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Aggregate Import Demand in Japan: And Comparisons with Changes in Japanese Beef Import Demand Resulting from the Beef Market Access Agreement

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AGGREGATE IMPORT DEMAND

IN JAPAN

And Comparisons with Changes in Japanese Beef Import Demand Resulting from the Beef Market Access Agreement

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ABSTRACT

The United States excels and leads the world in beef production. One reason for the large production is the fact that the United States is also the world's largest beef consumer. But over the past twenty years, beef consumption in the United States has been on the decline. Among the Japanese, beef consumption is on the rise. Given the objective to gain competitiveness in world trade, the ability of the United States to export more beef and take advantage of these circumstances may help the United States increase exports.

The purpose of this thesis is to evaluate the effects of the Beef Market Access Agreement on the demand for beef in Japan. This is done by looking at the situation in both a Macroeconomic and Microeconomic manner. First, a literature review evaluating several studies which look into these effects is considered. Two studies are highlighted among the review to evaluate predictions of beef demand over the ten years after the lifting of restrictions. These show that changes in personal income and the price of beef will influence changes in the demand for beef.

Afterwards, an aggregate import demand specification is introduced and tested for Japan. This specification also suggests that income and import price are determining factors in aggregate import demand.

The thesis begins with macroeconomic comparisons between the United States and Japan, demonstrating the trade balance differences among the nations. Later, Japan's economy with respect to beef production, demand and prices is introduced and compared with the United States. A history of Japan's food production and consumption in general and beef demand in particular is also highlighted.

Although the evaluation is in the beef industry alone, and since historical demand has been skewed by restrictions. Therefore, evaluation of Japanese aggregate import demand is the second of the two main objectives of this thesis.

This thesis evaluates circumstances which have resulted in Japan's beef quota, and current, encouraging events which have been dismantling these restrictive practices.

After the literature review, the econometric model is tested using quarterly statistics from 1960-1990. The results of the model are given and compared with the findings of the earlier literature studies. Finally, recommendations for further study are considered.

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INTRODUCTION

The United States and Japan are two of the strongest economic nations in the world, producing a variety of goods and services for domestic consumption and for international trade. Part of this international trade is with each other, and there is a significant export trade difference between the two nations, with the United States becoming less competitive than the Japanese in the area of foreign exports.

One way that the United States may improve this balance of trade deficit is to increase its beef exports to Japan. Beef consumption is on the rise in Japan, and the 1988 Beef Market Access Agreement will remove restrictions which have historically stifled U.S. efforts to meet increasing Japanese consumer demand for beef.

The purpose of this thesis is to evaluate the effects of the Beef Market Access Agreement on the demand for beef in Japan. This will be done in two ways. First, a literature review evaluating several studies which look into these effects will be considered. Two studies will be highlighted among the review to evaluate predictions of beef demand over the ten years after the lifting of restrictions. These will show that changes in personal income and the price of beef will influence changes in the demand for beef.

Second, an aggregate import demand specification will be introduced and tested for Japan. This specification will also suggest that income and import price are determining factors in aggregate import demand.

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United States and Japan, demonstrating the trade balance differences between the nations. Later, Japan's economy with respect to beef production, demand and prices will be introduced and compared with the United States. A history of Japan's food production and consumption in general and beef demand in particular will also be highlighted.

Although the evaluation will be in the beef industry alone, and since historical demand has been skewed by restrictions, it would be beneficial to compare these evaluations with a study of aggregate import demand by the Japanese. Therefore, evaluation of Japanese aggregate import demand is the second of the two main objectives of this thesis.

According to the Organization for Economic Cooperation and Development, (OECD), the United States excels and leads the world in beef production. One reason for the large production is the fact that the United States is also the world's largest beef consumer. But over the past twenty years, as will be explored later, beef consumption in the United States has been on the decline. Among the Japanese, as will be further explored later, beef consumption is on the rise. Given the objective to gain competitiveness in world trade, the ability of the United States to export more beef and take advantage of these circumstances may help the United States increase exports. This thesis will evaluate the circumstances which have resulted in Japan's beef quota, and current, encouraging events which have been dismantling these restrictive practices.

After the literature review and the testing of the econometric model, results of the model will be given and compared with the findings of the earlier literature studies. Finally, a conclusion will be given along with recommendations for further study.

CONTRIBUTION TO BODY OF KNOWLEDGE:

This effort will contribute to the body of knowledge because although several papers have been written on aggregate import demand, I have found no prior studies on aggregate import demand by Japan. This thesis will follow from a paper on aggregate demand for other Pacific Rim countries, (Arize, 1991). By applying similar econometric techniques with statistical information from Japan, I hope to contribute to the body of knowledge by testing the model with a developed nation in the area.

The methodology, though very basic, should prove useful for comparison of trends in the marketplace between Japanese aggregate import demand and Japanese import demand for American beef. Addressing the influence of changes in income and prices on the demand for imported beef by the Japanese should also prove useful. The qualitative evaluation should prove valuable to many Midwestern beef producing companies who wish to better market their product in the world arena.

Trade restrictions in general are, by nature, in conflict with the objective of free trade. If the objective for the world is free trade, reality dictates free trade to be advantageous only if the parties considering free trade can benefit more than they could with quotas, tariffs, and other restrictions. Given the history of international trade in the world, sadly, it seems restrictions have been the ruling policy, for mainly parochial reasons.

