RURAL ECONOMY

Analysis of East Asian Meat Import Demand:
Market Prospects for Alberta and Canada

Michele M. Veeman, Terrence S. Veeman and Shiferaw Adilu

Project Report 02-04
AARI Project #990030

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Abstract

This study focuses on the demand for meat and the market vulnerabilities that apply to four selected Asian markets that are of potential importance to meat exporters. The markets identified for this purpose are Japan, South Korea, Indonesia, and Singapore. An initial overview of market prospects and vulnerabilities based on previous studies is reported. Detailed assessments of import demand and substitution between various meats for meat exports from Canada/Alberta to each of these markets was also undertaken. This required collection and analysis of extensive data relating to consumption and imports of major meat groups in the four Asian countries. Two different econometric models were applied. These included source-differentiated Almost Ideal Import Demand Systems and Multiple Competitive Interaction models. Detailed estimates are reported of the substitution tendencies, in the form of cross-elasticities between various meats (beef, pork, poultry and other) and between different sources of the various meats. Meat sources include Canada, the United States, European Union, Oceania, Developing Asia and others. Developing Asia exports reflect that Thailand, Taiwan and China are all major meat exporters to other countries in Asia; Latin America is also a significant exporter of beef to some countries in this region.

Market share elasticities are negative and significant with respect to own prices in almost all cases in each of the four importing countries. Furthermore, the own price elasticities are elastic in the majority of cases except in the meat import market of South Korea. It can be concluded that the meat market in East Asia is very price responsive

and that price is the most important determinant of meat market share in these countries.

Cross-price elasticities may be grouped into two classes: cross price elasticities between same products from different sources (e.g., between U.S. beef and beef from Oceania in the Japanese beef import market) and cross price elasticities between goods (e.g., between U.S. beef and poultry from any source in the Japanese meat import market). Findings about cross product-price elasticities are not as conclusive as the own price elasticities. The cross-elasticities are positive only in 61 percent of the cases. In Indonesia, Japan, and Singapore, substitution relationships are more prevalent in pork import markets than in any other meat market, while in South Korea, such relationships are more prevalent in the beef import market than in any other meat market. This implies that competition is stiffer in the pork and beef markets of these countries.

A combination of high expenditure elasticity for imports and inelastic own price elasticity for imports from a given exporter imply strong export potential for that export source in a given import market. The U.S. appears to enjoy such a position in Indonesia, Japan, and South Korea for most of the meats for which it is a major exporter. Canada faces elastic own price and expenditure elasticities in its pork exports to both Japan and South Korea, but inelastic own price and expenditure elasticities in the beef market of South Korea.

Although East Asian meat import markets are dominated by the closely located exporters of Australia, New Zealand and some Asian countries, significant swings are observed in the market shares of these sources from time to time, particularly in

Indonesia and South Korea. Thus there are real opportunities for more distant exporters, like Canada, to take advantage of these. This will require strategic planning, to build the information capacity to service these markets through knowledge of their preferences, organizations and trade practices. It will also require appropriate positioning, through aggressive, appropriately directed, effective promotion and development activities. Investment in market information is necessary to improve both capacity and positioning activities. Even so, price and quality are important features for the potential of export to these markets to be achieved. Investment in food safety provisions, and development of an associated “safe food” image is likely to be an important feature of reputation in this context.

1. Introduction: The Purpose for and Benefits of this Study to Alberta's Agriculture

The newly industrialized countries of Asia, including Indonesia, Thailand, Taiwan and Singapore, as well as their high-income neighbour, Japan, have been viewed as major sources of future growth in high value agricultural products, meats in particular. These nations are appreciable and growing consumers of chicken, pork and beef. Imports account for a growing proportion of their consumption and it is expected that this will increase due to income growth in these nations, limits to local production, and continuing trade liberalization effected through the World Trade Organization (WTO).

This project had objectives to: identify significant target markets for meat imports by selected Asian nations that are of major potential significance to Alberta and Canada and to provide detailed assessments of market potential and vulnerabilities of these markets. Four potential export markets for major meats and related value-added foods were identified for detailed assessment in the study; their selection was based on existing information, previous studies, and the advice of representatives of the Canadian meat industry and government trade officials. The selected markets for meat that are the focus of this study are Japan, South Korea, Indonesia and Singapore,

Canada may be at a relative comparative disadvantage in some segments of these markets, due to their closer location to Australia and New Zealand, which are major exporters of grass-fed beef and mutton/lamb, and since regional export market development, especially in high income Asian markets, has been a more longstanding focus for meat industry bodies in Australia and New Zealand. However, very substantial growth in facilities and production in the Canadian hog sector has been embarked upon in recent years, based in large measure on favourable anticipation of income-led growth

in Asian market demand for meat. In recent years Canadian meat industry groups have become more focused on off-shore export market development.

That these markets have vulnerabilities was evident from the events of the “Asian financial crisis” that dampened growth, lowered levels of income and employment and reduced consumption. This affected world prices for a variety of resource and agricultural products. It is not clear how fast these economies will rebound to pre-crisis levels of income or whether their “pre-crisis” growth rates can be achieved or sustained. The disarray in Asian and other financial markets has led to regulatory changes for some national financial institutions, as well as adjustments in international financial management procedures. These have the capacity to moderate the severity of outcomes from future national financial crises in such economies. However, there are other sources of variability in world meat markets. These include disease problems or constraints on production that may limit other competitors’ access to particular markets. It is difficult to predict the frequency and extent of impacts on market prices from these sources. Thus one focus of this study is the identification of specific issues and sources of market vulnerability and uncertainty associated with the selected markets. The vulnerabilities that we identify focus on the ability of Canada/Alberta, relative to other major exporters, to penetrate the selected Asian markets for meat imports. A market strategy that emphasizes the need for market information is of particular importance in this context.

A further major focus of this study is to provide a detailed assessment of meat import demand in four selected Asian markets, namely Indonesia, Japan, South Korea and Singapore, based on import demand models. For this purpose, two types of

econometric models are used. These examine the effects of both market and "non-market" factors on import demand for meat in the selected East Asian countries. These results are related to the competitive position of Canada/Alberta and/or strategies to improve this competitive position.

1.2 Report Organization

Section 1 of this report provides introductory information. In Section 2, background information on the market situations of four selected East Asian meat markets is summarized, projections drawn from the literature of previous studies are noted, and an outline is given of vulnerabilities in each market. This assessment is based on a review of existing studies by industry groups, governments and other sources. In Section 3, a summary is given of the methodology, estimation and results of one component of the detailed analysis of import market demand for the four selected regions. These analyses of import demand for Japan, South Korea, Indonesia and Singapore are based on results of source-differentiated Almost Ideal Demand System models. An alternative approach to analyze the competitive situations of exporters in a given import market is applied in Section 4 of the report. This model, drawn from business economics literature, is the multiple competitive interaction model (MCI). It is also applied to analyze meat import demand for Japan, South Korea, Indonesia and Singapore. The final section of the report summarizes the results and conclusions and draws implications of these for Alberta/Canada. Some results are presented in the form of Appendix tables and graphs.

2. East Asian Meat Market Situations and Vulnerabilities

2.1 Japan's Meat Market

Japan is the second largest economy in the world, with a population size in excess of 126 million and per capita income of over US$ 32,000 (1999). Expenditure on food products accounts on average for 20 percent of households' budgets. Seafood and meat make up the largest share of the food budget at 21 percent. With increased disposable household income, over the past half century, the food consumption pattern of Japanese consumers has changed; consumption of rice as the staple item has declined while consumption of livestock products, oils and fats, and beverages has increased. There is, as well, a marked change in dietary habits towards Western style foods, partly due to strong marketing efforts, notably by major exporters -- the US and Australia.

Increases in expenditure for food are mainly due to qualitative rather than quantitative changes in the Japanese diet; food consumption in Japan is mature and saturated in terms of total calorie requirements. Potential for growth in consumption has been assessed for the hotel, restaurant and institution sector, and in the retail sector, for non-grain crops, livestock, meat and dairy products, and for processed foods (Agriculture and Agri-food Canada, 1997).

Agricultural production including cereals, rice, dairy, beef, pork, fruits and vegetables has been steadily contracting in Japan, though Japan still maintains price and income supports and some protective measures on imported commodities in favour of its agricultural producers. These measures include tariffs, quotas, and non-tariff barriers such as sanitary and phytosanitary requirements and administered prices on

various commodities and products. Most domestically produced commodities, including rice, beef, pork, and dairy products, are affected by one or more of these measures.

Japan is the world's largest net importer of agriculture and food products; it meets 50 percent of domestic food requirements through imports. The gains from Japanese food imports have been mainly captured by the United States, which accounts for about 37 percent of this food import market (Agriculture and Agri-food Canada, 1997). Canada, the fifth largest supplier, possesses 5.8 percent of the Japanese agri-food market. For Canada, Japan is the second largest agri-food export market (Agriculture and Agri-food Canada, 1997). Financial crises in 1997-98 affected Japan's economy but the effects on agricultural trade were small (ERS, 2000).

Relative to other major suppliers, Canada's market share of Japan's meat imports is very small, averaging less than four per cent over the 1980-1996 period. Canada's market share followed an upturn trend between 1980 and 1988, but subsequently declined substantially until 1996. By contrast, with an average share of 22 per cent, the meat market share of the United States grew by 1.6 per cent per annum over the period from 1980 to 1996. The European Union (EU), with an average market share of some eleven percent, increased its market share by 5.8 per cent per annum over the period from 1980 to 1996. The other major suppliers of meat to the Japanese market are Australia (18 percent, in the same period of meat imports) and Taiwan (13 percent).

The Japanese Beef Market

Japan's domestic beef production is predominantly a byproduct of dairy production with nearly 60 percent of total cattle slaughter coming from dairy breeds.

Though beef production has increased in Japan, its self–sufficiency in beef has dropped over the years. For example, in 1985, beef self-sufficiency was 72 percent, but by 1993 this fell to 44 percent as growth in beef consumption exceeded production, resulting in an increased level of imports. Per capita beef consumption in Japan increased from 6.4 kg in 1985 to about 11 kg in 1995, an increase of about 72 percent, making Japan one of the fastest growing beef markets in the world. Japan has become the world's largest beef importer, second only to the U.S. In 1998, of the total beef consumption of 1.5 million tons, 957 thousand tons (i.e., close to 64 per cent) was imported (Foreign Agricultural Services, 1999(a)).

Major reasons for increased Japanese beef consumption have been the rise in disposable household income, population growth and changes in price relativities. The rise in beef imports in the first half of the 1990s (e.g., in 1992 by 30 percent, and in 1993 by another 34 percent) is attributable to tariff reductions and appreciation of the yen.

Since the beginning of import liberalization in 1991, and through the long recession, Japanese consumers became more price conscious. However, quality considerations are still very important to Japanese food choices. The main non-price criteria for food quality are freshness and taste (Foreign Agricultural Services, 1997). The major beneficiaries of Japan's growing beef imports have been Australia and New Zealand, due to their geographical proximity. Australia dominates the category of fresh and chilled beef with an increased portion of this being grain-fed beef, whereas the U.S. has mainly supplied frozen grain-fed cuts. Projections suggest a rise in Japanese beef imports. Japanese importers and consumers are expected to purchase competitively

priced beef, which would give Australia a slight advantage with its lower priced frozen, grass-fed beef (Foreign Agricultural Services, 1999a).

Japan is Canada's second largest export market (after the U.S. export market) for frozen and chilled beef and beef offal. In 1994, Canadian exports of fresh, chilled and frozen beef were valued at $20 million, and in 1995, exports reached $43 million. In 1996, beef consumption in Japan dropped, a reduction attributed to food safety concerns; consequently, Canadian exports of fresh, chilled and frozen beef to Japan dropped to $31 million (Agriculture and Agri-food Canada, 1997). Subsequently, Japan's beef imports have continued to follow an increasing trend. Canadian exports of fresh, frozen and beef to Japan approached $100 million in 2001 (Agriculture and Agri-food Canada, 2002).

The Japanese Pig Meat Market

Domestic pig meat production, accounting for 8 percent of total agricultural output, is the second most important agricultural output (after rice) in Japan. However, pork production has been declining since 1989 and this trend is forecast to continue. Even so, per capita pig meat consumption increased only modestly from 14.3 kg in 1986 to 17.2 in 1995. Currently, Japanese pork production only meets 60 to 65 per cent of Japan's consumption needs. In 1998, import of pork, for which Japan is the world's largest importer, totaled 505,000 tons, though this was a 1.5 percent decline from 1997 (Foreign Agricultural Services, 1999b).

In Japan, domestically produced pork is mainly sold fresh and chilled for table use. Hence, the decline in local production has resulted in a significant increase in fresh and chilled imports, which rose from 227,280 tons in 1986 to 838,188 tons in

1995. The main suppliers of pork to the Japanese market are Taiwan and Denmark. Canada has a higher share for pork in Japan's meat import market than it has for any other meat (an average of 13 per cent over the period from 1980 to 1996). However, its market share for pork has steadily declined over the same period; between 1980 and 1983, Canada accounted for 30 per cent of the fresh, chilled or frozen pork imports of Japan, but between 1993 and 1996, its share averaged only five per cent. Canadian pork exports to Japan totaled $553 million in 2001 (Agriculture and Agri-food Canada, 2002).

Japan's switch to more imports of fresh/chilled, rather than frozen, pork may favor Asian suppliers because of their geographic proximity. However, through competitively lower prices allied with new freezing/shipping technology, Canada and other sources should be able to capture a more appreciable share of the Japanese pork market. For example, more recently, in the late 1990's, lower pork prices and the strength of the yen against the US dollar boosted pork imports from the U.S. Consequently, the U.S. held the largest share of the Japanese pork import market in 1998. The export potential of Taiwan and other Asian suppliers, such as South Korea, which had a market share of 18 per cent of Japanese pork imports in 1998, could also be adversely affected by their own increasing domestic demand, which would favour surplus countries like Canada. The demand for frozen pork, used in ham and sausage making and the hotel and restaurant industry, is also expected to increase. Canada has been assessed to be able to benefit more from this opportunity in frozen pork exports since it is better able to meet Japanese frozen pork specification requirements (Foreign Agricultural Services, 1999b).

The Japanese Poultry Market

Japan is the world's fourth largest poultry importer. However, due to economic stagnation and weak consumer demand relative to supplies, the poultry import market has become extremely competitive. China, Thailand and Brazil are its major suppliers (Foreign Agricultural Services, 1999c). In 1998, prepared chicken imports were the fastest growing component of the poultry trade in Japan, reaching 92,5000 tons. Although Thailand is historically the top producer/exporter of prepared chicken, Chinese exports to Japan surpassed Thailand's, reaching 40,500 tons in 1998 (a 30 percent rise over the previous year), owing to more focused efforts, advantages of low cost labour and investments in a major Japanese food processing plant in China (Foreign Agricultural Services, 1999c). Poultry exports to Japan from the United States are also strong, accounting for 21 percent share of broiler meat and 29 percent share of prepared chicken meat imports. One profitable and expanding segment of the Japanese food industry is the home meal replacement sector, which includes convenience food sales and home delivery services. This sector is mainly responsible for driving the poultry import market in recent years (Foreign Agricultural Services, 1999c). Canada exports some poultry breeding stock to Japan. However, Canada accounts for very minor exports of chicken meat to Japan (Agriculture and Agri-food Canada, 2002).

2.2. South Korea's Meat Market

South Korea is one of the "newly industrialized" Asian countries. It has a population size of over 47 million that grows by one percent a year. Until it was hit by the recent financial crisis, like many other countries in the region, South Korea had

enjoyed a decade of impressive economic growth. The gross per capita national product (GNP) had reached US$10,550 in 1997. However, this was estimated to be $9,666 in 2000 (Agriculture and Agri-food Canada 2002), despite earlier predictions that from 1998 to 2002, GNP per capita would grow at 1.9 per cent (World Bank, 1998). Increased food imports have been expected, as Koreans develop a taste for Western style cuisine. However, demand for domestic products was expected to decline by 15 percent as a result of the high inflation and high unemployment that resulted from the Asian financial crisis (APEC, 1998).

South Korea's agriculture generated 5.7 percent of the nation's GDP in 1997. It is projected that by 2004, agriculture's share of the Korean GDP will decrease to just 3.6 percent and the farm population will decline to 3.12 million. High cost small owner-operated farms characterize Korean agriculture. Rice remains the dominant crop, accounting for about one-third of the total agricultural output value. Meat production has risen annually with consumer demand. Beef, pork and chicken represent 14, 63, and 23 percent respectively of total meat production.

