major markets for FY 1998 to 2004 for MAP, and 2000-2005 for FMDP are shown in Tables 2, 3, and 4. These represent funds given to USDEC as the government's contribution to export market development. In this section, all references to MAP and FMDP represent the government's contribution to export market activities and are exclusive of the dairy industry (USDEC) contribution, although the market development activities are conducted by the UDSEC. Market development activities for U.S. whey products and cheese have been concentrated in the Asian markets. Between FY 2000 and 2005, $455,312 (59%) and $954,093 (74%) in FMDP funds was spent promoting cheese and whey respectively in these markets (Tables 2, and 3). In the case of cheese, Japan received the highest amount of FMDP promotion expenditures (about $233,023; representing 30% of FMDP funds). Next to Japan, Mexico comes second in terms of receiving FMDP funds for cheese market development with 25% of the funds being spent in this market. While China received 18%, South Korea and Brazil received about 10% each of FMDP funds for cheese market development activities (Table 2).

Approximately $ 4.8 million (55%) of the total MAP cheese funds $8.7million was spent in the Asian market for promoting cheese and $465,780 (45%) of the total MAP whey funds (Tables 2 and 3). Most of the market development activities in Asia were conducted in Japan, followed by South Korea, and Thailand, and Taiwan. Other Asian countries that benefited from cheese and whey market development activities in this region are Philippines, and Malaysia. Japan received the highest amount of MAP cheese funds with approximately $3.4 million; representing about 39% of MAP funds spent in this market for promotional activities. About $3 million (35%) went to the Mexican market promoting the U.S. cheese, followed by South Korea, receiving almost $1 million (11%) for cheese promotional activities. About 17% of MAP whey promotion expenditures were spent in Japan, while Thailand, South Korea and Mexico received approximately 15%, 10% and 9% respectively for whey market development activities with 38% going to ROW (Table 3). Total FAS promotional expenditures for the period under review (1998-2005) was approximately $9.5 million for cheese and $2.3 million for whey. Out of these, the Asian region received about $5.3 million (56%) and $1.4 million (61%) for cheese and whey promotional activities respectively (Tables 2, and 3). Japan topped other markets in terms of total FAS cheese promotion expenditures received, with about $3.6 million (38%), followed by Mexico receiving about ($3.2 million; representing 34%) and South Korea receiving approximately $1 million (11%). For whey market development activities, Thailand and South Korea received approximately $0.4 million each for the promotion of whey, representing 20% each of total FAS whey promotion funds. While 13% of the funds was spent in Mexico, Japan received 10% (about $0.24 million) with approximately $0.5 million (23%) spent in ROW for whey promotional activities.

In the NFDM export markets, Thailand received the highest promotion expenditures under MAP, and FMDP (about 33% of total expenditures). China received approximately 17% of total FAS promotion expenditures on NFDM, while about 14% and 12% were spent in Japan and Mexico respectively (Table 4). The Asian market has evolved as a potential market for U.S. dairy exports and in the face of competition from other dairy exporting countries, promotional efforts by the U.S. is important for expanding its market share in this region. The food processing industry is conditioned for solid growth. Strong economies are raising incomes, encouraging Western investment, fueling the food service and food retail industries, and ultimately raising demand for processed food, much of it with a Western blend. The Asian food processing sector has been projected to grow at a rate of 12 to 15 percent annually for the next five years (from 2005). Demand for "healthier" foods, including low fat dairy products and fortified drinks is believed to drive expansion (USDEC[c]).

Cheese is the most singly promoted commodity of all U.S. dairy products for the period of study. In fact, under MAP, cheese promotion accounted for 50% and above of total MAP dairy promotional funds, from FAS contributions every year from 1998 to 2003, and about 48% in 2004 (Table 5). For the FY 1998 to FY 2004, approximately $8.7 million (57.4%) of total MAP dairy promotional expenditures, from FAS contributions was spent on cheese market development activities. Next to cheese is whey as a dairy product receiving about $1 million (6.8%) of MAP dairy promotion expenditures from

FY 1998 to FY 2004. NFDM is at a far distant third in terms of promotion expenditures, receiving about 1.3% of total MAP dairy promotion funds. Other dairy products which include yogurt, butter, ice cream, lactose, fluid milk, and infant formula, among others received about $5 million (34.5%) of MAP dairy promotion expenditures.

In terms of FMDP promotion expenditures, whey products received 26.5% the approximately $4.9 million of total FMDP dairy promotion funds from FY 2000 to FY 2005 (Table 6). Cheese and NFDM market development activities received about 15.8% and 4.6% of total FMDP dairy promotion expenditures respectively, while about $2.6 million (53.1%) was spent promoting other dairy products. A total of approximately $20 million was expended on U.S. dairy promotion worldwide from 1998 to 2005 (excluding MAP FY 2005, and FMDP FY 1998 and 1999) by the FAS (Table 7). About $9.5 million (47%) of this fund was spent on cheese promotion activities while whey products and NFDM received approximately $2.3 million (12%), and about $0.4 million (2%) for market development activities. Other dairy products received about $7.9 million (39%) of total FAS dairy promotion funds during the period of this study (Table 7).

The U.S. dairy industry's contribution to export market development (exclusive of government's funds) as promotion expenditures through USDEC from 1998 to 2005 in select countries are presented in Table 8. Dairy industry's contribution to cheese market development in Mexico, Japan, and South Korea during the period under review was about $1.30 million, $1.32 million and $0.68 million respectively, while the government' contribution was about $3.26 million, $3.62 million, and $1.06 million respectively in Mexico, Japan, and South Korea (Table 9). Export development expenditure on cheese among the three markets was least in South Korea. Total promotion expenditures on cheese in all the markets appear to decline over years. In Japan, total promotion expenditures tend to increase from 1998 to 2000, but have been on a decline since, except for a slight increase in 2002. While total cheese promotion expenditure in Mexico increased from 1998 to 2001, and has been on a decline since then; the South Korean market appears to have witnessed a decline in total cheese promotion expenditures from 1998 to 2002, except for increases in 1999 and 2003 (Table 9).

The dairy industry's expenditure on whey market development stood at about \$0.58 million in Mexico, \$0.83 million in South East Asia, and \$0.42 million in South Korea, compared to FAS expenditures of \$0.31 million in Mexico; and about \$0.46 million in Thailand, and South Korea (Table 10). The industry's expenditure was only available for South East Asia, and market development expenditures on dairy products by the dairy industry in this study for Thailand were unavailable. Total whey promotion expenditures seem to increase over time, although this does not appear to have followed a definite pattern. Promotion expenditures in 2005 show substantial increases over those of 1998 in all the three markets (Table 10).

NFDM as a product received no expenditures for market development in Japan from the industry from 1998 to 2005, while about \$41,000; and \$177,000 was spent on export promotion activities in Mexico, and South East Asia respectively; FAS expenditures on NFDM export promotion was \$60,826; \$48,341; and \$139, 861 in Japan, Mexico, and Thailand respectively (Table 11). Total promotion expenditures on NFDM by the government and the dairy industry tend to decrease from 1998 to 2005 (Table 11), although increases were noted in Thailand in 2005, compared to 1998. However, it should be noted that the industry's expenditures for Thailand represent those of the South East Asian region.

CHAPTER II

LITERATURE REVIEW

A variety of studies have been conducted on the U.S. dairy industry, but these are limited to dairy domestic and trade policies effects on the industry (Dobson, 1996,1999, 2003; Dobson and Wagner, 2003; Manchester and Blayney, 2001;Bailey, 2005[a]). The effectiveness of promotion expenditures on domestic dairy products (Kaiser, 1998**;** Kaiser and Chung, 2000) and on export sales of various agricultural commodities have also been the focus of many studies in the literature (Fuller, Bello, and Capps, 1992; Halliburton and Henneberry, 1995; Armah and Epperson, 1997; Henneberry and Lu, 2000). An attempt to analyze the impacts of the DEIP and its prospect under the GATT Agreement was made by Dobson and Knapp (1994).

Diverse econometric models have been used by many researchers in estimating the effects of promotion and advertisement on demand. Also, studies differ in terms of choice of variables and source of data on promotion expenditures, which may lead to different outcomes and conclusions about the effect of promotion (Coulibaly and Brorsen, 1999). The choice of functional form in demand studies are not based on a particular set of criteria. Several studies have been conducted on the appropriateness of functional forms among alternative specifications (Barten, 1993; Schmitz and Seale Jr., 2002; Fousekis and Revell, 2000; Keller and Van Driel, 1985). Many have focused on the appropriate model selection in the context of a demand system.

Barten (1993) used the Central Bureau of Statistics (CBS), the Almost Ideal Demand System (AIDS), the National Bureau of Research (NBR), Rotterdam, and a general model in demand studies for major groups, comprising of food pleasure goods, durables and remainder using annual data in a demand system, with a view to finding which model performs best. Schmitz and Seale, Jr (2002) studied the import demand for disaggregating fresh fruits in Japan by using a general model that nests the CBS, AIDS, NBR, and Rotterdam models. The AIDS and NBR specifications were rejected while those of the Rotterdam and CBS were not rejected. Fousekis and Revell (2000) employed a differential demand systems approach in estimating meat demand in the United Kingdom. According to this study, the Rotterdam and CBS models which are differential demand systems with fixed price effects are more appropriate in explaining allocation decisions for meat in the United Kingdom. They also reported that the parameter estimates from CBS and Rotterdam are very similar. Non nested tests have also been used to select between alternative functional forms. Alston and Chalfant (1993) conducted a study by selecting between the FDAIDS and Rotterdam models and found that the Rotterdam model is appropriate for the U.S. meat demand system. Dameus et al. (2001) used a Cox's non nested test that is based on parametric bootstrap to test the FDAIDS against the Rotterdam demand systems. They concluded that the Rotterdam model better explains the U.S. demand for meat.

Export Promotion

Lanclos, Devados, and Guenthner (1997) evaluated the impacts of advertisements on the U.S. frozen potatoes exports (USFP). Their studies included variables such as real price of USFP, real per capita GDP of the selected importing countries (Japan, Mexico, Philippines and Thailand), total advertising, and per capita foreign direct investments represented by the food service industry investments (FSII). For advertising, U.S. annual Potato Board advertising expenditure in each of the four markets and third party advertising for USFP were used as separate variables. The number of McDonald's restaurants in each of the countries was used as a proxy for total foreign direct investment (FDI). A single-equation model was used to estimate per capita demand equation of the countries investigated. Results indicated that although advertising and FSII appear to have smaller impacts, they are important factors influencing the per capita demand for USFP in the smaller markets (Philippines, Mexico and Thailand). Import demand for USFP in Japan (mature market) is primarily influenced by changes in income and USFP prices. They also found that the third party program generates larger sales increases than the Potato Board's advertising program in Philippines and Thailand; with the returns to promotion expenditure of $11.77 and $16.36 respectively, compared to $1.42 and $1.51 for the two countries under the Potato Board program.

Impacts of U.S. export promotion programs on the export demand for U.S. orange juice was evaluated by Armah Jr. and Epperson (1997). The study used a single demand equation and a linear-log functional form which included such variables as exchange rate, real U.S. export price of frozen concentrated orange juice (FCOJ), real prices of U.S. competitor's FCOJ, real per capita GNP of importing country, real per capita expenditure on orange juice promotion program, dummy variables for countries and time trend. They supported the use of a single equation by assuming that the importing countries are price-takers since in the case of citrus juice, domestic market historically takes about 90% of total supplies. Annual allocation by the Florida Department of citrus for the FMD, TEA and MPP programs to France, Germany, Japan, the Netherlands and the United Kingdom was used to measure the promotion expenditure variable. Using OLS estimation, with White's heteroskedastic-consistent covariance matrix; it was concluded that cross-price, real income, and promotion expenditures had positive impacts on U.S. FCOJ export quantity, while U.S. export price and real exchange rate were negatively related to U.S. export quantity. Returns to promotion expenditure were \$5.61 (Japan), \$7.44 (France), \$7.64 (United Kingdom), \$37.09 (Germany) and \$51.92 (Netherlands).

Rosson, Hamming, and Jones (1986) conducted an analysis of promotion response for Apples, Poultry and Tobacco; under the foreign market promotion programs. Total U.S. export volume was specified as being dependent on U.S. real export price, U.S. competitor's real price, real U.S. expenditures for export promotion, and dummy variables for regions. The model was estimated using regression analysis applied to time-series/cross-sectional (TSCS) data. As suggested by Kmenta, data were transformed to address the problems of autocorrelation and heteroskedasticity that are often associated with the use of TSCS data. For each equation, price variables were incorporated in three forms: U.S. price and competitor's price, U.S. price alone, and the relative price. FMD expenditures for each of the commodities were used as promotion expenditures. Results indicated that export sales of apples and tobacco were stimulated by promotional efforts. While returns per dollar of expenditure varied across commodities, they were positive implying that promotional activities were successful. Over the period of 1973 through 1981, returns per dollar of promotion expenditure was \$60 and \$31 for apples and tobacco, respectively.

Le, Kaiser, and Tomek (1998) analyzed the effectiveness of U.S. promotion expenditures for red meat in selected Pacific Rim countries. Using a single-equation model, double log functional form, and time-series data pooled from four countries; per capita imports of red meats was regressed against relative price of red meat imported from the U.S., relative price of U.S. red meat substitute (poultry), real GDP of the importing country, the exchange rate index, domestic production of red meats, U.S. export promotion expenditure (PRO), PRO lagged by one year, and dummy variables for various regions. Pooling was required due to the limited number of time series observations per country. Only promotion expenditures by FAS for the FMD and TEA programs for promoting U.S. red meat exports to Hong Kong, South Korea, Singapore and Taiwan were used. Results from this study showed that current promotion expenditures had positive effects on Taiwan and South Korea markets, but was only significant in South Korea. Lagged promotion expenditure was also shown to have a positive effect in all export markets, except in Hong Kong. The econometric estimates obtained were used as a basis for a simulation of scenarios involving the re-allocation of promotion expenditures among countries. Simulation results suggest that the total value of U.S. red meat exports would have increased by 102% in all the four countries from 1985 to 1994 if promotion expenditure in Hong Kong, Singapore and Taiwan were reduced by 90% and reallocated to the South Korean market.

Kaiser, Liu, and Consignado (2003) measured the economic impacts of California raisin export promotion program in Japan and the United Kingdom (U.K). A single-equation, double log import demand, using time series data for Japan and U.K. from 1965 to 1998 was used. Single equation was used because of the difficulty of obtaining all the relevant data on related commodities which were required if a demand systems approach are used. Variables included in the model were real price of California raisins, real price of competing suppliers' (Australia and South Africa in Japan and Greece and Turkey in the U.K.) raisins, retail price index of bakery products in the importing country as substitutes or complements), real per capita GDP of the importing country and real California raisin industry's export promotion expenditure. Promotion expenditure was based on expenditure on export programs operated by the Raisin Administrative Committee in Japan and the U.K. The authors concluded that export promotion programs increased demand for raisins in Japan and the U.K. with the export promotion elasticity of 0.029 in Japan and 0.133 in the U.K. Prices of California raisins and competitors' prices were consistent with prior expectations and were found to be important in determining per capita import demand of Japan and the U.K.

An evaluation of the effectiveness of U.S. non- price promotion programs for almonds in Japan, South Korea, Taiwan, Hong Kong and Singapore was conducted by Halliburton and Henneberry (1995). In the model in this study, total quantity of almond imports from the U.S. was specified to be a function of unit import price of almonds, price of almond substitutes and complements, total GDP of importing countries, U.S. export promotion expenditures for almonds (PRO), one year lag of PRO, country dummies, and the time trend. The study applied Time Series Cross Sectional data to three different specifications (Cobb-Douglass, linear and log-linear). For the promotion variable, U.S. government expenditures for the TEA and MPP programs were used. While current promotion expenditures were not found to have significant effects in South Korea and Singapore, promotion was found effective in Taiwan, using a linear as well as an exponential functional form. The coefficient of one- year lagged promotion expenditures was not significant in Singapore and South Korea, but it was found significant in the other three countries. Using the linear model, returns to promotion expenditures ranged from \$4 to \$9 for every dollar of TEA and MPP spent in Japan, Taiwan and Hong Kong.

Henneberry and Lu (2000) evaluated the effectiveness of U.S. non price promotional programs for wheat in Japan, Korea, Algeria, Egypt and Morocco; using the linear approximation of an almost ideal demand system (LA/AIDS). Three separate models were considered. Model I included prices of U.S. wheat, price of U.S. competitor's wheat, total expenditure on wheat and U.S. export promotion expenditures. Model II included all the variables in model I and price of imported wheat substitute, not differentiated by source. Model III included all the variables in model II in addition to quantities of productions of all domestic cereals. U.S. export promotion expenditures were based on data obtained from FAS and the U.S. Wheat Associates. They reported that the impact of U.S. export promotion expenditure was small in magnitude but positive and significant in Japan and Korea. Expenditure and own-price elasticities had signs that were consistent with economic theory and were more important than promotion expenditures. Wheat from other sources was also shown to compete with U.S. wheat. Return on investment was reported to be \$23.30 (Japan) and \$69.90 (Korea). Results of the three models were consistent, implying robustness of the estimators.

The effects of U.S. promotion programs and trade policies of importing countries on the import demand for U.S. fresh grapefruits (USFGF) in Japan, France, Canada, and the Netherlands were analyzed by Fuller, Bello, and Capps (1992). The study specified four-single equation import demand functions and estimated these by joint generalized least squares. Single equation was used based on the assumption that the fresh grapefruit price faced by U.S. importers is exogenous, as the domestic grapefruit market in the U.S. takes about 90% of the U.S. grapefruit production. The importing countries are therefore assumed to be price-takers. Per capita imports of USFGF was dependent on real per capita GDP of importing country, real price of USFGF substitute, promotion expenditure on USFGF, ad-valorem tariff rate in importing country, quota removal by Japan, quarterly dummy variables and time trend. The results of the study showed that promotion expenditure had a significant influence on USFGF exports. Removal of Japan's import quota on USFGF in June 1971 was also reported to have significantly increased per capita imports by 0.296 pounds per quarter.

Onunkwo and Epperson (2000[a]) examined the impacts of U.S. export promotion programs on the export demand for U.S. pecans in Asia and the EU. A single equation, log-linear model, with total volume of U.S. pecan exports specified to be a function of real price of U.S. pecans, real price of U.S. walnuts, real price of U.S. almonds, real GDP, real promotion expenditures on U.S. pecans, real promotion expenditures on U.S. walnuts, real promotion expenditures on U.S. almonds, and dummy variables for region was used. OLS white's heteroskedasticity-consistent matrix and Newey-West autocorrelation-consistent matrix, with order one were used in the estimation procedure. The authors reported returns per dollar of pecan promotion expenditure of $6.45 for Asia and $6.75 for the EU. A summary of some promotion studies showing the returns to promotion expenditures are shown in Table 15.

Dobson and Knapp (1994) analyzed the impacts of the Dairy Export Incentive Program (DEIP) from 1992 to mid-1994 and prospects for the DEIP under the GATT Agreement, using a mathematical programming method. DEIP was reported to have helped in maintaining or expanding markets for U.S. dairy products. Also Simulation results as reported by the authors indicated an increase of less than 0.2% in producer surplus, less subsidy costs for the U.S., compared to base situation. The results also indicated a strong market penetration by the EU in major Nonfat Dry Milk (NFDM) markets. They further reported that the amount of NFDM that can be exported with subsidy will decline by about 40% in 2000 under GATT, compared to average exports under DEIP in 1992-1993, while cheese exports will not be affected much.

Import Demand

Previous studies on import demand for various commodities have been estimated, without incorporating export promotion as a variable. Tanyeri-Abur and Rosson (1997) conducted a study on the Mexican import demand for dairy products from 1996 to 2000. A double log functional form was used with total quantity of dairy products imports as the dependent variable. Explanatory variables in the study were lagged quantity of dairy product’s imports, real exchange rate, real GDP in Mexico and dummy variable for time period. They reported a strong relationship between income and both fluid milk and cheese imports. Cheese and NFDM own-price elasticities were inelastic while income elasticities exhibited an elastic response. Real exchange rate and import of previous period for fluid milk and cheese were also reported to be significant.

Balagtas, Coulibaly, and Diarra (2006) estimated an import demand for dairy products in Cote d'Ivoire using an LA/AIDS model. Monthly data from 1996 to 2005 was used in specifying the Ivorian import demand for yogurt, milk powder, cream, butter, cheese, condensed milk, and fluid milk; incorporating monthly variables. While yogurt, fluid milk and cream demand are elastic, demand for milk powder is inelastic. Expenditure elasticity of all the dairy products are inelastic (reflecting these products as necessities in Cote d'Ivoire), with the exception of condensed milk.

Yang and Koo (1994) estimated import demand equations for meat in Japan, using the source differentiated AIDS model. Budget shares of source differentiated meat was the dependent variable and natural log of prices of meats, natural log of expenditures on meat as explanatory variables. It was concluded that the U.S. has the largest potential for beef exports to Japan while Thailand and China have strong market position for poultry. The U.S. was also reported to compete with Canada and Taiwan in the pork market and with Thailand in the poultry market.

Chang and Hsia (2000) investigated the beef import market shares of Australia, New Zealand, and the U.S. in Taiwan and implications for Australia using a volume share model. The choice of the model above the more flexible demand systems (AIDS and LA/AIDS) was based on more reasonable results in terms of goodness-of-fit, signs, magnitude of the estimated coefficients and its being a common measure of market share and competitive market position in marketing literature (Chang and Hsia, 2000). Volume share of supply source (Australia, New Zealand, and U.S.) was specified as depending on relative prices of frozen imported beef, monthly earnings normalized by the average unit import value of Australian frozen beef and monthly dummy variables as seasonality variable. The authors reported that relative beef prices and consumers incomes were important factors influencing suppliers' market shares. Australian beef was also considered to be an inferior good.

Domestic Dairy Advertisement/Promotion

Studies on the effects of domestic advertisement/promotion on the demand for dairy product include Kaiser and Reberte (1996), Kaiser and Chung (2000)**,** Hill et al. (1999), Ward and McDonald (1986), Kaiser (1998). Kaiser and Reberte (1996) examined the impact of generic fluid milk advertising on whole, low fat and skim milk demand, using a double log functional form. Per capita demand for whole, low fat and skim milk was dependent on per capita fluid milk advertising expenditures, retail prices of whole, low fat and skim milk; retail prices of milk substitute, per capita income, seasonal quarterly dummy and a health index. The health index was constructed based on the percentage of consumers expressing fat concern in a survey. Fluid milk advertising campaign in New York City was reported to have positive influence on whole, low fat and skim milk demand.

Kaiser and Chung (2000) analyzed the impact of generic milk advertising in New York State markets. Quantity of fluid milk in selected cities was regressed on retail milk price, substitute price, income, dietary fat concerns, generic milk advertising expenditures, competing beverage advertising expenditure and seasonality. The results of the study indicated that generic milk advertising had a positive and significant impact in all but one market. Advertising had the largest impact on per capita milk demand in Buffalo, followed closely by New York City.

Hill et al. (1999) analyzed the profitability of incremental generic promotion expenditure by Australian Dairy Farmers, using an equilibrium displacement model. Simulation results show that 1% increase in domestic dairy promotion expenditure would result in a 0.002% increase in price of raw milk and in quantity supplied a 0.004% increase in dairy revenue and in producer surplus but a 0.018% decrease in net profits. Similarly, the authors reported that a 1% increase in dairy promotion expenditure on the export market would result in only very small increases in price and quantity (hence, revenue) for raw milk and net profits to dairy farmers would be reduced.

CHAPTER III

MODEL SELECTION

This study estimates a source-differentiated demand for U.S. whey, cheese, and NFDM in selected countries, using different demand specifications. These specifications are based on the multistage budgeting approach (Barten, 1977) in a consumer demand system. This approach is based on the premise that a country's income at the first stage is allocated between imported and domestic goods while at the next stage, allocation of total expenditure on imports is made among all imported goods. Next, total expenditure for a particular imported product is allocated among the different sources of supplies. Underlying the Rotterdam model is viewing the demand theory as a budget sharing process for the consumer, and marginal shares are assumed to be constant. Developed by Theil (1965) and Barten (1964), it is formulated in terms of logarithmic differentials and it satisfies the adding-up, homogeneity, and Slutsky symmetry conditions**;** and global concavity is satisfied if the estimated model is concave.