This thesis will take into account the international relationship between Japan and the United States. Considering the spectrum of restrictions to free trade, if the question were asked where these two nations stand, the

answers would depend on several different criteria. If a United States Congressional representative from Michigan, the heart of the American automobile industry, were asked about the relationship, the answer would be strikingly different than the petroleum producer in the Gulf of Mexico. These differences in opinions would occur for parochial reasons.

II. JAPANESE MACROECONOMIC BACKGROUND:

Japan's consumer market is very strong, with its Consumer Price Index steadily reflecting low inflation over the past few years, and its National Income has steadily risen since 1960, as shown in **APPENDIX #1**. Its total level of imports has risen steadily since 1960, reflecting its strong use of raw materials for the manufacture of value-added products like automobiles and electronic products. These value-added products make up a large portion of exports, an intregral part of Japan's economy.

One measurement of overall success in international trade is the current account balance, which is basically the difference between a nation's exports and imports, (unilateral transfers and services not withstanding). When the nation's imports are greater than it's exports, the nation is said to have a balance of trade "deficit". On the other hand, the nation with exports outpacing its imports, has a balance of trade surplus. When comparing the current account balance of both the United States and Japan, there is certainly a striking difference between the two nations. As demonstrated in **APPENDIX #2** at the end of 1989, Japan had a current account balance surplus of nearly $57 billion. This is amazing when considering that in 1980, they had a current account balance deficit of nearly $11 billion.

Japan completed 1986 with a current balance surplus of over $87 billion. This activity is even more amazing, when considering over the same time span, the value of the yen has significantly appreciated from a low of 260 yen/$ in 1982, to a high of 170 yen/$ at the end of 1989. Given conventional wisdom, when other things are equal, an appreciation of the yen would work to move Japan's current account into defecit. The opposite has in fact occurred.

The United States shows a current account balance history which is almost the exact opposite of the Japanese, especially over the past ten years. As the appendix shows, the United States was nearly balanced in its current account at the beginning of the 1980's, but began a nosedive in the early years of the decade and never turned up. Between 1982 and 1983, the current account balance deficit increased by nearly 70% to over $40 billion. In the next year, it increased another 145% to over $98 billion, peaking in 1986 to a level of $162 billion. As noted earlier, this descent was occurring during the same time as the yen appreciation, which may skew these already vexing statistics.

Given these facts, it could be stated that the United States is becoming less competitive in world export markets. Given the objective of free trade, the United States should continue to explore and establish strategies in world trade which will make America more competitive. One area of international trade would be in agriculture, an area where Japan's history has been colorful but turbulent.

III. JAPANESE MICROECONOMIC BACKGROUND

The third section of this study will begin with a descriptive analysis of Japan with respect to beef. Statistical tables will be presented illustrating various trends in Japanese beef consumption over the years. Consumption information will be contrasted with illustrations of Japanese beef production statistics. It will be shown that domestic production has not kept up with demand. In addition, beef price statistics will be illustrated, representing the distortion of traditional economic activity which shows market clearing and eventual equilibrium of supply and demand. The artificial shortage, resulting from the restrictive measures for beef imports will help explain the relatively high domestic prices for beef in Japan.

This study will examine the factors which contribute to the demand for beef among the Japanese consumer. The evaluation will also explain how distorted prices and supplies, resulting from import restrictions over the years have stunted the growth of beef demand relative to demand for substitute products. We will begin with historical analysis.

JAPAN AS AN AGRICULTURAL NATION

Agricultural produce accounted for up to 80% of Japan's total annual exports in the 1870-90 period. Agricultural and mineral products were also important export items that provided Japan with its necessary foreign exchange for domestic economic development. Among the major export items were agricultural products such as silk, silkworm eggs, tea, and rice.

The share of primary industries, such as agriculture, in national income dropped markedly in Japan during and after World War I to less than 30% in 1922. In the 1950's the shift in agricultural policy reflected public recognition of the importance of increasing Japan's self-supply of food, a recognition which became stronger after the outbreak of the Korean War, (Yoshioka, 1988, p.12). In 1960, 15% of Japan's GNP was produced by 25% of the Japanese population, (the rural base). By 1985, agriculture production accounted for less than 4% of GNP, and less than 5% of the population was employed in agriculture. The exodus of labor out of agriculture was primarily the result of both technological advances that required less on-farm labor, and increased opportunities in the industrial sector of the economy, (Wahl A, 1989, p. 22). Amazingly, this strong agricultural base was in a nation about the geographic size of California with only five percent of the land available for agricultural production. Moreover, the agricultural sector of the economy has historically had great influence on the political development of the nation of Japan. Ironically, this influence has changed disproportionately as the industrial sector of the nation has grown over the past half-century.

As much food as they now import, they have a strong current account surplus. Part of the reason is that much of their imports are either energy related or food related. According to the International Financial Statistics, the lion's share of their imports are for materials which they cannot produce enough of on their own, i.e. petroleum and certain kinds of food.

POLITICAL INFLUENCE OF THE FARMERS

The Japanese farmers, though smaller in numbers, still wield a lot of clout as a group. The support of agricultural cooperatives has become a decisive factor in winning elections in the Diet, (the Japanese Parliament), for both the ruling Liberal Democratic Party, (LDP), and opposition parties.