South Korea has highly supported its agriculture. Some of the trade restrictions in place in South Korea include quantitative restrictions, such as quotas and tariff-quotas, tariffs, food safety restrictions, food additive restrictions, labeling regulations, customs reclassification, inspection and documentation. Lack of transparency in regulations is viewed as a serious problem. However, as a result of the Uruguay Round negotiations, South Korea agreed to liberalize trade in various agricultural and food products (implementing this by July 1997 for numbers of commodities), with plans to provide domestic farmers with assistance to enable them compete with imports. Pork and

poultry were among the commodities included in the 1997 trade liberalization (Agriculture and Agri-food Canada, 1996). Import quotas were removed from cattle and beef in early 2001.

In 1995, Canada's share of the Korean agri-food import market was approximately 2 to 3 percent. Other competitors include the U.S., Japan, China, EU, Australia, and New Zealand. The Korean import market is fairly young, and Canada has been viewed to have a good opportunity to establish itself as significant competitor for a share of this market (Agriculture and Agri-food Canada, 1996).

The South Korean Beef Market

The Asian financial crisis of 1997 forced many domestic producers to liquidate their herds; at the beginning of 1999, Korean cattle inventories were estimated at 2.9 million head -- 11 percent less than in the previous year. Beef consumption for 1998 was estimated at 433,000 tons, 10 percent lower than in 1997. Imported beef accounted for 25 percent of total beef consumption, while in previous years, imports had accounted for approximately 40 percent. Consumption was expected to recover in 1999 to roughly 440,000 tons (Foreign Agricultural Service, 1999a).

South Korea's beef import quotas were gradually reduced from 1995 and were removed in early 2001, providing for import liberalization. Under its WTO commitments, Korea had agreed to a minimum access import quota of 255,000 tons of beef. However, in 1998 South Korea imported 47 percent less than in the previous year (only 40 percent of its minimum quota requirement). Even so, South Korea is expected to become the world's fastest-growing beef market. Over the next five years imports are expected to increase by 42 per cent. Per capita beef consumption is expected to

increase from eight kg to eleven kg in 2005. In 2000 Australia supplied about 40 percent (or 73,000 tons of beef) of Korea's import quota (Meat International, 2001).

The beef quota system was administered by the Livestock Product Marketing Organization (LPMO) which operated a Simultaneous-buy-sell (SBS) system with the so-called "super groups" of Korean importers. These are, in effect, private beef buying groups authorized to purchase import beef (Agriculture and Agri-food Canada, 1996). In 1998, the SBS super groups were assigned to import 60 percent of the minimum quota while the LPMO held the remaining amount. In 1999, through the SBS system, the U.S. captured 69 percent of the market, Australia accounted for 20 percent, Canada for 6 percent and New Zealand for 4 percent. Under the LMPO, the respective import shares for the same period were 61,20, 19, and 0.6 percent. Overall, import shares stood at 66, 20, 11, and 3 percent, respectively in 1999 for these exporters (Foreign Agricultural Services, 1999a).

The South Korean Pork Market

In recent years, pork consumption has shown significant increases in South Korea. South Korea is 90 percent self-sufficient in pork. Nonetheless, this country is an appreciable pork importer, one of the top seven pork import markets. As well, South Korea is a considerable pork exporter, mostly to Japan (ERS, 2000). Korea's pork industry, with large, modern production facilities, is one of its most advanced farm sectors, however, its progress is limited by imported feed restraints which lead to domestic pork being less cost competitive than most imports. Government extends support in the form of investment for rural infrastructure, export promotion for pork and improvement of swine genetics (Agriculture and Agri-food Canada, 1996).

Due to foot and mouth disease in Taiwan, in the late 1990's, the U.S., Canada and EU were expected to be strong competitors for a share of the Korean pork import market, which became more competitive with the liberalization of the pork industry in 1997 (Foreign Agricultural Services, 1997). In 2000, Canada's pork import share in South Korea was 9.6 percent and the U.S. import share was 7.9 percent (U.S. Meat Export Federation, 2001).

The South Korean Poultry Market

Poultry consumption in South Korea has rapidly increased. However, the domestic poultry industry has been able to meet increasing demand. As a result of improvements in production and marketing channels and decreasing costs, South Korea has not needed to import broiler chickens, except for the specifications of minimum import access established in the previous WTO negotiations (Agriculture and Agri-food Canada, 1996; ERS, 2000).

Poultry imports are mainly frozen turkey parts and duck. China is the dominant provider of duck meat to South Korea, and it is also expected to hold an advantage in the chicken meat sector, due to its location and price. South Korean meat processors import turkey, duck, and chicken for use in sausages. Other competitors in the Korean poultry market include Thailand, Australia and the U.S. (Foreign Agricultural Services, 1997).

South Korea's younger consumers are assessed to be taking to chicken as a healthy alternative to red meat products. There is an increasing trend for consumption of further processed chicken products and chicken parts. However, access to this market may be difficult for Canada, due to distance disadvantages, and the desire of

South Korea to develop its own domestic industry. It has also been suggested that despite liberalization of poultry imports, the Korean government may continue to employ non-tariff barriers such as sanitary or phytosanitary restrictions to encourage domestic production (Agriculture and Agri-food Canada, 1996).

2.3. Indonesia's Meat Market

With a population size of approximately 207 million (1999), Indonesia is the fourth most populous country in the world. After registering one of the best performances in South East Asia for two and a half decades (with GDP growth rate of 7.1 percent from 1970 to 1995 and real per capita GDP reaching US$1,175 by 1997), the Indonesian economy underwent a dramatic contraction from 1997 (APEC, 1998). The factors that contributed to this contraction and that caused serious shortfalls in agricultural production, raising food security concerns, included the Asian financial crisis, a poor harvest season that coincided with the 1997-98 El Nino years and the devaluation of the Rupiah. Real per capita GDP plummeted to US$450 in 1998 (AutoAsia, 1998), while real household expenditure fell by 24 percent. The poverty level increased (by 3 percent), leaving about 30 million people below the poverty line, and middle and upper income households also experienced hardships following the economic crisis of 1997 (World Bank, 1999).

The Indonesian Meat Market

Indonesia's official agricultural policy has included food self-sufficiency, increased agricultural product demand, and improved diets (Agriculture and Agri-food Canada, 1997). Agricultural diversification involved the development and processing of high valued crops and livestock (San et al., 1998). Since 1986, the Indonesian

government engaged actively in deregulation of some of its protective policies: it simplified its tariff structure, removed some import restrictions, and replaced non-tariff barriers with more transparent tariffs, thereby encouraging foreign and domestic private investment (Agriculture and Agri-food Canada, 1997). However, since Indonesia is predominantly a Muslim society (at 85 percent), there are special restrictions on meat products.

The Ministry of Agriculture regulates the importation of meat. Food imports are required by the registration system to have a registration number, and to possess labels that show the type, size and composition of the food, prior to importation. Import licenses that specify, among other requirements, the quality categories, country of origin, and halal certificate, are also required. Imported meat products are the only imported products that are legally required to have a halal label. Import licenses and labeling for pork products are subject to additional regulations. In 1996, Indonesia signed a “New Food Law” requiring labels to be printed in Indonesian. With government approval, domestic manufacturers could place a halal food label on their products voluntarily (Agriculture and Agri-food Canada, 1997)

Prior to July 1997, rising incomes were creating a demand for non-traditional agri-food commodities. Increased purchasing power allowed consumers to incorporate more western-style food products into their diet. Approximately 20 million Indonesians purchased western-style food on a regular basis (Agriculture and Agri-food Canada, 1997). As in most of Asia, consumption demand has been shifting from cereals to non-cereals foods such as livestock products, fruits and vegetables, and processed foods. However, declining incomes as a result of the financial crisis was expected to drastically

dampen this emerging luxury food market (San et al., 1998). Economic recovery has been expected to be slower for Indonesia than for many of its neighbours (ERS, 2000).

The Indonesian pork industry had expanded substantially since 1982, with an average annual growth rate of nine percent. A large portion of Indonesia's pork production is used in the hotel and restaurant sector. Major pork import sources are China and Australia and the U.S. Canada exported approximately 200 head of breeding stock to Indonesia in 1996 (Agriculture and Agri-food Canada, 1997).

Growth of cattle production in Indonesia has lagged behind poultry and pork because of slower demand. Per capita consumption of beef had been estimated at less than 2 kg a year. However, rising incomes prior to the economic crisis did result in increased domestic demand. Consequently, from 1995 to 1996, beef imports increased by 35 percent, demonstrating the growth potential in the Indonesian beef market in times of favourable economic conditions (Agriculture and Agri-food Canada, 1997).

Indonesia imported roughly US$13.5 million of beef in 1994 and 1995. The U.S. held a significant share of this market (over 50 percent) until the currency crisis caused the market to collapse. Recently Australia, Ireland, and New Zealand have supplied 46, 25 and 20 percent market shares of the muscle meat import market, respectively. The U.S. market share of beef imports is 3 percent (U.S. Meat Export Federation, 2001).

The fastest growing meat industry in Indonesia is poultry, although this sector collapsed during the financial crisis (ERS, 2000). Since 1982, the poultry meat industry grew at an average annual rate of 11 percent. This was mainly due to high domestic demand and implementation of government policies that reduced tariffs on feed and breeding stocks. There are opportunities for poultry breeding stocks to be built in

Indonesia. Canadian poultry breeding exports to Indonesia in 1996 were valued at $409,000, increasing by more than 400 percent from the previous year. However, Indonesia's poultry sector collapsed during the financial crisis (ERS, 2000). Although annual per capita consumption of poultry is only about 2.8 kg, data from 1985 to 1995 show consumption increasing by 23 percent. Duck meat is the most popular poultry meat in Indonesia, while chicken meat has grown. Indonesia imported approximately $11 million worth of poultry meat from the U.S., Brazil, and Denmark in the mid-1990's (Agriculture and Agri-food Canada, 1997).

Overall, Canada's access to Indonesia's meat market is limited by high transportation costs and a lack of Canadian capacity for halal slaughtering, although this has increased in recent years (currently eight federally inspected plants perform halal slaughtering). While Canada has not held a share of the Indonesian beef cattle market, it could potentially find a niche in the market for breeding cattle and/or processed meat imports, especially if Indonesia does not succeed in developing its own cattle population which was decimated by the financial crisis and civil unrest of 1998 and 1999.

Indonesia's economy is slowly recovering from the economic and political uncertainty of 1998 and 1999. In 2000, GDP grew by 2 percent and was expected to grow by 3 to 4 percent in 2001. This caused Indonesia's self-sufficiency rate for beef to drop to 80 percent. The uncertain political situation also led importers to shift from imports of live cattle to imports of primary cuts of beef. It appears that Indonesia will become very dependent on imported, rather than domestic-produced beef, at least for the next few years.

2.4. Singapore's Meat Market

With a 3.2 million (1999) all-urban population, Singapore has the world's fifth highest per capita income of some US $27,000. Due to scarcity of land, Singapore's agricultural sector is negligible, contributing only 0.2 per cent to the national GDP, but employing 3 per cent of the population. Consequently, Singapore imports 90 percent of its foodstuff from trading partners; it depends almost entirely on imports to meet the demand for beef and pork, while it produces some of its live and fresh poultry (Agriculture and Agri-food Canada, 2001).

Singapore's Meat Market

Singapore's total beef imports rose by 26 percent in 1999 and by another 11 per cent in 2000, amounting to 16,654 MT. Consumption of beef is also increasing, although the levels of consumption of beef are still small relative to poultry and pork. The recent increase in beef consumption is attributable to economic recovery in the region. Singapore's GDP grew 10.1 percent in 2000. Continued economic growth and a resurgence in the hotel, restaurant and institution (HRI) sector are expected to fuel increased per capita beef consumption in Singapore through to 2007. Imports of beef and beef variety meats are, therefore, expected to increase in coming years (U.S. Meat Export Federation, 2001).

Australia, Brazil, and New Zealand, the dominant suppliers of beef to the Singapore market, account in aggregate for approximately 90 to 95 percent of total beef imports. Australia alone provides approximately 35 percent of Singapore's beef imports, while New Zealand and Brazil capture 28 and 30 percent of this market, respectively. The U.S. market share varies between 5 and 10 percent, depending on its cattle prices

and changes in exchange rates. Latin America, China, and the EU serve as the remaining suppliers to this market.

Pork and poultry are the two most important types of meat consumed in Singapore, accounting for more than 89 percent of total meat consumption, with pork alone representing 38 percent; pork is a major dietary component for the Chinese consumers who make up almost 80 percent of Singapore's population. With the high levels of per capita income in Singapore, there is demand is for high quality lean cuts of pork, which is met by suppliers in Malaysia and Indonesia. Pig prices are quite seasonal in Singapore. This is due to the fact that producers and the current suppliers in Malaysia and Indonesia are unable to hold their stocks back from market in times of overproduction and low prices. If pigs are not sold when they reach marketable weight, more feed and labour is needed; furthermore, heavier pigs fetch lower prices per unit weight.

Singapore imports 120,000 MT of pork annually. Before the 1999 Nipah virus outbreak, Malaysia supplied 80 per cent of Singapore's fresh pork import needs of 60,000 MT. However, after the virus outbreak of 1999, fresh pork demand was satisfied by chilled imports from Australia and New Zealand (35,000 MT), with the balance supplied by live hogs imported from Indonesia. The U.S., Australia, Sweden and Canada dominate as suppliers of chilled pork exports to Singapore, owing to the trichinae-free certificates these can provide for their chilled pork. However, sales of chilled pork from the U.S., Sweden and Canada are currently limited because of long shipping times. Due to these constraints on the chilled pork market, the frozen pork import market is expected to increase significantly (U.S. Meat Export Federation, 2001).

Canadian agri-food exports to Singapore for 2000 were $15.9, million down significantly from $33.2 million in 1999. Canada's greatest obstacle to competitive pricing in meat imports to this market is freight cost.

2.5. Asian Meat Market Uncertainties and Vulnerabilities

As household income grows, the share of food expenditure on meat and meat products rise, relative to expenditures on cereals. This fact has been widely established in the literature on household food demand. A phenomenon affecting demand trends that has not yet been fully explained is the trend in eating habits towards Western style cuisines in countries that experience economic growth. This phenomenon is, for example, observed in the Newly Industrialized Asian countries and Japan. Both phenomena have positive implications for Western meat exporters, including Canadian/Alberta meat exporters, to these Asian countries.

However, the prospects for various exporters to capture a share of the increasing meat markets which arise from the trend for growing meat demand in the Asian countries are not equally distributed among all competing exporters. Of particular importance is the factor of distance between exporting and importing countries since this is associated with transport cost differences, issues of shelf life, and the constraints of technology and cost relative to prospects for exportation of fresh, chilled or frozen products. Consequently, the export opportunities of East Asian meat markets have favored the closely located meat exporters in Australia and New Zealand. This feature of geography will continue to disfavour U.S. meat exporters and, even more so, Canadian exporters, relative to their competitors in Asia and Oceania, which will

continue to enjoy a competitive edge to the extent that price, alone, plays a predominant role in deermining market shares.

Apart from distance, however, there are numbers of factors that need to be taken into consideration by Canadian meat exporters. Some of these contribute to market vulnerabilities; others to stability; still others influence market potential. A framework to analyze these factors involves grouping them into the three following groups: economic factors, policy-related changes, and natural and cultural/religious conditions. We consider the major influences in each of these groups in turn.

Financial and Political Crises

The financial crisis and recession in Asia and other regions of the world that dates from 1997 has had serious and negative effects on the economic performance of numbers of countries. International financial crises led to depreciated currencies, reduced growth and higher interest rates in Indonesia, Thailand, South Korea, Russia, Brazil and other Latin American countries (ERS, 2000). Other countries were also affected. For instance, the crisis dampened Japan's growth momentum such that real GDP growth dropped from 3.7 per cent in 1996 to –0.7 percent in 1997(APEC, 1998); this impeded Japan's recovery from one of the longest recessions since World War II (FAS online, 1997). However, although the prolonged recession in Japan has resulted in a decline in real disposable income, instead of reducing expenditure on food, Japanese consumers appeared to become more discriminating about how they spend their money (Agriculture and Agri-food Canada, 1997). Consequently, meat markets became more competitive.

One apparent outcome in Japan, with less regulation and a more open economy, was the shifting of price decision-making powers from manufacturers to retailers. This seems to have created more effective price competition that has mitigated some of the vulnerability of the import meat market. As Japanese consumers became more price-savvy, some national supermarkets, discount stores and larger retailers have adopted major innovations to lower prices through, among other measures, increasing direct imports (Foreign Agricultural Services, 1997).