The Almost Ideal Demand System (AIDS) developed by Deaton and Muellbauer (1980) has been one of the most widely used systems in demand analysis (Lariviere, Larue, and Chalfant, 2000; Boetel and Liu, 2003; Yang and Koo, 1994) due to its flexibility, theoretical plausibility, and ease of use. However, concavity is only satisfied locally, and not globally. Its derivation starts with the expenditure function, representing the Price Independent Generalized Logarithmic (PIGLOG) preference. Differentiating the expenditure function by Shephard's Lemma with respect to prices yields the budget share, which is a function of prices and utility (Yang and Koo, 1994) The functional forms of the two models' income and price terms, and the dependent variable differ (Lee, Brown, and Seales, 1994), although some studies have specified the differential version of the AIDS, and also used the Stone's price index in the Rotterdam model. The AIDS have been augmented using promotion and seasonality variables (Boetel and Liu, 2003; Laviere, Bruno, and Chalfant, 2000; Piggott et al., 1996; Richards, Ispelen, and Kagan, 1997). The Rotterdam model incorporating promotion and seasonality variables have also been reported in the literature (Seale, Sparks, and Buxton, 1992; Kinnucan et al., 1997).

The Central Bureau of Statistics (CBS) model was developed by Keller and van Driel (1985) of the Dutch Central Bureau of Statistics. It is based on Working's (1943) model and assumes the allocation of budget shares to each commodity group is a linear function of the log of income. The CBS has the income coefficients of AIDS, and the Rotterdam price coefficients. Just like with the AIDS and Rotterdam models, it has the adding-up, symmetry, and homogeneity conditions in terms of the coefficients only (Barten, 1993). It shares global concavity property with the Rotterdam model, but, unlike the Rotterdam model, it does not assume constant marginal shares. The National Bureau of Research (NBR) model is another hybrid model between the AIDS and Rotterdam models, and was developed by Neves (1987). It has the income coefficients of the Rotterdam model and the AIDS price coefficients. It can also satisfy the adding-up, symmetry, and homogeneity conditions (Barten, 1993). It assumes constant marginal shares and concavity is only satisfied locally, and not globally. The general model (Barten, 1993) is a differential version of the CBS, AIDS, NBR, and Rotterdam models in which these four models are nested into one. Studies using the CBS, NBR, and general models have been reported in the literature (Schmitz and Seales, 2002; Barten, 1993).

In this study, a nested test is first conducted to test among the AIDS, Rotterdam, CBS, and the NBR demand systems. This is used to determine which of the models is more appropriate or preferred for the U.S. cheese, whey, and NFDM import demand in select countries with export promotion expenditures as an important economic factor. In the absence of any of the four models being the preferred model, the general model is selected. Based on the separability tests results among the three dairy products in each of the selected countries (Mexico, Thailand, Japan, and South Korea), the models are specified for each commodity separately. Selected countries for the U.S. whey demand are: Mexico, South Korea, and Thailand; for U.S. cheese demand are: Mexico, South Korea, and Japan; and for U.S. NFDM demand are: Mexico, Thailand, and Japan.

Imported products are assumed to be separable from domestic products; and cheese, whey, and NFDM are also assumed to be separable from the rest of dairy products in this study. Source differentiated import demand for cheese in Mexico is specified in a system comprising the U.S., EU, Uruguay, New Zealand, and ROW. A source differentiated import demand system for cheese in South Korea is specified, and the system includes the U.S., EU, Australia, New Zealand, and ROW. The import demand specification for cheese in Japan is specified in a system consisting of the U.S., EU, Australia, New Zealand, and ROW. Source differentiated import demand for whey in Mexico is specified in a system which includes the U.S., EU, and ROW. A source differentiated import demand system for whey in South Korea is specified, and the system included the U.S., EU, and ROW. The import demand specification for whey in

Thailand is specified in a system that consists of the U.S., EU, Australia, and ROW. The import demand specification for NFDM in Japan is specified in a system comprised of the U.S., EU, Australia, New Zealand, Ukraine, and ROW. Source differentiated import demand for NFDM in Mexico is specified in a system which includes the U.S., EU, Canada, New Zealand, and ROW. A source differentiated import demand system for NFDM in Thailand is specified, and the system includes the U.S., EU, Australia, New Zealand, and ROW. U.S. total promotion expenditures on each of these commodities will be incorporated into each specification. Advertising is believed to have carryover effects, that is, it affects sales of commodities beyond the initial impacts (Liu and Forker, 1988). Low-cost, mature, frequently purchased products have been reported by Clarke (1976) of exhibiting advertising carry over effects of between three and nine months. Lagging promotion expenditure by one quarter is incorporated into the model with a view to capturing the carry-over effects that are associated with promotion efforts. Spillover effects of promotion are captured through the effect of U.S. promotion expenditures on the demand for the competitors' products in the system. U.S. promotion expenditures (current, and lag) are expected to have a positive effect on the demand for U.S. products, and a negative effect on the demand for the competitors' products.

Rotterdam Model

The Rotterdam model is specified as a single commodity, one country at a time. The model incorporating U.S. whey, cheese, or NFDM promotion expenditure and seasonality is specified as a source differentiated import demand for each of these products as follows:

(3.1) $$w_{ik}\, d\ln q_{ik} = \alpha_{ik} + \theta_{ik}\, d\ln Q_i + \sum_j \pi_{ikj}\, d\ln(p_{ij})$$

where subscripts *i* indicate goods (whey, cheese, or NFDM), and *k* and *j* indicate sources of supply; w_{ik} represents the import shares of product *i* from source *k*, q_{ik} represents the quantity of product *i* from source *k*; Q_i is an index of total volume of consumption of *i* from all sources; p_{ij} represents nominal price of product *i* from supply source *j* , where *j* includes *k*; $\alpha_{ik}, \theta_{ik}, \pi_{ikj}$ are parameters for the intercepts, income, and price of the source differentiated goods respectively.

The shift variables (promotion and seasonality) are incorporated into α_{ik} as

(3.2) $$\alpha_{ik} = \alpha_{ik0} + \tau_{ik1}\, d\ln A_{i1} + \tau_{ik2} \ln A_{i2} + \sum_d \varphi_{ikd}\, D_d$$

where A_{i1} represents current (quarter) U.S. total whey, cheese, or NFDM promotion expenditure (FAS and dairy industry) in the importing country; A_{i2} represents U.S. total whey, cheese, or NFDM promotion expenditure lagged one period (quarter), D_d represents seasonality due to the use of quarterly data, τ_{ik1} and τ_{ik2} represent current and lagged U.S. whey, cheese, or NFDM promotion expenditures coefficients respectively, while φ_{ikd} is the seasonality coefficient.

$d\ln q_{ik} = \log(q_{it}/q_{i,\,t-1})$; $d\ln p_{ij} = \log(p_{it}/p_{i,\,t-1})$;

$d\ln A_{it} = \log(A_{it}/A_{i,\,t-1})$; $d\ln A_{it-1} = \log(A_{it-1}/A_{i,\,t-2})$;

$d\ln Q = \sum_i w_{ik}\, d\ln q_{ik}$, the Divisia volume index. It can be interpreted as a third-order approximation to real expenditure on the commodity group.

(3.3) $w_{ik} = (w_{ik,\,t} + w_{ik,\,t-1})/2$; is the average expenditure share for i from source k.

Symmetry and homogeneity will be imposed (Kinnucan et al, 1997) as:

(3.4) $\pi_{ikj} = \pi_{ijk}$ (symmetry).

(3.5) $\sum_j \pi_{ikj} = 0$ (price homogeneity).

Adding-up property

(3.6) $\sum_i \alpha_{ik0} = 0,$ (intercept).

(3.7) $\sum_j \theta_{ik} = 1, \sum_i \pi_{ikj} = 0, \ \sum \tau_{ik1} = 0, \ \sum \tau_{ik2} = 0, \sum_d \varphi_{id} = 0,$

Elasticities are calculated as:

(3.8) $\eta_{ik} = \dfrac{\theta_{ik}}{w_{ik}}$ (expenditure elasticities).

(3.9) $\varsigma_{ik} = \dfrac{\pi_{ik}}{w_{ik}}$ (hicksian own price elasticities).

(3.10) $\varsigma_{ij} = \dfrac{\pi_{ij}}{w_{ik}}$ (hicksian cross price elasticities).

Marshallian price elasticities are calculated as:

(3.11) $\varepsilon_{ik,} = \dfrac{\pi_{ik}}{w_{ik}} - \theta_{ik}$ (own price elasticities).

(3.12) $\varepsilon_{ij} = (\pi_{ij} - \theta_{ik} w_{ij}) / w_{ik}$ (cross price elasticities).

Promotion elasticities are calculated as:

(3.13) $\rho_{iA} = \dfrac{\tau_{ik1}}{w_{ik}}$ (current promotion elasticities).

(3.14) $\rho_{iA1} = \dfrac{\tau_{ik2}}{w_{ik}}$ (lagged promotion elasticities).

(3.15) $\rho_{AT} = \dfrac{\tau_{ik1} + \tau_{ik2}}{w_{ik}}$ (total promotion elasticities)

All elasticities are calculated at the mean values. Although total promotion expenditures is not included in the model as a variable, total promotion elasticities are calculated according to the formula reported by Kinnucan et al. (1997)

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Almost Ideal Demand System (AIDS)

The AIDS model is specified as a single commodity, one country at a time, augmented with promotion and seasonality.

(3.16) $$w_{ik} = \alpha_{ik} + \sum_j \gamma_{ikj} \ln (p_{ij}) + \beta_{ik} \ln (E/P^*)$$

where subscripts i represent goods (whey, cheese, or NFDM), and k and j represent exporting countries, w_{ik} is the budget share of good i from source k; p_{ij} is the price of good i from source j (where j includes k); E is the group expenditure and P^* is the price index, α_{ik} is an intercept form, γ_{ikj} is the price coefficient of the source-differentiated good, and β_{ik} is the real expenditure coefficient..

P^* is defined as:

(3.17) $$\ln(P^*) = \alpha_o + \sum\sum \alpha_{ik} \ln(p_{ik}) + \frac{1}{2}\sum_i \sum_k \sum_j \gamma_{ikj} \ln(p_{ik})$$

In order to linearize equations (3.16) and (3.17), the Stone's price index is used as suggested by Deaton and Muellbauer (1980):

(3.18) $$\ln P^* = \sum_i \sum_k W_{ik} \ln(p_{ik})$$

The use of w_{ik} as an independent variable in the Stone's price and as a dependent variable in equation (3.18) may create a simultaneity bias. To avoid this, the Stone's price index is specified using a lagged w_{ik} as suggested by Eales and Unnevehr (1988) and the prices used in computing the price index scaled by their mean values (as suggested by

LaFrance, 1998). Bringing equation (3.16) into differential form and replacing the differential form of the stone price index, $d\, lnP^*$ by $\sum_i \sum_k W_{ik}\, d\ln(p_{ik})$, equation (3.16) can be expressed as:

$$(3.19) \qquad dw_{ik} = \alpha_{ik} + \sum_j \gamma_{ikj}\, d\ln(p_{ij}) + \beta_{ik}\, d\ln Q$$

where $dw_{ik} = w_{ik}\, d\ln p_{ik} + w_{ik}\, d\ln q_{ik} - w_{ik}\, d\ln E$

and $d\ ln\ E = d\ ln\ P + d\ ln\ Q$

Equation (3.19) can be written as expressed in Barten (1993):

$$(3.20) \qquad w_{ik}\, d\ln q_{ik} = \alpha_{ik} + (w_{ik} + \beta_{ik})\, d\ln Q + \sum (\gamma_{ikj} + w_{ik}\, \delta_{ikj} - w_{ik}\, w_{ij})\, d\ln p_{ij}$$

where $\delta_{ikj} = 1$ if k is equal to j; otherwise $\delta_{ikj} = 0$.

As expressed in Barten (1993):

$$(3.21) \qquad \beta_{ik} = \theta_{ik} - w_{ik} \text{ and } \gamma_{ikj} = \pi_{ikj} + w_{ik}\,\delta_{ikj} + w_{ik}\, w_{ij}$$

The incorporation of promotion variable, A_i, and seasonality due to the use of quarterly data as intercept shifters (Henneberry, Piewthongngan, and Qiang (1999) necessitate redefining the intercept term in equation (3.19) as:

$$(3.22) \qquad \alpha_{ik} = \alpha_{ik0} + \tau_{ik1}\, d\ln A_{i1} + \tau_{ik2}\, d\ln A_{i2} + \sum_d \varphi_{ikd}\, D_d$$

where A_{i1} is the current U.S. total whey, cheese, or NFDM promotion expenditure (FAS and dairy industry) in the importing country, A_{i2} represents U.S. total whey, cheese, or NFDM promotion expenditure lagged one period (quarter), D represents seasonality due to the use of quarterly data, τ_{ik1} and τ_{ik2} are the current and lagged U.S. total whey, cheese, or NFDM promotion expenditures promotion coefficients respectively, and φ_{ihd} is the seasonality coefficient.

The following properties are to be imposed:

(3.23) $$\gamma_{ikj} = \gamma_{ikj}$$ (symmetry)

(3.24) $$\sum_{j} \gamma_{ikj} = 0$$ (homogeneity)

Adding-up:

(3.25) $$\sum \alpha_{\mathrm{ik0}} = 0, \sum_{j} \gamma_{ikj} = 0, \sum_{i} \beta_{ik} = 0, \sum \varphi_{ikd} = 0, \sum \mu_{ik1} = 0, \sum \mu_{ik2} = 0,$$

Hicksian own and cross price elasticities are:

(3.26) $$\varsigma_{ik\,ik} = -1 + \frac{\gamma_{ikk}}{w_{ik}} + w_{ik}$$ (own-price elasticities)

(3.27) $$\varsigma_{ik\,ij} = \frac{\gamma_{ikj}}{w_{ik}} + w_{ij}$$ (cross-price elasticities)

The expenditure, promotion and Marshallian own and cross price elasticities are:

(3.28) $$\eta_{ik} = 1 + \frac{\beta_{ik}}{w_{ik}}$$ (expenditure elasticities)

(3.29) $$\varepsilon_{ik\,ik} = -1 + \frac{\gamma_{ikk}}{w_{ik}} - \beta_{ik}$$ (own-price elasticities)

(3.30) $$\varepsilon_{ik\,ij} = \frac{\gamma_{ikj}}{w_{ik}} - \beta_{ik}\left(\frac{W_{ij}}{W_{ik}}\right).$$ (cross-price elasticities between the same goods from different sources).

Promotion elasticities are calculated as:

(3.31) $$\rho_{iA} = \frac{\tau_{ik1}}{w_{ik}}$$ (current promotion elasticities)

(3.32) $$\rho_{iA\,1} = \frac{\tau_{ik2}}{w_{ik}}$$ (lagged promotion elasticities)

All elasticities are calculated at the mean values. Although total promotion expenditures is not included in the model as a variable, total promotion elasticities are calculated by summing equations (3.31 and 3.32), according to the formula reported by Kinnucan et al. (1997).

CBS Model

The import demand for U.S whey, cheese, or NFDM is specified using the CBS model (Keller and Van Driel, 1985), augmented with promotion and seasonality variables, and is specified as a single commodity, one country at a time as shown below:

(3.33) $$w_{ik}\,(d\ln q_{ik} - d\ln Q_i) = \alpha_{ik} + \beta_{ik}\, d\ln Q_i + \sum_j \pi_{ikj}\, d\ln(p_{ij})$$

where subscripts i indicate goods (whey, cheese, or NFDM), and k and j indicate sources of supply; w_{ik} represents the import shares of product i from source k, q_{ik} represents the quantity of product i from source k; Q_i is an index of total volume of consumption of i from all sources; p_{ij} represents nominal price of product i from supply source j , where j includes k; α_{ik}, θ_{ik}, $\pi_{ik\,j}$ are parameters for the intercepts, income, and price of the source differentiated goods respectively. The CBS model is a hybrid model between the AIDS and Rotterdam models, and it has the Rotterdam price coefficients, and the income coefficients of AIDS. In the Rotterdam model, the demand parameters, θ_{ik}, π_{ikj} are assumed to be constant, but there are no strong prior reasons that this should be so. Based on Working's Engel model, an alternative parameterization could be specified as:

(3.34) $$w_{ik} = \alpha_{ik} + \beta_{ik} \log E$$

Here $\sum_i \alpha_{ik} = 1$; $\sum_i \beta_{ik} = 0$; To derive the marginal share, multiply equation (3.34) by E and then differentiate with respect to E to obtain:

(3.35) $(\partial\, p_{ik}\, q_{ik}/\, \partial E) = \alpha_{ik} + \beta_{ik}\,(1+ \log E) = w_{ik} + \beta_{ik}$

From equation (3.35), *ik*th marginal share differs from the corresponding budget share by β_{ik}, as the budget share with respect to income and the associated marginal shares are not constant.

Equation (3.33) is obtained by substituting equation (3.35) for θ_{ik} in equation (3.1) where θ_{ik}, π_{ikj} are constant coefficients.

The shift variables (promotion and seasonality) are incorporated into α_{ik} as

(3.36) $$\alpha_{ik} = \alpha_{ik0} + \tau_{ik1}\, d\ln A_{i1} + \tau_{ik2} \ln A_{i2} + \sum_{d} \varphi_{ikd}\, D_d$$

where A_{i1} represents current U.S. total whey, cheese, or NFDM promotion expenditure (FAS and dairy industry) in the importing country; A_{i2} represents U.S. total whey, cheese, or NFDM promotion expenditure lagged one period (quarter), D_d represents seasonality due to the use of quarterly data, τ_{ik1} and τ_{ik2} represent current and lagged U.S. whey, cheese, and NFDM promotion expenditures coefficients respectively, while φ_{ikd} is the seasonality coefficient.

Theoretical restrictions are imposed as:

Adding-up:

(3.37) $$\sum_i \alpha_{ik0} = 0;\ \sum_j \beta_{ik} = 0, \sum_i \pi_{ikj} = 0,\ \sum \tau_{ik1} = 0,\ \sum \tau_{ik2} = 0, \sum_d \varphi_{id} = 0,$$

(3.38) $\pi_{ikj} = \pi_{ijk}$ (symmetry)

(3.39) $\sum_j \pi_{ikj} = 0$ (price homogeneity

The expenditure elasticity is calculated using the expression (Barten, 1993):

(3.40) $\eta_{ik} = 1+ \beta_{ik}\,/w_{ik}$ or $\eta_{ik} = \theta_{ik}\,/w_{ik}$

Hicksian price elasticities are calculated as:

(3.41) $$\varsigma_{ik} = \frac{\pi_{ik}}{w_{ik}}$$ (own price elasticities).

(3.42) $$\varsigma_{ij} = \frac{\pi_{ij}}{w_{ik}}$$ (cross price elasticities from different sources).

Marshallian price elasticities are calculated as:

(3.43) $$\varepsilon_{ik,} = \frac{\pi_{ik}}{w_{ik}} - (w_{ik} + \beta_{ik})$$ (own price elasticities).

(3.44) $$\varepsilon_{ij} = (\pi_{ij} - \beta_{ik} w_{ij}) / w_{ik} - w_{ij}$$ (cross price elasticities).

Promotion elasticities are calculated as:

(3.45) $$\rho_{iA} = \frac{\tau_{ik1}}{w_{ik}}$$ (current promotion elasticities).

(3.46) $$\rho_{iA1} = \frac{\tau_{ik2}}{w_{ik}}$$ (lagged promotion elasticities).

All elasticities are calculated at the mean values. Although total promotion expenditures is not included in the model as a variable, total promotion elasticities are calculated by summing equations (3.45 and 3.46), according the formula reported by Kinnucan et al. (1997).

NBR Model

The NBR model (Neves, 1987), augmented with promotion and seasonality variables, and is specified for each commodity, and one country at a time as shown below:

(3.47) $$d\, w_{ik+}\, w_{ik}\, d \ln \mathrm{Q} = \alpha_{ik} + \theta_{ik}\, d\, lnQ + \sum \gamma_{ikj}\, d \ln p_{ij}$$

According to Barten (1993), equation (3.47) can be re-written as:

(3.48) $$w_{ik}\, d \ln q_{ik} = \alpha_{ik} + \theta_{\mathrm{ik}}\, d \ln Q + \sum (\gamma_{ikj} + w_{ik}\, \delta_{ikj} - w_{ik}\, w_{ij})\, d \ln p_{ij}$$

where subscripts *i* represent goods (whey, cheese, or NFDM), and *k* and *j* represent exporting countries (*j* includes *k*), w_{ik} is the budget share of good *i* from source *k*; p_{ij} is the price of good *i* from source *j*.

Equation (3.47) is obtained by replacing the income coefficient β_{ik} in equation (3.19) by θ_{ik} - $w_{ik.}$ The NBR model has the price coefficients of AIDS and the Rotterdam income coefficients.

The shift variables (promotion and seasonality) are incorporated into α_{ih} as

(3.49) $$\alpha_{ik} = \alpha_{ik0} + \tau_{ik1}\, d \ln A_{i1} + \tau_{ik2}\, d \ln A_{i2} + \sum_{d} \varphi_{ikd}\, D_{d}$$

where A_{i1} represents current U.S. total whey, cheese, or NFDM promotion expenditure (FAS and dairy industry) in the importing country; A_{i2} represents U.S. total whey, cheese, or NFDM promotion expenditure lagged one period (quarter), D_d represents seasonality due to the use of quarterly data, τ_{ik1} and τ_{ik2} represent current and lagged U.S. whey, cheese, and NFDM promotion expenditures coefficients respectively, while φ_{ikd} is the seasonality coefficient.

Theoretical restrictions are imposed as:

(3.50) $$\sum_{i} \alpha_{ik0} = 0;\ \sum \theta_{ik} = 1, \sum_{i} \gamma_{ikj} = 0,\ \sum \tau_{ik1} = 0,\ \sum \tau_{ik2} = 0, \sum_{d} \varphi_{ikd} = 0,$$ (adding-up)

(3.51) $$\gamma_{ikj} = \gamma_{ikj}$$ (symmetry)

(3.52) $$\sum \gamma_{ikj} = 0$$ (price homogeneity

The expenditure elasticity is calculated using the expression (Barten, 1993):

(3.53) $$\eta_{ik} = \theta_{ik} / w_{ik}$$

Hicksian price elasticities are calculated as:

(3.54) $$\varsigma_{ik} = -1 + \frac{\gamma_{ikk}}{w_{ik}} + w_{ik}$$ (own price elasticities).

(3.55) $$\varsigma_{ij} = \frac{\gamma_{ikj}}{w_{ik}} + w_{ij}$$ (cross price elasticities from different sources).

Marshallian price elasticities are calculated as:

(3.56) $$\varepsilon_{ik,} = -1 + \frac{\gamma_{ikk}}{w_{ik}} - \theta_{ik}$$ (own price elasticities).

(3.57) $$\varepsilon_{ij,} = \frac{\gamma_{ikj} - \theta_{ik} w_{ij}}{w_{ik}} + w_{ij}$$ (cross price elasticities).

Promotion elasticities are calculated as:

(3.58) $$\rho_{iA} = \frac{\tau_{ik1}}{w_{ik}}$$ (current promotion elasticities).

(3.59) $$\rho_{iA1} = \frac{\tau_{ik2}}{w_{ik}}$$ (lagged promotion elasticities).

All elasticities are calculated at the mean values. Although total promotion expenditures is not included in the model as a variable, total promotion elasticities are calculated by summing equations (3.58 and 3.59), according to the formula reported by Kinnucan et al. (1997).

General Model

The general model (Schmitz and Seales, 2002) incorporating U.S. cheese promotion expenditure and seasonality is specified as an import demand as follows:

$$(3.60) \quad w_{ik}\, d\ln q_{ik} = \alpha_{ik} + (\kappa_{ik} + \sigma_1 w_{ik})\, d\ln Q_i + \sum_j [\mathrm{X}_{ikj} + \sigma_2 w_{ik}(\delta_{ikj} - w_{ij})]\, d\ln(p_{ij})$$

where subscripts *i* indicate goods (whey, cheese, or NFDM), and *k* and *j* indicate sources of supply; w_{ik} represents the import shares of product *i* from source *k*, q_{ik} represents the quantity of product *i* from source *k*; Q_i is an index of total volume of consumption of *i* from all sources; σ_1, and σ_2 are expenditure and price nesting parameters respectively, which are to be estimated; κ_{ik} and X_{ikj} represent the expenditure and price coefficients respectively.