But one problem is other nation's concern about of how the Japanese subsidize their farmers. One of the main topics at the Uruguay Round, in which Japan participated, was adjusting the agricultural policy, already proposed by major industrialized nations including Japan. This was the first positive contribution made by Japan in the multilateral agricultural trade negotiations. Until the Uruguay round, Japan was more like an observer in battles between the United States and Europe in agricultural related issues. Therefore Japan had not made it's position clear. Battles over agricultural subsidies were not isolated between the United States and Japan alone. Europe, Canada, and Mexico have complained about United States policies and the U.S. has reciprocated.

The U.S. government requested abolition of import quotas on twelve farm products, charging that they constituted a violation of the General Agreement on Trade and Tariffs, (G.A.T.T.). The Japanese government countered by telling the U.S. that these were important farm products in some regions of Japan and the elimination of import quotas would be difficult. Japan instead offered expansion of the quotas. In the fall of 1986,

the US demanded that a G.A.T.T. panel be set up to scrutinize the issue, (Yoshioka, 1988, p. 9). The resulting 1988 Beef Market Access Agreement will be discussed later.

CHANGING TIMES IN JAPANESE AGRICULTURE

The world has demanded changes in the way the Japanese treat their farmers. And these demands have also surfaced in Japan as well. Debate over agricultural policy reform has developed because political parties have been shifting their political bases from rural to urban areas, although the Diet, the Japanese parliament, has not reapportioned itself for decades. During this time there has been continued increases in urban population while rural population has decreased. The political leaders, especially those of the ruling LDP, came to recognize that political parties must set policies that appeal to urban dwellers to maintain their political majority, (Yoshioka, 1988, p. 88). All of these demographic changes have worked to put increasing pressures on the status quo of protection.

JAPAN AS AN IMPORTER AND CONSUMER OF BEEF

Japan continues to be the largest market for American agricultural exports. In 1987, the United States exported nearly $6 billion worth of agricultural products to Japan, three times as large as its exports to the Netherlands, the second largest importer. Seventy-five percent of the beef which

is exported from the United States is exported to Japan. In addition, nearly half of the beef which the Japanese import comes from the United States, (OECD).

Statistics for 1985 indicate that Japan's per-household eating and drinking expenses considered as a percentage of total consumer expenditure (known as Engel's coefficient) stood at 27.6%. 61% of that amount is either in processed foods or dining out...a 50% increase over the last 50 years, (Yoshioka, 1988, p. 81). 41% of Japan's retail businesses are food related, employing 2.35 million people. The so-called "Westernization of eating habits" has taken place and the intake of meat has increased. During the period 1960 to 1985, the annual Japanese per-capita intake of beef increased from 7 kg. to 13 kg; as shown in **APPENDIX #3**. This increase is especially significant when compared with the figures which show annual per-capita pork consumption. Although pork consumption is higher by nearly 6 kg., it is easy to detect the trends in Japanese tastes, especially in the last eight years of measurement.

The Japanese consumer has a strong preference for highly marbled cuts of beef and will pay high prices for the choice grade Wagyu or Kobe beef that is used to season other foods. Wagyu beef comes from the native Japanese beef breed. Kobe is premium quality Wagyu beef and is often associated with the Kobe region of Japan, (Van der Sluis and Hayes, 1991, p. 46). While Japan's own table meat production has been increasing, which will be demonstrated later, table meat imports have also been rising in response to multiplying and diversifying consumer demands. Frozen and specialized cuts of meat make for more convenient preparation time in Japanese households and in restaurants. In addition, the Japanese are

interested in "prepared meats", a strong niche for U.S. and Midwestern producers. At the same time, imports of liberalized farm processed goods are also increasing rapidly. As the years has progressed, the percentage of income for food spent in restaurants have increased from 7% in 1965, to nearly 16% in 1986. This surely contributes to the increase in Japanese demand for beef, (Yoshioka, 1988, p. 11).

JAPANESE FOOD HISTORY

It may be difficult to perceive the reason why Japan has historically been so protective of the food industry. But even though Japan has emerged as a strong industrial nation, the people are still concerned about shortages of food. There are several reasons for this fear:

1) The past century has included different occurrences of famine, the 1918 rice riot, (caused by a steep rise in rice prices), and famine conditions during and after the second world war.

2) Past U.S. action with the soybean embargo in 1973, which the Japanese suspect that the United States implemented to hold down their domestic prices, and the 1980 U.S. grain embargo, to protest the Soviet invasion of Afghanistan. These events aroused fears that agricultural exports to Japan may be interrupted by the exporting nations' domestic interests or by changes in Japan's diplomatic relations with other nations, (Yoshioka, 1988, p. 34).

3) Concern over food safety. Some strongly oppose an expansion of imports on the grounds that the safety of imported foods cannot be checked.

4) The possibility of unlimited import liberalization raises concern that the domestic agricultural sector may decay.

The underlying theme of the Japanese concerns is measured by the "Self-Sufficiency Ratio," which is calculated in the following manner:

$$\text{Self-Sufficiency Rates} = \frac{\text{Calories from domestic food}}{\text{Total calories supplied by domestic production}} \times 100$$

The beef self-sufficiency ratio of the Japanese has dropped from 91% in 1960, to 71.2% in 1989, (Ohga, 1989, p. 3). This compares with the United States which had a 150% ratio in 1983, (Yoshioka, 1988, p. 45). This information is provided by the MAFF, (Ministry of Agriculture Forestry and Fisheries). As mentioned earlier, the demand for beef has been on the rise, and even though domestic production is up, it hasn't kept up with demand. A strong example of this is the fact that Japan's ratio continues to decline, even though the percentage of beef production to total agricultural output has increased from 2% in 1960 to 3.6% in 1984.