The financial crisis and economic difficulties in South Korea and Indonesia can be viewed to have had mixed effects from the point of view of meat exporting countries. On one hand, the immediate effect of the crisis was the liquidation of domestic herds, making these nations less self sufficient in meat production. In the short run, this phenomenon would make exporters more competitive, even with sluggish meat demand (from income pressures). A more dominant influence, as the economies of these countries recover, is that their build-up in domestic livestock capacity may not match with growth in domestic meat demand, enabling (Western) meat exporters to have better access to these countries' domestic meat markets. The realization of such opportunities calls for strategic planning, including building knowledge capacity through improvement of information and understanding of consumers' preferences, market organization and marketing practices. Also required is investment in market positioning, through development and performance of aggressive and effective promotion and market development activities on the part of Canadian exporters or their agents. Market intelligence is required to support each of these activities.

In Indonesia's case, market vulnerability was linked to political turmoil in the country, which resulted in an exodus of large numbers of ethnic Chinese, who had formed the country's main pool of commercial and managerial skill, as well as providing US $40 billion of domestic capital (The Economist Intelligence Unit, 1998). Thus Indonesia's economic recovery is, to great measure, linked to its political recovery. Whether changes in political leadership will bring long-term stability to that country is yet to be seen. In the light of this uncertainty, economic recovery and resurrected meat demand will favour meat exporters to this market, because domestic producers will require time to increase the domestic cattle population which was decimated by the financial crisis and civil unrest.

Economic Policy and International Economic Relations

Trade agreements signed within the framework of multilateral negotiations of the WTO are factors that can continue to improve market opportunities and market stability for Canadian exporters. Successful negotiations that lead to tariff reductions and increases in minimum access commitments for imports of East Asian countries will continue to have benefits for exporters by improving their competitiveness relative to domestic producers and contributing to more predictability in world markets. These benefits can increase if future rounds of WTO negotiations can reduce continuing tariff protection and streamline provisions for food-safety concerns, discouraging the use of these provisions as pretexts for protection. However, given the increased interest in food safety and long-standing and continuing interest in encouraging domestic production in Japan (beef), South Korea (poultry) and Indonesia (beef), non-tariff

barriers such as sanitary and phytosanitary restrictions can be predicted to continue to be noticeable hurdles, at least in the short to the medium run.

From the point of view of Canadian/Albertan interests, the feature that Japan does not belong to preferential trading arrangements with its Asian neighbours, applying tariffs on a MFN basis, has positive implications. Japan's move to increased multiculturalism, within such organizations as Asian Pacific Economic Cooperation (APEC) and the World Trade Organization (WTO) results in improved dispute consultations and settlements, thereby improving market predictability. It is to be noted that Japan has launched only two anti-dumping actions and has never taken countervailing actions. However, the safeguard measures that Japan took on frozen beef and pork in 1995 and 1996, as provided for in the Uruguay Round Agreement on Agriculture, did have significant market-disrupting effects. These were more significant for pork trade, but also concerned Canada relative to exports of fresh, chilled and frozen beef (Agriculture and Agri-food Canada, 1997).

There are certain policy hurdles that entail unpredictability in the Japanese meat market. Notable among these is that the domestic beef market is protected by the Livestock Industry Promotion Council (LIPC) which carries out import policies. However, Japan's tariffs for imports of fresh and frozen beef dropped from 70 per cent in 1997 to 38.5 percent in 2000. The tariff rate for chilled/frozen pork in 2000 was 4.3 percent, or 5.7 percent with safeguard or special safeguard provisions. Tariffs on canned ham / luncheon meat / seasoned pork / battered or breaded are higher at 20 percent, reflecting higher levels of tariff protection given to these value-added meat products.

Natural and Cultural/Religious Factors

Limits to domestic production in some of the fast growing economies of Asia and Japan will continue to improve import access by meat exporters. This potential influence may extend from meat markets in the constrained economies to markets where production-constrained nations are export competitors. However, as consumption of meat levels off, competition will favor those exporters that can competitively supply lower-priced meats with desired quality specifications.

Trade restrictions arising from religious convictions are likely to be important in Indonesia, where halal certificates and related labeling are mandatory for meat imports. This seems to be a growing issue also in Singapore. Restrictions for religious reasons can be expected to be stricter with more evident religious fundamentalism in these countries. Canada is at a disadvantage in this regard due to the lack of widespread facilities for halal slaughtering.

Animal diseases, such as the recent Foot and Mouth disease outbreaks in Europe and the Nipah virus in Malaysia, have created increased market opportunities for disease-free exporters like Canada. Very recent evidence from both Japan and South Korea has shown high levels of consumer anxiety, with associated fluctuations in sales, reflecting reports of incidents of BSE ("mad cow") and vCJD diseases. Food safety provisions are of increasing importance. Strictness in animal and plant health policy, together with development/adoption of stringent food safely procedures, allied with effective trace-back and recall procedures can, with additional efforts to promote this positive image, aid market penetration and market potential for exporters that follow these strategies. There will certainly be heightened anxieties or uncertainties among

consumers of meat in situations where meat safety problems become apparent in exporting nations. The reality and the image of being a food safety-focused exporter is likely to be of increasing importance in future years. Trust lost in these situations will have long-run effects.

3. Modeling International Demand for Meat

A number of economic, demographic, and socio-cultural factors affect the demand for meat. These include prices, income, population growth, urbanization and cultural or religious restrictions. It is not clear why urbanization alone (as distinct from the influence of income) induces more consumption of animal products, such as meat and milk. One hypothesis is that lowered activity patterns in urban areas reduce the consumption of cereals. Another is that aspirations and demonstration effects may come into play.

Additional factors may determine meat import demand by the meat origin and meat type, and these may reflect the nature of trade relations with other nations and in other products, credit provisions, export promotion, long-term agreements and the effects of product quality or type, such as product freshness, whether it is from grass-fed versus grain-fed cuts, whether the product is or has been frozen, and so on. The relative movements of exchange rates affects imports of meat while trade liberalization in meat and other products affects imports through its effects either directly on prices or income.

International meat markets, like domestic markets, have become important determinants of the profitability of producers in exporting countries, such as Canada. Consequently, there is a growing interest in developing marketing programs for meats

that may aid exporters to access these markets. Empirical analysis of import demand that generates estimates of responsiveness of demand to prices and expenditure contributes towards trade policy formulation and assessment of existing ones.

Few types of demand systems have been used in empirical import demand analysis. One such system is based on the Almost Ideal Demand System (AIDS) model, originated by Deaton and Muellbauer (1980). The outstanding advantages of this model is that it is flexible, theoretically plausible and easy to use (Yang and Koo, 1994); it gives an arbitrary first order approximation to any demand system, satisfies the axioms of choice exactly, and aggregates perfectly over consumers without assumptions about expenditure elasticities (Deaton and Meullbauer, 1980). The linearized AIDS demand system is applied in this study to calculate own-price, cross price, and expenditure elasticities of meat market shares of competing countries in the four selected East Asian countries. These four countries are among the Pacific Rim nations that have become target markets for meats due to the growing demand for imported meat that has accompanied their remarkable economic growth.

There have been two biases in most empirical import demand studies that have applied the AIDS model. The first is an aggregation bias when imports of a given good (e.g., beef) from different sources are aggregated. The implication of this is the assumption that consumers in the importing country perceive beef, for example, from different exporting countries, as identical. The Armington model that has been used extensively in import demand analysis allows for imperfect substitutions among products from different sources. However, its assumptions of hometheticity and a single

constant elasticity of substitution make it restrictive (Alston et al; Winters; Yang and Koo).

Aggregation of products is justifiable if the prices under consideration were moving together, by the same proportion (Hicks, 1956), or if disparities in product perception among consumers are believed to be insignificant. However, proportional change in prices can be ruled out due to differences in transaction costs. Furthermore, there are a number of reasons why importers may perceive products from different sources differently, one such reason being differences in quality (perceived or real) for products from different sources.

The second bias in import demand studies that have applied the AIDS model .results from the assumption of block separability among different goods (Yang and Koo, 1994). In this case, the model consists of share equations for a given good, differentiated by origins, but with the exclusion of other potentially substitutable goods. That is, the model assumes that source-differentiated beef, for example, can be analyzed without regard for poultry, pork or other meats. Block separability is a strong assumption given the close substitutability of the different meats in consumption. General observation and empirical research provides evidence of significant consumption substitutions between different meats. Each of the two assumptions, if unrealistic, can bias elasticity measures or lead to inaccurate policy prescription to individual exporting countries (Yang and Koo, 1994).

On the issue of block separability, one concern is whether domestic meats and fish are separable from imported meats. The hypothesis of separability between fish and meats was not rejected in previous studies (e.g., in Japan by Hayes et al, 1990;

and in Taiwan, South Korea, and Japan by Capps et al, 1994). For this reason, and for lack of data, fish are excluded from this study. There are no theoretical grounds to preclude consideration of domestic production of meats as a substitute for import-sourced products, and some studies have included domestic product and imported product in the same model (e.g., Hayes et al, 1990). However, there are two technical problems in including domestic products and imports in one AIDS model. First, domestic data differ from import data, especially when import goods have different marketing channels from their domestic counterparts and where import restrictions such as quota affects the amount of imports at given prices. Second, given the limited time series data for the AIDS analysis, adding domestic production of different meat types would cause a serious problem of degrees of freedom. Consequently, this study assumes separability between fish and meats and between imports and domestic production of meats.

In the present study the AIDS model is applied to the analysis of meat import demand by four Asian countries, namely Indonesia, Japan, South Korea and Singapore by differentiating products by exporting country and without imposing block separability. The mathematical representation of relaxing the two assumptions involves only a slight modification of the original AIDS model.

3.1. Derivation of the Source Differentiated AIDS Model

The almost ideal demand system (AIDS) is given by

$$W_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i \ln (M/P) \quad i = 1,\ldots,n \qquad (1)$$

Where M is total expenditure, p_j is the price of the jth good, w_i is the value share of the ith good, n is the number of goods and P is a price index given by

$$\text{Ln } P = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln p_i + \tfrac{1}{2} \sum_{i=1}^{n}\sum_{j=1}^{n} \gamma_{ij} \ln p_j \ln p_j \quad (2)$$

Ln P is in many applications approximated by the Stone's Index:

$$\text{Ln } P = \sum_{i=1}^{n} w_i \ln p_i \quad (3)$$

Equation (1) together with equation (3) is called the linear approximate almost ideal demand system (LA/AIDS), and is applied in this study. To ensure desirable theoretical properties, the following restrictions are imposed on the AIDS system.

$$\text{Adding up: } \sum_{i=1}^{n} \alpha_i = \sum_{i=1}^{n} \gamma_{ij} = 0 \qquad (j = 1, \ldots, n), \sum_{i=1}^{n} \beta_i = 0, \quad (4)$$

$$\text{Homogeneity: } \sum_{j=1}^{n} \gamma_{ij} = 0 \qquad (i = 1, \ldots, n), \text{ and} \quad (5)$$

$$\text{Symmetry: } \gamma_{ij} = \gamma_{Jij} \quad (6)$$

The source-differentiated version of equation (1) is simply given by (Yang and Koo, 1994):

$$W_{ih} = \alpha_{ih} + \sum_{j=1}^{n}\sum_{k=1}^{m} \gamma_{ih\,jk} \ln(p_{jk}) + \beta_{ih} \ln (M/P) \quad (7)$$

where the subscripts i and j denote goods (e.g., beef, poultry, etc) and h and j denote products (sources of meat in this case). Stone's index (equation 3) and the various theoretical restrictions (equations 4, 5 and 6) are modified accordingly to represent source differentiation.

The source-differentiated AIDS model of equation (7) allows differential responses by an importing country to meats from different exporting countries, but at the same time, does not require uniform number or source of products under each good. One setback of the model relative to the customary use of the AIDS model is the increased number of parameters to be estimated and the problem of resulting degrees

of freedom that arises from source differentiation. For instance, for a system of four goods (meat types) and four origins, the parameters to be estimated in each equation consists of 16 price parameters, one expenditure parameter and one intercept (i.e., a total of 18 parameters). The multiplied number of parameters poses serious problem of degrees of freedom in import demand systems that use limited time-series data.

In order to reduce the number of parameters, Yang and Koo (1994) suggest block substitutability, which involves a restriction on cross price effects. It is thus assumed that source differentiation is only important for cross price elasticities of products of the same good, but not for products of different goods. For example, the cross price effect of U.S. poultry on Japanese beef import from any source is assumed not to be significantly different from the cross price effect of Canadian poultry on the same product (i.e., Japanese beef import from any source). That is, beef import demand by Japanese consumers from any source is assumed to be affected similarly by price changes in poultry from all sources. Notationally,

$$\gamma_{ih\,jk} = \gamma_{ih\,j}, \text{ for all } k \in j \neq i \qquad (8)$$

With this assumption, the Source Differentiated AIDS model in equation (7) becomes:

$$W_{ih} = \alpha_{ih} + \sum_{k=1}^{m} \gamma_{ihk} \ln(p_{jk}) + \sum_{j=1}^{n} \gamma_{ih\,j} \ln(p_j) + \beta_{ih} \ln (M/P) \qquad (9)$$

where $\ln(p_j) = \Sigma_k w_{jk} \ln(p_{jk})$. With the block substitutability restriction imposed, the number of parameters to be estimated in a given equation, i, for four goods (meats), four product (sources) system reduces by half, including four coefficients for the prices of four products in good i, three coefficients for the prices of three other goods, one coefficient for total import expenditure and an intercept coefficient). In case of equal number of products in each good, the total number of parameters in the unrestricted

system will be equal to m*n + 2, while in the restricted system this will be equal to m + (n – 1) +2 parameters.

The conventional AIDS model for import demand, which ignores source differentiation of imports, can be derived as a special case, by imposing the following restrictions in equation (9):

$$\alpha_{ih} = \alpha_i \text{ , for all } h \in i;\ \gamma_{ih,kj} = \gamma_{ij} \text{ , for all } h, k \in i, j; \text{ and } \beta_{ih} = \beta_i \text{ , for all } h \in i. \quad (10)$$

Similarly, the assumption of block separability obtains by imposing the restriction:

$$\gamma_{ihj} = 0, \text{ for all } j \neq i. \quad (11)$$

Marshallian and Hicksian price elasticities are calculated from estimated parameters of the block-substitutability restricted model as follows:

Marshallian,

$$\varepsilon_{ihih} = -1 + \gamma_{ihh} / w_{ih} - \beta_{ih} \quad \text{(own price elasticity)} \quad (12)$$

$$\varepsilon_{ihik} = \gamma_{ihk} / w_{ih} - \beta_{ih} (w_{ik} / w_{ih}) \quad \text{(cross product price elasticity)} \quad (13)$$

$$\varepsilon_{ihj} = \gamma_{ihj} / w_{ih} - \beta_{ih} (w_j / w_{ih}) \quad \text{(cross good price elasticity)} \quad (14)$$

Hicksian,

$$\delta_{ihih} = -1 + \gamma_{ihh} / w_{ih} + w_{ih} \quad \text{(own price elasticity)} \quad (15)$$

$$\delta_{ihik} = \gamma_{ihk} / w_{ih} + w_{ik} \quad \text{(cross product price elasticity)} \quad (16)$$

$$\delta_{ihj} = \gamma_{ihj} / w_{ih} + w_j \quad \text{(cross good price elasticity)} \quad (17)$$

Expenditure elasticities are computed from:

$$\eta_{ih} = 1 + \beta_{ih} / w_{ih} \quad (18)$$

3.2. The Data

The econometric analysis is based on time series data covering 21 years (from 1974 to 1994). Import quantity and expenditure for the different meats from different sources were mainly obtained from various issues of the UN publication, *Commodity Trade Statistics*. These data were collected for Indonesia, Japan, South Korea and Singapore, for which a virtually complete set of data were available on the required variables and for the entire sample period mainly *from Commodity Trade Statistics*. Data from *World Trade Analyzer* (Statistics Canada, 1997) were used to fill in missing data from Commodity Trade Statistics. Other East Asian net meat importers, such as Thailand and Taiwan were not directly included as target markets in this study due to lack of complete data on expenditures, quantity and/or import prices for the sample time series. Furthermore, Thailand and Taiwan are major meat exporters to other East Asian countries. China was not included, in part because of the reasons that apply for Thailand and Taiwan, but also because China is a net meat exporter overall. China's meat imports were on average, less than five percent of its meat exports, during the sample period.

Unit values, for import prices, were obtained by dividing import expenditures by import quantities. Data for four meat types were identified, including beef, poultry, pork and other meat. The "other meat" category includes meat of sheep and goats, meat of asses, horses, etc., and meats that are not classified in the other three meat groups. Mean import shares (and their standard deviations) from major meat exporting countries for the four East Asian countries are summarized in Table 1.