(3.61) $\kappa_{ik} = \sigma_1 \beta_{ik} + (1 - \sigma_1)\, \theta_{ik}$; $\mathrm{Xik}_j = (1 + \sigma_{2)}\, \pi_{ik\, ij} - \sigma_2 \gamma_{ik\, ij}$

Re-writing equation (3.60) results in:

$$(3.62)\; w_{ik}\, d\ln q_{ik} = \alpha_{ik} + \kappa_{ik}\, d\ln Q_i + \sigma_1 w_{ik}\, d\ln Q_i + \sum_j \mathrm{X}_{ikj}\, d\ln p_{ij} + \sigma_2 w_{ik}(d\ln p_{ik} - d\ln P)$$

[4]Equation (3.62) is AIDS model if $\sigma 1 = 1$ and $\sigma_2 = -1$;

[5]Equation (3.62) is CBS model if $\sigma 1 = 1$ and $\sigma_2 = 0$;

[6]Equation (3.62) is NBR model if $\sigma_1 = 0$ and $\sigma_2 = -1$;

[7]Equation (3.62) is Rotterdam model if $\sigma_1 = 0$ and $\sigma_2 = 0$;

The shift variables (promotion and seasonality) are incorporated into α_{ik} as

$$(3.63) \quad \alpha_{ik} = \alpha_{ik0} + \tau_{ik1}\, d\ln A_{i1} + \tau_{ik2}\, d\ln A_{i2} + \sum_d \varphi_{ikd}\, D_d$$

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[4] $w_{ik}(dlnq_{ik} + dlnp_{ik} - dlnE) = \alpha_{ik} + \sum \kappa_{ik}\, dlnQ_i + \sum X_{ikj}\, dlnp_{ij}$ where $dw_{ik} = dlnq_{ik} + dlnp_{ik} - dlnE$, and $dlnE = dlnP + dlnQ$

[5] $w_{ik}(dlnq_{ik} + dlnQ_i) = \alpha_{ik} + \sum \kappa_{ik}\, dlnQ_i + \sum X_{ikj}\, dlnp_{ij}$

[6] $w_{ik}(dlnq_{ik} + dlnp_{ik} - dlnP) = \alpha_{ik} + \sum \kappa_{ik}\, dlnQ_i + \sum X_{ikj}\, dlnp_{ij}$ where dw_{ik} and dlnE are as in 4 above.

[7] $w_{ik}\, dlnq_{ik} = \alpha_{ik} + \sum \kappa_{ik}\, dlnQ_i + \sum X_{ikj}\, dlnp_{ij}$

where A_{i1} represents current U.S. total whey, cheese, or NFDM promotion expenditure (FAS and dairy industry) in the importing country; A_{i2} represents U.S. total whey, cheese, or NFDM promotion expenditure lagged one period (quarter), D_d represents seasonality due to the use of quarterly data, τ_{ik1} and τ_{ik2} represent current and lagged U.S. whey, cheese, and NFDM promotion expenditures coefficients respectively, while φ_{ikd} is the seasonality coefficient.

Theoretical restrictions are imposed as:

Adding-up:

(3.64)

$$\sum_i \alpha_{ik0} = 0;\ \sum_j k_{ik} = 1 - \sigma_1, \sum_i \mathrm{X}_{ikj} = 0,\ \sum \tau_{ik1} = 0,\ \sum \tau_{ik2} = 0, \sum_d \varphi_{ikd} = 0,$$

(3.65) $\mathrm{X}_{ikj} = \mathrm{X}_{ijk}$ (symmetry)

(3.66) $\sum_j \mathrm{X}_{ikj} = 0$ (price homogeneity)

The expenditure elasticity is calculated using the expression (Barten, 1993):

(3.67) $\eta_{ik} = \mathrm{kik} / w_{ik} + \sigma_1$ or $\eta_{ik} = \theta_{ik} / w_{ik}$

Hicksian price elasticities are calculated as:

(3.68) $\varsigma_{ik} = \dfrac{\mathrm{X}_{ik}}{w_{ik}} + \sigma_2 (1 - w_{ik})$ (own price elasticities).

(3.69) $\varsigma_{ij} = \dfrac{\mathrm{X}_{ij}}{w_{ik}} - \sigma_2\, w_{ij}$ (cross price elasticities).

Marshallian price elasticities are calculated as:

(3.70) $\varepsilon_{ik} = \dfrac{\mathrm{X}_{ik}}{w_{ik}} - k_{ik} + \sigma_2 - w_{ik} (\sigma_1 + \sigma_2)$ (own price elasticities).

(3.71) $$E_{ij} = \frac{(\mathrm{X}_{ij} - w_{ij}\, k_{ik})}{w_{ik}} - w_{ij}\,(\sigma_1 + \sigma_2)$$ (cross price elasticities).

Promotion elasticities are calculated as:

(3.72) $$\rho_{iA} = \frac{\tau_{ik1}}{w_{ik}}$$ (current promotion elasticities).

(3.73) $$\rho_{iA1} = \frac{\tau_{ik2}}{w_{ik}}$$ (lagged promotion elasticities)

All elasticities are calculated at the mean values. Although total promotion expenditures is not included in the model as a variable, total promotion elasticities are calculated by summing equations (3.72 and 3.73), according to the formula reported by Kinnucan et al. (1997).

Data

For the trade values, quarterly data from quarter 1 of 1998 to quarter 4 of 2005 (32 observations) collected from the USDA-FAS are used in these studies. The Harmonized System (HS) codes for the dairy products used in this study are HS 0406 for cheese (consists of cheese and curd), HS 040410 for whey (consists of all whey products), and HS 040210 for NFDM (consists of milk powder less than 1.5 percent fat). Raw data on various dairy products promotion expenditures were collected from the USDA-FAS on an annual basis. Although data provided was from 1995 to 2005, promotion expenditures by dairy products and by country started in 1998 under MAP and in 2000 under FMDP. Based on this, the period of study is from 1998 to 2005. However, for MAP, FY 2005 was excluded from this study because it was still an open year and expenditure was still inconclusive when data was provided by USDA-FAS. Due to few observations of annual promotion expenditures the "EXPAND"[8] procedure, with a "JOIN" option in SAS was used to expand promotion expenditures from annual to quarterly basis, thereby resulting in 32 observations. The same procedure was applied to the USDEC dairy promotion expenditures. Total dairy promotion expenditures for selected dairy products (NFDM, cheese, and whey) used in this study consists of the FAS (MAP and FMDP) and the USDEC expenditure. The USDEC promotion expenditure for Thailand was not available, and the expenditure for South East Asia is used as the industry's export promotion expenditures in Thailand.

Dairy products used in this study were selected based on the amount of expenditures devoted to market development. Hence, the top three largest recipients of FAS promotion expenditures, cheese, whey and NFDM were selected. For the years/period without promotion expenditures a small value was incorporated (0.0001) to take care of the logarithm component of the model used. The U.S. is included in all of the estimations as a supplier because the focus of this study has to do with the impact of U.S. promotion expenditure. However, for other suppliers of the commodities investigated, the criterion for selection is based on a country supplying 10 percent of total imports.

Trade values and dairy expenditures' data provided are in dollar terms. These are however converted to importing countries local currencies using the exchange rate: the

[8] The EXPAND procedure converts time series from one sampling interval or frequency to another. PROC EXPAND can collapse time series data from higher frequency intervals to lower frequency intervals, or expand data from lower frequency intervals to higher frequency intervals. By default, the EXPAND procedure fits cubic spline curves to the nonmissing values of variables to form continuous-time approximations of the input series. Output series are then generated from the spline approximations. Several alternate conversion methods are available. The JOIN method fits a continuous curve to the data by connecting successive straight line segments, and this produces a linear spline (SAS, 2003).

Japanese Yen, Mexican Pesos, Thai Baht, and the South Korean Won. Unit values of imported products are used for these studies by diving total import value by total import quantity. There were no trade data in some quarters, thereby resulting in missing price data. However, in some instances, data were available for import values while zero was recorded for import quantities; this probably is due to small import quantities. Several methods have been used in the literature to account for missing price data that results from zero expenditure on a good. Meyerhoeffer, Ranney, and Sahn (2005) used the monthly National Tobacco CPI as a proxy for tobacco price when there were no purchases. According to Heien and Pompelli (1988), expenditure is zero and the budget share undefined if households do not consume. In their study on the demand for beef products, they assume that zero quantity consumed is consistent with a continuous demand curve (Wales and Woodland, 1983). While agreeing that dichotomous logit models are usually used to treat the decisions to consume or not, they assumed a multivariate normal assumption, and used the AIDS model because more than 80 percent of the shares are non zero. Weliwita, Nyange, and Tsujii (2003) replaced zero units in their study by the cluster averages of non zero unit values.

In this study, for the Mexican data set, out of 96 observations there is only one zero consumption; of the 160 observations in the NFDM dataset, there is only one zero consumption (in terms of quantity, but there are data on expenditure). Thailand has four zero consumptions out of 160 observations in the NFDM dataset. Japan has the most zero observations, as there are 11 out of the 192 observations in the NFDM dataset. Of these 11 zero observations, four have expenditure data while quantity is recorded as zero. Heien and Pompelli (1988) estimated missing price data by regressing non-missing observations on income and region. In this study, an average of non zero unit prices for the quarters in the year is used as a proxy for missing unit prices Data used for exchange rates are from various issues of the International Financial Statistics (IFS) of the IMF. Quarterly dummy variable for seasonality is included in the models used.

Test for symmetric weak separability and Model Selection

For each country, a test in conducted to determine if the dairy products being investigated can be estimated separately. Each product with its sources of supply represents a group. For Thailand, there are two groups (whey and NFDM), Mexico has three groups (cheese, whey, and NFDM), South Korea has two groups (cheese and whey), while Japan has two groups consisting of cheese and NFDM. As suggested by Moshini, Moro, and Green (1994), a symmetric weak separability test is conducted using the general model and imposing restrictions, as suggested by Eales and Wessels (1999):

$$(3.74) \qquad X_{ik,\,hj} = \frac{(\kappa_{ik} + w_{ik}\sigma_1)}{(\kappa_{iq} + w_{iq}\sigma_1)}(X_{iq\,hj} - w_{iq}w_{hj}\,\sigma_2) + w_{ik}w_{hj}\,\sigma_2, \ \textit{for ik, iq} \in A \text{ and } hj \in B$$

where A and B represents dairy products.

For Thailand, the model has total restrictions of 19; South Korea has 14; and Japan has 29. The restrictions for Rotterdam model was specified as $\sigma_1 = 0$ and $\sigma_2 = 0$, and this was used for separability test for Thailand, while the general model was used for Japan and South Korea. The Likelihood ratio test is used to conduct the test and the results are presented in Table 17. However the test for Mexico is inconclusive due to the problem of insufficient degrees of freedom. The results show that separability is not rejected and this is also assumed for the Mexican import demand system in this study.

Model selection test is done twice in this study. Firstly, it is carried out before conducting the separability test, to determine which model is appropriate for the separability test, and the result is presented in Table 16. With the exception of Thailand, the result shows that the general model is appropriate for conducting the weak separability test in South Korea and Japan, while the Rotterdam model is used for Thailand. Secondly, based on the results of the weak separability test, a model selection test is conducted to determine which model is appropriate for the import demand system in each of these countries, for each of the commodities. The results are presented in Table 18.

There are four (4) separate import demand systems for cheese, using the CBS model for Mexico, CBS and Rotterdam models for South Korea, the Rotterdam model for Japan). Four whey import demand systems are also estimated, using the CBS and Rotterdam models for Mexico, the CBS model for South Korea, and the Rotterdam model for Thailand. The Rotterdam model was used in estimating the three (3) separate import demand systems in Mexico, Thailand, and Japan. The one (1) percent significance level was used in selecting the appropriate model. However, where more than one model is appropriate for a particular commodity, two models are selected at the 10 percent significance level. The CBS model is used in estimating the Mexican whey import demand system because its p-value (0.093) is closer to the 10 percent significance level than to the five (5) percent significance level (Table 18). These specifications are for one each commodity, and one country at a time, and augmented with the dairy product U.S. total promotion expenditure.

Estimation Procedure and Misspecification Test

The iterative seemingly unrelated regression (ITSUR) method is used in estimating the models used, with symmetry and homogeneity imposed. One equation is omitted in the system during estimation due to the adding-up conditions which results in singularity of the contemporaneous covariance matrix. Parameter estimates for the dropped equation is estimated by dropping another equation and then the system is re-estimated.
The joint conditional mean test (no autocorrelation, appropriateness of functional form and the stability of the parameters), and the joint conditional variance test (static homoskedasticity, dynamic homoskedasticity, and stability of the variance), and test of normality of the error terms are conducted using the misspecification tests as suggested by McGuirk et al (1995). The results are presented in Tables 19, 20, and 21 and shows that the assumptions of normality of error terms cannot be rejected at the one (1) percent significance level for the NFDM and cheese import demand systems (Tables 20, and 21), and in all cases for the whey demand systems, except for whey imported into Thailand from ROW (Table 19). Assumption of normality was rejected at the one percent level for whey imported into Thailand from ROW (Table 20).

Misspecification results for whey import demand in Mexico, Thailand and South Korea are presented in Table 19. The overall joint test for the joint conditional mean in the whey demand systems in Mexico and Thailand shows that the null hypothesis of parameter stability, linear functional form and no autocorrelation are not rejected at the 10 percent significance level. However, the South Korean whey import demand is re-estimated by correcting for autocorrelation. The null hypotheses of the joint conditional variance in all the whey import demand systems are not rejected at the 10% significance level (Table 19). Results of the joint conditional means tests for cheese import demand in South Korea and Japan indicates that the null hypothesis for parameter stability, linear functional form, and no autocorrelation cannot be rejected at the 10 percent level, while it was rejected in the Mexican demand system. The cheese import demand system in Mexico is re-estimated by correcting for autocorrelation. The results of the, joint conditional variance for the cheese demand system suggest that the null hypothesis of variance stability, static and dynamic homoskedasticity cannot be rejected at the 10 percent significance level(Table 20). All the null hypotheses for the joint conditional mean and variance in the NFDM demand systems are rejected at the one percent significance level, except for the overall joint test of the joint conditional mean in the Mexican and Japanese NFDM demand systems (Table 21). Nonetheless, all the NFDM import demand systems are re-estimated by correcting for autocorrelation in demand systems in Japan and Thailand, and for static heteroskedasticity in Mexico, using the Heteroskedasticity Consistent Covariance Matrix Estimator (HCCME).

CHAPTER IV

RESULTS AND DISCUSSION

Discussions of results focus on elasticities and marginal returns to promotion expenditures.

Cheese

Mexico

Parameter Estimates

The parameter estimates of cheese import demand in Mexico are presented in Tables 22.

Expenditure, Promotion and Price Elasticities

Tables 26 and 27 represent the estimated elasticities for cheese import demand in Mexico. The Hicksian (compensated) price elasticities is an indication of percentage response in quantities demanded as a result of a one percent change in price, holding real expenditures on imported cheese constant. The Marshallian (uncompensated) price elasticities indicate the percentage response in quantities demanded as a result of a one percent change in price, holding nominal expenditures on imported cheese constant; thus, it measures both substitution and income effects. The Marshallian elasticities estimates are more negative than the corresponding Hicksians because they are affected by price and real income effects (Schmitz and Seale, Jr., 2002). In the Mexican cheese import demand system, all own-price elasticities (Marshallian and Hicksian) have negative signs and are consistent with economic theory. Marshallian elasticities and Hicksian elasticities own price elasticities are significant at the one percent level for cheese imported from the U.S. and ROW. Marshallian elasticities own price elasticities are significant at the 10 percent level for cheese imported from New Zealand, and at the five percent level for the Hicksian elasticities. All the Marshallian own-price elasticities are greater than one in absolute value, except for the EU own price (Tables 26). All but the U.S. and EU Hicksian own price elasticities are greater than one in absolute value (Tables 27), indicating an elastic own-price response. The Hicksian own-price elasticities indicate that a one percent increase in own-price of cheese would reduce import demand for U.S. cheese in Mexico by 0.85%, and those of New Zealand, and ROW by 2.37% and 1.43% respectively. The U.S. cheese exporters therefore stand to have increased total revenue with a small increased in cheese price, compared to New Zealand, and ROW.

Eleven out of the 20 Marshallian cross price elasticities have positive signs, indicating substitutability relationships among cheese from different sources while nine (9) are complementary to each other. Cross price elasticity of cheese from country *j* with respect to cheese from country *k* indicates a percentage response in the quantity demanded of cheese from country *j* in response to a one percent change in the price of cheese from country *k*. A positive cross price elasticity indicates a percentage increase in the quantity demanded of cheese from country *j* in response to a one percent increase in the price of cheese from country *k*; while a negative cross price elasticity indicates a percentage increase in the quantity demanded of cheese from country *j* in response to a one percent decrease in the price of cheese from country *k.* Cheese from the EU cheese is a significant substitute to ROW cheese at the 10 percent significance level while the New Zealand is a significant substitute in Mexico to those from Uruguay (Table 26). Fourteen of the 20 Hicksian cross price elasticities are substitutes to each other; with four (4) being significant (at one percent level) while six (6) are insignificant complements to each other. Significant substitutability relationships are shown between the EU cheese and ROW cheese; and also between cheese imported from Uruguay and New Zealand into Mexico (Table 27).

Expenditure elasticities are positive and significant at the one percent level for the U.S., EU and Australia; and at five percent level for ROW. Uruguay stands to benefit most from an increase in allocation of expenditure to cheese in Mexico. Although New Zealand has the highest elastic own price elasticity, its expenditure elasticity is not significantly different from zero. While Uruguay and the EU have the most elastic expenditure elasticities, their own price elasticities are not significantly different from zero. Although both the U.S and ROW expenditure elasticities are less than one in absolute value, ROW's expenditure elasticity is slightly higher than that of the US and its own-price elasticity more elastic than that of the U.S. (Table 27). The implication of this result is that if the expenditure on imported cheese in Mexico were to increase, more of the expenditures would be spent on cheese imported from Uruguay and the EU. However, if there is a decrease in the Mexican expenditure on imported cheese, a greater portion of their budget on imported cheese would be spent on the U.S. cheese.

The U.S. cheese promotion (current and lag) did not significantly increase import demand for cheese in Mexico (Table 27). In line with expectations, U.S. current export promotion expenditure on cheese increased demand for cheese imported from the U.S., but contrary to expectations, its effect was also positive on the demand for cheese from the EU in Mexico. It however has negative effects on cheese imported from Uruguay, New Zealand and ROW, as expected. Onunkwo and Epperson (2000[b]) reported similarly on the U.S. walnut export promotion in the European Union was not significantly different from zero. The U.S. export promotion expenditure on cheese in Mexico has an insignificant positive spillover effects on sales of other competing suppliers of cheese (EU for current promotion expenditures, and other suppliers when promotion is lagged). Spillover promotion effects occurred in this study as U.S. competitors' benefit from the promotion efforts on cheese by the U.S in Mexico. Richards, Van Ispelen, and Kagan (1997) also reported spillover promotion effects of U.S. apple export promotion to sales of U.S. competitors in Singapore and the United Kingdom. However, total cheese promotion has an insignificant positive effect on only the U.S. sales in Mexico and negative but insignificant effects on the cheese sales of U.S. competitors (Table 27).

Effects of Seasonality

The parameter estimates of seasonal indicator variable for the Mexican cheese import demand system are presented in Table 26. Seasonality has no significant effects on the import demand for cheese in Mexico.

South Korea

Results of both the CBS and Rotterdam are presented since the model selection test was unable to reject the two specifications.

Parameter Estimates

The parameter estimates of cheese import demand in South Korea are presented in Tables 23 and 24.

Expenditure, Promotion and Price Elasticities

Tables 28 to 31 represent the estimated elasticities for cheese import demand in South Korea, and shows negative and significant own-price elasticities for the U.S, EU and Australian cheese in South Korea. Own-price elasticities are consisted with economic theory. The CBS and Rotterdam models yield similar results with a few differences in significance levels. While the EU Marshallian own-price elasticities are significant at the five percent level for the CBS model, they are significant at the one percent level for the Rotterdam model (Tables 28 and 30). The Marshallian and Hicksian own-price elasticities of the EU, and Australia cheese are greater than one in absolute value, indicating an elastic own-price response; while those of the US (except for the Rotterdam Hicksian) are also close to one in absolute value. The Rotterdam Hicksian own-price elasticities indicate that a one percent increase in own-price of cheese would reduce import demand for U.S. cheese in South Korea by 0.86%, and those of the EU, and Australia by 1.77% and 1.32% respectively. The U.S. cheese exporters would therefore benefit from an increase in total revenue with a small increased in cheese price, compared to the EU, and ROW cheese exporters. Of the CBS 20 cross price elasticities, 14 are substitutes to each other, with one of the Marshallian elasticities being significant at the ten percent level and two of the Hicksian elasticities (EU and Australian cheese) significant at the five percent level. There are six insignificant complementary relationships among cheese from different sources (Tables 28 and 29). Fourteen of the

Rotterdam Marshallian cross price elasticities is positive with two (2) being significant (between EU and Australia). There are two (2) insignificant complementary relationships among the six (6) negative cross price elasticities (Table 30). The Rotterdam Hicksian cross price elasticities in the South Korean import demand system has 16 substitutability relationships (four are significant at five and ten percent levels) and four (4) insignificant complementary relationships (Table 31).

Expenditure elasticities are all positive; significant at the ten percent for the U.S.; at the one percent for the EU, Australia and New Zealand using CBS and Rotterdam model; and significant at ten percent level for ROW using the CBS model (Tables 29 and 31). While other supplying countries expenditure elasticities are greater than 1 in absolute value, those of the U.S. are less than one. A one percent increase in the expenditure on imported cheese in South Korea would result in a greater than one percent increase in the shares on U.S. competitors' cheese while the U.S. cheese exporters' shares of the increased imported expenditure would be less than one percent.

Contrary to expectations, U.S. cheese export promotion expenditure results in a negative effect on US export sales in South Korea and this effect is highly significant (at one percent) for lagged expenditure. However, total promotion expenditure effect on the U.S. cheese demand in South Korea is not significantly different from zero, although, effect is negative (Tables 29 and 31). This suggests that a one percent increase in U.S. cheese promotion expenditures results in a 0.14% and 0.16% decrease in the demand for U.S. cheese in South Korea, using the CBS and Rotterdam models respectively. In other words, a one percent decrease in U.S. cheese promotion expenditures results in a 0.14% and 0.16% increase in the demand for U.S. cheese in South Korea, using the CBS and

Rotterdam models respectively. Total U.S. cheese promotion expenditures in South Korea appear to have been on the decrease from 1998 to 2005 (Table 9) while cheese import demand has been on the increase (Table12). Onunkwo and Epperson (2000[b]) reported similarly on the U.S. walnut export promotion in the Asia with walnut exports trending up while walnut promotion expenditures trended down; and also for Almonds in Asia (Onunkwo and Epperson, 2001). The EU benefited from cheese promotion efforts in South Korea with a significant positive lag and total promotion elasticity at the ten and five percent levels respectively, using the CBS model and positive significant total promotion elasticity at the ten percent level using the Rotterdam model. The U.S. promotion expenditure on cheese in South Korea significantly reduced the import demand for ROW cheese at five percent for current promotion expenditure and at 10 percent for total promotion expenditure (Tables 29 and 31).

Effects of Seasonality

The parameter estimates of seasonal indicator variable in the South Korean cheese import market are presented in Table 28 and 30. Demand for cheese imported from Australia were significantly higher in the quarters II and IV, and lower in Quarter III; for New Zealand cheese in quarter IV, compared to the first quarter. However, with the CBS cheese model, seasonality effects on Australian cheese are not significant in the third quarter. In South Korea, drinking milk accounts for 75 percent of milk production while processing accounts for the remaining 25 percent (Austrade, 2007). Production of raw milk is high from winter to spring, while market demand is high in spring and autumn. Demand for cheese imports are expected to rise in spring and autumn, that is, second and fourth quarters; and to decline in the first quarter.