JAPANESE BEEF PRODUCTION

Looking at the scale of Japan's meat supply and demand on a carcass basis in fiscal 1989, while production declined by .03% from the previous year to 3.582 million tons, imports increased at a steady pace to 1.443 million tons. As shown in **APPENDIX #4**, Japanese meat production has increased at a phenomenal rate. Production has almost doubled since 1976. The table also shows, by comparison, that even though they produce more

pork, pork production has increased at only a fraction of the rate that beef production has increased over the same 15 year period, since 1972.

Historically, beef cattle has been a by-product of draft power, that is, for pulling plows and carts on the farm. Cattle were used as draft animals for several years and then fattened and sold for meat. As a by-product, feeder cattle have been available at a relatively modest cost.

However, when tractors substituted for the draft animals from the late 1950's to the early 1960's, the Japanese beef industry lost the cheap feeder cattle supply. Since the late 1960's the fattening of dairy steers has developed and now is supplying nearly 60% of the domestic beef. Yet the average size of the beef cattle raising and feeding farms in Japan is still very small, less than five cattle per farm, totaling two million cattle raised and fed by only 450,000 producers, (Hayami, 1979, p. 342).

According to MAFF statistics compiled in 1985, the share of the livestock sector in the aggregate gross agricultural production value of Japan with respect to beef stood at 3.6%. And the growth pace of domestic beef cattle production relative to demand in Japan appears unlikely to increase in the future. There is simply not enough domestic land.

BEEF PRICES

One interesting observation is that although prices of beef have slowly but steadily risen since 1965, demand has continued to rise, as shown earlier. Amazingly, the demand for beef has continued to increase even though prices have been increasingly high in Japan. The average price of middle-grade dairy steers in Japan is at least four times greater than the cost, insurance, and freight (CIF) price of equivalent imported beef, (Van der

Sluis and Hayes, 1991, p. 46). As shown in **APPENDIX #5**, beef prices have remained in the Y3,000 to Y3,500 range for nearly fifteen years. The reasons for this relatively high price will be explained later. The Japanese currently consume beef at a per capita level which is approximately half of the average world level of beef consumption, and less than half of the annual per capita consumption level in Hong Kong, a country with less than half the per capita real income of Japan, (Van der Sluis and Hayes, p. 45). When compared with pork prices, it is especially interesting that the demand for beef is increasing at a faster rate than the increase in the demand for pork.

In summary, demand for beef is high in Japan, despite high prices and the prospects for better markets in Japan are very positive. On the other hand, a very different, relatively negative scenario exists in the United States.

THE UNITED STATES AND ITS BEEF CONSUMPTION TRENDS

Beef consumption in the United States has been on the downturn over the past several years. Most research finds that in the mid 1970's, beef demand in the United States became less elastic with respect to own price and income while chicken became a stronger substitute for beef, or more responsive to income, (Thurman, 1987, p. 33). A shift in demand due purely to health concerns may be one reason. Americans have become concerned about the health risks of red meat consumption. The beef industry has responded by producing leaner cuts of meat for domestic consumption, but there is evident proof that the market share is dwindling. As early as

1972, per capita beef consumption in the United States was around the 80 lb. level per year. During the same timeframe, combined consumption of poultry, fish, and cheese was only 57 lbs. per capita per year. In the past twenty years, the tables have turned dramatically with 83 lbs. per capita in poultry fish and cheese consumed and only 65 lbs. per capita of beef consumed by Americans, (Saupe, pp. 5-8). This all has occurred even though the relative price of beef has actually dropped over the same time period.

As mentioned earlier, the high demand for beef by the Japanese and the reduced demand for beef in the United States infers great market potential for U.S. beef exporters, and all other related domestic industries, (i.e. grain, fertilizer, and capital goods such as farm implements). But historically, the increased consumption of U.S. produced beef products by the Japanese has been restrained over the years by restrictive measures of the Japanese government.

TRADE RESTRICTIONS

The Japanese livestock industry has maintained high protection levels, generally through the use of a quota to support the domestic cattle industry and encourage production. Through the complicated quota structure, demonstrated below, the government has maintained established domestic beef target prices. Then, through the "beef price stabilization scheme," a fine-tuning mechanism of purchasing and storing or releasing frozen beef from stocks, the government has stabilized prices around the target within a politically and socially acceptable range. The rapidly increasing demand for beef in Japan has forced the government to allow imports to increase over

time to keep prices from increasing significantly above the stabilization range. As a consequence, Japanese domestic beef prices have been higher and more stable than otherwise might have been the case, (Wahl A, 1991, p. 119).

LIVESTOCK INDUSTRY PROMOTION COUNCIL

The retailing system for imported beef was regulated by the Livestock Industry Promotion Council, (LIPC), which limited market access for importers and exporters.