Table 1. Import Shares and their Standard Deviation in Four East Asian Meat Markets for 1974-94

	Indonesia		Japan		South Korea		Singapore	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Beef	0.6143	0.1122	0.300	0.080	0.6119	0.3130	0.3259	0.0639
Canada					0.0225	0.0305		
U.S.A	0.0626	0.035	0.1185	0.072	0.2049	0.1387	0.0352	0.0098
Oceania	0.4743	0.1519	0.1743	0.0397	0.3667	0.2572	0.21	0.0985
Developing Asia	0.0459	0.0383					0.021	0.0058
Other	0.0315	0.0391	0.0075	0.0037	0.0178	0.0449	0.0596	0.0401
Poultry	0.2655	0.068	0.1125	0.0336	0.0368	0.0369	0.3814	0.0755
U.S.A	0.1302	0.0406	0.0458	0.0179	0.0222	0.0227	0.2111	0.0623
EU	0.0707	0.0429			0.0096	0.0111	0.1059	0.0457
Developing Asia			0.0533	0.0292				
Other	0.0646	0.0453	0.0134	0.0106	0.0049	0.0061	0.0644	0.0513
Pork	0.0749	0.058	0.4261	0.0709	0.0602	0.0563	0.1835	0.0345
Canada			0.0677	0.0382				
U.S.A	0.0097	0.0151			0.0229	0.0293		
Oceania	0.0134	0.0318					0.0125	0.0479
EU			0.1343	0.042	0.0248	0.0356	0.0515	0.0209
Developing Asia	0.0382	0.0393	0.1274	0.0631			0.1097	0.0321
Other	0.0136	0.0136	0.0967	0.0463	0.0126	0.0186	0.0118	0.0101
Other Meat	0.0453	0.036	0.161	0.104	0.291	0.285	0.1176	0.0652

Derived from data in Commodity Trade Statistics (UN, various publications).[1]

Over the sample period, Indonesia spent some 60 percent of its import expenditures on meat to import beef, 75 percent of which was from Developed Oceania (i.e., from Australia and New Zealand). Poultry ranked second in meat import expenditure, accounting for a little more than a quarter of import expenditures on meat. The major supplier of poultry to the Indonesian meat market is the United States. Imports of pork and other meat jointly account for 12 percent of total expenditure on meat imports.

[1] Major "other" sources of meat are for Indonesia: Brazil, Hungary, Israel, Japan, and Switzerland; for Japan: Argentina, Brazil, Chile, Hungary, Israel, Mexico and Switzerland; for South Korea: Argentina, Hungary and Japan; and for Singapore: Argentina, Brazil, Hungary, Japan, Switzerland and Uruguay.

Unlike Indonesia, pork imports (at 43 percent) constituted the largest share of meat imports for Japan during the sample period. Developing Asia (DA) -- primarily Taiwan-- and EU, between them controlled 60 percent of the pork exports to this market. Canada captured the third largest share of the Japanese pork market. Beef imports (at 30 percent of total Japanese meat imports) rank second, Oceania and U.S. supplying almost all of this, while poultry imports, ranking third, represent 11 percent of total expenditures on meat imports over the sample period of 1974-1994.

South Korea imports mainly beef (61 percent) and other meat (29 percent). Oceania and the U.S., supplied over 90 percent of this beef import demand. Pork and poultry, at very minor shares of 6 and 3.7 percent, respectively, rank third and fourth.

In Singapore, poultry imports (at 38.7 percent) constitute the largest share of total meat imports, while beef (at 31.7 percent) and pork (at 18 percent) rank second and third, respectively. Oceania, U.S., EU and DA (primarily Taiwan) are the main meat import sources for Singapore.

Overall, the largest beef exporter into the four East Asian countries is Oceania (specifically, Australia and New Zealand). The U.S. is the second largest source of beef imports for these countries. The U.S. dominates the overall poultry import market of the four countries. Exports by DA (primarily China, Thailand and Taiwan) and EU account for most of the remaining poultry import market. EU and DA (primarily China and Taiwan) are also the major source of pork imported by the same countries.

3.3. Meat Import Demand Analysis for Indonesia

An import demand system of equation (9), consisting of 13 share equations (one equation was arbitrarily dropped to avoid the singularity problem) was estimated for

Indonesia by a non-linear system estimation technique using Shazam version 8.0 (White et al, 1998). Homogeneity and symmetry restrictions (between products) were applied in estimating the import demand system. From estimated price and expenditure parameters, Hicksian and Marshallian elasticities were computed. Since Hicksian (or income-compensated) elasticities have the advantage of enabling examination of net substitutability, these are presented in Table 2, and underlie the ensuing discussions. Marshallian elasticities for each of the four countries are reported in Appendices 1 to 4. Mean values and standard deviations of imports are given in Appendix Tables 5 to 8. Trends in meat import shares are given in Appendices 9 through 12.

The following observations can be made from Table 2. First, except in one instance, own price elasticities are negative for all meat types and sources, as expected by theory. Second, all own price elasticities but one are statistically significant at the 5 per cent level.

Thus in each of the four import meat markets in Indonesia, meat market shares of import competing countries are significantly and negatively responsive to changes in own product prices as predicted by economic theory. Third, in the meat import market, for several sources, import shares are elastic indicating the sensitivity of Indonesian meat imports to own import prices. This is the case for beef import shares of DA (mainly China and Hong Kong) and other sources. This is also the case for poultry import market shares for the EU. Pork import market shares of Oceania, DA, and other sources are also own-price elastic.

Table 2. Hicksian Price and Expenditure Elasticities of Meat Import Demand in Indonesia

Variable	Beef Market Shares of				Poultry Market Shares of			Pork Market Share of				Other Meat Market Share	
	USA	Oceania	DA	Others	USA	EU	Others	USA	Oceania	DA	Others	USA	DA
Beef Price													
USA	-0.782*	0.113*	1.233*	-1.546*									
Oceania	0.853*	-0.577*	1.462*	1.649*									
Developing Asia	-0.812*	0.141*	-1.423*	1.220*									
Other	-0.778*	0.110*	-0.459*	-2.654*									
Poultry Price													
USA					-0.58*	-0.004	0.180*						
EU					0.144*	-1.255*	0.585*						
Others					0.089*	0.534*	-0.891*						
Pork Price													
USA								0.619*	0.002	0.431*	0.665*		
Oceania								0.003	-1.219*	0.739*	2.921*		
Developing Asia								1.699*	2.111*	-1.114*	2.945*		
Other								0.932*	2.970*	-1.118*	-1.186*		
Other Meat Price													
USA												-0.200	-1.483*
Developing Asia												-3.531*	-1.359*
Other												1.615*	-0.588*
Average Price													
Beef					0.342*	-0.056	0.521*	-0.539	-2.317*	0.876*	0.825	0.280	0.163
Poultry	0.398*	0.408*	-2.047*	-1.528				0.518	1.287	-0.402	0.686	1.243	0.687
Pork	1.112	-0.747	3.196	4.121	0.704	1.282	-0.298					0.089	-1.905
Others	0.080	-0.359	0.379	0.626	0.992	-1.473	0.538	3.852*	1.378	-1.327	-0.404		
Expenditure	1.331*	-1.953	-0.884	-0.536	1.122*	1.365*	1.995*	1.505	3.283*	4.770	2.021	2.291	2.662

Asterisk marks (*) indicate significance at the 5 percent level.

It is informative for purposes of discussion to group net cross price elasticities into two classes: those between products (sources) of the same good and those between goods. Cross product-price elasticities are in the majority of cases positive and significant, as would be predicted by economic theory. This is particularly evident for Indonesia's pork import market, indicating that imports from the U.S., Oceania, DA (mainly China) and other sources are substitutes for each other. Moreover, most of these net substitution elasticities are significant at the five percent level; in about half of the cases these are elastic. Notably, pork imports from DA are close substitutes for pork from any other source.

In the beef import market, U.S. and Oceania beef are substitutes, though these are inelastic. Oceania beef is also a substitute to beef from DA and other sources. Contrary to our expectations, negative and significant cross price elasticities obtained between U.S. beef and beef from DA and other sources, suggesting complementary rather than substitute relationships between these products.

In the poultry import market, the computed cross price elasticities are all inelastic, (and U.S. poultry has a complementary relationship with EU poultry, though this relationship is insignificant). Complementary relationships also apply between U.S. and DA (China and Hong Kong) in the "other" meat market. Yang and Koo (1994) suspect that complementary relationships between products may result from the various restrictions imposed on the model and the effect of co-movement of exchange rates on unit values that are used as proxy for import prices. However, differences in quality of products may also give rise to apparent complementary relationships if different qualities of meat serve different income groups.

In observing the second set of cross-price elasticities, we note that these are inelastic in the majority of cases and significant only in one fifth of the cases. In terms of individual cases, imports of poultry are substitutes for imports of beef, pork and other meat from the U.S. and Oceania. It also appears that poultry, pork and other meat are substitutes to beef imported from the U.S.. Pork and other meat imports are substitutes for beef from DA and other sources, but complementary to beef from Oceania. These two goods are also complementary to poultry from EU. Beef is substitute for poultry from U.S., pork from DA and other sources, and other meat from the U.S. and DA. Beef is, however, complementary to poultry from EU and pork from the U.S. and Oceania. Complementary relationships between meat types in the Indonesian meat market are largely (in 85 percent of the cases) insignificant at the five percent level.

Complementary relationships, such as observed above, though contrary to our expectations, are not peculiar to this study. Complementary relationships have been found in many other similar studies (e.g., Johnson et al, 1998; Hayes et al, 1990; Wang et al, 1998; Yang and Koo, 1994). One hypothesis for such phenomena is the fixed expenditure hypothesis. According to this hypothesis, when prices of two products differ substantially and the own price elasticity of a product is less than unity, a decrease in the price of the product may increase the consumption of both commodities, with a relatively fixed expenditure on the group (Pitts and Herlihy, 1983). Considering the magnitudes of own-price elasticities in Table 2, this hypothesis could hold only in half of the cases of the complementary relationships. Johnson et al (1998) argue that the unexpected complementary relationships may simply point out some of the differences in consumer preferences between Asian countries and the West. Hayes et al (1990) note that the

common response to the problem of complementarity is to mine the data through alternative definitions of prices or quantities, or by using alternative functional forms, or by re-specifying an appropriate utility function. Other suggestions include the imposition of net substitutability econometrically by restricting compensated cross-price elasticities to be greater or equal to zero. However, this approach, apart from preventing the researcher from learning from the data, may not produce reasonable results (Hayes et al, 1990). In this instance, a better alternative would be to simply regard negative cross-price elasticities from the unrestricted models as zero by assumption. This approach is better because, at least, positive cross-price elasticities would better reflect realities represented in the data.

Expenditure elasticities are positive and elastic in the pork, poultry and other meat markets. In the beef market, the expenditure elasticity is positive and elastic for the U.S., but negative for the remaining import sources, suggesting that, as expenditure on beef imports increase, Indonesia imports more from the U.S and less from all other sources including Oceania and DA. One explanation for divergence in expenditure elasticities is quality differences perceived by Indonesian beef consumers, such as preference for grain-fed beef from the U.S. over grass-fed beef from Oceania (Yang and Koo, 1994). In the pork market, with a rise in total expenditure, Indonesia is likely to import twice as much from Oceania or three times as much from DA as it does from the U.S. Considerably diverse expenditure elasticities are also observed in the poultry market. Over all, only three expenditure elasticities are significant at the 5 percent level.

3.4. Meat Import Demand Analysis for Japan

The Japanese import demand system includes 12 share equations (one equation dropped arbitrarily to avoid singularity). Own price elasticities, computed from estimated

parameters of the Source differentiated AIDS model, are mainly negative and significant in all of the four Japanese meat markets for each import source. The exception to this is the own price elasticity of imports from Developing Asia (DA)—primarily from Taiwan-- in the pork market, which is positive. In the Japanese beef import market, U.S. and other sources' market shares are elastic with respect to own prices, as are the market shares of Developing Asia and other sources in the poultry market. In the pork market, Canada's market share exhibits negative, significant and elastic own price elasticity, as do market shares of other sources.

Cross product-price elasticities are mainly positive but insignificant in the Japanese beef import market. Insignificant substitutions may imply quality differences between the products in question (Hahn et al, 1990). Beef imports from the U.S. and Oceania appear to be somewhat complementary. In the poultry market, significant substitution exists only between U.S. poultry and poultry from other sources. Canadian pork is a substitute for pork imports from EU, DA (mainly Taiwan) and other sources. Furthermore, the substitution relationships between Canadian pork and pork from the other three sources are mainly significant and elastic.

Cross price elasticities between meat types in the Japanese meat market are indicated in the lower section of Table 3. There is some substitution between poultry and pork imports and beef from the U.S. and other sources. Only pork is a substitute for beef from Oceania. "Other meat" substitutes for beef imports from Oceania and from other sources. Imports of beef, pork and other meat are each substitutes for poultry imported from DA (primarily from Thailand and China) and other sources, but are complementary to

Table 3. Hicksian Price and Expenditure Elasticities of Meat Import Demand in Japan

	Beef Market Shares			Poultry Market Shares			Pork Market Share				Other Meat Market Share	
Variable	USA	Oceania	Other	USA	DA	Others	Canada	EU	DA	Others	Oceania	LA
Beef Price												
USA	-1.222*	-0.785*	0.063									
Oceania	-0.534*	-0.677*	1.633									
Other	0.003	0.103	-2.232*									
Poultry Price												
USA				-0.839*	0.584*	2.484*						
Developing				0.681*	-1.440*	-2.153*						
Others				0.729*	-0.542*	-2.144*						
Pork Price												
Canada							-1.202*	0.642*	0.282	2.865*		
EU							1.275*	-0.570*	2.108*	-1.353*		
Developing							0.532*	2.000*	1.104*	-1.360*		
Other							4.093*	-0.974*	-1.602*	-1.351*		
Other Price												
Oceania											-1.103*	-0.009
Latin America											-0.002	-0.826*
Other											-0.243*	-0.465*
Average Price												
Beef				-0.653	1.662	2.699	-2.376*	-1.449*	0.078	-2.960*	0.549*	0.713*
Poultry	0.522	-0.214	0.580				1.853*	0.838	2.234*	0.670	-0.408	-6.904*
Pork	0.447*	1.674*	0.093	-2.615*	0.859	0.911					-1.153*	-4.807*
Others	-0.462	2.265*	0.459	-2.402*	0.555	2.307	-0.340	-1.549*	0.454	-4.045*		
Expenditure	2.983*	1.735	2.595*	1.153*	0.243	0.275	1.145*	1.677*	1.796*	0.577	0.779	-1.175

Asterisk marks (*) indicate significance at the 5 percent level.

poultry imports from the U.S. Poultry imports are substitutes for pork imported from Canada, EU, DA, and other sources. In other words, poultry imports are substitutes for pork imports regardless of from where the latter is imported. By contrast, imported beef and other meat complement only for pork imported from Canada and EU. The own and cross-price elasticities found in the Japanese meat market are largely consistent with findings from other studies on the Japanese meat market (e.g., Yang and Koo, 1994).

Expenditure elasticities are positive for almost all meat import sources. That is, as aggregate expenditure on meat increases in Japan, the meat market shares of most exporters rises. The exception is for Latin America in the other meat market. Most expenditure elasticities are elastic and half of them significant. In the beef and poultry markets, expenditure elasticities for U.S. beef and U.S. poultry are larger than those from other beef and poultry import sources. In the pork market, the expenditure elasticity for Canadian pork is elastic, but smaller than for EU and DA.

3.5. Meat Import Demand Analysis for South Korea

South Korea's import demand system involves a total of 13 share equations (one equation dropped arbitrarily to avoid singularity). The computed income compensated price and expenditure elasticities for meat imported by South Korea are presented in Table 4. Similar to Indonesian and Japanese meat import markets, own-price elasticities are negative in all four meat markets for all import sources, and these are mainly significant at the 5 percent level. U.S and other sources face an elastic beef demand, while Oceania and Canada face an inelastic response for their beef exports. Beef imports from the U.S. and Canada are substitutes for each other, and significantly so. Beef imports from Oceania are substitutes for U.S. beef, but complements for Canadian

Table 4. Hicksian Price and Expenditure Elasticities of Meat Import Demand in South Korea

	Beef Market Shares				Poultry Market Shares			Pork Market Share			Other Meat Market Share		
Variable	USA	Oceania	Canada	Others	USA	EU	Others	USA	EU	Other	USA	Oceania	EU
Beef Price													
USA	-3.722*	0.162	0.103*	-3.380*									
Oceania	1.477	-0.551*	-0.004	4.341*									
Canada	1.688*	-0.007	-0.671*	4.503*									
Other	-2.682*	0.378*	0.044*	-1.576*									
Poultry Price													
USA					-0.155*	0.027	0.459*						
EU					0.029	-1.177*	-0.023						
Others					0.253*	-0.012	-1.289*						
Pork Price													
Oceania								-2.855*	-0.631*	-4.205*			
Developing Asia								-0.274*	-0.607	0.616			
Other								-0.936*	0.316	-0.247			
Other Price													
USA											-0.573*	-0.044*	2.108*
Oceania											-1.443*	-0.476*	-1.789
EU											0.536*	-0.014	-3.198*
Other											1.318*	0.054	-2.829*
Average Price													
Beef					-0.313	1.983*	-1.977*	0.266	-0.918	1.426*	0.887*	0.378*	-0.240
Poultry	4.909*	0.239	0.042	-0.842				0.056	0.326*	-0.425*	-0.129	-0.569*	-0.863
Pork	7.519*	0.120	0.097*	-4.083*	1.371*	1.869*	1.346*				1.499*	0.232	-5.959*
Others	9.770*	0.924*	0.193*	-4.053*	1.798*	3.302*	-0.872*	0.522*	0.262	0.386			
Expenditure	3.683	1.015	0.815	3.355	2.501*	4.025*	2.193*	1.459	3.679	2.347*	3.525*	1.584*	-1.375

Asterisk marks (*) indicate significance at the 5 percent level.

beef, although both relationships are insignificant. Complementary relationships are observed between beef from the U.S. and other sources.