Japan

Parameter estimates

The parameter estimates of cheese import demand in Japan are presented in Tables 25.

Expenditure, Promotion and Price Elasticities

Estimated elasticities for the Japanese cheese Import demand using Rotterdam model are presented in Tables 32 and 33. All own price elasticities are consistent with economic theory and are significant at the one percent level for the U.S. and New Zealand own price; at the 10 percent level for Australia, and greater than one in absolute values. This is in contrast to results obtained by Christou et al. (2006); and Washington and Kilmer (2001) where the U.S cheese own-price in Japan exhibited an inelastic response However; the U.S. own-price elasticitity is less responsive than those of New Zealand, and Australia. A one percent increase in Hicksian own price would reduce result in a 1.67% decrease in import demand for U.S. cheese in Japan; and a decrease of 2.38%, and 2.03% in import demand for cheese from New Zealand, and Australia (Table 33). Out of the 20 cross price elasticities, eight (8) of the Marshallian elasticities are positive (with two being significant at five percent level and two (2) at 10 percent level) exhibiting substitutability relationships among cheese imported from different sources. There are 12 Marshallian negative insignificant cross price elasticities (Table 32). Ten of the Hicksian cross price elasticities are negative (6 are significant) while 10 are insignificant complements to each other. There is significant substitutability between the US and Australian cheese; Australian and ROW cheese at the 10 percent level; and between Australia and New Zealand cheese at the five percent level (Table 33). While a one percent increase in the price of U.S. cheese would result in a 0.3% increase in the import demand for cheese from Australia; a one percent increase in the price of cheese from Australia would lead to a 2.26% increase in the demand for cheese from the U.S. in Japan.

All expenditure elasticities are positive, significant for all other competing suppliers (at one percent level) but insignificant for the U.S., with Australia, having the most elastic own-price and expenditure elasticities (Table 33). Australia would therefore likely to benefit more in the event of an increase in Expenditures on imported cheese in Japan. Effect of U.S. export promotion expenditure is only significant for ROW at five percent level. Lagging promotion by one period will increase the demand for ROW cheese in Japan significantly. Although current and total promotion expenditure increases the import demand for U.S. cheese in Japan, effect is not significant (Table 33). The effect of U.S promotion expenditures on the import demand for U.S. cheese in Japan is not significantly different from zero. Ineffective allocation of funds to promotion activities by the U.S. in Japan or low levels of promotion expenditures may account for the .insignificant impact of U.S cheese promotion expenditures. Insignificant promotion effects of walnut in the EU have been reported by Onunkwo and Epperson (2000[b]), suggesting a no-responsiveness to promotion efforts in a mature market. Spillover effects of U.S. apple promotion effects on competitors' sale were reported by Richards, Van Ispelen, and Kagan (1997) in Singapore, and the United Kingdom.

Effects of Seasonality

The parameter estimates of seasonal indicator variable for the Japanese cheese import demand system are presented in Table 32. Demand for cheese imported from the EU are significantly higher in quarters II, III, and IV, compared to the first quarter, while seasonality effects in quarters II,and IV are negative on the demand for cheese from Australia.Japan utilities over 80 percent of its milk production as fluid milk while 20 percent is processed (Campo and Beghin, 2005). Japan has a school milk program but school children attends school for a major part of each quarter, with the longest school break between end of July and end of August. Import of cheese is assumed to increase in all quarters.

Whey

Mexico

The model selection test was unable to reject the CBS and Rotterdam models; therefore the results of both specifications are presented.

Parameter Estimates

Parameter estimates of the import demand for whey in Mexico are presented in Tables 34, and 35.

Expenditure, Promotion and Price Elasticities

Estimated elasticities for whey import demand in Mexico are shown in Table 38, 39, 40, and 41. Results obtained from the CBS and Rotterdam models are similar except for some differences in significance levels. The two models show that the Marshallian own price elasticities for the U.S. and ROW are negative (consistent with economic theory) and significant (at the one percent level) while they are positive but insignificant at the 10 percent level for the EU (Tables 38 and 40). Own price and expenditure elasticities for ROW are highly elastic while they are inelastic for the U.S. The Hicksian own-price elasticities indicate that a one percent increase in own-price of whey would reduce import demand for U.S. whey in Mexico by 0.14%; and those of ROW by 1.36% under the CBS specification (Table 39), and by1.45% under the Rotterdam specification (Table 41). The U.S. whey exporters would therefore benefit from increased total revenue with a small increase in whey price, compared to their ROW counterparts. The U.S. whey and whey from ROW are significant substitutes to each at one percent level (Tables 39 and 41). An attempt by the U.S. whey exporters to increase total whey import revenue by increasing own-price by one percent would increase the demand for ROW whey by about 1.8%. Whey imports from the EU and ROW have significant negative cross-price elasticities at the 10 percent level, using the CBS model (Table 39) while these are not significant under the Rotterdam specification (Table 41).

Expenditure elasticities are positive and significant at the one percent level in the U.S. and ROW equations but negative and insignificant (at 10 percent level) for the EU. While a one percent increase in whey imports expenditures in Mexico would result in about 0.88% increase in the demand for U.S. whey; demand for whey from ROW would increase by over 4%. ROW whey exporters are likely to benefit from an increase in Mexican income. Effects of U.S. whey promotion expenditures are not significant at the 10 percent level although they are positive (for the current period and total promotion) on the import demand for U.S. whey in Mexico (Tables 39 and 41). Import demand for whey in Mexico therefore seems unresponsive to the U.S. promotional efforts, probably due to the low levels of whey promotion expenditures. Onunkwo and Epperson (2000[b]) reported that the U.S. walnut export promotion in the European Union were not significantly different from zero.

Effects of Seasonality

The parameter estimates of seasonal indicator variable in the Mexican whey import market are presented in Table 38 and 40. While seasonality significantly increases the demand for whey from the EU and U.S., in quarters III and IV respectively,, the effects are significantly negative on those from ROW in quarters III and IV, compared to the first quarter. Milk production in Mexico peaks between June and September (Escoto, Cortes, and Macias, 2001), domestic production of NFDM, cheese and whey from raw milk are expected to be high in the third quarter compared to quarters I, II, and IV. Demand for imported whey is assumed to fall in the third quarter and to increase in quarters I, II, and IV.

South Korea

Parameter Estimates

Parameter estimates of South Korea import demand for whey are presented in Table 36.

Expenditure, Promotion and Price Elasticities

All the Marshallian and Hicksian own-price elasticities in the South Korean whey import demand system are greater than one in absolute value, negative and significant at the one percent level except for U.S. Hicksian own price elasticity which is significant at the five percent level (Tables 42 and 43). The own-price elasticities are in agreement with economic theory. The Hicksian elasticities indicate that a one percent increase in own-price would result in the South Korean whey consumers decreasing their demand for whey from the U.S., EU, and ROW by 1.20%, 1.08%, and 1.38% respectively (Table 43). Substitutability relationships exist among all the whey imported from different sources, but only one of the Marshallian cross price elasticity is significant (at the 10 percent level) while four (4) of the Hicksian cross price elasticities are significant substitutes at the five percent level.

Expenditure elasticities are positive at significant at one, five and 10 percent levels for the U.S, EU, and ROW respectively (Tables 43). The U.S. expenditure elasticity is greater than one in absolute value, while those of the EU and ROW are less than one. An increase of one percent in the expenditures on imported whey in South Korea would lead to an increase of 1.37%, 0.66%, and 0.86% in the demand for whey from the U.S., EU, and ROW. With an anticipated growing income in South Korea, a greater percentage of the increase in expenditure on whey will go to the demand for U.S. Whey. Although there is no significant effect of U.S whey export promotion on the demand for whey in South Korea, effect is positive on the demand for U.S. whey, and negative on the sales of EU and ROW whey (Table 43). South Korea as a market for U.S.

whey is tends to be unresponsive to U.S. whey promotion expenditures .This may be due to the low level of funds devoted to whey export promotion activities in South Korea.

Effects of Seasonality

The parameter estimates of the seasonal indicator variable for the South Korean whey import demand system are presented in Table 42. Demand for whey from The EU are significantly higher in quarters II, III, and IV; and lower for those from ROW in the quarter III, compared to quarter I. Demand for whey imports is expected to rise in spring and autumn, that is, second and fourth quarters; and to decline in the first quarter since market demand for milk is high in spring and autumn (second and fourth quarters) with less milk available for processing.

Thailand

Parameter Estimates

Parameter estimates of the import demand for Whey in Thailand are shown in Table 37.

Expenditure, Promotion and Price Elasticities

Own price elasticities in Thailand for the U.S., EU and ROW whey are negative and significant while it is positive, and insignificant for Australian whey (Tables 44 and 45). Marshallian own-price elasticities are significant at the 10 percent levels for US whey and at the one percent level for the EU and ROW whey (Table 44). However, the U.S. Hicksian own-price elasticity is not significant at the 10 percent level while those of the EU and ROW are significant at the five and one percent respectively (Table 45). A one percent increase in own-price would decrease the demand for whey from the EU and ROW significantly by 0.525, and 0.99% respectively; and from the U.S., and Australia insignificantly by 0.6% and 0.76% respectively (Table 45).None of the Marshallian cross price elasticities is significant at the 10 percent level, although there are four (4) substitutability and eight (8) complementarities among whey imported from different sources (Table 44). Six (6) out of the 12 Hicksian cross-price elasticities are substitutes to each other, with the US and EU whey being significant substitutes at the five percent level. There are also six insignificant complementarities among the Hicksian cross-price elasticities (Table 45).

All expenditure elasticities are positive; conforming to economic theory, with those of the U.S. and EU being significant at the one (1) percent level (Table 45) The U.S. expenditure shows an elastic response, an indication that the U.S. exporters of whey products stand to benefit most from an increase in expenditures on imported whey in Thailand. U.S. whey promotion effects are significantly positive on the demand for Australian whey, portraying a positive spillover effect of U.S. whey export promotion effects on the sales of Australian whey in Thailand. The demand for U.S. whey in Thailand shows no significant response to whey promotion efforts by the U.S. (Table 45).

Effects of Seasonality

Table 44 shows the parameter estimates of seasonal indicator variable for whey imports in Thailand. Import demand for U.S whey is significantly lower in quarter III, but higher in the same quarter for whey from the EU. In Thailand, the school milk program of the National Milk Drinking Campaign Board accounts for over 40 percent of local milk production and leads excess supply of milk during school breaks (Rabobank, 2004).Schools in Thailand are in session from May to October, and November to March. Availability of milk for purposes other than drinking is less in quarters I, III, and IV; and import demand for whey is assumed to increase at this time of the year, with a decline in the second quarter.

NFDM

Mexico

Parameter Estimates

The parameter estimates of the import demand for NFDM in Mexico are presented in Table 46.

Expenditure, Promotion and Price Elasticities

In the Mexican import demand system, all the Marshallian own-price elasticities are negative, but significant at the five percent level for the EU and at one percent for ROW (Table 49). The U.S Hicksian own-price elasticity is positive but insignificant at the 10 percent level, while all the other own price elasticities are negative, and significant for EU at five percent level and at one percent level for ROW (Table 50). The Hicksian price elasticities indicate that a one percent increase in own-price would result in a decrease of over 4% and 8% respectively in the demand for NFDM from the EU and ROW. There are 10 positive, and 10 negative Marshallian cross price elasticities, with only the New Zealand NFDM in the Canadian NFDM equation is significant at the 10 percent level (Table 49). Only two of the 20 Hicksian cross-price elasticities are significant with NFDM imported into Mexico from Canada and New Zealand being significant complements to each at the 10 percent level (Table 50).

Expenditure elasticities are all positive except for New Zealand equation. Both the U.S. and EU expenditure elasticities are not significant at the 10 percent level, and are less than one in absolute value while those of Canada and ROW are greater than one in absolute value and significant at the five and one percent levels respectively (Table 50). NFDM from ROW will significantly account for a larger percentage of any increase in the Mexican expenditure on imported NFDM. Although the U.S. expenditure elasticity is not significant, NFDM imports from the U.S. into Mexico would probably continue to account for a larger share of the Mexican NFDM expenditure because of the NAFTA agreement. The U.S budget share in the Mexican NFDM import market is about 50 percent. The U.S NFDM promotion and elasticities are small, and promotion expenditures have no significant effects on the demand for NFDM in Mexico (Table 50). Although promotion effects on the sales of U.S. NFDM are positive, these are not significantly different from zero. Le, Kaiser, and Tomek (1998) also reported positive, insignificant effects of promotion expenditures on the import demand for U.S. red meat in Taiwan. Halliburton and Henneberry (1995) similarly reported the ineffectiveness of promotion on the import demand for U.S. almonds in South Korea, and Singapore. They attributed promotion ineffectiveness to maturity of the markets for U.S. almonds, low levels of promotion expenditures, and ineffective allocation of funds to promotion activities. Only 2.1% of FAS promotion expenditures on dairy export market development was on NFDM (Table 7), and NFDM received the least funding among the three dairy products from the government and the dairy industry (Tables 9-11).

Effects of Seasonality

The parameter estimates of seasonal indicator variable for the Mexican NFDM import demand system are presented in Table 49. Demand for NFDM from the U.S. is significantly higher in quarters II, and III, compared to the first quarter. Demand for imported NFDM is assumed to fall in the third quarter and to rise in quarters I, II, and IV due to the fact that milk production in Mexico peaks between June and September (Escoto, Cortes, and Macias, 2001), and domestic production of NFDM from raw milk is expected to be high in the third quarter compared to quarters I, II, and IV.

Japan

Parameter Estimates

Parameter estimates of Japan import demand for NFDM are shown Table 47.

Expenditure, Promotion and Price Elasticities

Tables 51 and 52 shows the elasticities for NFDM import demand in Japan. All the Marshallian and Hicksian own price elasticities are negative except for those of the U.S. which are positive but insignificant at the 10 percent level. While the Marshallian own-price elasticities for the EU and New Zealand are significant at the five percent level, they are significant at the 10 percent level for the Hicksian own-price elasticities. The Hicksian price elasticities indicate an increase of 1.19% and 1.22% in the demand for NFDM from the EU, and New Zealand respectively, with a one percent increase in own-price (Table 52). There are 18 positive Marshallian and 18 positive Hicksian cross price elasticities, suggesting substitutability relationships among NFDM from different sources. However, while none of the Marshallian positive cross price elasticities is significant at the 10 percent level, four (4) of the Hicksian substitutability relationships are significant (Tables 51 and 52). The EU and U.S. NFDM; and EU and Ukraine NFDM are significant substitutes to each other at the 10% level (Table 52). Twelve of the cross-price elasticities have negative signs with four (4) of the Marshallian elasticities and two (2) of the Hicksian elasticities being significant (Tables 51 and 52). All expenditure elasticities are positive, significant at one percent level for the EU, Australia, and New Zealand, at 10 percent for Ukraine; and insignificant at 10 percent level for US and ROW. Australian NFDM exporters are likely to benefit most from an increase in NFDM import expenditures in Japan, as a one percent increase in expenditures on NFDM imports would result in over 3% increase in the demand for NFDM from Australia. The impact of U.S. NFDM promotion on import demand for NFDM in Japan is small but its current and total effect has negative and significant effects on the demand for the NFDM imported from the EU. Promotion did not have any other significant effects on the demand for NFDM in Japan (Table 52). Export Promotion efforts of the U.S. in the Japanese NFDM market is not significantly different from zero. This may be associated with low levels of promotion expenditures on this commodity in Japan (Table 11).

Effects of Seasonality

The parameter estimates of seasonal indicator variable for the Japanese NFDM import demand system are presented in Table 51. Seasonality effects show a significant increase in the demand for NFDM from the EU in quarters II, III, and IV; in quarters II, and IV for Australian NFDM; and in quarter III for NFDM from Ukraine. However, NFDM from ROW is significantly reduced in quarter III. Import of NFDM is assumed to increase in all quarters.

Thailand

Parameter Estimates

Parameter estimates for NFDM import demand in Thailand are presented in Table 48.

Expenditure, Promotion and Price Elasticities

Own-price elasticities are negative for the U.S, EU, and ROW but positive for Australia and New Zealand in the import demand system for NFDM in Thailand. ROW own-price elasticities are significant at the five percent level (Tables 53 and 54). The Hicksian price elasticities suggest an increase of over 7% in the demand for NFDM from ROW with a one percent increase in own-price. New Zealand Hicksian own-price elasticity is positive and significant at 10 percent level (Table 54). Nine (9) of the 20 Marshallian cross price elasticities are positive, with the US and ROW NFDM exhibiting a significant substitutability relationship between each other. There are 11 negative cross price elasticities with two being significant at the five and 10 percent levels (Table 53). Ten of the Hicksian cross price elasticities are substitutes while 10 suggests complementarities among NFDM from different sources. The U.S. NFDM and ROW NFDM are significant substitutes while U.S. NFDM and New Zealand NFDM are significant complements at the five percent level (Table 54). All the expenditure elasticities are positive, significant at the one percent level for US, EU, Australia and New Zealand and insignificant for ROW at 10 percent level. The U.S. NFDM exporters are in a position to benefit from an increase in import expenditures on NFDM, as a one percent increase in expenditures on NFDM would result in over 6% increase in the demand for U.S NFDM. While export promotion expenditures NFDM have no significant effect on the demand for U.S. NFDM, current promotion efforts has a significant and positive effect on the demand for NFDM from ROW in Thailand (Table 54). Promotion seems to have a positive spillover effect on the demand for NFDM from ROW in Thailand. Similar spillover effects of U.S. apple export promotion in Singapore and the United Kingdom has been reported by Richards, Van Ispelen, and Kagan (1997).

Effects of Seasonality

Table 53 shows the parameter estimates of seasonal indicator variable for NFDM imports into Thailand. The demand for NFDM from the U.S. are significantly lower in quarters II, and IV; but higher in quarters II, and III, for NFDM from the EU; and in quarter IV for NFDM from New Zealand; compared to quarter I. Import demand for NFDM is assumed to be higher in quarters I, III, and IV, with a decline in the second quarter. This could be attributed to excess availability of milk for purposes other than drinking in the second quarter when school children are on break, and the school milk program is not in use.

Marginal Returns to Promotion Expenditures (MRPE)

Marginal promotion impacts on import demand is calculated by multiplying appropriate promotion elasticity with the ratio of mean expenditure on appropriate commodity to the mean promotion expenditures (Richards, Van Ispelen, and Kagan, 1997).

Table 55 shows the marginal impacts of U.S. cheese promotion on import demand for Cheese in Mexico, South Korea and Japan. An additional dollar spent by the U.S. on cheese promotion in Mexico yields a return of $29.85 in the current period to U.S. dairy producers, while lagging promotion by one period yield negative return of $8.97. MRPE of total promotion expenditures is nonetheless positive for the US ($20.95). Since the effects of U.S. promotion expenditures on import demand are not significantly different from zero, and elasticities used in the calculations of the MRPE are not significant at that level, these returns are not significant (at 10 percent level). This may be an indication that cheese import demand in Mexico is not responsive to the U.S cheese promotion expenditures. Onunkwo and Epperson (2000[b]) reported similarly on the U.S. walnut export promotion in the European Union. The MRPE on cheese promotion in the South Korean market shows negative returns to the U.S. in the current, lagged periods and for total promotion efforts (Table 55). Lagging promotion by one period result in a negative and significant MRPE to the U.S. dairy producers in the magnitude of $9.45 for the CBS and $10.63 for Rotterdam, at the one percent level. That is, using the CBS model, the U.S. dairy producers' stands to lose $9.45 in the current period with an additional dollar spent on cheese promotion by the U.S. in South Korea. The demand for the U.S. cheese therefore tends to increase with a decrease in U.S cheese promotion expenditure. Total U.S. cheese promotion expenditures in South Korea appears to have been on the decrease from 1998 t0 2005 (Table 9) while cheese import demand has been on the increase (Table12). Onunkwo and Epperson (2000[b]) reported similarly on the U.S. walnut export promotion in the Asia with walnut exports trending up while walnut promotion expenditures trended down; and also for Almonds in Asia (Onunkwo and Epperson, 2001).The decreasing marginal returns to cheese promotion expenditures in South Korea calls for caution in the allocation of promotion expenditures in this market. The spillover effect of U.S. cheese promotion in the EU is positive and significant ($6 in the lagged period, and $17.34 from total promotion). While export promotion efforts by the U.S. seem to have resulted in an increase in the demand for cheese from the EU, promotion efforts by the EU in South Korea could also have contributed to this positive impact of promotion on the demand for cheese from the EU. There is a significant marginal return to decreasing promotion expenditures of between $74.68 and $83.03 to ROW cheese (Table 55).

In the Japanese cheese market, although MRPE to the U.S. dairy producers in the current and total periods are positive ($4.77-$4.98) these are not significantly different from zero since the promotion elasticities associated with the MRPE are not significant. However lagging promotion by one period result in a MRPE of $5.12 to ROW and this is significant at the five percent level because of the significance of its associated elasticity at this level (Table 55). Ineffective allocation of funds to promotion activities by the U.S. in Japan may account for the .insignificant MRPE to the U.S. cheese producers.

The marginal returns of U.S. whey promotion expenditure in Mexico, South Korea, and Thailand are presented in Table 56. In all the markets the MRPE are not significant (except for the whey market in Thailand with a MRPE of $11.07 to Australia in the current period), since their associated promotion elasticities are not significant at the 10 percent level. Although MRPE to the U.S. dairy producers are positive, these markets seem to be non responsive to the U.S. whey promotional efforts. This could be due to to low levels of promotion expenditures devoted to whey products, compared to cheese. Promotion expenditures on whey from 1998 to 2005 is low, when compared to cheese (Table7, 9, and 10).

Results presented in Table 57 are the marginal returns to U.S. NFDM promotion expenditures in Mexico, Thailand and Japan. MRPE to producers of NFDM from ROW in Thailand is positive ($20.49) and significant at the 10 percent level while those imported from the EU into Japan are negative ($63.77 to $83.86) and significant at the one percent level. In all other cases, MRPE are not significantly different from zero. Non significant MRPE to the U.S. producers of NFDM could be due to the low levels of promotion expenditures devoted to NFDM, compared to cheese. High values are associated with the MRPE in Mexico (Table 57) and this could be associated with the low levels of promotion expenditures relative to the size of the market.

Summary and Conclusions

The impacts of U.S. export promotion on the import demand for cheese, whey, and NFDM in select countries is estimated, using the source differentiated import demand systems. The effects of other variables such as prices, expenditures, and seasonality are also investigated. Four demand systems: Rotterdam, AIDS, CBS, and NBR are used in this study. A model selection test as suggested by Barten (1993) which nests the four demand systems into a general model are used in selecting the model which best explain consumer behavior. Estimations are made for each commodity for each country at a time in a source differentiated demand system. Based on the results of the model selection test, the Rotterdam model is used to estimate the import demand for cheese and NFDM in Japan; whey and NFDM in Thailand; cheese in South Korea; and whey in Mexico. The CBS is used in estimating the import demand for cheese and whey in South Korea; and cheese and whey in Mexico.

In the Mexican cheese import market, all expenditure elasticities are significant and positive with the exception of New Zealand with positive but insignificant expenditure elasticity. While Uruguay and the EU expenditure elasticities are greater than one (2.807 and 1.191 respectively), their own-price elasticities are not significantly different from zero. The U.S. and ROW expenditure elasticities are inelastic, suggesting that cheese from these sources are necessities in Mexico. The impacts of U.S. cheese promotion expenditures on demand are not significant, although they are positive in the current period and in total for the U.S cheese. Cheese from Uruguay and New Zealand are significant substitutes to each other, as well as those of ROW and the EU. Mexico appears to be a mature market for U.S. cheese exports.