The LIPC also controlled the remainder of the general quota, which was allocated to certain Japanese trading companies through the simultaneous buy/sell (SBS) system which allowed Japanese buyers to import beef directly from foreign beef exporters. The tender portion of the LIPC quota was designed to allow the LIPC to dictate the quality and origin of Japanese beef imports. The LIPC tendered licenses for imports of specific grades of specific beef cuts from specific markets. Licensed trading companies then purchased the beef from exporters in those specific markets. The LIPC was also charged with managing a "beef-calf price stabilization scheme" providing deficiency payments to calf producers when market prices fall below target prices, (Wahl A, 1991, p. 119). The above mentioned pressure on the demand for beef in Japan, political pressures by the non-agricultural factions in Japan, and the high pressure among the other nations of the world, especially the United States, influenced the Japanese government to make some concessions. Considering their desire to increase influence among the other nations in G.A.T.T., Japan entered into the **Beef Market Access Agreement**,

which will be explained later. First the comparisons between the use of the import tariff and the import quota will be considered and the significance of Japan's use of the quota.

TARIFF AND QUOTA - A COMPARISON

Under free trade, Japan's domestic producers would act as a price taker of beef and produce at a level where "marginal revenue" is equal to "marginal cost". Japan would have the opportunity to import beef to better meet the domestic consumer demand. Prices would be driven by what the market will bear for both domestic and imported beef. If there would be a price difference, it would be because of perceived quality, or some other market force.

In the event of an "ad valorem tariff," for example, which would be a percentage of the value of the imported beef, the result would increase the cost for the exporting company. In order to achieve profit margins, the company would have to increase the price of the imported beef. On the other hand, it would not be willing to even ship the beef to Japan unless it felt the beef could be sold. In other words, if the increase in import price for the purpose of achieving profits results in consumers leaving imported beef and moving to domestic beef, the imported beef would be unable to be sold. The decision of the exporting company could be to either decrease exports, or eliminate them completely. The results for Japan would be a shortage of beef, and a loss of revenue which would have been realized from the tariff. The subsequent shortage would result in higher domestic prices and a reduction in consumer satisfaction.

This summary is not an attempt to evaluate completely the concept of tariffs and elements such as "terms of trade gain" and "distortion losses". This summary concludes, in concurrence with the situation analysis of the Japanese beef production environment which will be mentioned next, that the tariff would not be a good source of subsidy to the producers, relative to the quota because it could work to reduce imports and fail to receive revenue for the purposes of helping the Japanese beef producers.

IMPORT QUOTA - RESTRICTION OF CHOICE

One of the strongest reasons for the persistence of the beef quota among the Japanese is one that may be surprising. Since land is scarce in Japan, it would seem that there is little opportunity for improvements in the beef production industry, given the need for land for grazing, etc. Interestingly enough, the pork producers, over the years, have been able to improve their methods into what amounts to large-scale operations. They have also been able to increase their profit margins and reduce their costs by introducing more feed grains which are imported from the west and Australia. On the other hand, the traditional methods of Wagyu beef production has not really changed over the years. The grass-fattened methods have remained constant, ignoring modern technology and the increased returns to scale that would accompany it. As was mentioned earlier, the farmers who raise these cattle have actually been overrepresented politically in the Japanese representative bodies. In other words, it has been only recently that re-

apportionment has been demanded by those who live in the cities. Prior to this, the quota was used for protection of the farmers who raised cattle in the traditional but costly and noncompetitive manner.

The quota involves a cap, or restriction on the quantity of beef which may be imported. As was mentioned earlier, the Japanese have an elaborate method of securing the revenues from the quota system, and these revenues have been directed to help the beef producers survive and modernize.

The effective difference between the quota, which the Japanese have used, and the above explained tariff, is that the government receives very little revenue in the quota system. The increases in revenue comes from the Japanese people in the form of higher prices. There is some revenue, of course, which is realized from the import licenses which are issued, but not nearly the same as the inflated price of domestic beef resulting from the supply shortage of beef in the consumer market.

The quota, and the actions of the LIPC supports the farmers by increasing the income of the producers. The extra revenue which comes from the inflated prices of the domestic beef is used for the welfare of the producers. Import quality beef has been as much as 40% lower in price per pound than domestic beef. But the scarcity of the import product as a result of the quota, and the inability for domestic producers to keep up with the growing demand allowed for prices to remain high. The subsequent profits from the high prices, and license fees from foreign companies to import beef were used for the welfare of these farmers. This went on for twenty years until the United States, Australia, and other beef exporting nations, and more importantly, the majority of Japanese consumers, and voters, had finally had enough.

THE 1988 BEEF MARKET ACCESS AGREEMENT

On June 20, 1988, the U.S. trade representative and the Japanese agriculture minister signed an agreement to liberalize the Japanese beef market. Under this Beef Market Access Agreement, (BMAA), the Japanese beef import quota would increase in annual increments of 60,000 metric tons until 1991. The private quota, which is owned by private companies and is not under control of the LIPC, increased to 60% of the quota in 1990 from 10% of the quota in 1987. Tariffs remained at 25% during the three year transition period from 1988-1991. In 1991 the quota was removed and the tariff rate was increased to 70 percent. It drops to 60 percent in 1992 and to 50 percent thereafter. A provision called the Emergency Adjustment Measure (EAM) allows the Japanese to impose an additional 25% ad valorem tariff if imports increase by more than 20% in any one year. This emergency provision expires in April of 1994. at which time Japan has agreed to comply with the results of the General Agreement on Tariffs and Trade (GATT) negotiations. Presumably, this provision will entail a gradual elimination of the 50% tariff.