In South Korea's poultry market, imports from the U.S. are substitutes for poultry from EU and other sources. By contrast, in the pork market, imports from Canada and EU have complementary relationships. In the "other meat" market, U.S. and Oceania products are complementary to each other but substitutes for EU products. Two-thirds of the cross product-price elasticities in the four markets are inelastic; in the majority of cases these measures are significant.

Aggregate imports of poultry, pork, and other meat are substitutes for beef imports from the U.S., Canada and Oceania, significantly so for beef imports from the U.S., as well as for Canadian beef, with respect to pork and other meat. Aggregate beef imports are complementary to U.S. poultry but significantly substitute for EU poultry. Pork and other meats are substitutes for poultry from both EU and the U.S.

Furthermore, these substitution relationships are elastic and significant at the 5 percent level. Beef, poultry and "other meats" imports are substitutes for Canadian pork, while poultry and other meats are substitutes for EU pork. Beef and pork imports are substitutes for "other meat" from the U.S. and Oceania, but complementary to those from the EU. Cross-price elasticities of "other meat" market shares of the U.S., Oceania, and EU with respect to poultry imports suggest a complementary relationship between poultry and "other meats". Overall, the four meat types are substitutes for each other in two-thirds of the cases and significant in 70 percent of the substitution relationships.

Expenditure elasticities are positive and elastic for import sources of the different meat types, except for “other meats” from the EU. Judging by the absolute magnitude of the expenditure elasticities, the following comments can be made: In the beef market, as total expenditure on beef increases, South Korean consumers tend to spend three and four times more on U.S. beef than they do on beef from Oceania and Canada, respectively. In the poultry and pork markets, consumers tend to spend more of their increased import expenditure on EU products than on poultry from the U.S. or other sources or on pork from Canada. However, overall, expenditure elasticities are significant in less than half of the cases.

3.6. Meat Import Demand Analysis for Singapore

The import demand system for Singapore involved 13 share equations (one equation arbitrarily dropped to avoid singularity). Expenditure elasticities for imported meat are generally of a lower magnitude for Singapore than the other three East Asian countries. However, the elasticities are mainly elastic and significant for poultry, pork and other meat, but not for beef imports (Table 5). This result is consistent with the reality that poultry and pork are the preferred meats in Singapore. In the beef import market, expenditure elasticities are inelastic and insignificant for imports from the U.S. and Latin America (LA)—primarily Brazil and Argentina---which are both appreciable exporters to this market. As expenditure for beef imports increases in Singapore, more is imported from other sources than either from the U.S., or Oceania, or LA. Expenditure elasticities for poultry imports from EU, Developing Asia (DA), and other sources are elastic, while that of the U.S. is inelastic and insignificant. Expenditure elasticities in the remaining two markets are elastic for each of the import sources.

Table 5. Hicksian Price and Expenditure Elasticities of Meat Import Demand for Singapore

	Beef Market Shares				Poultry Market Shares				Pork Market Share			Other Meat Market Share	
Variable	USA	Oceania	LA	Others	USA	EU	DA	Others	EU	DA	Others	Oceania	DA
Beef Price													
USA	-1.685*	-0.180*	0.914*	-0.225*									
Oceania	-1.075*	-1.992*	4.245*	0.994*									
LA	1.055*	0.821*	-1.711*	0.825*									
Other	-0.256*	0.190*	-1.716*	-0.082									
Poultry Price													
USA					-2.199*	0.440	-0.231	-3.051					
EU					0.221	-1.293	5.187*	8.240*					
Developing Asia					-0.924	2.266*	-2.052*	8.180*					
Others					-0.263	1.413*	1.815*	-1.730*					
Pork Price													
EU									-2.139*	0.055	2.871*		
Developing Asia									0.118	0.094	4.105*		
Other									1.353*	0.909*	-3.393*		
Other Price													
Oceania												-0.687*	-1.131*
Developing Asia												-0.103*	-0.940*
Other												-0.154	-3.080*
Average Price													
Beef					0.499*	0.583	2.013	-9.058*	0.998	1.487*	-3.518*	0.122	2.605*
Poultry	0.686	0.608*	-3.734*	0.570					1.101*	-0.127	0.030	-1.407*	-3.606*
Pork	-0.801	0.023	3.949*	2.337*	0.615	0.652	1.193	-0.854				0.218	5.949*
Others	-1.851*	-1.735	2.172*	2.078*	-0.822	0.527*	4.112*	-1.663	1.797*	1.804*	0.461		
Expenditure	0.161	0.679*	0.067	2.268*	0.487	1.134*	1.402	1.922*	1.748*	1.545*	2.280*	1.228	4.752*

Asterisk marks (*) indicate significance at the 5 percent level.

Own price elasticities are negative for all meat types and sources. These measures are elastic and significant at the 5 percent level in the majority of cases. Exceptions are beef from other sources, poultry from EU, pork from DA and other meat from Oceania, which are either inelastic or insignificant. Cross product-price elasticities in the beef market suggest that beef imports from Oceania and the U.S. are complementary to each other, but substitutes for beef from LA. In the poultry market, the U.S. and EU supply products that are substitutes for each other. However, U.S. poultry is complementary to poultry from DA and other sources. In the pork market, products from EU, DA and other sources are substitutes for each other, while in the "other meats" market, the cross product-price elasticities suggest complementary relationships between products from Oceania and DA.

Aggregate poultry imports are substitutes for beef imports from the U.S., Oceania, and other sources, though these relationships are insignificant at the 5 percent level. Pork imports substitute for beef imports from Oceania, LA, and other sources.Beef and pork imports are substitutes for poultry from each of the U.S., EU and DA. Beef, poultry and other meat imports are substitutes for pork imports from EU and DA. While beef and pork imports are substitutes for "other meat" imports from Oceania and DA, poultry imports are complementary to other meats from the same sources. Overall, in more than two-thirds of the cases, a substitution relationship exists between the four meat types regardless of import origins. The majority of the substitution relationships are significant at the 5 percent level.

4. An Alternative Approach and Model to Analyze Exports' Competitive Situation

One major theoretical approach applied to model import market shares is the demand system approach such as used in the preceding section. In this approach, import demands are analyzed similar to domestic demand system. Consequently, import (market) shares are derived from an optimization problem for importing countries and are functions of import prices and total imports or total expenditure.

An alternative approach, obtained from the marketing literature, while typically not explicitly built upon optimization principles, has the advantage of flexibility in providing a direct and pragmatic way of modelling factors that are important marketing strategies to exporters but can not be included in conventional models of consumer demand. In the alternative approach, market shares are viewed as a function of the marketing efforts of suppliers or attraction factors related to products or sources. Two notable models in this approach are the Multiplicative Competitive Interaction (MCI) model and the Multinomial logit (MNL) model. While the preponderance of applications of these models has been for domestic branded products, the models can be usefully applied to international market share analysis.

4.1. Derivation of the MCI Model

There are, generally, two views in identifying the factors that determine the relative sales volume of individual exporters into a given importing country. According to the first view, the market share of country i in a given market is a function of (or more precisely, proportional to) its marketing efforts (Kotler, 1984). According to the second view (Bell, Keeney and Little, 1975), market shares are determined by the attraction of consumers toward the alternative brands of a good. In the context of this study, brands

can be viewed as meats from different sources. It should be noted that this view is in line with the Armington model, which differentiates products by source and has been extensively used in studies of international trade.

Following the second view, let A_i denote the attraction of brand i, and S_i its market share. Bell, Keeney and Little (1975) propose the following axioms:

a) $A_{i\,t} \geq 0$ for all i, and $\sum_j A_{i\,t} > 0$;

b) $A_{i\,t} = 0 \Rightarrow S_{i\,t} = 0$;

c) $A_{i\,t} = A_{j\,t} \Rightarrow S_{i\,t} = S_{j\,t}$ $(i \neq j)$; and

d) When $A_{j\,t}$ changes by Δ the corresponding change in $S_{i\,t}$ $(i \neq j)$ is independent of j.

Given these axioms, and the hypothesis that attraction determines market shares, $S_{i\,t}$ can be expressed as follows:

$$S_{it} = A_{it} / \left(\sum_j A_{jt} \right) \text{ and } \quad A_{it} = f\left(X_t \right) \tag{19}$$

where X_t is the set of factors that affect attraction. If *f* in (19) has a multiplicative form, this gives the model called the Multiplicative Competitive Interaction (MCI) model. If, instead, *f* is an exponential function, the market share model of (19) becomes a multinomial logit (MNL) model. Both the MNL and MCI models meet two “logical-consistency requirements”, specifically, the estimated market shares from the model are nonnegative and, secondly, the sum of estimated market shares is greater than zero and less than or equal to one (Cooper and Nakanishi, 1988). In what follows, we apply the MCI model due to its superior performance in previous studies.

Let *f(X)* in equation (19) take the following form:

$$A_{it} = \exp(\alpha_{it}) \prod_{k} X_{kit}\, \varepsilon_{it}\ , \tag{20}$$

so that**,**

$$S_{it} = [\exp(\alpha_{it}).\prod_{k} X_{kit}\, \varepsilon_{it}] / \sum_{i} [\exp(\alpha_{it}).\prod_{k} X_{kit.}\, \varepsilon_{it}] \tag{21}$$

To obtain the final estimable form of the MCI model, Cooper and Nakanishi (1988) suggest a log-centering transformation of (21). This involves (i) take the logarithms of both sides of equation (21); (ii) sum over i and divide through by m; and (iii) subtract (ii from (i) to obtain:

$$\log\ (S_{it}/\tilde{S}) = \alpha^{*}_{it} + \sum_{k} \beta_{kt}\,(X_{kit} / \tilde{X}) + \varepsilon^{*}_{it} \tag{22}$$

Where $\alpha^{*}_{it} = (\alpha_{it} - \bar{\alpha}), \varepsilon^{*}_{it} = \log(\varepsilon_{it} / \tilde{\varepsilon}),$ and $\tilde{S}, \tilde{X}$ and $\tilde{\varepsilon},$ are the geometric means of S_{it}, X_{kjt}, and $\varepsilon_{it.}$, respectively; $\bar{\alpha}$ is the arithmetic mean of α_{it}. Equation (22) was estimated by an OLS method using LIMDEP version 7. The regression was corrected for detected heteroscedasticity and first-order autocorrelation. The following attraction factors were included as explanatory variables.

Attraction Factors

It has been postulated that the quality of the product, reliability of the supplier, related services provided by the supplier, and long-term trading arrangements may affect the export performance of a given country, in addition to relative prices (Richardson, 1971). Trade relationships that importing countries and exporters have in other products, the need by importers to diversify sources in order to reduce risks of import shortfalls, and the use, by some exporters, associated commodity groups or

national agencies, of trade allowances/credit provisions and advertising or promotional activities may affect market shares of trading countries.

While all the above factors are important determinants of agricultural trade patterns for the majority of agricultural products, the factors included in the MCI model in this study are those for which data is readily available. Consequently, a measure of quality, trade relations in other products, and per capita income of importing countries were included, as were alternative specific constants.

Source differentiation implicitly suggests quality differentials between import sources. However, a more explicit representation of *quality* is attempted in this study by relating import prices to domestic producer prices for the different meat types. Consequently, a quality factor is represented for each meat type by the ratio of import prices to domestic producer prices in the meat importing countries. This variable is included in the model together with the import price variable. Whereas import prices are expected to reflect the conventional law of demand and thus demonstrate a negative relationship with meat market shares, the ratio between import prices and domestic producer prices, if positive, is expected to reflect premiums attached to quality.

The basis for the hypothesised measure to assess quality is the simple logic that a positive effect of this ratio on the market share of a given product or import source is a result of higher quality of the product as perceived by the consumers. Therefore, a positive relation between market share and import/domestic price ratio, given a negative relationship between import price and market shares, is hypothesised to indicate the premium consumers attach to quality. Domestic producer prices were chosen over

domestic retail prices in calculating the hypothesised quality measure, as the latter might include import prices.

The rationale in including a measure of reciprocal trade in the MCI model is that an established *reciprocal trade* in other goods is expected to affect meat importing countries' decision to import and how much to import from a particular source. To capture this feature, a reciprocal trade relation variable is specified in the following way. Given a meat importing country j (j=1,...,n) and a meat exporting country i (i=1,...,m), let E_j be the value of exports of all goods from country j to all meat exporting countries, and E_{ij} be the value of exports of country j to country i. Then the reciprocal trade variable is defined as $E_{ij}/E_{j.}$

Per capita incomes of importing countries were included as individual specific constants to capture the effect of per capita income growth on the choice of meat source and meat type. This variable is included also to assess the frequent suggestion in various studies and reports that consumers in Newly Industrialized Asian countries and Japan have tended to adopt a Western style consumption pattern as their income grows. Since all choices (or meat sources) face the same per capita income in a given meat importing country, the equivalent of dummy variable interaction terms were used to incorporate per capita income in the MCI model. Consequently, in estimating the MCI model one of the per capita income terms are arbitrarily dropped to avoid the problem of singularity.

Finally, *alternative or choice specific constants* were added for each source. The alternative specific constants (ASCs) represent the value of the dependent variable if all other variables take a value of zero. Since the value of the alternative specific constant

for a randomly selected import source is set to zero, the results have to be seen in relative terms, i.e., vis-à-vis the randomly selected base case. Alternatively, the alternative specific constants can be viewed as comparing the market shares of import sources with that of the arbitrarily selected source, everything else held constant.

The data required for the MCI model were drawn from the following sources: Meat import market shares and import prices were directly taken from the data used in the source differentiated model. Measures of reciprocal trade were calculated from data obtained from *Commodity Trade Statistics* (UN, various publications). Domestic producer prices in each of the four importing countries for each meat type were obtained from *FAO Online* publications. Per capita incomes were obtained from *International Financial Statistics* (IMF, 1999).

4.2. Results and Discussion

In estimating the MCI model by source, the four meat types were aggregated into one meat category for each import source. Differentiation of meat by type and source was not possible due to the severe problem of degrees of freedom that result from including individual and choice specific alternatives in the model. For the same reason, the number of countries included in the estimation was restricted only to major meat exporters to the four East Asian countries. It follows that the dependent and independent variables (such as price, quality and reciprocal trade) included in the estimation and analysis represent aggregate values of the respective variables over meat types. The results of the MCI model (i.e., equation 22) and discussions of these are presented in the following sections.

MCI Model Results for Indonesia's Meat Import Market

Judging by the coefficients of the alternative specific constants (ASCs), other things remaining constant, the import market shares of Developing Asia (DA) rises in Indonesia relative to "other sources", which is chosen as the base case. The market shares of the remaining sources decline relative "other sources", significantly so for Oceania at the five percent level.

Quality of meat identified by source has a positive and significant effect (at the 5 percent level) on the choice of source and thus affects the market share of competing import sources. This result is reinforced by the negative, albeit insignificant, coefficient of the price variable meat imports shares. Reciprocal trade has also a positive effect on meat market shares, but this effect is statistically insignificant at the 5 percent level. As per capita income grows in Indonesia, the meat market shares of the U.S., Oceania and EU rise significantly relative to the market share of "other sources" (the base case), while the market share of DA falls relative to "other sources" (in all cases, significantly at the 5 percent level).