The South Korean cheese import demand using the CBS and Rotterdam models yield similar results. Expenditure elasticities are positive and mostly significant. With the exception of the U.S. cheese, all expenditure elasticities are elastic, suggesting cheese from these sources are luxury goods in South Korea. The EU, Australia, and New Zealand all have own-price elasticities greater than one in absolute value. However, for the U.S., own-price and expenditure elasticities are inelastic and significant. There are no significant Marshallian substitutes for the U.S. cheese in South Korea, and the U.S. might be able to use price as an advantage in competing with other suppliers of cheese in South Korea. U.S. cheese export promotion in the U.S. equation is negative, with its carry-over effect being significant. However, total promotion elasticity is not significantly different from zero. Spill-over effect of the U.S. export promotion in South Korea is negative and significant on the demand for ROW cheese, and positively significant on the EU cheese.

In the Japanese demand systems, all expenditure elasticities are positive, significant for all sources of imports with the exception of the U.S. cheese. Own-price elasticities are elastic and significant for cheese from the U.S, Australia, and New Zealand. U.S. Cheese promotion effect is only significant for ROW cheese and effect is positive. Although current and total promotion effects on the demand for U.S. cheese are not significant, these effects are positive. Australian cheese is significant substitutes to those of New Zealand, ROW, and U.S.

Expenditure and own-price elasticities for the U.S. and ROW whey in Mexico are significant and consistent with economic theory. Both are inelastic for the U.S. whey and elastic for ROW whey. Promotion effects are not significant but positive for the U.S. (current and total promotion effects). Positive but insignificant promotion spill-over effects are also noted. Although the U.S. and ROW whey are significant substitutes to each other, the U.S. seems to have a competitive advantage[9] in the Mexican whey market, by using price as a weapon to increase total export revenue.

In the South Korean whey import market, all expenditure elasticities are significant although the U.S. has the most elastic expenditure elasticity, and would likely benefit most from an increase in expenditures on imported whey in South Korea; while those of the EU and ROW are inelastic. All own-price elasticities are significant and

[9] Competitive advantage is defined, based on five fundamental competitive forces which are: entry of competitors, threat of substitutes, bargaining power of buyers, bargaining power of suppliers, and rivalry among existing players in terms of dominance (Porter, 1985). Inelastic own-price elasticity can be used by exporters to increase total revenue through price increase.

elastic. Promotion effects of the U.S. are insignificant but positive only for the U.S. whey, while the spill-over effects are insignificant and negative on the EU and ROW whey. Significant substitutability relationships exist between whey from the U.S. and those of the EU and ROW.

Marshallian own-price and expenditure elasticities of whey imported from the U.S. and EU into Thailand are significant and conform to economic theories, with the EU own-price elasticity having a significantly inelastic response, and the U.S. expenditure showing a significantly elastic response. U.S. has the most elastic expenditure elasticity, and stands to benefit most from an increase in expenditures on imported whey in Thailand. ROW own-price elasticity is also negative and significant. U.S. whey promotion effects are significantly positive on the demand for Australian whey, and insignificant for whey demand from other sources.

In the Mexican NFDM import demand market, own-price elasticities are only significant for the EU and ROW while expenditure elasticities are significant for NFDM from Canada and ROW. None of these elasticities are significant for NFDM from the U.S., although the U.S. budget share in Mexico is about 50 percent. Effects of U.S. promotion expenditures are small and insignificant. Many studies have reported that promotion effects on demand is small and statistically insignificant in most cases (Brester and Schroder (1995); Piggot et al. (1996); Kinnucan et al. (1997); Coulibaly and Brorsen (1999), thereby concluding that promotion is ineffective. Brester and Schroeder (1995) noted quick dissipitation effects of advertising on quarterly consumption of meat and suggests a continual (quarterly) expenditures for an effective meat advertisement. They reported own-price advertising elasticities of between 7 and 90 times smaller than own-price elasticities. Kinnucan et al. (1997) also reported the tendency of meat advertising elasticities to be small compared to price and expenditure elasticities.

All the Marshallian and Hicksian own price elasticities in the Japanese NFDM import demand system are negative except for those of the U.S. which are positive but insignificant at the 10 percent level. All expenditure elasticities are positive, significant at one percent level for the EU, Australia, and New Zealand, at 10 percent for Ukraine; and insignificant at 10 percent level for US and ROW. The effects of U.S. NFDM promotion in Japan are significantly negative on NFDM from the EU, and significantly positive on ROW NFDM in Thailand. There are no other significant effects promotions on NFDM from other sources in the countries. Expenditure elasticities in both countries are positive, but significant for NFDM from the EU, Australia, New Zealand, and Ukraine in the Japanese market; and for all sources but ROW in Thailand. In Thailand, U.S. NFDM exporters would benefit most from a rise in expenditures on NFDM imports. Own-price elasticities are only significant for ROW NFDM in Thailand and for the EU and New Zealand in Japan.

Seasonality tends to play a role in the demand for cheese in Japan for cheese imported from Australia and the EU; and in South Korea for cheese imported from Australia and New Zealand. For whey, seasonality seems to play an important role in the demand for U.S. whey in Mexico and Thailand; whey from the EU in Mexico, South Korea, and Thailand; and for ROW whey in Mexico and South Korea. In the case of NFDM, seasonality appears to affect demand in Japan for NFDM from the EU, Australia, Ukraine, and ROW; while it only affects demand for U.S. NFDM in Mexico. In Thailand demand for NFDM from the U.S., EU, and New Zealand is significantly influenced by seasonality.

Marginal returns to promotion expenditures (MRPE) is negative for the U.S. cheese in South Korea. This marginal returns to decreasing promotion expenditures ranges between $1 and $11.53. The EU has a positive MRPE of about $17 in the South Korean cheese market while returns to ROW cheese are negative ($75 – $83). It appears that the demand for the U.S. cheese in South Korea tends to increase with a decrease in U.S cheese promotion expenditure. Total U.S. cheese promotion expenditures in South Korea appear to have been on the decrease from 1998 to 2005 (Table 9) while cheese import demand has been on the increase (Table12). Onunkwo and Epperson (2000[b]) reported similarly on the U.S. walnut export promotion in the Asia with walnut exports trending up while walnut promotion expenditures trended down; and also for Almonds in Asia (Onunkwo and Epperson, 2001).The decreasing marginal returns to cheese promotion expenditures in South Korea calls for caution in the allocation of promotion expenditures in this market as it tends toward maturity. Returns to ROW cheese in the Japanese market are significantly positive ($5.12), while MRPE for the U.S. cheese producers in Japan, and Mexico are not significantly different from zero.. In Thailand, MRPE for whey is positive for Australia ($11.07) and for ROW NFDM ($20.49) in the current period. However, in Japan MRPE on NFDM is negative for the EU ($63.77 - $83.86). MRPE for the U.S. whey producers in South Korea, and Mexico, and Thailand; and also for the U.S. NFDM producers in Japan, Mexico, and Thailand are not significantly different from zero. This may be associated with low levels of whey promotion expenditures, or focus of promotion activities.

The U.S. promotion activities in regard to these commodities seem not to be effective. It appears all the markets studied with the exception of the South Korean cheese market are non responsive to the U.S dairy export promotion efforts. Low levels of promotion expenditures on whey and NFDM market developments, or ineffective allocation of funds to promotion activities could have accounted for non responsiveness of these markets to promotion efforts. Promotion efforts could be geared towards reminding customers more about the unique features of U.S. dairy products, bearing in mind that other competitors with the U.S. are also involved in export promotion. Although promotion expenditures of competing countries are not included in this study, competitors' promotion efforts could have partly accounted for the significant positive spillover effects of promotion in some of the selected markets.

This study has been able to make an empirical contribution to literature as it represents the first empirical study known to have been conducted on the effectiveness of the U.S. dairy export promotion expenditure, by selected dairy products and countries. Promotion expenditures by product and countries are only available for few years, and these results in few observations for export promotion expenditures. The promotion expenditures used in this study are not the actual promotion expenditures, as the annual promotion expenditures were expanded into a quarterly basis using the "EXPAND" procedure in SAS, and this may have bearing on the impact of promotion expenditures as reported in this study. This represents a major limitation of this research. Another limitation of this study is the non-inclusion of U.S. competitors' promotion expenditure.

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APPENDIX

Table 1: MAP AND FMDP Export Promotion Expenditures ($), FY 1998-2005

Year	USDEC-FMD	Total FMD	USDEC-MAP	Total MAP
1998	384786 (1.40%)[a]	27527813	2687338 (2.20%)[a]	121945816
1999	529175 (1.71%)	30910387	1591048 (1.73%)	91818722
2000	629545 (2.05%)	30731138	1555931 (1.64%)	94660926
2001	622946 (2.03%)	30750004	1540887 (1.65%)	93421899
2002	691618 (2.25%)	30773582	1712362 (1.70%)	100533928
2003	966518 (2.92%)	33122041	2703591 (2.10%)	128944671
2004	962091 (2.68%)	35957730	3426212 (2.51%)	136503953
2005	1038721 (2.89%)	35897064	Open Year[b]	Open Year[b]
Total	5825400 (2.28%)	255669759	15217369 (1.98%)	767829915

Source: Based on data provided by FAS, USDA (September 20, 2006)

[a] Figures in parentheses represent the percentage of total FMD and MAP expenditure received by USDEC and devoted to dairy export market development.

[b] FY 2005 was still an open year under MAP as at the time the data were provided, hence promotion expenditures was inconclusive.

Table 2: MAP AND FMDP Export Promotion Expenditures: Cheese (1998-2005)

Country	MAP Expenditure ($)	Country	FMDP Expenditure ($)	Country	FAS Expenditure ($)
Japan	3382792 (38.7%)[a]	Japan	233023 (30.0%)[a]	Japan	3615814 (38.0%)[a]
Mexico	3067913 (35.1%)	Mexico	193678 (24.9%)	Mexico	3261591 (34.3%)
S/Korea	977478 (11.2%)	China	142725 (18.4%)	S/Korea	1057042 (11.1%)
Brazil	348219 (4.0%)	Brazil	79885 (10.3%)	Brazil	428104 (4.5%)
Thailand	185744 (2.1%)	S/Korea	79565 (10.2%)	China	285286 (3.0%)
Taiwan	159887 (1.8%)	Germany	39600 (5.1%)	Thailand	185744 (2.0%)
China	142561 (1.6%)	ROW	9250 (1.2%)	Taiwan	159887 (1.7%)
ROW	473867 (5.4%)	Total	777725 (100%)	Germany	39600 (0.4%)
Total	8738462 (100%)			ROW	483117 (5.1%)
				TOTAL	9516186 (100%)

Source: Compiled from FAS promotion Expenditures provided by USDA-FAS (September 20, 2006)
[a]Figures in parentheses represent the percentage of MAP, FMDP, and FAS total promotion expenditures devoted to market development activities in each country by USDEC.

Table 3: MAP AND FMDP Export Promotion Expenditures: Whey (1998-2005)

Country	MAP Expenditure ($)	Country	FMDP Expenditure ($)	Country	Total FAS Expenditure ($)
Japan	174799 (17.0%)[a]	S/Korea	353703 (27.2%)[a]	Thailand	463986 (19.9%)[a]
Thailand	153217 (14.9%)	Thailand	310769 (23.9%)	S/Korea	458041 (19.6%)
S/Korea	104338 (10.1%)	Mexico	214244 (16.5%)	Mexico	310635 (13.3%)
Mexico	96391 (9.3%)	Indonesia	91031 (7.0%)	Japan	235119 (10.1%)
Brazil	51377 (5.0%)	China	90980 (7.0%)	China	124406 (5.3%)
China	33426 (3.2%)	Japan	60320 (4.6%)	Indonesia	91031 (3.9%)
Egypt	25000 (2.4%)	Philippines	47290 (3.6%)	Brazil	51377 (2.2%)
ROW	392529 (38.1%)	ROW	133924 (10.3%)	Philippines	47290 (2.0%)
Total	1031078 (100%)	Total	1302261 (100%)	Egypt	25000 (1.1%)
				ROW	526454 (22.6%)
				Total	2333339 (100%)

Source: Compiled from FAS promotion Expenditures provided by USDA-FAS (September 20, 2006)
[a]Figures in parentheses represent the percentage of MAP, FMDP, and FAS total promotion expenditures devoted to market development activities in each country by USDEC.

Table 4: MAP AND FMDP Export Promotion Expenditures: NFDM (1998-2005)

Country	MAP Expenditure ($)		Country	FMDP Expenditure ($)		Country	Total FAS Expenditure ($)	
Thailand	64229	(32.8%)[a]	Thailand	75631	(33.5%)[a]	Thailand	139861	(33.2%)[a]
Japan	50000	(25.5%)	China	57592	(25.5%)	China	72592	(17.2%)
Mexico	29764	(15.2%)	Philippines	19933	(8.8%)	Japan	60826	(14.4%)
China	15000	(7.7%)	Indonesia	19933	(8.8%)	Mexico	48341	(11.5%)
Argentina	5000	(2.6%)	Mexico	18576	(8.2%)	Philippines	19933	(4.7%)
ROW	31734	(16.2%)	Japan	10826	(4.8%)	Indonesia	19933	(4.7%)
Total	195728	(100%)	Malaysia	10600	(4.7%)	Malaysia	10600	(2.5%)
			ROW	12575	(5.6%)	Argentina	5000	(1.2%)
			Total	225669	(100%)	ROW	44310	(10.5%)
						Total	421396	(100%)

Source: Compiled from FAS promotion Expenditures provided by USDA-FAS (September 20, 2006)
[a]Figures in parentheses represent the percentage of MAP, FMDP, and FAS total promotion expenditures devoted to market development activities in each country by USDEC.

Table 5: MAP Dairy Market Development Expenditures By Dairy Products

Year	Cheese		Whey		NFDM		Other Dairy		Total	
1998	1341656	(49.9%)[a]	396892	(14.8%)[a]	101499	(3.8%)[a]	847291	(31.5%)[a]	2687338	(100%)
1999	852970	(53.6%)	209120	(13.1%)	36575	(2.3%)	492383	(30.9%)	1591049	(100%)
2000	984553	(63.3%)	243301	(15.6%)	57654	(3.7%)	270424	(17.4%)	1555931	(100%)
2001	1149079	(74.6%)	42686	(2.8%)	-	-	349122	(22.7%)	1540887	(100%)
2002	1188788	(69.4%)	67046	(3.9%)	-	-	456528	(26.7%)	1712362	(100%)
2003	1588806	(58.8%)	53449	(2.0%)	-	-	1061336	(39.3%)	2703591	(100%)
2004	1632610	(47.7%)	18584	(0.5%)	-	-	1775018	(51.8%)	3426212	(100%)
Year Total	8738462	(57.4%) [b]	1031078	(6.8%) [b]	195728	(1.3%) [b]	5252102[b]	(34.5%)	15217369	(100%)

Source: Compiled from FAS promotion Expenditures provided by USDA-FAS (September 20, 2006).

[a] Figures in parentheses represent the product's promotion expenditures as percentage of total dairy promotion expenditures devoted to market development activities each year by USDEC.

[b] Figures in parentheses represent product's year totals as percentage of dairy year totals promotion expenditures devoted to market development activities worldwide by USDEC.

Table 6: FMDP Dairy Market Development Expenditures By Dairy Products

Year	Cheese		Whey		NFDM		Other Dairy		Total
2000	140036	(22.2%)[a]	-	-	28550	(4.5%)[a]	460959	(73.2%)[a]	629545 (100.0%)
2001	115993	(18.6%)	327684	(52.6%)[a]	8373	(1.3%)	170897	(27.4%)	622946 (100.0%)
2002	106587	(15.4%)	250771	(36.3%)	71547	(10.3%)	262714	(38.0%)	691618 (100.0%)
2003	247166	(25.6%)	240742	(24.9%)	66717	(6.9%)	411893	(42.6%)	966518 (100.0%)
2004	103496	(10.8%)	201047	(20.9%)	-	-	657548	(68.3%)	962091 (100.0%)
2005	64447	(6.2%)	282018	(27.2%)	50482	(4.9%)	641775	(61.8%)	1038721 (100.0%)
2000-2005 Total	777725	(15.8%)[b]	1302261	(26.5%)[b]	225669	(4.6)%[b]	2605786	(53.1%)[b]	4911440 (100.0%)

Source: Compiled from FAS promotion Expenditures provided by USDA-FAS (September 20, 2006).

[a] Figures in parentheses represent the product's promotion expenditures as percentage of total dairy promotion expenditures devoted to market development activities each year by USDEC.

[b] Figures in parentheses represent product's year totals as percentage of dairy year totals promotion expenditures devoted to market development activities worldwide by USDEC.

Table 7: FAS Dairy Market Development Expenditures By Dairy Products

Year	Cheese		Whey		NFDM		Other Dairy		Total[c]	
1998	1341656	(49.9%)[a]	396892	(14.8%)[a]	101499	(3.8%)[a]	847291	(31.5%)[a]	2687338	(100.0%)
1999	852970	(53.6%)	209120	(13.1%)	36575	(2.3%)	492383	(30.9%)	1591049	(100.0%)
2000	1124589	(51.5%)	243301	(11.1%)	86204	(3.9%)	731383	(33.5%)	2185476	(100.0%)
2001	1265071	(58.5%)	370370	(17.1%)	8373	(0.4%)	520019	(24.0%)	2163833	(100.0%)
2002	1295375	(53.9%)	317816	(13.2%)	71547	(3.0%)	719242	(29.9%)	2403980	(100.0%)
2003	1835972	(50.0%)	294191	(8.0%)	66717	(1.8%)	1473229	(40.1%)	3670109	(100.0%)
2004	1736106	(39.6%)	219631	(5.0%)	-	-	2432566	(55.4%)	4388303	(100.0%)
2005	64447	(6.2%)	282018	(27.2%)	50482	(4.9%)	641775	(61.8%)	1038721	(100.0%)
1998-2005Total	9516186	(47.3%)[b]	2333339	(11.6%)[b]	421396	(2.1%)[b]	7857888	(39.0%)[b]	20128809	(100.0%)

Source: Compiled from FAS promotion Expenditures provided by USDA-FAS (September 20, 2006).

[a] Figures in parentheses represent the product's promotion expenditures as percentage of total dairy promotion expenditures devoted to market development activities each year by USDEC.

[b] Figures in parentheses represent product's year totals as percentage of dairy year totals promotion expenditures devoted to market development activities worldwide by USDEC.

[c] Total FAS promotion expenditures on all dairy products excludes FMDP expenditures for 1998 and 1999, since expenditures by dairy products under FMDP started in FY 2000 Also MAP expenditures for FY 2005 are excluded.

Table 8: USDEC Export Promotion Expenditures on Cheese, Whey, and NFDM (1998-2005)

	Cheese			Whey			NFDM		
Year	Mexico	Japan	S/Korea	Mexico	SE Asia	S/Korea	Mexico	Japan	SE Asia
1998	54000	125000	24000	41000	25000	66000	12000	0	17000
1999	230000	156000	110000	36000	56000	39000	0	0	20000
2000	316000	434000	131000	134000	52000	32000	2000	0	29000
2001	184000	187000	102000	66000	92000	63000	0	0	0
2002	244000	167000	83000	102000	111000	39000	0	0	14000
2003	72000	67000	81000	52000	88000	49000	0	0	25000
2004	99000	89000	73000	78000	81000	41000	17000	0	35000
2005	98000	91000	78000	69000	325000	91000	10000	0	37000
Total	1297000	1316000	682000	578000	830000	420000	41000	0	177000

Source: Compiled from data provided by USDEC (September 13, 2007).

Table 9: Total Cheese Promotion Expenditures in Japan, Mexico, and South Korea (1998-2005)

	Japan			Mexico			South Korea		
Year	FAS	USDEC	Total	FAS	USDEC	Total	FAS	USDEC	Total
1998	575314	125000	700314	436848	54000	490848	174699	24000	198699
1999	363687	156000	519687	329256	230000	559256	119272	110000	229272
2000	591191	434000	1025191	348740	316000	664740	68335	131000	199335
2001	451361	187000	638361	599842	184000	783842	80329	102000	182329
2002	552031	167000	719031	506699	244000	750699	94713	83000	177713
2003	570175	67000	637175	552731	72000	624731	295912	81000	376912
2004	512055	89000	601055	467475	99000	566475	223781	73000	296781
2005	0	91000	91000	20000	98000	118000	0	78000	78000
Total	3615814	1316000	4931814	3261591	1297000	4558591	1057043	682000	1739043

Source: Compiled from FAS promotion expenditures provided by USDA-FAS (September 20, 2006) and from data provided by USDEC (September 13, 2007).

Table 10: Total Whey Promotion Expenditures in Thailand, Mexico, and South Korea (1998-2005)

	Thailand*			Mexico			South Korea		
Year	FAS	USDEC	Total	FAS	USDEC	Total	FAS	USDEC	Total
1998	0	25000	25000	48234	41000	89234	0	66000	66000
1999	62504	56000	118504	30583	36000	66583	36314	39000	75314
2000	40000	52000	92000	17573	134000	151573	26161	32000	58161
2001	10000	92000	102000	65180	66000	131180	102250	63000	165250
2002	77034	111000	188034	49514	102000	151514	90368	39000	129368
2003	11036	88000	99036	47187	52000	99187	82109	49000	131109
2004	128412	81000	209412	0	78000	78000	72907	41000	113907
2005	135000	325000	460000	52362	69000	121362	47932	91000	138932
Total	463986	830000	1293986	310635	578000	888635	458041	420000	878041

Source: Compiled from FAS promotion expenditures provided by USDA-FAS (September 20, 2006) and from data provided by USDEC (September 13, 2007).
* USDEC promotion expenditure in Thailand represents the industry's expenditure in South East Asia.

Table 11: Total NFDM Promotion Expenditures in Japan, Mexico, and Thailand (1998-2005)

	Japan			Mexico			Thailand*		
Year	FAS	USDEC	Total	FAS	USDEC	Total	FAS	USDEC	Total
1998	50000	0	50000	19764	12000	31764	0	17000	17000
1999	0	0	0	0	0	0	36575	20000	56575
2000	8733	0	8733	26483	2000	28483	27654	29000	56654
2001	2093	0	2093	2093	0	2093	0	0	0
2002	0	0	0	0	0	0	25032	14000	39032
2003	0	0	0	0	0	0	10600	25000	35600
2004	0	0	0	0	17000	17000	0	35000	35000
2005	0	0	0	0	10000	10000	40000	37000	77000
Total	60826	0	60826	48341	41000	89341	139861	177000	316861

Source: Compiled from FAS promotion expenditures provided by USDA-FAS (September 20, 2006) and from data provided by USDEC (September 13, 2007).

* USDEC promotion expenditure in Thailand represents the industry's expenditure in South East Asia.

Table 12: Total U.S. Cheese Exports to South Korea, Mexico, and Japan (1998-2005 Values)

Year	South Korea	Mexico	Japan
1998	6881985	24371094	25149374
1999	7952719	25102395	24201748
2000	11792637	45608857	27981283
2001	14371828	65449528	28380522
2002	14531247	66704454	28712407
2003	17083464	75713993	26294500
2004	20609677	94847335	30211668
2005	25491499	92869795	29667573

Source: Compiled from Trade data provided by USDA-FAS (April 26, 2007)

Table 13: Total U.S. Whey Exports to South Korea, Mexico, and Thailand (1998-2005 Values)

Year	South Korea	Mexico	Thailand
1998	8199929	33986664	3586178
1999	8038076	28399752	6862762
2000	12363973	30042049	7755657
2001	11790187	38137606	7347039
2002	9060200	31701948	6899295
2003	10740746	29276546	7234425
2004	11328905	38115638	6570579
2005	19904892	43017245	11668942

Source: Compiled from Trade data provided by USDA-FAS (April 26, 2007)

Table 14: Total U.S. NFDM Exports to Japan, Mexico, and Thailand (1998-2005 Values)

Year	Japan	Mexico	Thailand
1998	58569	70450279	9236050
1999	183234	79849631	4859549
2000	160678	57673955	2100229
2001	791584	136362693	6065397
2002	8656	73775406	6039283
2003	4947661	115400032	6141860
2004	26646999	196574098	10519612
2005	25192675	292422965	15682577

Source: Compiled from Trade data provided by USDA-FAS (April 26, 2007)

Table 15: Promotion Studies: Returns to Promotion Expenditures (RPE)

Products	Authors	RPE ($)
Vidalia onions	Costa, Epperson, Huang, and McKissick (2002)	$52.68
Grapefruits Exports	Fuller and Bello (1992)	$4.13 - 6.65
Apple exports	Richard, Van Ispelen, and Kagan (1997)	$24.72 - 27.84
Tobacco	Rosson, Hamming, and Jones (1986)	$31
Apples	Rosson, Hamming, and Jones (1986)	$60
Almond	Halliburton and Henneberry (1995)	$4.95 - 8.59
Almond	Onunkwo and Epperson (2001)	-$47.74
Walnuts	Onunkwo and Epperson (2000[b])	-$6.14
Frozen Potatoes	Lanclos, Devados, and Guenthner (1997)	$1.13 - 16.36
Frozen concentrated orange juice	Armah and Epperson (1997)	$5.61 - 51.92
Rice	Wang (2005)	$10 - 40

Source: Various Journal Publications

Table 16: Model Selection Test for non-Separable Commodities (p-values)

Model	Thailand	South Korea	Japan
	Whey and NFDM	Cheese and Whey	Cheese and NFDM
Rotterdam	0.019	0.000	0.000
AIDS	0.000	0.000	0.000
CBS	0.000	0.000	0.000
NBR	0.000	0.000	0.000

Test was not conducted for Mexico because there was the problem of insufficient degrees of freedom.