Other equally important provisions of the agreement include the elimination of the LIPC and its regulations, the elimination of discrimination based on whether animals are grass fattened or grain fattened, and the elimination of regulations licensing only certain exporters to compete in the Japanese beef market. The result of these provisions should be the elimination of all nontariff barriers, (Van der Sluis, 1991, p. 49).

The implementation of the BMAA sets the stage for opportunity among exporting nations like the United States to improve its trade balance. What are some of the economic factors which would influence changes in Japanese beef demand, working to increase U.S. exports of beef? Would lower prices influence Japan's willingness to increase consumption of beef? Or would increased supply of beef work to change the "status" of the product itself from "luxury" to "staple?"

IV. LITERATURE REVIEW

The fourth section of the thesis will evaluate the results of several studies of the effects of the lifting of beef trade restrictions in a qualitative manner. The aggregate import results will be considered with reference to Japanese demand for the import of beef from the United States. It would be of great interest to attempt to derive an equation for Japanese demand for beef. But given the Japanese past internal policy of protectionism, the required resources for that endeavor would be outside the scope of this paper. Instead, I will evaluate the results and projections of two different published works.

JAPANESE BEEF DEMAND AFTER RESTRICTIONS

One key source of American beef export success is, clearly, the demand for beef in Japan. Japanese trade restrictions have had a great impact on this demand. The lifting of these restrictions could help U.S. exports. Some important questions asked are: How will demand for beef be greater without

these restrictions? How could the United States benefit from this increased demand? How will the economic conditions of the Midwestern United States, a predominant area of beef production in North America, benefit from the easing of restrictions of Japanese beef imports?

We may begin to answer these questions by evaluating the works of different scholars. There have been several published studies directly evaluating the effects of the BMAA, and changes in demand resulting from the change in policy. Others address general theory in the meat industry. Still others question the results and predictions of previous works. Dr. Keiji Ohga estimated the effects of the lifting of restrictions on Japanese beef prices, consumption, and import demand. He developed the model while at the National Research Institute of Agricultural Economics in late 1989.

Dr. Thomas Wahl completed his Ph.D. in Agricultural Economics at Iowa State University with his doctoral dissertation modeling the entire livestock industry in Japan under trade liberalization.

It is important to note that the evaluation of these works will not be an apples to apples comparison, but some of the findings will be evaluated together.

The evaluation of both papers will begin with a summary of the models and presuppositions. Later, the description of the models will be stated and finally the results of each will be given. Some loose comparisons and evaluations will also be drawn and the questions of the United States reactions to the liberalization will be contemplated.

Some of the other works looked at different factors. (Gorman and Mori, 1989) used evaluations of elasticities and concluded that most estimates of the quantities of beef that would be imported under conditions of free trade

may be overly optimistic because of questionable assumptions regarding the degree of substitutability of imported beef and domestic beef. They went on to contend that an expected increase in beef imports to Japan in the absence of import quotas would be much smaller in quantity than under the assumptions that imported beef is homogeneous and perfectly substitutable with domestically produced beef, or imported beef is identical with domestically fed dairy beef. If trade were even partially liberalized, wholesale prices of imported beef would decline by nearly 50%. The initial impact of trade liberalization would be that imports of beef would double, not total consumption of beef in Japan.

(Eales and Unnevehr, 1991) explicitly considered the contradictory effects of exports and imports on domestic prices, and project that exports to Japan will likely increase. They inverted a matrix of elasticity estimates from an Almost Ideal Demand Model, (AIDS), of meat products to yield own and cross-price flexibilities from fed and nonfed beef. Domestic demand parameters showed that the price enhancing efforts of exports is larger than the price depressing effects of imports. In addition, trade liberalization has the potential to increase exports more than imports. Thus, the U.S. industry would gain from liberalization of trade, although these gains would be tempered by the long run domestic supply response.

(Mori, Gorman, and Lin, 1988) looked at currency exchange consideration and suggested that a big increase in beef imports might depress prices of imported beef in the Japanese wholesale market appreciably, as growth in income is expected to be very moderate for some years to come. Because of the stronger yen against the U. S. dollar and Australian dollar in the past year or so, however, the Japanese beef import market would be

considerably far from free trade conditions, even if wholesale prices of imported beef fall 30 percent or even more.

(Unnevehr and Eales, 1991) used static demand models which explained demand behavior for poultry in Japan, where income growth has been less rapid. Income growth has been an important determinant of demand growth. Income elasticities are large and significant for poultry in all countries in the Pacific Rim. This result agrees with Bennett's law regarding the increasing importance of meat in the diet as incomes grow. The significance of income has important implications for future demand growth, as the decline in real prices due to technological change is likely to slow in the future. This shows increased income may also be important for the demand for beef imports.

DESCRIPTION OF OHGA'S MODEL

Dr. Ohga first developed his "Beef Supply and Demand Model" in 1984, and then updated the model in 1989 after the BMAA settlement. Ohga differentiated between two types of beef consumption. He considered Import Quality beef (IQ) to be in a different price bracket than domestic, (dairy) beef. Because of this, he considers three scenarios. In case A, domestic beef will cost the same as imported beef. In case B, domestic beef will cost 20% more than imported beef. In case C, domestic beef will cost 40% more than imported beef. The model is non-linear and dynamic showing relations of supply, self-sufficiency ratios, import levels, demand and prices of beef using fifty simultaneous equations The parameters were estimated with quarterly data from fiscal 1973-1986, (Ohga, 1990, p. 11).