Own and cross elasticities provide the exact measures of the effects of the independent variables on the dependent variable (i.e., import meat market shares). For Indonesia's import meat market, these are presented in Table 7. Significant coefficients in Table 6 imply corresponding significant elasticities as can be inferred from the elasticity formulas, which depend on market shares.[2] The following observations can be made from the computed elasticities. First, own and cross elasticities are all inelastic,

[2]The market share elasticities are calculated by the following formulae:

$$\xi_{S\,i,i} = \beta_k (1 - S_i) \quad \text{(Own elasticity)} \quad (23)$$

$$\xi_{S\,i,j} = -\beta_k . S_j \quad \text{(Cross elasticity)} \quad (24)$$

where β_k is the common coefficient of the variable k, and S_i, S_j is the market share of country i, j.

but this can be expected for aggregated meat market shares; second, except for Oceania (with an average market share of 50 percent in Indonesia's meat imports during the sample period), the own elasticities are larger than the cross elasticities. This may imply that the attraction factors (such as price, quality, and reciprocal trade) associated with a given meat import source have larger effects on the market share of that source than the effect of these factors on any other competitor's market share.

Table 6. The MCI Model Results for Indonesian's Meat Import by Source

Variable	Coefficient	t-ratio
ASCs		
USA	-1.594	-1.089
OCEANIA	-5.984	-3.469*
EU	-3.445	-1.821
DA	11.011	7.234*
PRICE	-0.379	-0.805
QUALITY	0.128	2.610*
RECIPROCAL TRADE	0.396	0.938
Y (PER CAPITA INCOME)		
USA	0.316	2.267*
OCEANIA	0.831	5.333*
EU	0.409	2.272*
DA	-0.905	-6.194*
R-square 78720		

Asterisks (*) indicate significance at the 5 percent level. "Other sources" are taken as the base case for ASCs and Y (per capita income).

Table 7. Own and Cross Price Elasticities from the MCI Model of the Indonesian Meat Market

Variable	USA	Oceania	EU	Dev. Asia
Price				
Own	-0.300	-0.186	-0.345	-0.324
Cross	0.079	0.193	0.034	0.055
Quality				
Own	0.101	0.063	0.116	0.109
Cross	-0.027	-0.065	-0.012	-0.019
Reciprocal trade				
Own	0.313	0.195	0.360	0.338
Cross	-0.083	-0.201	-0.036	-0.057
Y (own)	0.250	0.409	0.372	-0.774

Cross elasticities with respect to per capita income were not calculated since this variable is an individual specific variable identical for all alternatives.

Third, elasticities are higher at low levels of market shares and decline gradually as market share increases, which suggests that meat exporters with minimal shares can increase their import shares faster by improving their attraction factors or marketing strategies.

MCI Model Results for Japanese Meat Import Market

Canada, U.S.A., Oceania, EU and DA were included as major sources of Japanese meat imports. Both reciprocal trade and quality have positive, and in the case of reciprocal trade, significant effects on the meat market shares of meat import sources (Table 8). The positive sign of the quality variable supports the assertion that for Japanese consumers, quality is an important non-price variable in their choice of meat source. This finding is of particular interest since producer prices in Japan were inflated during the sample period as a result of high levels of agricultural protection, thus depressing the import /producer price ratio used in the MCI model to capture quality effects.

Table 8. The MCI Model Results for Japan's Meat Import by Source

	Coefficient	t-ratio
ASCs		
CANADA	5.416	3.912*
OCEANIA	5.127	4.248*
EU	1.255	1.494
DA	-3.105	-2.328*
OTHER	0.201	0.159
PRICE	-1.988	-1.488
RECIPROCAL TRADE	0.464	4.904*
QUALITY	1.932	1.567
Y (PER CAPITA INCOME)		
CANADA	-0.482	-4.222*
OCEANIA	-0.323	-3.376*
EU	-0.133	-1.996*
DA	0.238	2.116*
OTHER	-0.063	-0.635
R-Square 0.787		

Asterisks (*) indicate significance at the 5 percent level. In order to facilitate comparison with Canada, the U.S. is taken as the base case for ASCs and Y (per capita income).

Over the sample period per capita income growth in Japan has favoured only DA relative to the U.S., which is chosen as the base case. That is, as income grows, the meat market share of the U.S. (the base case) rises significantly, relative to Canada, Oceania and EU. This reflects trends shown in the data. For example, during the ten-year period between 1975 and 1984, Canada's market share in the Japanese meat market averaged about 11 percent and that of the U.S. averaged 22 percent, whereas over the subsequent ten years, Canada's share averaged less than four percent while that of the U.S. rose to 28 percent. However, per capita income in Japan grew faster during the second ten-year period than during the first ten-year period.

The estimated ASCs suggest that, if all other things remained constant, Canada, Oceania and the EU would have increasing market shares in Japanese meat imports relative to the U.S. (the base case). By contrast, the market share of DA would have declined relative to the market share of the U.S. if all other things remained constant.

Calculated own elasticities of meat market shares with respect to price and quality for all sources are elastic and comparable across alternative sources. However, suppliers with small import meat market shares in Japan (such as Canada and the EU) appear to benefit slightly more from improving their price and quality competitiveness. Meat import market shares are inelastic with respect to reciprocal trade, with calculated own and cross elasticities for all sources lying within a close range. Relative to the U.S., the market share elasticities of other major import sources with respect to Japanese per capita income growth have mixed signs. These are negative for Canada, Oceania and EU, but positive for DA. Numerically larger elasticity measures apply for Canada relative to any other country or group of countries.

Table 9. Own and Cross Price Elasticities from the MCI Model of the Japanese Meat Market

Variable	CANADA	USA	OCEANIA	EU	DA
Price					
Own	-1.84	-1.50	-1.44	-1.71	-1.61
Cross	0.15	0.49	0.55	0.28	0.38
Quality					
Own	1.79	1.46	1.40	1.66	1.56
Cross	-0.14	-0.47	-0.54	-0.28	-0.37
R-trade					
Own	0.43	0.35	0.33	0.40	0.38
Cross	-0.03	-0.11	-0.13	-0.07	-0.09
Y (own)	-0.45		-0.23	-0.11	0.19

Cross elasticities with respect to per capita income were not calculated since this individual specific variable is identical for all alternatives.

MCI Model Results for the South Korean Meat Import Market

The Alternative Specific Constants (ASCs) of the model are positive for Oceania but negative for Canada and the EU (Table 10). That is, if other things remained constant, Oceania's market share would have risen in South Korea's meat import market, while the shares of Canada and EU would decline relative to the market share of the U.S.

Table 10. The MCI Model Results for South Korea's Meat Import by Source

	Coefficient	t-ratio
ASC		
CANADA	-2.384	-0.545
OCEANIA	3.189	1.368
EU	-4.788	-1.429
OTHER	5.086	1.768
PRICE	-3.176	-0.992
QUALITY	2.915	0.978
RECIPROCAL TRADE	-2.072	-3.137*
Y (PER CAPITA INCOME)		
CANADA	-0.462	-1.331
OCEANIA	-0.682	-3.626*
EU	0.061	0.224
R-Square 0.6914		

Asterisk marks (*) indicate significance at the 5 percent level. In order to facilitate comparison with Canada, the U.S. is chosen as the base case for ASCs and Y (per capita income).

Average import prices have a negative effect on market shares, as would be expected, but this effect is insignificant. The effect of the quality variable is, though insignificant, positive as expected. A possible explanation for the insignificant effect of quality on South Korean imports may be, as in Japan, due to import protection for domestic cattle and beef (which constituted by far the highest expenditure on South Korean meat imports) and its effect on inflation of domestic producer prices.

The coefficient for reciprocal trade is negative and significant, reflecting characteristics of the data. South Korea's meat imports are predominantly from Oceania, which supplied over 60 percent of this country's meat imports during the sample period. However, South Korea's reciprocal trade with Oceania is the lowest among the various countries from which it imports meat. In fact, the overall correlation coefficient between meat import market share and reciprocal trade is negative (r=-0.36). The interpretation of a negative coefficient for reciprocal trade may have to be handled with qualification. Whereas a positive effect can imply a positive cause and effect relationship between market share and reciprocal trade, a negative effect could simply be a statistical fact (or correlation) that does not necessarily imply a negative cause and effect relationship between the two variables. The best we can say in such situation is that reciprocal trade has no any effect on the market share of competing countries in the South Korean meat import market. In this instance, the relatively large role of Oceania in South Korea's meat import markets may well reflect the long-standing policy of market development of the Oceanic countries (Australia and New Zealand) toward that market. For example, market development efforts for lamb meat exports to Asian

countries have been emphasized since the inclusion of the United Kingdom in the European Union, which reduced market access for sheep meat from Oceania.

Relative to the import market share of the U.S., the market shares of Canada and Oceania decline as South Korea's per capita income rises, significantly so in the case of Oceania. By contrast, with per capita income growth in South Korea, the meat import share of the EU increases relative to that of the U.S.

Calculated own elasticities are generally elastic with respect to average import prices, quality and reciprocal trade, but not so with respect to per capita income growth (Table 11). By contrast, cross elasticities are generally inelastic, except in the case of Oceania. In fact, for Oceania, changes in the value of its attraction factors affect the market share of others more than these do its own meat import market share in South Korea.

Table 11. Own and Cross Price Elasticities from the MCI Model of the South Korea's Meat Market

Variable	CANADA	USA	OCEANIA	EU
Price				
Own	-3.10	-2.36	-1.18	-3.05
Cross	0.08	0.82	2.00	0.13
Quality				
Own	2.84	2.16	1.08	2.80
Cross	-0.07	-0.75	-1.83	-0.12
R-trade				
Own	-2.02	-1.54	-0.77	-1.99
Cross	0.05	0.53	1.30	0.08
Y (own)	-0.45		-0.25	0.06

Cross elasticities with respect to per capita income were not calculated since this individual specific variable is identical for all alternatives.

MCI Model Results for Singapore's Meat Import Market

Relative to "other sources" (the base case), the import market shares of the U.S and Developing Asia (DA) tend to increase (significantly at the 5 percent level) in Singapore's meat market while those of Oceania and EU decline with per capita income growth in Singapore, significantly so for Oceania (Table 12). This result is reflected in

trends in the data. During the sample period, the meat import share of the U.S. increased by close to 2 percent per year, while import shares for Oceania and EU declined by an average of 3 and one percent per year, respectively.

Table 12. The MCI Model Results for Singapore's Meat Import by Source

	Coefficient	t-ratio
ASC		
USA	-3.109	-2.177*
OCEANIA	5.060	3.421*
EU	2.675	1.777
DEVELOPING ASIA	-3.830	-3.739*
PRICE	-3.349	-0.576
QUALITY	1.946	0.354
RECIPROCAL TRADE	-0.422	-1.659
Y (PER CAPITA INCOME)		
USA	0.324	3.029*
OCEANIA	-0.302	-2.328*
EU	-0.168	-1.518
DEVELOPING ASIA	0.358	4.439*
R-Square 0.7219		

Asterisk marks (*) indicate significance at the 5 percent level

Average import prices have a negative but insignificant effect on the market share of import sources. The quality coefficient is positive but insignificant, which is unexpected given the belief of Singaporeans' preference for high quality meat. The coefficient of reciprocal trade is negative, though insignificant. Here too, the implication is that reciprocal trade is not a factor in Singaporean importers decision on meat source. In fact, less than 5 percent of Singapore's exports were to Oceania during the sample period, while this country imported about 30 percent of its meat imports from Australia and New Zealand.

The coefficients of the Alternative Specific Constants (ASCs) suggest that, if all other things were held constant, the import shares of the U.S. and DA would decline relative to "other sources" (the base case), while those of Oceania and EU increase.

Meat import shares are elastic with respect to own price and quality factors. Cross elasticities are generally inelastic except for Oceania with respect to meat import price. Developing Asia has the largest elasticity with respect to income. This reflects that, with income growth in Singapore during the sample period, much of the growth in demand for high quality lean pork imports was met by Developing Asia (mainly Malaysia and Indonesia).

Table 13. Own and Cross Price Elasticities from the MCI Model of Singapore's Meat Market

Variable	USA	OCEANIA	EU	DA
Price				
Own	-2.51	-2.32	-2.78	-2.74
Cross	0.84	1.03	0.57	0.61
Quality				
Own	1.46	1.35	1.61	1.59
Cross	-0.49	-0.60	-0.33	-0.36
R-trade				
Own	-0.32	-0.29	-0.35	-0.35
Cross	0.11	0.13	0.07	0.08
Y (own)	0.24	-0.25	-0.14	0.33

Cross elasticities with respect to per capita income were not calculated since this individual specific variable is identical for all alternatives.

5. Summary and Conclusions: Implications for Alberta and Canada

A major objective of this study was to provide a detailed analysis of meat import demand analysis for four major meat importing Asian markets, namely, Indonesia, Japan, South Korea and Singapore, to appraise vulnerability and uncertainty factors in these markets, and to assess market opportunities for Canadian meat exports.

Interest in the newly industrialized Asian countries, as well as their high-income neighbour, Japan. arises from the fact that these nations have been and will continue to be growing consumers of meat and since an increasing proportion of meat consumption in these countries will likely have to be met by imports. Income growth, limits to domestic production, and continuing trade liberalization effected through the

World Trade Organization (WTO) are expected to lead to increases in meat imports of these nations.

Three types of factors were identified as contributing to meat market uncertainty and vulnerability in the four East Asian countries. These are economic, policy related, and natural and cultural/religious factors. On the basis of review of reports and data that followed events of the Asian financial crisis, one may conclude that the East Asian economies and their meat import markets are susceptible to shocks in the financial and external sectors. However, the crises had less drastic impact on the import meat market than these had on overall economic activity.

First, though real disposable income declined due to the crises, consumers in Japan, for example, became more discriminating about how they spent their money, instead of reducing expenditure on food. Second, the reduction in meat consumption as a result of falling disposable income was shared between domestic supplies and imports. Thus, the domestic livestock sector in Indonesia and South Korea, for example, was affected more severely than would have been expected. Consequently future prospects for meat export into Indonesia, in particular, appear to be stronger as domestic capacity building will take considerable period of time. Third, it seems that the recession may hit more the lower economic groups (presumably those who would consume more domestic meat than imports) than the higher economic groups (who by comparison consume more imported meat).

Domestic policy-related hurdles are likely to continue to be a source of uncertainty in the meat import market. All of the four countries considered have policies geared at encouraging domestic production of one type of meat or another through

import protection measures of one kind or another. Trade agreements signed under WTO have the potential to continue to significantly improve market stability, predictability and market opportunity for Canadian exporters. Tariff reductions and increases in minimum access commitments will continue to benefit exporters by improving their competitiveness and ensuring more predictability of meat import markets. These benefits should be enhanced as further rounds of WTO negotiations reduce remaining tariff protection and streamline provisions for food-safety concerns, thereby discouraging the use of these provisions as pretexts for protection. In the meantime, Canada's reputation as an animal disease free country may give it an edge over meat exporting countries affected by one type of animal disease or another. However, Canada has to be cost competitive with the U.S., which is also an animal disease free country, if it is to improve its market share in East Asian meat markets.

Cultural and or religious restrictions on meat imports will continue to cause some uncertainty, particularly in Indonesia where additional import restrictions apply for religious reasons. A similar tendency may follow in Singapore, where there is growing religious pressure on food standards. If Canada wants to improve its access into the meat markets of Indonesia and other East Asian nations with substantial Muslim populations, it will have to encourage more Canadian agencies to engage in halal certification.

Although East Asian meat import markets are dominated by the closely located exporters of Australia, New Zealand and some Asian countries, significant swings are observed in the market shares of these sources from time to time, particularly in Indonesia and South Korea. There are real opportunities for more distant exporters, like

Canada, to take advantage of these situations. This will require strategic planning, to provide informational capacity building to service these markets through knowledge of their preferences, organizations and trade practices. It will also require appropriate positioning, through aggressive, appropriately directed, effective promotion and development activities. Investment in market intelligence is necessary, to improve capacity and positioning activities. Investment in food safety provisions, enabling this feature to be used in market development and promotion, is also advisable.

In order to examine market responses to changes in prices and total expenditure, and to assess the extent of substitution relations between different meat types and meats of different origin, import demand systems were estimated for each of four meat importing East Asian countries by applying a source differentiated AIDS model. The following observations can be made regarding the income-compensated elasticities computed from the estimated parameters of this model:

Market share elasticities are, as would be expected by economic theory, negative and significant with respect to own prices in almost all cases in each of the four importing countries. Furthermore, the own price elasticities are elastic in the majority of cases except in the meat import market of South Korea. It can be concluded that the meat market in East Asia is price responsive and that price is still the most important determinant of meat market share in these countries.

Cross-price elasticities may be grouped into two classes: cross price elasticities between products of different origin (e.g., between U.S. beef and beef from Oceania in a given beef import market) and cross price elasticities between goods (e.g., between U.S. beef and poultry from any source in a given meat import market). Findings about

cross product-price elasticities are not as conclusive. These are positive only in 61 percent of the cases. In Indonesia, Japan, and Singapore, substitution relationships are more prevalent in the pork import markets than in any other meat market, while in South Korea, such relationships are more prevalent in the beef import market than in any other meat market. This implies that competition is stiffer in the pork and beef markets of these countries.