Table 17: Results of Weak Separability Tests

Country	Products	p-value	Conclusion
Japan	Cheese and NFDM	0.108	Reject not separability
Thailand	Whey and NFDM	0.935	Reject not separability
SouthKorea	Cheese and Whey	0.120	Reject not separability
Mexico	Cheese, Whey, NFDM	*	

* There was the problem of insufficient degrees of freedom; assumed separability not rejected.

Table 18: Results of the Model Selection Tests (p-values)

Model	Thailand		South Korea		Japan		Mexico		
	Whey	NFDM	Cheese	Whey	Cheese	NFDM	Cheese	Whey	NFDM
Rotterdam	0.145	0.975	0.405	0.003	0.017	0.023	0.016	0.443	0.208
AIDS	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000
CBS	0.013	0.000	0.866	0.065	0.008	0.000	0.492	0.093	0.058
NBR	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Selection	Rotterdam	Rotterdam	CBS, Rotterdam	CBS	Rotterdam	Rotterdam	CBS	CBS, Rotterdam	Rotterdam

Table 19: Misspecification Test Results for Whey Import Demand in Mexico, Thailand, and South Korea

Normality			Joint Conditional Mean			Joint Conditional Variance		
Mexico	Rotterdam	CBS	**Mexico**	Rotterdam	CBS	**Mexico**	Rotterdam	CBS
Whey from U.S.	0.506[a]	0.502	Parameter Stability	0.224	0.402	Variance Stability	0.480	0.290
Whey from EU	0.116	0.113	Linear Functional Form	0.045	0.432	Static Homoskedasticity	0.807	0.376
Whey from ROW	0.786	0.445	No Autocorrelation	0.494	0.500	Dynamic Homoskedasticity	0.482	0.808
			Joint Test	0.135	0.600	Joint	0.822	0.635
Thailand	Rotterdam		**Thailand**	Rotterdam		**Thailand**	Rotterdam	
Whey from U.S.	0.409		Parameter Stability	0.071		Variance Stability	0.397	
Whey from EU	0.609		Linear Functional Form	0.886		Static Homoskedasticity	0.565	
Whey from Australia	0.163		No Autocorrelation	0.158		Dynamic Homoskedasticity	0.219	
Whey from ROW	<0.000		Joint Test	0.356		Joint	0.460	
South Korea	CBS		**South Korea**	CBS		**South Korea**	CBS	
Whey from U.S.	0.840		Parameter Stability	0.437		Variance Stability	0.063	
Whey from EU	0.691		Linear Functional Form	0.652		Static Homoskedasticity	0.327	
Whey from ROW	0.539		No Autocorrelation	0.000		Dynamic Homoskedasticity	0.308	
			Joint Test	0.007		Joint	0.224	

[a] p-values

Table 20: Misspecification Test Results for Cheese Import Demand in Mexico, South Korea, and Japan

Normality			Joint Conditional Mean			Joint Conditional Variance		
Mexico	CBS		**Mexico**	CBS		**Mexico**	CBS	
Cheese from U.S.	0.844[a]		Parameter Stability	0.032		Variance Stability	0.685	
Cheese from EU	0.691		Linear Functional Form	0.007		Static Homoskedasticity	0.040	
Cheese from Uruguay	0.280		No Autocorrelation	0.030		Dynamic Homoskedasticity	0.670	
Cheese from N/Zealand	0.013		Joint Test	0.001		Joint	0.142	
Cheese from ROW	0.045							
South Korea	Rotterdam	CBS	**South Korea**	Rotterdam	CBS	**South Korea**	Rotterdam	CBS
Cheese from U.S.	0.294	0.164	Parameter Stability	0.252	0.168	Variance Stability	0.116	0.161
Cheese from EU	0.078	0.173	Linear Functional Form	0.038	0.368	Static Homoskedasticity	0.284	0.888
Cheese from Australia	0.244	0.648	No Autocorrelation	0.324	0.600	Dynamic Homoskedasticity	0.392	0.156
Cheese from N/Zealand	0.156	0.176	Joint Test	0.101	0.264	Joint	0.135	0.323
Cheese from ROW	0.424	0.179						
Japan	Rotterdam		**Japan**	Rotterdam		**Japan**	Rotterdam	
Cheese from U.S.	0.093		Parameter Stability	0.972		Variance Stability	0.827	
Cheese from EU	0.490		Linear Functional Form	0.227		Static Homoskedasticity	0.741	
Cheese from Australia	0.671		No Autocorrelation	0.429		Dynamic Homoskedasticity	0.138	
Cheese from N/Zealand	0.919		Joint Test	0.493		Joint	0.574	
Cheese from ROW	0.113							

[a] p-value

Table 21: Misspecification Test Results for NFDM Import Demand in Mexico, Thailand, and Japan

Normality		Joint Conditional Mean		Joint Conditional Variance	
Mexico	Rotterdam	**Mexico**	Rotterdam	**Mexico**	Rotterdam
NFDM from U.S.	0.840[a]	Parameter Stability	0.957	Variance Stability	0.103
NFDM from EU	0.200	Linear Functional Form	0.001	Static Homoskedasticity	0.000
NFDM from Canada	0.428	No Autocorrelation	0.729	Dynamic Homoskedasticity	0.519
NFDM from N/Zealand	0.068	Joint Test	0.041	Joint	0.000
NFDM from ROW	0.999				
Thailand	Rotterdam	**Thailand**	Rotterdam	**Thailand**	Rotterdam
NFDM from U.S.	0.673	Parameter Stability	0.829	Variance Stability	0.390
NFDM from EU	0.438	Linear Functional Form	0.000	Static Homoskedasticity	0.000
NFDM from Australia	0.438	No Autocorrelation	0.037	Dynamic Homoskedasticity	0.953
NFDM from N/Zealand	0.438	Joint Test	0.002	Joint	0.000
NFDM from ROW	0.409				
Japan	Rotterdam	**Japan**	Rotterdam	**Japan**	Rotterdam
NFDM from U.S.	0.160	Parameter Stability	0.659	Variance Stability	0.419
NFDM from EU	0.155	Linear Functional Form	0.326	Static Homoskedasticity	0.004
NFDM from Australia	0.633	No Autocorrelation	0.002	Dynamic Homoskedasticity	0.443
NFDM from N/Zealand	0.766	Joint Test	0.023	Joint	0.012
NFDM from Ukraine	0.158				
NFDM from ROW	0.252				

[a] p-value

Table 22: Parameter Estimates of Mexico Import Demand for Cheese using CBS Model

Independent variable	U.S.	EU	Uruguay	New Zealand	ROW
Intercept	0.059	0.010	0.011	-0.066	-0.013
	(0.042)	(0.032)	(0.029)	(0.041)	(0.038)
Price of cheese from U.S.	-0.304	0.070	0.021	0.124	0.088
	(0.115)**	(0.071)	(0.069)	(0.097)	(0.087)
Price of cheese from EU		-0.111	-0.014	-0.134	0.188
		(0.100)	(0.078)	(0.107)	(0.081)**
Price of cheese from Uruguay			-0.132	0.207	-0.082
			(0.113)	(0.099)**	(0.090)
Price of cheese from N/Zealand				-0.335	0.137
				(0.179)*	(0.113)
Price of cheese from ROW					-0.331
					(0.128)**
Expenditure	-0.075	0.035	0.159	-0.079	-0.040
	(0.124)	(0.086)	(0.079)*	(0.114)	(0.103)
U.S.Current Cheese Promotion	0.095	0.022	-0.027	-0.054	-0.035
	(0.063)	(0.049)	(0.042)	(0.064)	(0.055)
U.S.Lagged Cheese Promotion	-0.029	-0.024	0.021	0.003	0.027
	0.053	(0.039)	(0.035)	(0.054)	(0.044)

* Significant at the 10% level, ** significant at the 5% level

Table 23: Parameter Estimates of South Korea Import Demand for Cheese using CBS Model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Intercept	0.009	-0.011	-0.017	0.022	-0.003
	(0.011)	(0.009)	(0.016)	(0.023)	(0.013)
Price of cheese from U.S.	-0.154	-0.049	0.109	0.069	0.026
	(0.055)**	(0.033)	(0.068)	(0.086)	(0.018)
Price of cheese from EU		-0.174	0.151	0.047	0.024
		(0.039)***	(0.058)**	(0.067)	(0.016)
Price of cheese from Australia			-0.455	0.203	-0.008
			(0.171)**	(0.168)	(0.029)
Price of cheese from N/Zealand				-0.298	-0.021
				(0.220)	(0.041)
Price of cheese from ROW					-0.021
					(0.024)
Expenditure	-0.087	0.037	0.017	0.014	0.018
	(0.043)*	(0.036)	(0.066)	(0.093)	(0.052)
U.S.Current Cheese Promotion	-0.003	0.027	0.045	-0.018	-0.051
	(0.020)	(0.017)	(0.031)	(0.042)	(0.025)**
U.S.Lagged Cheese Promotion	-0.024	0.014	-0.002	0.008	0.004
	(0.008)***	(0.007)*	(0.012)	(0.017)	(0.010)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 24: Parameter Estimates of South Korea Import Demand for Cheese using Rotterdam Model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Intercept	0.009	-0.011	-0.013	0.020	-0.004
	(0.010)	(0.010)	(0.016)	(0.023)	(0.013)
Price of cheese from U.S.	-0.148	-0.053	0.116	0.061	0.024
	(0.053)**	(0.033)	(0.067)*	(0.086)	(0.018)
Price of cheese from EU		-0.184	0.165	0.057	0.014
		(0.042)***	(0.060)**	(0.070)	(0.017)
Price of cheese from Australia			-0.478	0.193	0.004
			(0.171)**	(0.171)	(0.029)
Price of cheese from N/Zealand				-0.288	-0.023
				(0.227)	(0.041)
Price of cheese from ROW					-0.019
					(0.024)
Expenditure	0.081	0.120	0.403	0.311	0.084
	(0.042)*	(0.039)***	(0.066)***	(0.093)***	(0.052)
U.S.Current Cheese Promotion	-0.002	0.028	0.049	-0.019	-0.055
	(0.019)	(0.018)	(0.031)	(0.042)	(0.025)**
U.S.Lagged Cheese Promotion	-0.027	0.012	-0.005	0.015	0.005
	(0.007)***	(0.007)	(0.012)	(0.017)	(0.010)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 25: Parameter Estimates of Japanese Import Demand for Cheese using Rotterdam Model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Intercept	-0.001	-0.036	0.042	-0.004	-0.001
	(0.004)	(0.011)***	(0.020)**	(0.010)	(0.004)
Price of cheese from U.S.	-0.078	0.009	0.105	-0.019	-0.017
	(0.015)***	(0.028)	(0.054)*	(0.032)	(0.012)
Price of cheese from EU		-0.068	0.111	-0.023	-0.029
		(0.108)	(0.172)	(0.082)	(0.030)
Price of cheese from Australia			-0.835	0.506	0.112
			(0.365)**	(0.196)**	(0.065)*
Price of cheese from N/Zealand				-0.422	-0.042
				(0.138)***	(0.041)
Price of cheese from ROW					-0.023
					(0.023)
Expenditure	0.018	0.223	0.530	0.173	0.056
	(0.019)	(0.051)***	(0.092)***	(0.051)***	(0.018)***
U.S.Current Cheese Promotion	0.005	-0.003	0.008	-0.007	-0.003
	(0.004)	(0.013)	(0.022)	(0.012)	(0.005)
U.S.Lagged Cheese Promotion	-0.0002	0.012	-0.023	0.006	0.005
	(0.003)	(0.008)	(0.014)	(0.007)	(0.003)**

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 26: Marshallian Price Elasticities and Estimates of the Seasonality Variable for Mexican Cheese Import Demand using the CBS model

Independent variable	U.S.	EU	Uruguay	New Zealand	ROW
Price of cheese from U.S.	-1.134	-0.040	-0.759	0.722	0.085
	(0.346)***	(0.396)	(0.785)	(0.694)	(0.388)
Price of cheese from EU	0.053	-0.822	-0.670	-1.030	0.661
	(0.234)	(0.561)	(0.889)	(0.767)	(0.364)*
Price of cheese from Uruguay	-0.010	-0.181	-1.747	1.465	0.521
	(0.229)	(0.435)	(1.284)	(0.673)**	(0.403)
Price of cheese from N/Zealand	0.237	-0.904	1.957	-2.436	-0.472
	(0.298)	(0.594)	(1.124)*	(0.706)*	(0.497)
Price of cheese from ROW	0.063	0.754	-1.586	0.870	-1.620
	(0.273)	(0.452)	(1.541)*	(0.806)	(0.562)***
Quarter II	-0.089	0.013	-0.029	0.057	0.047
	(0.068)	(0.049)	(0.046)	(0.065)	(0.061)
Quarter III	-0.026	-0.026	-0.013	0.070	-0.006
	(0.044)	(0.032)	(0.029)	(0.042)	(0.038)
Quarter IV	-0.094	-0.043	-0.015	0.139	0.012
	(0.087)	(0.066)	(0.059)	(0.082)	(0.075)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 27: Estimated Promotion, Expenditure, and Hicksian Elasticities of Mexican Cheese Import Demand using the CBS model

Independent variable	U.S.	EU	Uruguay	New Zealand	ROW
Price of cheese from U.S.	-0.852	0.385	0.241	0.880	0.379
	(0.323)***	(0.387)	(0.781)	(0.684)	(0.374)
Price of cheese from EU	0.197	-0.606	-0.158	-0.949	0.811
	(0.198)	(0.554)	(0.886)	(0.758)	(0.349)***
Price of cheese from Uruguay	0.059	-0.076	-1.489	1.464	-0.355
	(0.193)	(0.427)	(1.281)	(0.697)***	(0.389)
Price of cheese from N/Zealand	0.349	-0.735	2.353	-2.373	0.593
	(0.271)	(0.588)	(1.121)***	(1.266)**	(0.486)
Price of cheese from ROW	0.247	1.031	-0.936	0.973	-1.429
	(0.243)	(0.443)***	(1.026)	(0.797)	(0.552)***
Expenditure	0.791	1.191	2.807	0.445	0.826
	(0.348)***	(0.471)***	(0.897)***	(0.803)	(0.445)**
U.S.Current Cheese Promotion	0.267	0.121	-0.310	-0.384	-0.151
	(0.177)	(0.271)	(0.469)	(0.449)	(0.233)
U.S.Lagged Cheese Promotion	-0.080	-0.131	0.241	0.024	0.118
	(0.149)	(0.214)	(0.385)	(0.380)	(0.191)
U.S.Total Cheese Promotion[a]	0.187	-0.010	-0.070	-0.360	-0.033
	(0.149)	(0.210)	(0.379)	(0.347)	(0.193)

** Significant at the 5% level, *** significant at the 1% level.

[a] represents both current and lag promotion expenditure elasticities.

Table 28: Marshallian Price Elasticities and Estimates of the Seasonality Variable for South Korean Cheese Import Demand using the CBS model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Price of cheese from U.S.	-0.988	-0.703	0.120	0.058	0.140
	(0.327)***	(0.323)**	(0.190)	(0.304)	(0.273)
Price of cheese from EU	-0.338	-1.823	0.307	0.055	0.209
	(0.194)*	(0.379)**	(0.163)*	(0.235)	(0.229)
Price of cheese from Australia	0.460	0.965	-1.630	0.319	-0.748
	(0.409)	(0.581)	(0.477)***	(0.596)	(0.461)
Price of cheese from N/Zealand	0.261	0.064	0.254	-1.333	-0.475
	(0.507)	(0.651)	(0.465)	(0.773)	(0.591)
Price of cheese from ROW	0.115	0.138	-0.097	-0.148	-0.383
	(0.109)	(0.159)	(0.080)	(0.146)	(0.328)
Quarter II	-0.022	0.011	0.040	-0.037	0.007
	(0.014)	(0.012)	(0.022)*	(0.031)	(0.018)
Quarter III	-0.005	0.015	-0.037	0.016	0.011
	(0.014)	(0.012)	(0.022)	(0.030)	(0.017)
Quarter IV	-0.001	0.014	0.047	-0.068	0.008
	(0.013)	(0.011)	(0.021)**	(0.029)**	(0.017)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 29: Estimated Promotion, Expenditure, and Hicksian Elasticities for South Korean Cheese Import Demand using the CBS model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Price of cheese from U.S.	-0.904	-0.472	0.298	0.237	0.354
	(0.326)**	(0.318)	(0.187)	(0.296)	(0.255)
Price of cheese from EU	-0.288	-1.682	0.415	0.164	0.339
	(0.194)	(0.378)***	(0.161)**	(0.231)	(0.255)
Price of cheese from Australia	0.403	1.460	-1.248	0.701	-0.111
	(0.505)	(0.567)**	(0.470)**	(0.579)	(0.398)
Price of cheese from N/Zealand	0.401	0.458	0.557	-1.029	-0.290
	(0.502)	(0.644)	(0.460)	(0.762)	(0.575)
Price of cheese from ROW	0.150	0.236	-0.022	-0.072	-0.292
	(0.108)	(0.157)	(0.079)	(0.143)	(0.335)
Expenditure	0.490	1.358	1.046	1.049	1.256
	(0.253)*	(0.355)***	(0.183)***	(0.325)***	(0.699)*
U.S.Current Cheese Promotion	-0.016	0.261	0.124	-0.062	-0.714
	(0.115)	(0.169)	(0.085)	(0.149)	(0.330)**
U.S.Lagged Cheese Promotion	-0.141	0.137	-0.006	0.029	0.052
	(0.046)***	(0.066)*	(0.033)	(0.061)	(0.134)
U.S.Total Cheese Promotion[a]	-0.158	0.398	0.118	-0.033	-0.661
	(0.120)	(0.177)**	(0.089)	(0.158)	(0.350)*

* Significant at the 10% level, ** Significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 30: Marshallian Price Elasticities and Estimates of the Seasonality Variable for South Korean Cheese Import Demand using the Rotterdam model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Price of cheese from U.S.	-0.946	-0.708	0.130	0.027	0.127
	(0.324)***	(0.339)**	(0.196)	(0.319)	(0.282)
Price of cheese from EU	-0.359	-1.888	0.340	0.087	0.071
	(0.191)*	(0.399)***	(0.163)**	(0.244)	(0.240)
Price of cheese from Australia	0.505	1.171	-1.719	0.278	-0.714
	(0.418)	(0.619)*	(0.495)***	(0.637)	(0.477)
Price of cheese from N/Zealand	0.220	0.219	0.212	-1.315	-0.275
	(0.484)	(0.664)	(0.458)	(0.771)	(0.582)
Price of cheese from ROW	0.104	0.049	-0.073	-0.160	-0.340
	(0.105)	(0.166)	(0.079)	(0.145)	(0.324)
Quarter II	-0.023	0.008	0.041	-0.034	0.008
	(0.014)	(0.013)	(0.022)*	(0.031)	(0.018)
Quarter III	-0.005	0.018	-0.046	0.018	0.015
	(0.014)	(0.013)	(0.022)**	(0.030)	(0.017)
Quarter IV	-0.0002	0.012	0.049	-0.067	0.006
	(0.013)	(0.012)	(0.021)**	(0.029)**	(0.017)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 31: Estimated Promotion, Expenditure, and Hicksian Elasticities for South Korean Cheese Import Demand using the Rotterdam model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Price of cheese from U.S.	-0.864	-0.510	0.319	0.212	0.320
	(0.307)**	(0.317)	(0.185)*	(0.298)	(0.241)
Price of cheese from EU	-0.310	-1.768	0.455	0.199	0.188
	(0.192)	(0.402)***	(0.165)**	(0.243)	(0.232)
Price of cheese from Australia	0.678	1.591	-1.317	0.671	0.050
	(0.392)*	(0.578)**	(0.472)**	(0.596)	(0.386)
Price of cheese from N/Zealand	0.356	0.552	0.531	-1.004	-0.304
	(0.500)	(0.673)	(0.472)	(0.792)	(0.552)
Price of cheese from ROW	0.140	0.135	0.010	-0.079	-0.255
	(0.105)	(0.167)	(0.080)	(0.143)	(0.325)
Expenditure	0.476	1.156	1.109	1.083	1.131
	(0.248)*	(0.380)***	(0.185)***	(0.324)***	(0.701)
U.S.Current Cheese Promotion	-0.014	0.271	0.134	-0.066	-0.738
	(0.112)	(0.181)	(0.085)	(0.148)	(0.331)**
U.S.Lagged Cheese Promotion	-0.159	0.117	-0.014	0.053	0.061
	(0.045)***	(0.071)	(0.033)	(0.060)	(0.134)
U.S.Total Cheese Promotion[a]	-0.173	0.388	0.120	-0.013	-0.677
	(0.118)	(0.189)*	(0.090)	(0.157)	(0.350)*

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level
[a] represents both current and lag promotion expenditure elasticities.