Presuppositions

The premises for Ohga's model were as follows:

1. Tariff rates as dictated by BMAA.
2. Dictated price ratios, cases A, B, and C.
3. Exchange rate is Y125 = $1 through the year 2000.
4. Cost and Freight is $3.6/kg for imported beef.
5. Japanese population is to increase by 1/2 percent and individual consumer expenditure to increase by four percent per annum.

The fattening period for grain-fed beef is about 3-6 months in the case of imported beef. On the other hand, the fattening period for domestic dairy steer beef cattle is 12 months on average. (two to four times as long as that of the U.S., (Ohga, 1990, p. 5). Ohga considers this difference in meat quality significant.

OHGA'S ESTIMATION RESULTS

In the case of a ratio of 1.0 between domestic and imported beef prices, according to Ohga, the wholesale price of domestic beef was expected to remain firm in 1989, drop by 20% from the current level of 3,500 Y/kg., to 2,800 Y/kg., through 1995, with a total 17% lower, at 2,905 Y/kg., by the year 2000. Import Quality (IQ) price would drop by about 30% by fiscal 1995 to 2,450 Y/kg.

Import volume of beef was expected to increase from about 390,000 tons in 1988 to 560,000 in 1990 and 1.07 million in 1995 and 1.55 million in 2000. Total supply of beef would reach 2.29 million metric tons by the year 2000.

Per capita beef consumption was expected to increase from 5.0 kg. in 1987 to about 11 kg. by the year 2000. As a result, the self sufficiency ratio in beef was expected to drop from 60% in 1988 to 39% in 1995 and settle at 32% by the year 2000.

In the case of a 1.2/1 ratio of domestic prices to wholesale prices, the wholesale price of domestic beef was expected to remain firm in fiscal 1989 at 3,500 Y/kg., drop by 20% to 2,800 Y/kg., by 1995. Prices would then level off by the year 2000 at the 2,800 Y/kg. level. Import quality beef would drop to 67% of its current level, at 2,345 Y/kg., by fiscal 1995. Import volume of beef is expected to increase to 900,000 metric tons in 1995, which was 160,000 tons less than the import volume predicted in case A and the volume would increase to 1.21 million metric tons per year by the year 2000. This figure is 330,000 metric tons less than the results from case A. Total predicted supply of 1.96 million tons by the year 2000 would be twice the current import level.

On the consumption side, per capita beef consumption was expected to increase from 5.0 kg. in 1987 to about 10.1 kg. As a result, the self sufficiency ratio in beef is expected to drop from 60% in 1988 to 43% in 1995 and finally settle at 38% by the year 2000.

In the case of the 1.4/1 ratio of domestic prices to wholesale prices, the wholesale price of domestic beef is expected to drop by 6% from the current level of 3,500 Y/kg., to 3,290 Y/kg., through 1995, and staying at

the 3,500 Y/kg. level by the year 2000. Domestic cattle consumption would drop by nearly 9% by fiscal 1995. Import quality beef volume was expected to increase from about 390,000 metric tons in 1988 to nearly 770,000 metric tons in 1995, which is 130,000 metric tons less than the predicted result under case B and an increase in imported beef volume to 1.06 million metric tons by the year 2000, which is 150,000 metric tons fewer than from case B. Total supply will be 1.86 million metric tons by the year 2000, which amounts to a 1.9 times increase.

According to Ohga, per capita beef consumption is expected to increase from 5.0 kg. in 1987 to about 9 kg. As a result, the self sufficiency ratio in beef is expected to drop from 60% in 1988 to 39% in 1995 and finally settling at 32% by the year 2000.

DESCRIPTION OF WAHL'S MODEL

Dr. Thomas Wahl developed his model of dynamic adjustment in Japanese livestock markets under trade liberalization while a student at Iowa State University. He considered the analysis to be beneficial to government policy makers as they assess future agriculture direction. (Wahl B, 1989, p. 2).

Wahl started his evaluation with a literature review, principally concerning meat production structure and comments on the above mentioned history of food security concerns among the Japanese people. He refers to the work of Longworth, who is considered a strong source of information among American scholars writing about Japanese agriculture in general and the Japanese beef industry in particular.

Wahl used the Almost Ideal Demand System, (AIDS), to estimate consumption price, import levels, and total supply levels. He estimated the model using forty-nine simultaneous equations which incorporate the entire Japanese livestock industry. This study looks only at his estimations for the beef industry under the lifting of trade restrictions. He then tested for separability, perfect substitutability, and net substitutability.

Like Ohga, Wahl was concerned with whether IQ beef and domestic beef could be considered perfect substitutes. Although Ohga considered three cases, Wahl tested for Perfect Substitutability incorporating an "asymptotic likelihood ratio test," which determined whether the two types of beef were perfect substitutes, (Wahl B, 1989, p. 41). The results of the test indicated that domestic and IQ beef may be close substitutes; however, they were less than perfect substitutes. (Wahl B, 1989, p. 64). This concurs with Ohga's reasoning for using three cases in his estimations.

WAHL'S ESTIMATION RESULTS

Wahl estimated under the assumptions of both complete liberalization, and adherence to the GATT. Under the GATT proposal, the BMAA trade barriers were converted to tariff equivalents and according to the "modified Swiss" formula, the tariff is reduced in equal measures over ten years.