Nearly 40 percent of the cross product-price elasticities (which took negative signs) suggest complementary relationships among 40 percent of the products originating from different sources; the majority (60 percent) of these relationships are inelastic. The phenomenon of complementarity is particularly prevalent in the Japanese and South Korean meat import markets. Yang and Koo (1994) argue that apparent complementary relationships between products may arise from restrictions such as homogeneity, symmetry and other model restrictions. We conjecture that patterns of preferences leads importers to prefer particular meats from particular sources such that quality differences may be reflected in the appearance of complementary relationships among different meats.

Two third of the cross-good (or meat)-price elasticities are positive suggesting substitution relationships between the different meat types in 67 percent of the cases. In Indonesia, “other meat”; in Japan, beef; in South Korea and Singapore, pork have more substitution relationships with the remaining three meat types than any other meat type. By comparison, less substitution takes place between poultry and the remaining three meat types in each of the four East Asian countries. Apparent complementary relationships exist between meat types (e.g., between U.S. poultry and aggregate beef

import) in one third of the cross meat relationships. Although this outcome has been found in other studies of Asian meat markets, it raises questions because it is hard to explain, for example, why a fall in import price of beef or pork or “other meats” leads Japanese meat consumers to increase imports of poultry from the U.S. Various suggestions are made in the economic literature either to explain or react to this phenomenon. One explanation, the fixed expenditure hypothesis, states the conditions under which complementary relationships may arise between two goods that would normally be considered substitutes for each other (Pitts and Herlihy, 1983). A second conjecture hypothesizes that complementary relationships between meats may reflect differences in consumer preferences between Asia and the West (Johnson et al, 1998). The tendency for substitution between meat products is more commonly seen from studies of consumer behaviour in the West.

One of the approaches used in the literature to tackle the issue of complementary relationships between goods expected to be substitutes to each other is to seek substitution relationships through data mining, involving alternative definitions of prices or quantities, or application of alternative functional forms, or by re-specifying the utility function. Other suggestions include imposition of net substitutability econometrically by restricting Hicksian (or income-compensated) cross-price elasticities to be greater or equal to zero. This approach may obscure or bias true relationships (Hayes et al, 1990). A better alternative to imposing restrictions on Hicksian elasticities may be simply to regard negative cross-price elasticities from unrestricted models as zero by assumption. The positive cross-price elasticities, at least, are then likely to be better reflections of the reality that is expressed by the data.

A combination of high expenditure elasticity for imports and inelastic own price elasticity for imports from a given exporter imply strong export potential for that export source in a given import market. The U.S. appears to enjoy such a position in Indonesia, Japan, and South Korea for most of the meats for which it is a major exporter. Canada faces elastic own price and expenditure elasticities in its pork exports to both Japan and South Korea, but inelastic own price and expenditure elasticities in the beef market of South Korea.

An alternative approach to analyze import demand was applied through the Multiplicative Competitive Interaction model in order to assess the effect of some variables that cannot be included in the AIDS models of meat import demand. Consequently, price, quality, reciprocal trade and per capita income were included as explanatory variables of meat import market shares. For this estimation the different meats were aggregated into one meat category but differentiated by source. Results show that aggregate meat import prices have a negative effect on meat market shares in each of the four countries, but significantly so only in Singapore.

The hypothesized quality variable has a positive coefficient in all cases but is significant only for Indonesia. Reciprocal trade has a positive and significant effect in Japan, a positive but insignificant effect in Indonesia and no effect in South Korea and Singapore. The equivalent of dummy variable interaction terms were used to include per capita income in the estimation. The income coefficients suggest that, as per capita income increases in Indonesia, more meat is imported from the U.S., Oceania, and EU, and less from Developing Asia relative to “other sources”. In Japan, per capita income growth favours only Developing Asia relative to the U.S. but disfavours other competing

countries including Canada. In South Korea, as per capita income increases, the market share of Canada and Oceania declines relative to that of the U.S., while that of the EU increases. Only the U.S. increases its meat market share in Singapore relative to that of "other sources" as per capita income rises in Singapore.

The lack of availability of a complete data set on the relevant variables for Alberta prevented us from applying this study at the provincial level. However, Alberta's increasing and substantial share of total Canadian meat exports indicate that the results we report are more relevant to Alberta than to any other province. For example, Alberta's share in total Canadian beef exports averaged 58.5 percent for the 1989 to 2000 period (for which comparable data were available). During the same period, Alberta's average share of total Canadian pork exports was about 15 percent, while its share in all other meat exports of Canada was 17 percent. Overall, during the reference period, 37 percent of Canadian meat exports to the rest of the world were from Alberta.

Data required to calculate Alberta's share of Canadian meat exports to the four East Asian countries included in this study were not available. However, taking Alberta's share in Canadian agri-food exports to these countries as a proxy, we note that, except in Singapore, for which Canadian agri-food exports are relatively small, Alberta's meat export shares to the East Asian countries is substantial. For example, Alberta's average shares of total Canadian agri-food exports to Indonesia, Japan and South Korea were 32%, 32.5% and 33%, respectively over the period from 1989 to 2000. These figures may underestimate Alberta's share of Canadian meat exports to these countries, in the light of several other features. These are, first, that Alberta's share in Canadian agri-food exports to the East Asian countries (at 32.5%) is higher than its share of Canadian

agri-food exports to the rest of the world (at 19.8%). Second, Alberta's share in Canadian meat exports (at 37%) is higher than its share in Canadian agri-food exports (at 21.5%). Third, Alberta's share in Canadian meat exports (at 37%) is higher than Alberta's share in Canadian non-meat agri-food exports (at 17.5%).

Overall, we can conclude that there are market prospects for exports of meats from Canada and Alberta to East Asian nations. Quality and price are important features for the export potential to these markets to be achieved. The vulnerabilities of export growth to these markets requires strategic planning. Investment in market information will be an important means of contributing to the capacity to penetrate these markets and to counteract their vulnerabilities. Achieving a high quality reputation requires emphasis on food safety procedures.

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Publications Emanating from the Study

One article is under review and two further articles are in preparation.

Appendix 1. Marshallian Elasticities of Meat Import Demand for Indonesia

Variable	Beef Market Shares of				Poultry Market Shares of			Pork Market Share of				Other Meat Market Share	
	USA	Oceania	DA	Others	USA	EU	Others	USA	Oceania	DA	Others	USA	DA
Beef Price of													
USA	-0.866*	0.235*	1.288*	-1.513*									
Oceania	0.222	0.349	1.881*	1.903									
Developing	-0.873*	0.231*	-1.382*	1.245*									
Other	-0.820*	0.171*	-0.431	-2.637*									
Poultry Price													
USA					-	-0.182*	-0.080*						
EU					0.064	-1.351*	0.444*						
Others					0.017	0.446*	-1.019*						
Pork Price of													
USA								0.604*	-0.014	0.385	0.641*		
Oceania								-0.017	-1.263*	0.675	2.868*		
Developing								1.641*	1.986*	-	2.868*		
Other								0.911*	2.925*	-	-1.213*		
Other Meat													
USA												-0.216	-3.551*
Developing												-0.376*	-1.403*
Other												1.615*	-0.588*
Average Price													
Beef					0.001	-0.546*	-0.356	-1.115	-3.984*	-	-0.068	-0.779	-1.124
Poultry	0.045	0.926*	-1.813*	-1.385				0.309	0.606	-	0.340	0.825	0.171
Pork	1.012	-0.601	3.262	4.161	0.621	1.180	-0.447					-0.015	-2.026
Others	0.020	-0.271	0.419	0.650	0.941	-1.535	0.447	3.783*	1.229	-	-0.495		
Expenditure	1.331*	-1.953	-0.884	-0.536	1.122*	1.365*	1.995*	1.505	3.283*	4.770	2.021	2.291	2.662

Asterisk marks (*) indicate significance at the 5 percent level.

Appendix 2. Marshallian Elasticities of Meat Import Demand for Japan

Variable	Beef Market Shares			Poultry Market Shares			Pork Market Share				Other Meat Market Share	
	USA	Oceania	Other	USA	DA	Others	Canada	EU	DA	Others	Oceania	LA
Beef Price												
USA	-	-1.087	-									
Oceania	-	-0.883	1.325									
Other	-0.020	0.090	-									
Poultry Price												
USA				-0.891*	0.573*	2.471*						
Developing				0.619*	-	-2.167*						
Others				0.713*	-	-2.148*						
Pork Price												
Canada							-1.280*		0.161	2.854*		
EU							1.121*	-	1.866*	-1.433		
Developing							0.386			-3.199*		
Other								-	-	-1.407		
Other Price												
Oceania											-1.180*	0.107
Latin America											-0.022	-0.796*
Other											-0.272*	-0.422*
Average Price												
Beef				-0.782	1.634	2.668	-2.532*	-	-0.274	-2.946	0.461*	0.845*
Poultry	0.187	-0.409	0.288				1.410*	0.336	1.719*	0.292	-0.740	-6.404*
Pork	-0.825	0.935	-	-3.106*	0.755	0.794					-1.278*	-4.618*
Others	-	1.986*	0.041	-2.587*	0.516	2.263	-0.525	-	0.164	-4.206*		
Expenditure	2.983	1.735	2.595	1.153*	0.243	0.275	1.145*		1.796*	0.577	0.779	-1.175

Asterisk marks (*) indicate significance at the 5 percent level.

Appendix 3. Marshallian Elasticities of Meat Import Demand for South Korea

	Beef Market Shares				Poultry Market Shares			Pork Market Share			Other Meat Market Share		
Variable	USA	Oceania	Canada	Others	USA	EU	Others	USA	EU	Other	USA	Oceania	EU
Beef Price													
USA	-3.805*	0.139	0.085*	-3.455*									
Oceania	0.722	-0.759	-0.171	3.273*									
Canada	0.337	-0.379	-0.970*	3.273*									
Other	-2.748*	0.360*	0.029*	-1.636*									
Poultry Price													
USA					-0.212*	-	0.409						
EU					-0.033	-	-0.077*						
Others					0.222*	-	-1.316*						
Pork Price													
USA								-2.887*	-	-4.257*			
Oceania								-0.288	-0.642	0.594			
Developing								-0.943*	0.298	-0.258			
Other													
Other Price													
USA											-0.600*	-0.056*	2.119*
Oceania											-2.362*	-0.889*	-1.431
EU											0.530*	-0.017	-3.195*
Other											1.244*	0.021	-2.801*
Average Price													
Beef					-0.405	1.834*	-2.058*	0.213	-1.053	1.340*	0.674*	0.282*	-0.157
Poultry	4.687*	0.178	-0.007	-1.044				-0.369	-	-1.108*	-0.258	-0.627*	-0.813
Pork	7.383*	0.083	0.067	-4.206*	0.644*	0.698*	0.707*				0.473	-0.229	-5.559*
Others	8.698*	0.628	-0.045	-5.029*	1.798*	3.302*	-0.872*	0.522	0.262	0.386			
Expenditure	3.683	1.015	0.815	3.355	2.501*	4.025*	2.193*	1.459	3.679		3.525*	1.584*	-1.375

Asterisk marks (*) indicate significance at the 5 percent level.

Appendix 4. Marshallian Elasticities of Meat Import Demand for Singapore

	Beef Market Shares				Poultry Market Shares				Pork Market Share			Other Meat Market Share	
Variable	USA	Oceania	DA	Others	USA	EU	DA	Others	EU	DA	Others	Oceania	DA
Beef Price													
USA	-1.691*	-0.204*		-0.305*									
Oceania	-1.109*	-2.135*		0.733*									
LA	1.049*	0.794*	-	0.733*									
Other	-0.262*	0.162*	-	-0.173									
Poultry Price													
USA					-2.302*	0.201	-	-3.359*					
EU					0.169	-	5.038	8.091*					
Developing Asia					-0.946*		-	8.091*					
Others					-0.271		1.789	-1.765*					
Pork Price													
EU									-2.230*	-0.024	2.754*		
Developing Asia									-0.074	-0.076	3.855*		
Other									1.311*	0.871*	-3.449*		
Other Price													
Oceania												-0.797*	-1.557*
Developing Asia												-0.113*	-0.979*
Other												-0.178	-3.174*
Average Price													
Beef					0.313*	0.151	1.478	-9.791*	0.331	0.897	-4.388*	-0.346	0.792
Poultry	0.624*	0.349*	-	-0.295					0.782	-0.409	-0.385	-1.631*	-4.473*
Pork	-0.831*	-1.532*		1.924*	0.526	0.445	0.938	-1.205				0.076	5.400*
Others	-1.870*	-1.813*		1.816*	-0.878	0.396	3.950	-1.885	1.595*	1.626*	0.197		
Expenditure	0.161*	0.679*	0.067	2.268*	0.487	1.134	1.402	1.922	1.748*	1.545*	2.280*	1.228	4.752*

Asterisk marks (*) indicate significance at the 5 percent level.

Appendix 5. Average Value (in thousands of US Dollars) and Standard Deviation of Meat Exports into Indonesia by Major Meat Exporters (1974-1994)

	Beef			Poultry			Pork			Other Meat		
Variable	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94
USA												
Mean	225	1432	1966	455	2986	5120	60	187	159	25	213	29
Standard Dev.	102	876	700	210	1139	1560	60	366	220	7	475	29
Oceania												
Mean	1654	12991	22703				67	407	138			
Standard Dev.	1395	6884	18661				158	965	143			
EU												
Mean				224	1940	2737						
Standard Dev.				234	1424	1464						
Dev. Asia												
Mean	273	861	696	328	806	475	379	352	491	85	185	857
Standard Dev.	121	658	483	215	469	337	175	285	125	44	220	460
Others												
Mean	313	196	466	112	508	329	49	164	589	17	942	1982
Standard Dev.	75	75	424	77	264	181	47	83	390	16	1286	579

Appendix 6. Average Value (in thousands of US Dollars) and Standard Deviation of Meat Exports into Japan by Major Meat Exporters (1974-1994)

	Beef			Poultry			Pork			Other Meat		
Variable	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94
Canada												
Mean							90080	128178	137721			
Standard Dev.							36602	30608	33294			
USA												
Mean	42977	256050	126734	36535	122902	194024						
Standard Dev.	31069	203971	227935	20016	89251	19234						
Oceania												
Mean	154608	352993	997084							159823	153066	134632
Standard Dev.	92450	88504	215800							47713	48862	11679
EU												
Mean							106557	339006	729786			
Standard Dev.							61778	196297	124805			
Dev. Asia												
Mean				23313	109910	542653	62111	307911	110386			
Standard Dev.				16320	76379	138393	18178	248788	274106			
Latin Am.												
Mean										48014	41969	19480
Standard Dev.										40929	25440	3376
Others												
Mean	5769	20341	36286	5502	24848	152358	194620	343816	793338	210171	231818	189345
Standard Dev.	3222	18490	7216	2734	26569	27788	96117	176287	196185	88493	44298	16791

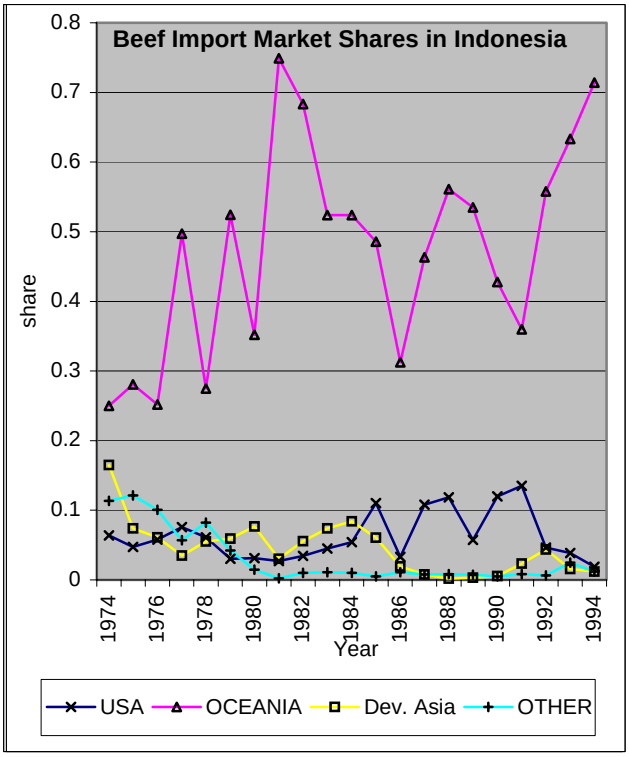
Appendix 7. Average Value (in thousands of US Dollars) and Standard Deviation of Meat Exports into South Korea by Major Meat Exporters (1974-1994)