Table 32: Marshallian Price Elasticities and Estimates of the Seasonality Variable of Japanese Cheese Import Demand using Rotterdam model

Independent variable	U.S.	EU	Australia	NZ	ROW
Price of cheese from U.S.	-1.683	-0.005	0.229	-0.130	-0.426
	(0.314)***	(0.079)	(0.151)	(0.151)	(0.257)
Price of cheese from EU	0.058	-0.419	-0.207	-0.399	-1.040
	(0.603)	(0.308)	(0.492)	(0.399)	(0.647)
Price of cheese from Australia	2.126	0.094	-2.906	2.142	-1.326
	(1.172)*	(0.500)	(1.037)**	(0.924)**	(1.361)
Price of cheese from N/Zealand	-0.487	-0.199	1.128	-2.203	2.135
	(0.721)	(0.244)	(0.574)*	(0.687)***	(0.914)**
Price of cheese from ROW	-0.390	-0.114	0.248	-0.243	-0.547
	(0.269)	(0.088)	(0.186)	(0.201)	(0.491)
Quarter II	0.007	0.054	-0.068	0.006	0.002
	(0.005)	(0.014)***	(0.024)**	(0.012)	(0.004)
Quarter III	-0.004	0.046	-0.032	-0.011	0.001
	(0.005)	(0.013)***	(0.023)	(0.013)	(0.004)
Quarter IV	0.005	0.050	-0.077	0.022	0.001
	(0.008)	(0.024)**	(0.040)*	(0.020)	(0.007)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 33: Estimated Promotion, Expenditure, and Hicksian Elasticities of Japanese Cheese Import Demand using Rotterdam model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Price of cheese from U.S.	-1.665	0.025	0.300	-0.092	-0.370
	(0.322)***	(0.081)	(0.154)*	(0.156)	(0.264)
Price of cheese from EU	0.188	-0.196	0.316	-0.109	-0.622
	(0.604)	(0.311)	(0.490)	(0.394)	(0.649)
Price of cheese from Australia	2.258	0.320	-2.376	2.435	2.385
	(1.164)*	(0.496)	(1.039)**	(0.943)**	(1.378)*
Price of cheese from N/Zealand	-0.409	-0.066	1.442	-2.030	-0.903
	(0.694)	(0.236)	(0.599)**	(0.663)***	(0.879)
Price of cheese from ROW	-0.372	-0.084	0.318	-0.204	-0.491
	(0.266)	(0.088)	(0.184)*	(0.198)	(0.488)
Expenditure	0.376	0.642	1.508	0.833	1.204
	(0.401)	(0.148)***	(0.261)***	(0.246)***	(0.379)***
U.S.Current Cheese Promotion	0.112	-0.008	0.023	-0.033	-0.074
	(0.093)	(0.036)	(0.063)	(0.055)	(0.096)
U.S.Lagged Cheese Promotion	-0.005	0.035	-0.065	0.027	0.115
	(0.059)	(0.024)	(0.041)	(0.034)	(0.054)**
U.S.Total Cheese Promotion[a]	0.107	0.027	-0.042	-0.006	0.041
	(0.103)	(0.040)	(0.071)	(0.061)	(0.106)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 34: Parameter Estimates of Mexico Import Demand for Whey using CBS Model

Independent variable	U.S.	EU	ROW
Intercept	-0.040	-0.038	0.078
	(0.038)	(0.036)	(0.026)***
Price of whey from U.S.	-0.113	-0.006	0.120
	(0.043)**	(0.034)	(0.020)***
Price of whey from EU		0.034	-0.028
		(0.032)	(0.016)
Price of whey from ROW			-0.091
			(0.015)***
Expenditure	-0.104	-0.135	0.239
	(0.076)	(0.070)*	(0.046)***
U.S.Current Whey Promotion	0.053	-0.002	-0.051
	(0.091)	(0.089)	(0.060)
U.S.Lagged Whey Promotion	-0.036	0.009	0.027
	(0.062)	(0.060)	(0.040)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 35: Parameter Estimates of Mexico Import Demand for Whey using Rotterdam Model

Independent variable	U.S.	EU	ROW
Intercept	-0.045	-0.034	0.079
	(0.038)	(0.035)	(0.024)***
Price of whey from U.S.	-0.116	-0.004	0.121
	(0.043)**	(0.033)	(0.020)***
Price of whey from EU		0.027	-0.023
		(0.031)	(0.015)
Price of whey from ROW			-0.098
			(0.015)***
Expenditure	0.740	-0.027	0.287
	(0.076)	(0.068)	(0.044)***
U.S.Current Whey Promotion	0.045	0.011	-0.056
	(0.091)	(0.085)	(0.057)
U.S.Lagged Whey Promotion	-0.030	-0.004	0.034
	(0.062)	(0.058)	(0.039)

** Significant at the 5% level, *** significant at the 1% level.

Table 36: Parameter Estimates of South Korea Import Demand for Whey using CBS Model

Independent variable	U.S.	EU	ROW
Intercept	0.088	-0.116	0.028
	(0.060)	(0.052)**	(0.024)
Price of whey from U.S.	-0.537	0.403	0.133
	(0.192)**	(0.153)**	(0.063)**
Price of whey from EU		-0.454	0.051
		(0.130)***	(0.046)
Price of whey from ROW			-0.184
			(0.030)***
Expenditure	0.163	-0.144	-0.019
	(0.144)	(0.123)	(0.056)
U.S.Current Whey Promotion	0.050	-0.029	-0.021
	(0.077)	(0.067)	(0.030)
U.S.Lagged Whey Promotion	0.001	-0.002	0.0005
	(0.008)	(0.007)	(0.003)

** Significant at the 5% level, *** significant at the 1% level.

Table 37 Parameter Estimates of Thailand Import Demand for Whey using Rotterdam Model

Independent variable	U.S.	EU	Australia	ROW
Intercept	0.042	-0.043	0.004	-0.003
	(0.041)	(0.038)	(0.026)	(0.011)
Price of whey from U.S.	-0.200	0.286	-0.078	-0.008
	(0.182)	(0.126)**	(0.113)	(0.033)
Price of whey from EU		-0.280	-0.019	0.013
		(0.130)**	(0.082)	(0.029)
Price of whey from Australia			0.073	0.025
			(0.103)	(0.023)
Price of whey from ROW				-0.030
				(0.010)***
Expenditure	0.509	0.444	0.018	0.029
	(0.116)***	(0.111)***	(0.074)	(0.031)
U.S.Current Whey Promotion	-0.045	-0.042	0.077	0.010
	(0.070)	(0.067)	(0.045)*	(0.019)
U.S.Lagged Whey Promotion	0.044	0.002	-0.030	-0.016
	(0.065)	(0.062)	(0.041)	(0.018)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 38: Marshallian Price Elasticities and Estimates of the Seasonality Variable for Mexican Whey Import Demand using the CBS model

Independent variable	U.S.	EU	ROW
Price of whey from U.S.	-0.865	0.229	-2.00759
	(0.092)***	(0.672)	(0.646)***
Price of whey from EU	-0.095	0.375	-0.87136
	(0.041)**	(0.329)	(0.247)***
Price of whey from ROW	0.085	-0.256	-1.664
	(0.025)***	(0.167)	(0.224)***
Quarter II	0.026	0.013	-0.039
	(0.047)	(0.045)	(0.031)
Quarter III	0.015	0.101	-0.116
	(0.054)	(0.051)*	(0.035)***
Quarter IV	0.110	0.017	-0.127
	(0.054)*	(0.053)	(0.036)***

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 39: Estimated Promotion, Expenditure, and Hicksian Elasticities for Mexican Whey Import Demand using the CBS model

Independent variable	U.S.	EU	ROW
Price of whey from U.S.	-0.136	-0.060	1.7736
	(0.052)**	(0.335)	(0.300)***
Price of whey from EU	-0.007	0.340	-0.416
	(0.040)	(0.322)	(0.238)*
Price of whey from ROW	0.144	-0.280	-1.358
	(0.024)***	(0.160)*	(0.224)***
Expenditure	0.875	-0.348	4.543
	(0.091)***	(0.700)	(0.688)***
U.S.Current Whey Promotion	0.064	-0.022	-0.757
	(0.109)	(0.885)	(0.891)
U.S.Lagged Whey Promotion	-0.043	0.090	0.398
	(0.074)	(0.597)	(0.602)
U.S.Total Whey Promotion[a]	0.021	0.068	-0.360
	(0.110)	(0.889)	(0.901)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 40: Marshallian Price Elasticities and Estimates of the Seasonality Variable for Mexican Whey Import Demand using the Rotterdam model

Independent variable	U.S.	EU	ROW
Price of whey from U.S.	-0.880	0.182	-1.75965
	(0.065)***	(0.501)	(0.501)***
Price of whey from EU	-0.094	0.299	-0.76792
	(0.045)*	-0.348	(0.256)***
Price of whey from ROW	0.085	-0.211	-1.735
	(0.027)***	(0.167)	(0.232)***
Quarter II	0.030	0.007	-0.036
	(0.047)	(0.043)	(0.030)
Quarter III	0.020	0.095	-0.115
	(0.054)	(0.049)*	(0.034)***
Quarter IV	0.110	0.022	-0.132
	(0.055)*	(0.051)	(0.035)***

* Significant at the 10% level, *** significant at the 1% level.

Table 41: Estimated Promotion, Expenditure, and Hicksian Elasticities for Mexican Whey Import Demand using the Rotterdam model

Independent variable	U.S.	EU	ROW
Price of whey from U.S.	-0.140	-0.043	1.78845
	(0.0520)**	(0.334)	(0.298)***
Price of whey from EU	-0.005	0.272	-0.3407
	(0.040)	(0.313)	(0.228)
Price of whey from ROW	0.145	-0.229	-1.448
	(0.024)***	(0.153)	(0.216)***
Expenditure	0.889	-0.270	4.263
	(0.091)***	(0.678)	(0.659)***
U.S.Current whey Promotion	0.054	0.111	-0.833
	(0.109)	(0.851)	(0.848)
U.S.Lagged whey Promotion	-0.036	-0.041	0.506
	(0.075)	(0.574)	(0.574)
U.S.Total whey Promotion[a]	0.018	0.070	-0.327
	(0.110)	(0.854)	(0.858)

** Significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 42: Marshallian Price Elasticities and Estimates of the Seasonality Variable for South Korean Whey Import Demand using the CBS model

Independent variable	U.S.	EU	ROW
Price of whey from U.S.	-1.811	0.667	0.614
	(0.454)***	(0.388)*	(0.513)
Price of whey from EU	0.330	-1.356	0.018
	(0.369)	(0.339)***	(0.398)
Price of whey from ROW	0.116	0.033	-1.492
	(0.147)	(0.118)	(0.235)***
Quarter II	-0.134	0.169	-0.035
	(0.104)	(0.090)*	(0.041)
Quarter III	-0.065	0.113	-0.048
	(0.068)	(0.059)*	(0.027)*
Quarter IV	-0.144	0.157	-0.013
	(0.103)	(0.091)*	(0.041)

* Significant at the 10% level, *** significant at the 1% level.

Table 43: Estimated Promotion, Expenditure, and Hicksian Elasticities for South Korean Whey Import Demand using the CBS model

Independent variable	U.S.	EU	ROW
Price of whey from U.S.	-1.202	0.960	0.998
	(0.430)**	(0.364)**	(0.470)**
Price of whey from EU	0.903	-1.081	0.379
	(0.342)**	(0.314)***	(0.347)
Price of whey from ROW	0.299	0.120	-1.377
	(0.141)**	(0.110)	(0.226)***
Expenditure	1.365	0.657	0.860
	(0.327)***	(0.300)**	(0.462)*
U.S.Current whey Promotion	0.112	-0.069	-0.135
	(0.274)	(0.262)	(0.375)
U.S.Lagged whey Promotion	0.003	-0.004	-0.009
	(0.013)	(0.012)	(0.018)
U.S.Total whey Promotion[a]	0.114	-0.073	-0.152
	(0.271)	(0.258)	(0.371)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 44: Marshallian Price Elasticities and Estimates of the Seasonality Variable for Thailand Whey Import Demand using the Rotterdam model

Independent variable	U.S.	EU	Australia	ROW
Price of whey from U.S.	-1.104	0.254	-0.886	-0.594
	(0.567)*	(0.250)	(1.232)	(1.166)
Price of whey from EU	0.035	-0.963	-0.300	-0.103
	(0.399)	(0.264)***	(0.909)	(1.089)
Price of whey from Australia	-0.377	-0.113	0.745	0.732
	(0.337)	(0.154)	(1.083)	(0.763)
Price of whey from ROW	-0.068	-0.001	0.253	-1.022
	(0.096)	(0.053)	(0.236)	(0.333)***
Quarter II	-0.020	0.054	-0.039	0.004
	(0.059)	(0.054)	(0.038)	(0.016)
Quarter III	-0.091	0.114	-0.012	-0.010
	(0.053)*	(0.050)**	(0.034)	(0.014)
Quarter IV	-0.023	-0.005	0.016	0.012
	(0.055)	(0.053)	(0.035)	(0.015)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 45: Estimated Promotion, Expenditure, and Hicksian Elasticities for Thailand Whey Import Demand using the Rotterdam model

Independent variable	U.S	EU	Australia	ROW
Price of whey from U.S.	-0.596	0.531	-0.822	-0.262
	(0.542)	(0.234)**	(1.186)	(1.085)
Price of whey from EU	0.852	-0.519	-0.199	0.429
	(0.376)**	(0.240)**	(0.860)	(0.958)
Price of whey from Australia	-0.233	-0.035	0.763	0.826
	(0.336)	(0.152)	1.081	(0.757)
Price of whey from ROW	-0.023	0.024	0.258	-0.993
	(0.096)	(0.053)	(0.237)	(0.331)***
Expenditure	1.514	0.824	0.189	0.987
	(0.345)***	(0.205)***	(0.775)	(1.056)
U.S.Current whey Promotion	-0.134	-0.078	0.809	0.326
	(0.208)	(0.123)	(0.468)*	(0.639)
U.S.Lagged whey Promotion	0.130	0.004	-0.313	-0.536
	(0.193)	(0.115)	(0.434)	(0.598)
U.S.Total whey Promotion[a]	-0.003	-0.074	0.496	-0.210
	(0.195)	(0.116)	(0.438)	(0.599)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 46: Parameter Estimates of Mexico Import Demand for NFDM using Rotterdam Model

Independent variable	U.S.	EU	Canada	New Zealand	ROW
Intercept	-0.249	-0.031	0.095	0.014	0.170
	(0.136)*	(0.199)	(0.079)	(0.067)	(0.212)
Price of NFDM from U.S.	0.098	0.052	-0.027	-0.093	-0.031
	(0.254)	(0.281)	(0.132)	(0.145)	(0.372)
Price of NFDM from EU		-0.940	0.120	0.321	0.446
		(0.389)**	(0.159)	(0.321)	(0.518)
Price of NFDM from Canada			-0.025	-0.126	0.057
			(0.078)	(0.072)*	(0.105)
Price of NFDM from N/Zealand				-0.223	0.121
				(0.136)	(0.184)
Price of NFDM from ROW					-0.593
					(0.110)**
Expenditure	0.254	0.092	0.137	-0.046	0.563
	(0.227)	(0.406)	(0.162)	(0.104)	(0.537)
U.S.Current NFDM Promotion	0.001	0.003	-0.004	-0.001	0.002
	(0.007)	(0.010)	(0.003)	(0.005)	(0.010)
U.S.Lagged NFDM Promotion	0.008	-0.007	0.002	-0.004	0.000
	(0.014)	(0.008)	(0.004)	(0.003)	(0.006)

* Significant at the 10% level, *** significant at the 1% level.

Table 47: Parameter Estimates of Japanese Import Demand for NFDM using Rotterdam Model

Independent variable	U.S.	EU	Australia	New Zealand	Ukraine	ROW
Intercept	0.096	-0.146	-0.082	0.060	-0.053	0.125
	(0.080)	(0.040)***	(0.082)	(0.050)	(0.055)	(0.069)*
Price of NFDM from U.S.	0.006	0.026	-0.005	-0.013	-0.044	0.030
	(0.028)	(0.013)*	(0.028)	(0.016)	(0.017)**	(0.023)
Price of NFDM from EU		-0.156	-0.194	0.068	0.160	0.096
		(0.013)*	(0.135)	(0.077)	(0.093)	(0.110)
Price of NFDM from Australia			-0.112	-0.071	0.227	0.154
			(0.477)	(0.258)	(0.274)	(0.376)
Price of NFDM from N/Zealand				-0.348	0.076	0.288
				(0.196)*	(0.194)	(0.221)
Price of NFDM from Ukraine					-0.107	-0.313
					(0.348)	(0.361)
Price of NFDM from ROW						-0.256
						(0.023)
Expenditure	0.036	0.155	0.387	0.280	0.106	0.035
	(0.071)	(0.035)***	(0.078)***	(0.048)***	(0.051)*	(0.067)
U.S.Current NFDM Promotion	0.002	-0.007	0.003	-0.002	0.002	0.001
	(0.005)	(0.002)***	(0.004)	(0.002)	(0.003)	(0.004)
U.S.Lagged NFDM Promotion	-0.001	-0.002	0.002	0.000	-0.002	0.003
	(0.004)	(0.002)	(0.005)	(0.003)	(0.003)	(0.004)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 48: Parameter Estimates of Thailand Import Demand for NFDM using Rotterdam Model

Independent variable	U.S	EU	Australia	New Zealand	ROW
Intercept	0.249	-0.226	0.024	-0.081	0.033
	(0.106)**	(0.102)*	(0.086)	(0.046)*	(0.051)
Price of NFDM from U.S.	-0.067	0.086	-0.059	-0.269	0.310
	(0.262)	(0.238)	(0.206)	(0.109)**	(0.120)**
Price of NFDM from EU		-0.159	0.142	-0.144	0.075
		(0.728)	(0.636)	(0.343)	(0.275)
Price of NFDM from Australia			0.066	-0.126	-0.023
			(0.718)	(0.374)	(0.284)
Price of NFDM from N/Zealand				0.453	0.086
				(0.434)	(0.173)
Price of NFDM from ROW					-0.449
					(0.024)
Expenditure	0.448	0.193	0.207	0.117	0.036
	(0.095)***	(0.090)***	(0.077)**	(0.041)***	(0.047)
U.S.Current NFDM Promotion	-0.010	0.009	-0.003	-0.004	0.007
	(0.008)	(0.008)	(0.008)	(0.004)	(0.004)*
U.S.Lagged NFDM Promotion	0.003	-0.002	0.001	0.000	-0.002
	(0.008)	(0.008)	(0.007)	(0.004)	(0.004)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 49: Marshallian Price Elasticities and Estimates of the Seasonality Variable for Mexican NFDM Import Demand using the Rotterdam model

Independent variable	U.S.	EU	Canada	New Zealand	ROW
Price of NFDM from U.S.	-0.054	0.035	-0.763	-0.674	-4.308
	(0.603)	(1.683)	(1.059)	(1.478)	(5.309)
Price of NFDM from EU	-0.001	-4.578	0.746	3.155	4.593
	(0.612)	(1.990)**	(1.303)	(3.080)	(7.271)
Price of NFDM from Canada	-0.118	0.521	-0.339	-1.144	0.721
	(0.255)	(0.826)	(0.645)	(0.704)	(1.489)
Price of NFDM from N/Zealand	-0.244	1.487	-1.138	-2.080	-0.031
	(0.296)	(1.486)	(0.575)*	(1.265)	(2.562)
Price of NFDM from ROW	-0.100	2.097	0.383	1.183	-8.873
	(0.746)	(2.469)	(0.853)	(1.747)	(2.351)***
Quarter II	0.427	0.121	-0.098	-0.104	-0.347
	(0.202) **	(0.275)	(0.107)	(0.100)	(0.318)
Quarter III	0.451	-0.230	-0.105	-0.043	-0.073
	(0.157) ***	(0.292)	(0.097)	(0.078)	(0.224)
Quarter IV	0.291	0.150	-0.185	0.075	-0.331
	(0.196)	(0.356)	(0.143)	(0.113)	(0.394)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 50: Estimated Promotion, Expenditure, and Hicksian Elasticities for Mexican NFDM Import Demand using Rotterdam Model

Independent variable	U.S.	EU	Canada	New Zealand	ROW
Price of NFDM from U.S.	0.200	0.250	-0.217	-0.890	-0.431
	(0.517)	(1.342)	(1.002)	(1.382)	(5.207)
Price of NFDM from EU	0.107	-4.486	0.979	3.062	6.247
	(0.573)	(1.855)**	(1.296)	(3.062)	(7.260)
Price of NFDM from Canada	-0.054	0.575	-0.202	-1.198	0.797
	(0.251)	(0.761)	(0.634)	(0.688)*	(1.471)
Price of NFDM from N/Zealand	-0.190	1.533	-1.021	-2.126	1.692
	(0.295)	(1.532)	(0.586)*	(1.295)	(2.570)
Price of NFDM from ROW	-0.063	2.128	0.462	1.152	-8.310
	(0.757)	(2.473)	(0.854)	(1.749)	(2.398)***
Expenditure	0.517	0.438	1.111	-0.440	7.892
	(0.462)	(1.936)	(0.530)**	(0.663)	(1.691)***
U.S.Current NFDM Promotion	0.002	0.015	-0.036	-0.014	0.023
	(0.015)	(0.048)	(0.026)	(0.031)	(0.082)
U.S.Lagged NFDM Promotion	0.017	-0.032	0.017	-0.036	0.002
	(0.028)	(0.038)	(0.026)	(0.031)	(0.083)
U.S.Total NFDM Promotion[a]	0.019	-0.017	-0.019	-0.050	0.025
	(0.031)	(0.055)	(0.034)	(0.039)	(0.112)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 51: Marshallian Price Elasticities and Estimates of the Seasonality Variable of Japanese NFDM Import Demand using the Rotterdam model

Independent variable	U.S.	EU	Australia	New Zealand	Ukraine	ROW
Price of NFDM from U.S.	0.023	0.073	-0.385	-0.149	-0.254	0.182
	(0.277)	(0.106)	(0.254)	(0.062)**	(0.086)***	(0.175)
Price of NFDM from EU	0.201	-1.341	-2.093	0.108	0.676	0.636
	(0.158)	(0.575)**	(1.160)*	(0.270)	(0.430)	(0.769)
Price of NFDM from Australia	-0.085	-1.612	-1.343	-0.362	0.991	1.038
	(0.279)	(1.037)	(4.115)	(0.913)	(1.276)	(2.629)
Price of NFDM from N/Zealand	-0.226	0.176	-1.548	-1.498	0.211	1.927
	(0.246)	(0.566)	(2.106)	(0.658)**	(0.858)	(1.461)
Price of NFDM from Ukraine	-0.497	0.962	1.223	0.053	-0.598	-2.217
	(0.224)**	(0.715)	(2.375)	(0.693)	(1.626)	(2.532)
Price of NFDM from ROW	0.255	0.562	0.838	0.868	-1.514	-1.807
	(0.243)	(0.826)	(3.172)	(0.763)	(1.651)	(3.439)
Quarter II	-0.220	0.224	0.311	-0.022	-0.086	-0.206
	(0.151)	(0.072)***	(0.144)**	(0.083)	(0.090)	(0.120)
Quarter III	-0.046	0.122	-0.036	-0.100	0.262	-0.201
	(0.081)	(0.043)**	(0.092)	(0.061)	(0.072)***	(0.082)**
Quarter IV	-0.093	0.183	0.061	-0.134	0.084	-0.102
	(0.137)	(0.068)**	(0.136)*	(0.081)	(0.087)	(0.114)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Table 52: Estimated Promotion, Expenditure, and Hicksian Elasticities of Japanese NFDM Import Demand using Rotterdam model

Independent variable	U.S.	EU	Australia	New Zealand	Ukraine	ROW
Price of NFDM from U.S.	0.059	0.196	-0.039	-0.046	-0.203	0.207
	(0.271)	(0.102)*	(0.236)	(0.056)	(0.080)**	(0.162)
Price of NFDM from EU	0.247	-1.186	-1.658	0.237	0.741	0.668
	(0.128)*	(0.572)*	(1.158)	(0.270)	(0.428)*	(0.761)
Price of NFDM from Australia	-0.044	-1.474	-0.956	-0.247	1.049	1.067
	(0.264)	(1.030)	(4.078)	(0.902)	(1.263)	(2.602)
Price of NFDM from N/Zealand	-0.127	0.513	-0.603	-1.218	0.350	1.997
	(0.154)	(0.586)	(2.202)	(0.687)*	(0.896)	(1.529)
Price of NFDM from Ukraine	-0.421	1.218	1.940	0.266	-0.492	-2.165
	(0.165)**	(0.703)*	(2.336)	(0.679)	(1.607)	(2.496)
Price of NFDM from ROW	0.287	0.732	1.316	1.010	-1.444	-1.771
	(0.223)	(0.834)	(3.211)	(0.773)	(1.665)	(3.465)
Expenditure	0.347	1.179	3.307	0.980	0.488	0.243
	(0.679)	(0.266)***	(0.668)***	(0.169)***	(0.237)*	(0.465)
U.S.Current NFDM Promotion	0.020	-0.049	0.029	-0.006	0.009	0.006
	(0.004)	(0.016)***	(0.037)	(0.009)	(0.012)	(0.025)
U.S.Lagged NFDM Promotion	-0.009	-0.016	0.015	0.001	-0.009	0.021
	(0.042)	(0.017)	(0.041)	(0.009)	(0.014)	(0.029)
U.S.Total NFDM Promotion[a]	0.011	-0.065	0.044	-0.005	0.0001	0.027
	(0.046)	(0.017)***	(0.040)	(0.009)	(0.014)	(0.029)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 53: Marshallian Price Elasticities and Estimates of the Seasonality Variable for Thailand NFDM Import Demand using the Rotterdam model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Price of NFDM from U.S.	-1.452	0.204	-0.233	-1.393	4.923
	(3.915)	(0.665)	(0.649)	(0.547) **	(1.916)**
Price of NFDM from EU	-1.114	-0.637	0.217	-0.937	1.001
	(3.646)	(2.052)	(2.022)	(1.741)	(4.431)
Price of NFDM from Australia	-2.995	0.228	0.005	-0.819	1.204
	(3.113)	(1.773)	(2.288)	(1.889)	(4.554)
Price of NFDM from N/Zealand	-5.371	-0.511	-0.533	2.161	-0.483
	(1.658)***	(0.956)	(1.180)	(2.174)	(2.771)
Price of NFDM from ROW	4.226	0.177	-0.115	0.397	-7.216
	(1.799)**	(0.766)	(0.895)	(0.868)	(3.268)**
Quarter II	-0.479	0.525	-0.057	0.067	-0.057
	(0.182)**	(0.175)***	(0.149)	(0.081)	(0.088)
Quarter III	-0.089	0.274	-0.159	0.059	-0.085
	(0.029)	(0.124)**	(0.105)	(0.054)	(0.062)
Quarter IV	-0.379	0.101	0.090	0.224	-0.036
	(0.162)**	(0.152)	(0.130)	(0.067)***	(0.078)