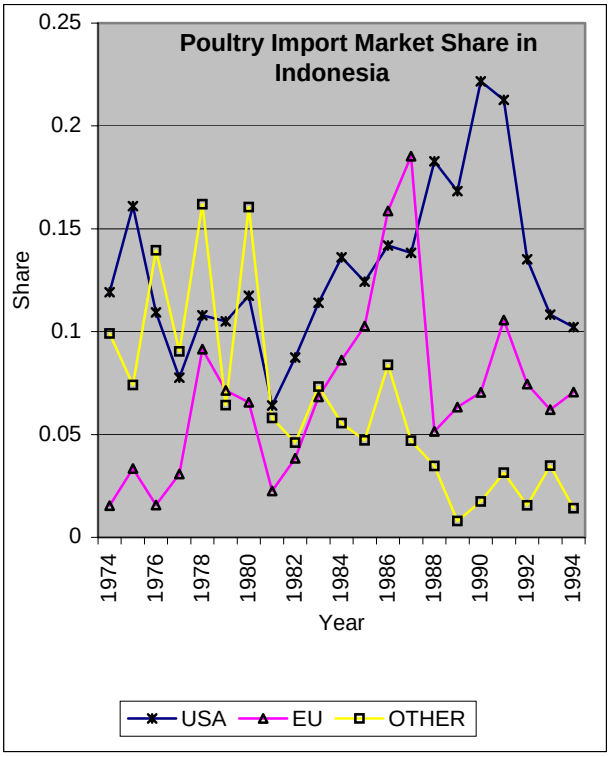
	Beef			Poultry			Pork			Other Meat		
Variable	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94
Canada												
Mean	896	4838	2662									
Standard Dev.	1248	5799	2094									
USA												
Mean	9940	16903	194285	5559	670	6024	467	1172	19088	144	424	1278
Standard Dev.	9705	18134	48965	8504	402	2714	684	462	7666	70	271	702
Oceania												
Mean	28582	57637	203883							19876	13235	21312
Standard Dev.	38233	62130	42120							14459	3335	3526
EU												
Mean				348	1051	24285	111	460	7513	176	24	385
Standard Dev.				331	1211	28655	132	430	1895	362	32	297
Others												
Mean	1027	2280	91	2902	307	9132	98	161	6636	486	1541	2407
Standard Dev.	1594	4177	95	4643	305	12734	135	107	3606	258	1797	618

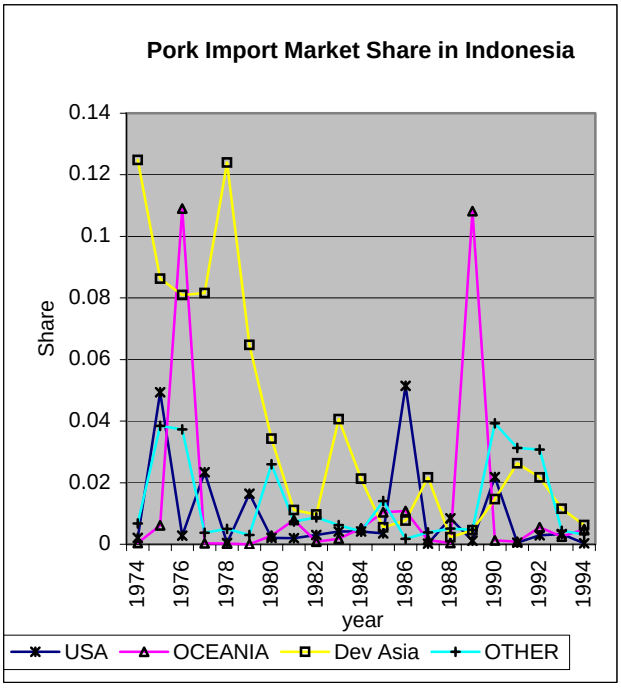
Appendix 8. Average Value (in thousands of US Dollars) and Standard Deviation of Meat Exports into Singapore by Major Meat Exporters (1974-1994)

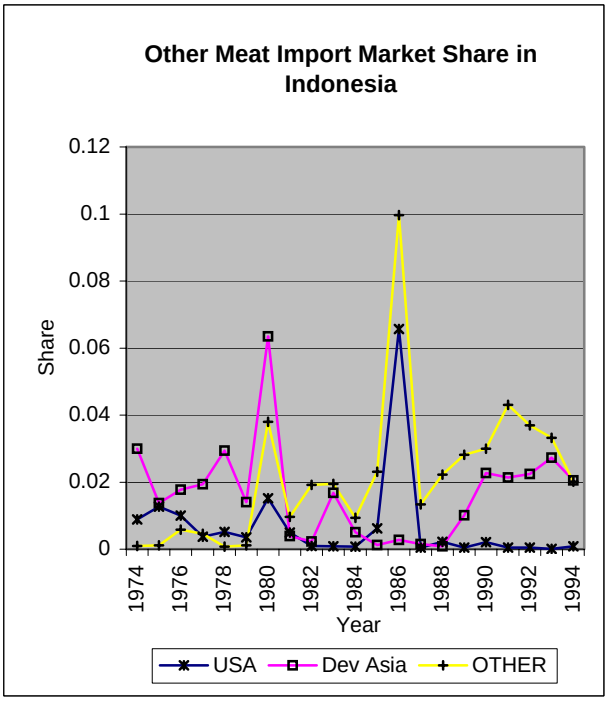
	Beef			Poultry			Pork			Other Meat		
	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94	1974-79	1980-89	1990-94
USA												
Mean	1504	3810	9688	9841	28943	38221						
Standard Dev.	545	1294	1895	5814	9861	5104						
Oceania												
Mean	16179	22090	22559				120	1455	176	5300	9535	13897
Standard Dev.	6130	10113	4076				71	3712	182	1121	1466	1594
EU												
Mean				6472	8902	27897	2867	6287	7854			
Standard Dev.				1148	4005	5559	355	3359	820			
Developing												
Mean	882	2438	5038	435	4787	21180	4742	13113	25289	296	1442	909
Standard Dev.	244	922	1720	89	3701	2869	1311	5909	4243	136	1521	749
Others												
Mean	1267	7332	19418	807	2207	6199	328	2120	1895	308	2939	1151
Standard Dev.	447	6618	2232	792	2504	2377	87	1775	1074	103	3134	167

Appendix 9. Meat Import Market Share Trends in Indonesia

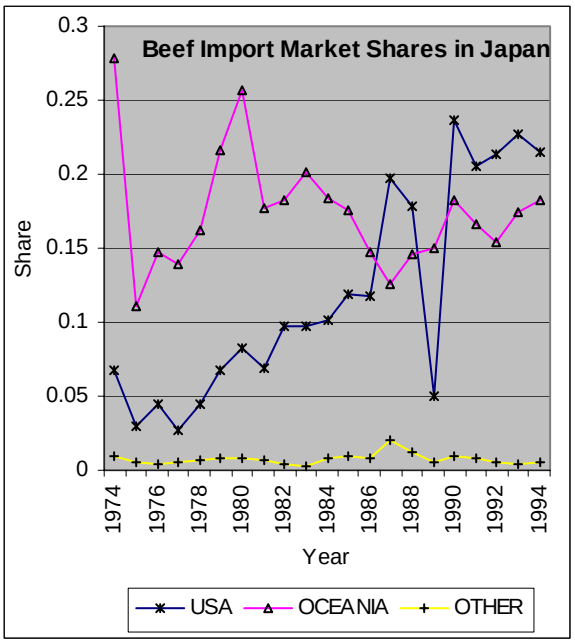


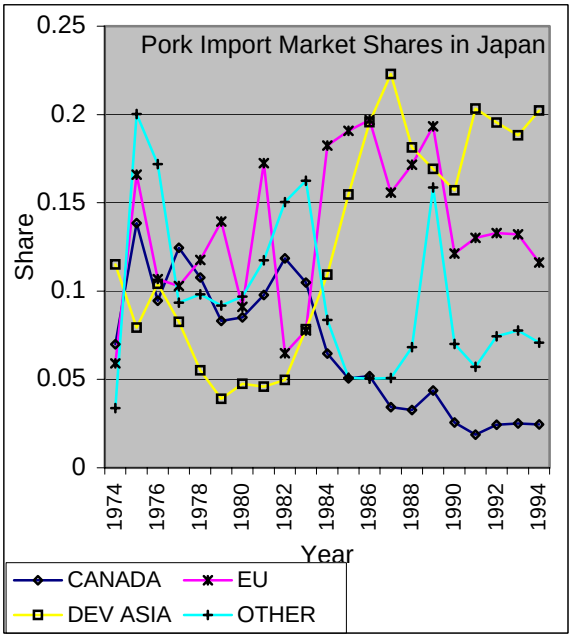


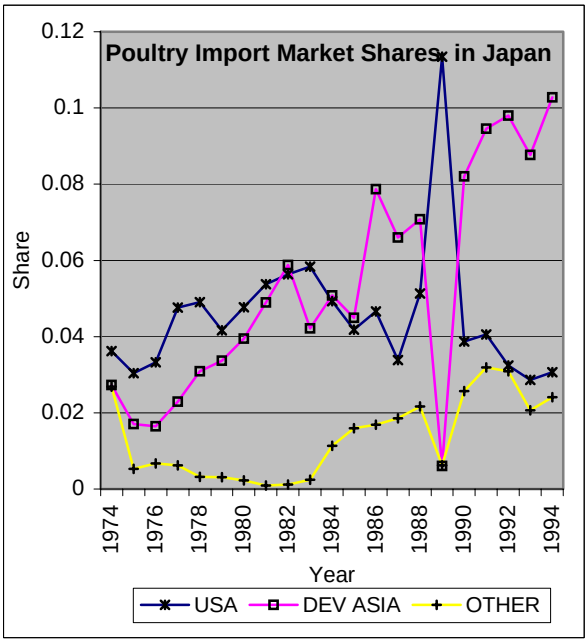


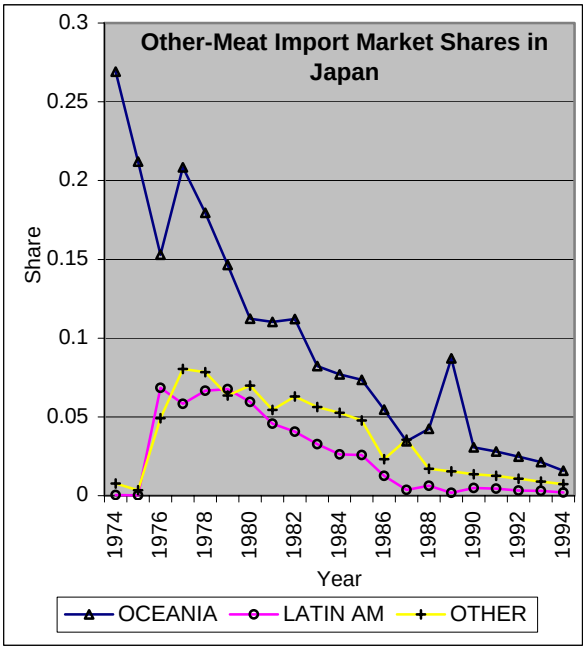


Appendix 10. Meat Import Market Share Trends in Japan

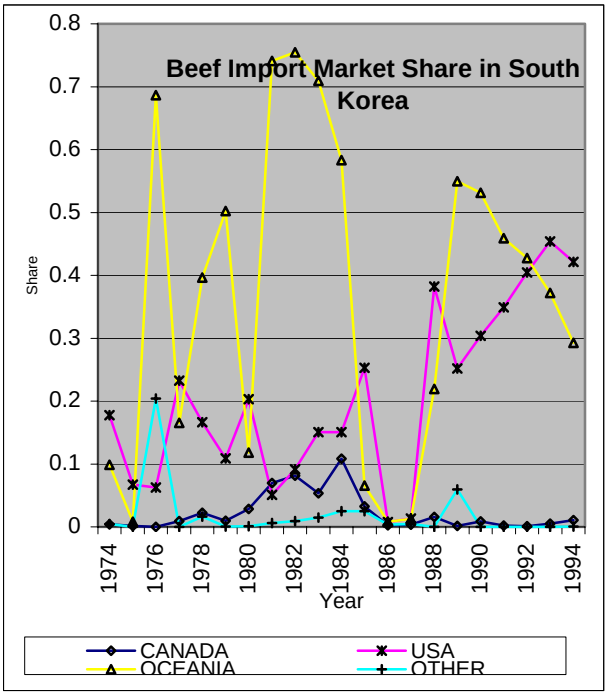


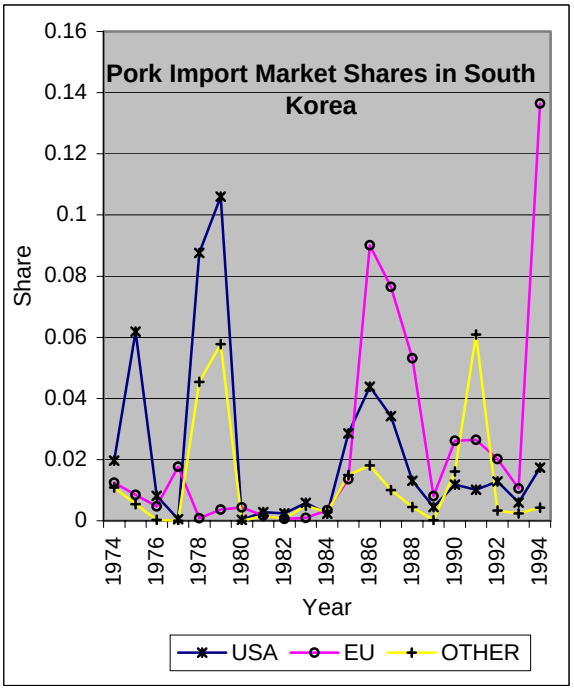


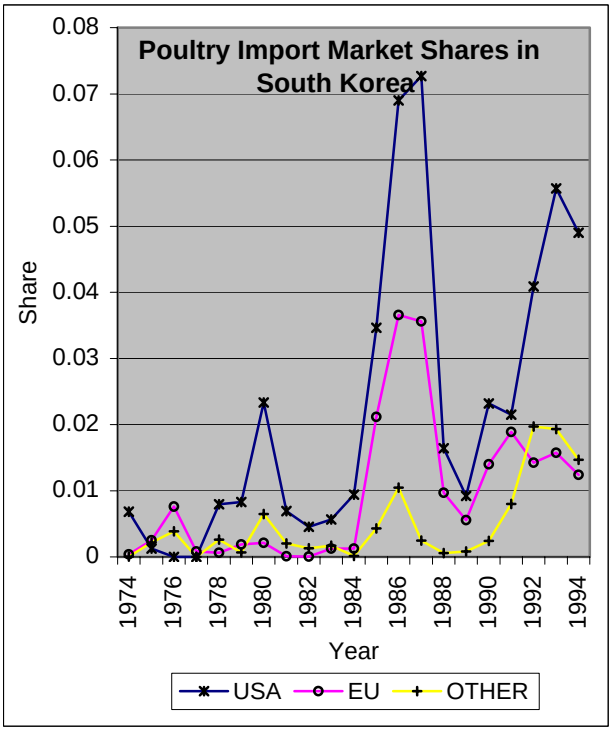


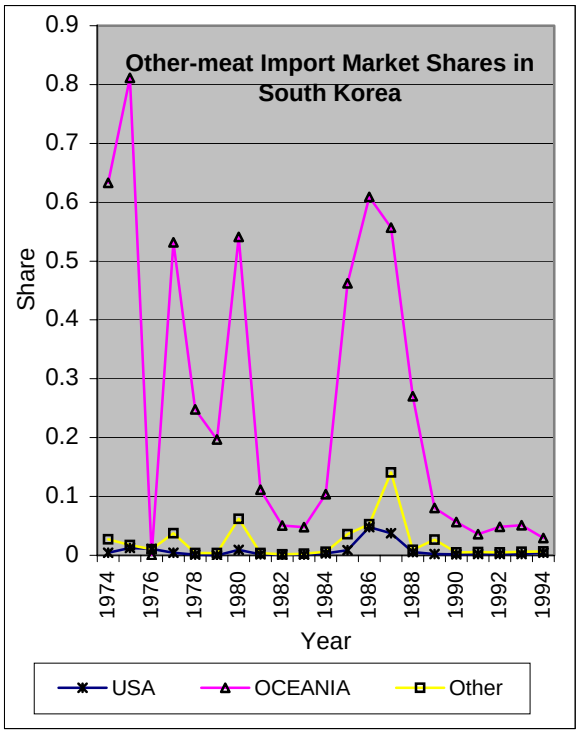


Appendix 11. Meat Import Market Share Trends in South Korea









Appendix 12. Meat Import Market Share Trends in Singapore