** Significant at the 5% level, *** significant at the 1% level.

Table 54: Estimated Promotion, Expenditure, and Hicksian Elasticities for Thailand NFDM Import Demand using the Rotterdam model

Independent variable	U.S.	EU	Australia	New Zealand	ROW
Price of NFDM from U.S.	-1.004	0.240	-0.189	-1.353	4.961
	(3.920)	(0.666)	(0.650)	(0.548)**	(1.919)**
Price of NFDM from EU	1.286	-0.444	0.453	-0.726	1.205
	(3.572)	(2.034)	(2.010)	(1.724)	(4.394)
Price of NFDM from Australia	-0.890	0.397	0.211	-0.633	-0.370
	(3.082)	(1.778)	(2.287)	(1.881)	(4.541)
Price of NFDM from N/Zealand	-4.036	-0.403	-0.402	2.278	1.383
	(1.634)**	(0.958)	(1.182)	(2.181)*	(2.769)
Price of NFDM from ROW	4.645	0.210	-0.074	0.434	-7.180
	(1.797)**	(0.767)	(0.896)	(0.869)	(3.273)**
Expenditure	6.706	0.538	0.659	0.590	0.570
	(1.032)***	(0.181)***	(0.202)***	(0.158)***	(0.548)
U.S.Current NFDM Promotion	-0.149	0.026	-0.011	-0.018	0.120
	(0.121)	(0.023)	(0.024)	(0.019)	(0.067)*
U.S.Lagged NFDM Promotion	0.039	-0.004	0.002	0.001	-0.032
	(0.123)	(0.022)	(0.024)	(0.019)	-0.066
U.S.Total NFDM Promotion[a]	-0.109	0.022	-0.008	-0.017	0.087
	(0.147)	(0.028)	(0.029)	(0.023)	(0.084)

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 55: Marginal Returns to U.S. Cheese Promotion Expenditures

Mexico (CBS)	U.S.	EU	Uruguay	New Zealand	ROW
U.S.Current Cheese Promotion	29.85	6.19	-9.51	-15.42	-10.70
U.S.Lagged Cheese Promotion	-8.97	-6.70	7.40	0.97	8.40
U.S.Total Cheese Promotion[a]	20.95	-0.49	-2.13	-14.48	-2.33

South Korea (CBS)	U.S.	EU	Australia	New Zealand	ROW
U.S.Current Cheese Promotion	-1.08	11.32	16.37	-6.95	-80.25**
U.S.Lagged Cheese Promotion	-9.45***	6.00*	-0.82	3.25	5.93
U.S.Total Cheese Promotion[a]	-10.50	17.34**	15.63	-3.74	-74.68*

South Korea (Rotterdam)	U.S.	EU	Australia	New Zealand	ROW
U.S.Current Cheese Promotion	-0.95	11.76	17.67	-7.46	-83.03**
U.S.Lagged Cheese Promotion	-10.63***	5.12	-1.81	6.06	6.97
U.S.Total Cheese Promotion[a]	-11.53	16.92**	15.94	-1.45	-76.44**

Japan (Rotterdam)	U.S.	EU	Australia	New Zealand	ROW
U.S.Current Cheese Promotion	4.98	-2.80	7.79	-6.68	-3.29
U.S.Lagged Cheese Promotion	-0.21	11.66	-22.09	5.39	5.12**
U.S.Total Cheese Promotion[a]	4.77	8.86	-14.31	-1.29	1.84

* Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.
[a] represents both current and lag promotion expenditure elasticities.

Table 56 Marginal Returns to U.S. Whey Promotion Expenditures

Mexico (CBS)

	U.S.	EU	ROW
U.S.Current Whey Promotion	19.85	-0.78	-20.85
U.S.Lagged Whey Promotion	-13.83	3.28	11.35
U.S.Total Whey Promotion[a]	6.63	2.43	-10.08

Mexico (Rotterdam)

	U.S.	EU	ROW
U.S.Current Whey Promotion	16.77	3.92	-22.94
U.S.Lagged Whey Promotion	-11.60	-1.49	14.44
U.S.Total Whey Promotion[a]	5.69	2.53	-9.18

South Korea (CBS)

	U.S.	EU	ROW
U.S.Current Whey Promotion	11.40	-6.53	-4.75
U.S.Lagged Whey Promotion	0.31	-0.42	0.12
U.S.Total Whey Promotion[a]	11.93	-7.07	-4.72

Thailand (Rotterdam)

	U.S.	EU	Australia	ROW
U.S.Current Whey Promotion	-5.98	-5.97	11.07*	1.36
U.S.Lagged Whey Promotion	6.47	0.31	-4.75	-2.48
U.S.Total Whey Promotion[a]	-0.15	-5.99	7.15	-0.92

* Significant at the 10% level.

[a] represents both current and lag promotion expenditure elasticities.

Table 57: Marginal Returns to U.S. NFDM Promotion Expenditures

Mexico (Rotterdam)

	U.S.	EU	Canada	NZ	ROW
U.S.Current NFDM Promotion	25.51	62.63	-78.40	-32.09	36.75
U.S.Lagged NFDM Promotion	194.88	-126.01	34.96	-81.63	2.87
U.S.Total NFDM Promotion[a]	224.27	-67.70	-40.85	-114.86	38.85

Thailand (Rotterdam)

	U.S.	EU	Australia	NZ	ROW
U.S.Current NFDM Promotion	-29.20	28.61	-9.47	-11.74	20.49*
U.S.Lagged NFDM Promotion	8.04	-5.09	2.20	0.86	-5.77
U.S.Total NFDM Promotion[a]	-21.88	24.17	-7.50	-11.12	15.23

Japan (Rotterdam)

	U.S.	EU	Australia	New Zealand	Ukraine	ROW
U.S.Current NFDM Promotion	16.11	-63.77**	38.87	-16.26	17.85	7.78
U.S.Lagged NFDM Promotion	-7.29	-20.09	19.73	1.53	-17.68	29.66
U.S.Total NFDM Promotion[a]	8.82	-83.86**	58.59	-14.73	0.17	37.44

* Significant at the 10% level, ** significant at the 5% level.
[a] represents both current and lag promotion expenditure elasticities.

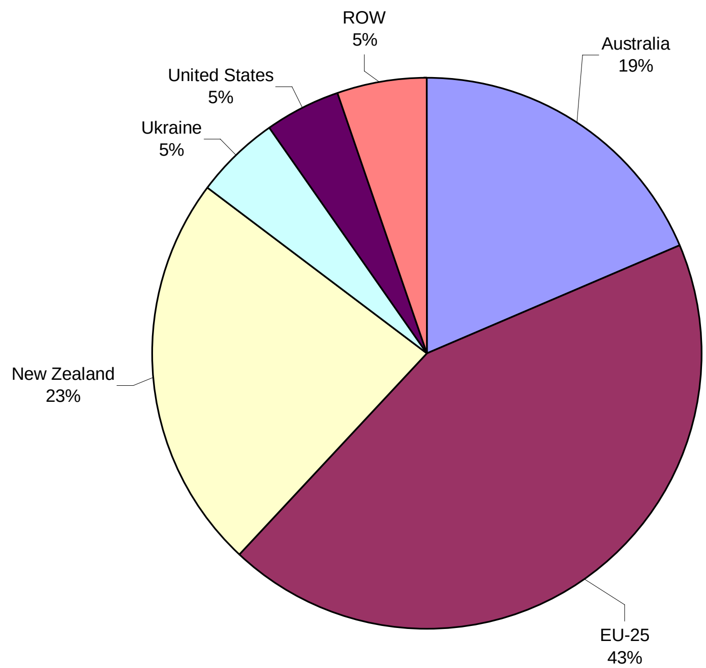

Figure 1: Major Exporters Global Volume Market Shares in Cheese, 2000-05 Average

Source: Based on Data Compiled from USDA/FAS. *Production, Supply, and Distribution. (USDA/FAS/PS & D), Official USDA Estimates.* Internet Site: http://www.fas.usda.gov/psd/psdselection.asp. (Accessed: August 4, 2006).

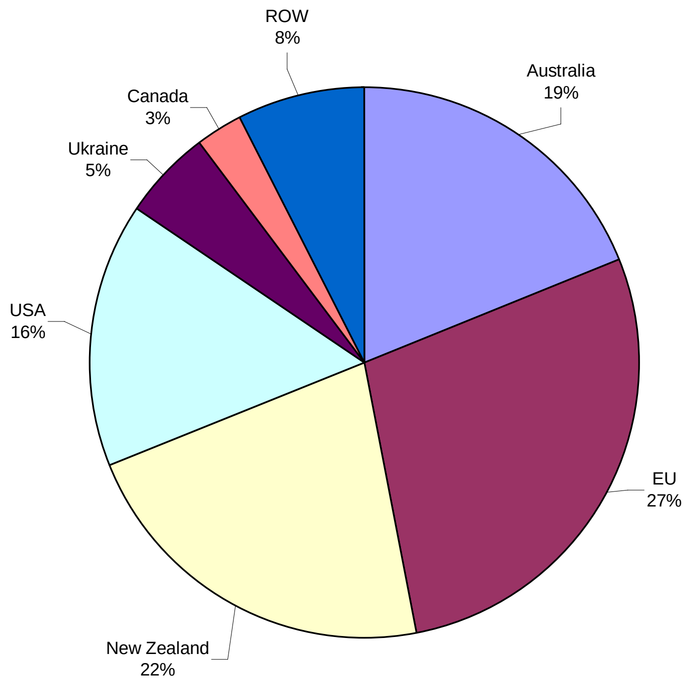

Figure 2: Major Exporters Global Volume Market Shares in NFDM, 2000-2005 Average

Source: Based on Data Compiled from USDA/FAS. *Production, Supply, and Distribution. (USDA/FAS/PS & D), Official USDA Estimates.* Internet Site: http://www.fas.usda.gov/psd/psdselection.asp. (Accessed: August 4, 2006).

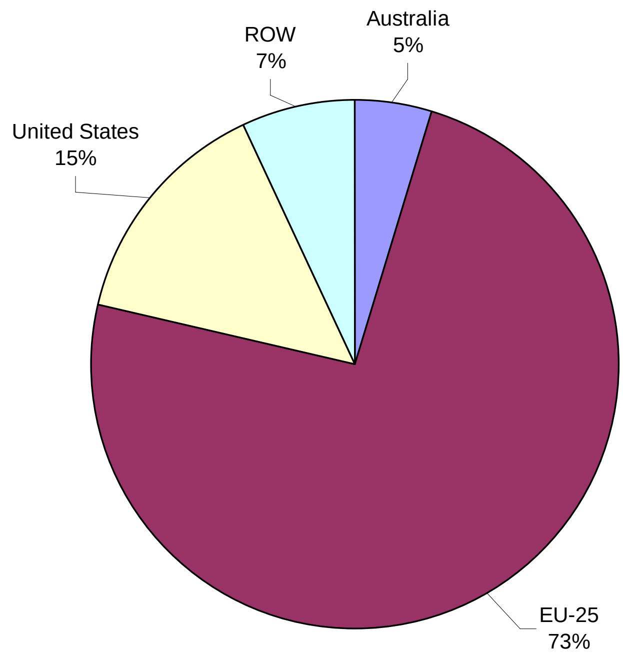

Figure 3: Major Exporters Global Volume Market Share in Dried Whey, 2000 -2005 Average

Source: Compiled from FAO Statistical Data (FAOSTAT). Internet Site: http://faostat.fao.org/faostat/collections?version=ext&hasbulk=0&subset=agriculture (Accessed: January 8, 2008).

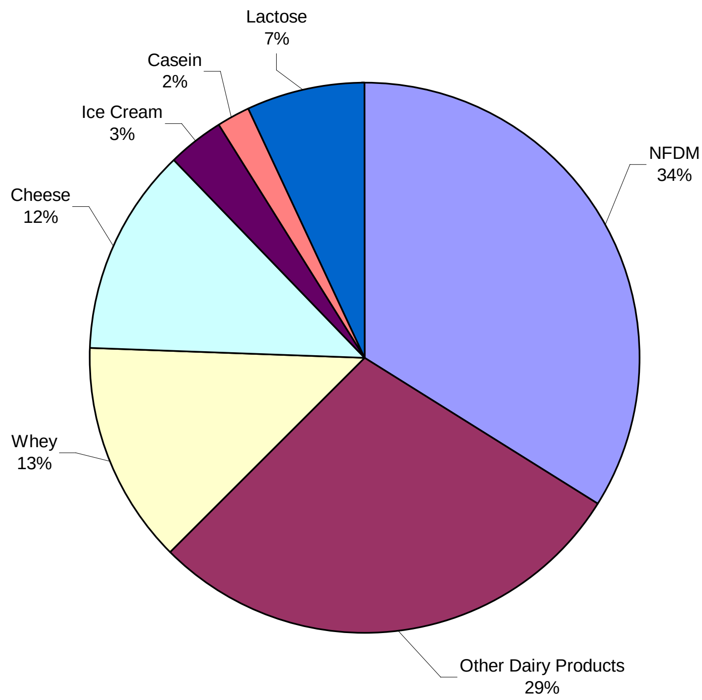

Figure 4: Composition of U.S. Dairy Exports' Value, 2005.

Source: Based on Data Compiled from USDA/ERS. *FATUS Export Aggregation*. Internet Site: http://www.fas.usda.gov/ustrdscripts/USReport.exe. (Accessed September 19, 2006).

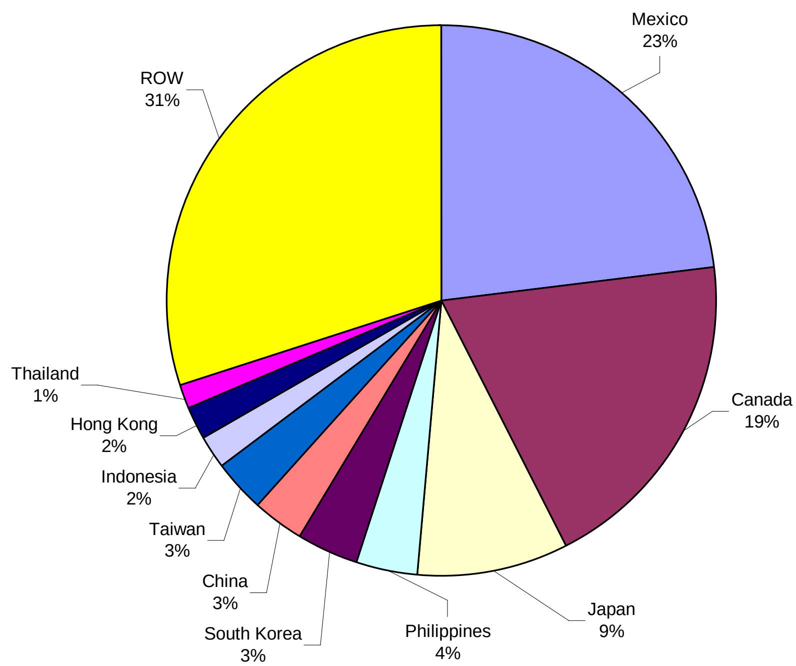

Figure 5: Top 10 Destinations for U.S. Dairy Products: 1998 – 2005 Total Values

Source: Based on Data Compiled from USDA/ERS. *FATUS Export Aggregation*. Internet Site: http://www.fas.usda.gov/ustrdscripts/USReport.exe. (Accessed September 19, 2006).

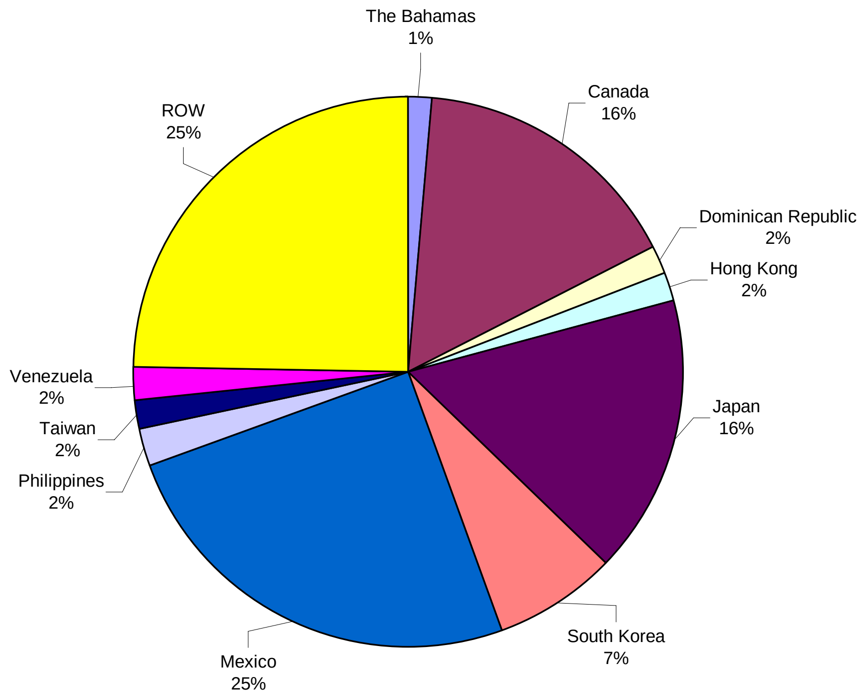

Figure 6: Top 10 Destinations for U.S. Cheese: 1998-2005 Total Values

Source: Based on Data Compiled from USDA/ERS. *FATUS Export Aggregation*. Internet Site: http://www.fas.usda.gov/ustrdscripts/USReport.exe.
(Accessed September 19, 2006).

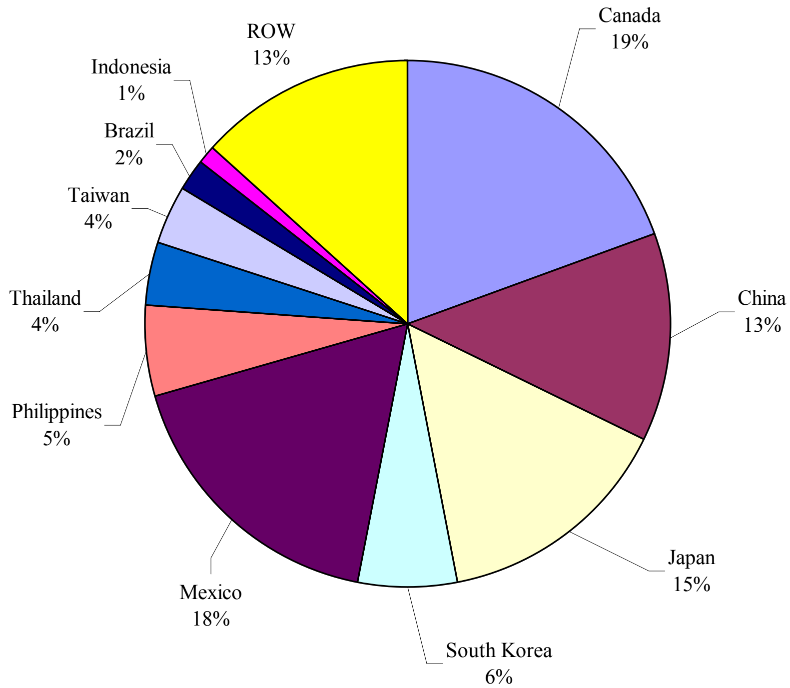

Figure 7: Top 10 Destinations for U.S. Whey: 1998-2005 Total Values

Source: Based on Data Compiled from USDA/ERS. *FATUS Export Aggregation*. Internet Site: http://www.fas.usda.gov/ustrdscripts/USReport.exe.
(Accessed September 19, 2006).

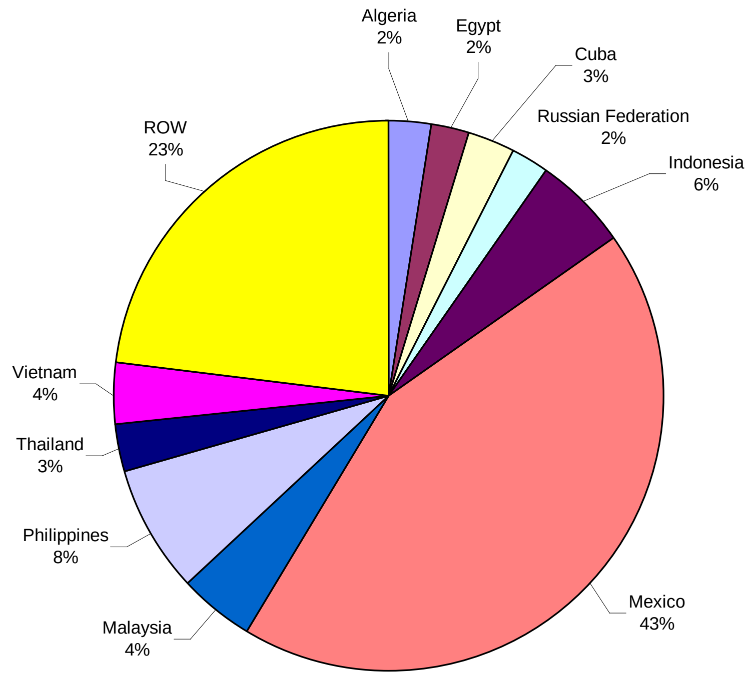

Figure 8: Top 10 Destinations for U.S. NFDM: 1998-2005 Total Values

Source: Based on Data Compiled from USDA/ERS. *FATUS Export Aggregation*. Internet Site: http://www.fas.usda.gov/ustrdscripts/USReport.exe.
(Accessed September 19, 2006).

VITA

Oluyemisi Yetunde Olukoya

Candidate for the Degree of

Doctor of Philosophy

Thesis: EFFECTIVENESS OF U.S. DAIRY EXPORT PROMOTION PROGRAMS IN SELECTED COUNTRIES

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Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: EFFECTIVENESS OF U.S. DAIRY EXPORT PROMOTION PROGRAMS IN SELECTED COUNTRIES

Pages in Study: 165 Candidate for the Degree of Doctor of Philosophy

Major Field: Agricultural Economics

Scope and Method of Study: The purpose of this study is to estimate the impact of U.S. dairy export promotion expenditures and determine the impacts of other factors affecting import demand for source differentiated whey, cheese, and nonfat dry milk (NFDM) in selected countries, using different versions of the differential demand systems. A model selection test was performed by using a general model that nests four demand systems: Rotterdam, Almost Ideal Demand System (AIDS), Central Bureau of Statistics (CBS), and National Bureau of Research (NBR) in selecting the model which best explains consumer allocation decisions. Tests for symmetric weak separability among the dairy products in each country were conducted.

Findings and Conclusions: The dairy products are estimated separately, based on the results of separability tests. The Rotterdam model best fits the import demand for cheese and NFDM in Japan; whey and NFDM in Thailand; cheese in South Korea; and whey and NFDM in Mexico while the CBS is used in estimating import demand for cheese and whey in South Korea; and cheese and whey in Mexico. The U.S. might be able to use price as an advantage in competing with other suppliers of cheese in South Korea and whey in Mexico. The U.S. has the most elastic expenditure elasticity in the whey import markets in South Korea, and Thailand; and in the NFDM import market in Thailand. There is a diverse degree of significant substitutability and complementarily relationships among the different sources of imports. Demand for U.S. dairy products appear to be non-responsive to U.S. dairy export promotion efforts in all the markets studied, with the exception of the South Korean cheese market. The decreasing marginal returns to cheese promotion expenditures in South Korea calls for caution in the allocation of promotion expenditures in this market. Low levels of promotion expenditures or ineffective allocation of funds to promotion activities could have accounted for non responsiveness of these markets to the U.S. dairy export promotion expenditures. Seasonality tends to play a role in the import demand for these dairy products.

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