Beef imports were projected to reach 657,000 metric tons during 1991, a 263,000 increase over 1990 levels under BMAA. This shows an opportunity for the world's beef exporters to significantly increase their exports to Japan. Under the assumption of complete liberalization, by 1997, beef imports are estimated to reach 2.069 million metric tons, representing a

68% increase over BMAA levels. Under the assumptions of the GATT proposal, beef imports increase to 945,000 metric tons by 1993 and 2.01 million by 1997. According to Wahl, the 1997 projection of beef imports under the GATT proposal is similar to the level projected under liberalization because both policies assume a zero tariff in 1997. Wahl explains that the 1997 level under the GATT proposal is slightly lower because of the dynamics of and lag in adjustment of the livestock production process, (Wahl B, 1989, p. 96).

Under the complete liberalization policy, the projected dairy steer carcass price fell by 68% in 1988. By 1997, dairy steer price under liberalization is projected to be 32% lower than the BMAA projection and 71% lower than the projected price under the quota. Dairy steer carcass price under the assumptions of the BMAA is 37% lower than the levels under the quota in 1991 and 57% lower by 1997. Under the assumptions of the GATT proposal, dairy steer carcass price is approximately the same as the BMAA result in 1991. However by 1997 the GATT proposal level is almost 200 yen lower than the BMAA results and approximately the same as the level under liberalization.

Domestic beef demand under liberalization, the BMAA, and GATT proposals would be about 7% lower than the quota results in 1991 and about 3% lower by 1997. The liberalization results in 1991 would be 15% lower than the quota results and 5% lower by 1997.

Wahl predicted import quality beef demand under liberalization would increase by 213% in 1988 and continue to increase, reaching a level of 90% higher than the BMAA results and 225% higher than the quota level in 1991. By 1997, IQ beef demand is projected to increase to 1.613 million

metric tons on a retail basis under liberalization. The projected level under the BMAA in 1997 is 121% higher than the quota but 50% lower than projected under liberalization.

SUMMARY OF WAHL-OHGA MODELS

Even though these two estimations are not an apples to apples comparison, the following table summarizes the important effects on the Japanese beef market in the estimation of both Ohga and Wahl, given the purposes of this thesis:

OHGA;

	Year	SSRatio		Price	Import Volume
Case A.					
	1989	60%		Y3,500/kg.	560,000 m.t.
	1995	39%	(IQ)	Y2,800/kg.	1,007,000 m.t.
			(Domestic)	Y2,450/kg.	
	2000	32%		Y2,905/kg.	1,055,000 m.t.

	Year	SSRatio		Price	Import Volume
Case B.					
	1989	60%		Y3,500/kg.	560,000 m.t.
	1995	43%	(IQ)	Y2,345/kg.	900.000 m.t.
			(Domestic)	Y2,800/kg.	
	2000	38%		Y2,800/kg.	1,021,000 m.t.

	Year	SSRatio		Price	Import Volume
Case C.					
	1989	60%		Y3,500/kg.	560,000 m.t.
	1995	39%	(IQ)	Y3,185/kg.	770,000 m.t.
			(Domestic)	Y3,200/kg.	
	2000	32%		Y3,500/kg.	1,006,000 m.t.

In all three cases, consumption is expected to nearly double in the next ten years.

WAHL;

Year	Imports (BMAA/GATT)-(Lib.)	Prices (BMAA/GATT)-(Lib.)
1990	394,000 m.t.	Y3,500/kg.
1991	657,000 m.t.-945,000 m.t.	Y3,500/kg-Y1,120/kg.
1997	1,230,500 m.t.-2,068,000 m.t.	Y1,215/kg.-Y1,015/kg.

In summary, both Ohga and Wahl estimate the lifting of the quota and the subsequent increase in supply of the Import Quality beef will result in a price reduction, increasing quantity demanded.

Since beef is considered to be a normal good, i.e. more beef is purchased at higher levels of income than at lower levels, the Engel curve, showing the relationship of income and beef consumption is positively sloped. The price reduction from the effects of trade liberalization with respect to beef results in an effective increase in income among the potential purchasers of beef in Japan.

The quota has, over the years, stifled the effective increase of income among beef consumers because the system kept beef prices artificially high. Amazingly though, as has been mentioned earlier, Japanese beef demand and consumption continues to increase. An explanation of this is that increases in income are more significant than the increases in relative prices. So the net effect allows for increases in demand. As long as beef is considered a "luxury" item, this would continue. The quota obstacle has now been removed with the BMAA, and both Ohga and Wahl's results should work in the same direction as the aggregate import demand model which will be estimated later.

Given the BMAA criteria, I feel Wahl and Ohga are relatively close in their projection of beef demand over the next five years, with both in the 1,000,000 metric ton range. It is Ohga who projects that import volume will stabilize around that level toward the end of the decade. On the other hand, even given the BMAA, Wahl expects demand to increase another 200,000 metric tons by 1997. One explanation for this increase would be his projection that prices of Import Quality beef drop to the Y1,200/kg. level under the BMAA. Since beef is a normal good, it would seem that, as was mentioned earlier, the reduction in price would work as an effective increase of real income.

I am concerned that Wahl may not take into account some of the dynamic effects of the steady increase in supply of beef as a result of the liberalization. His model addresses the changes in supply and demand, but it would seem that increased demand for a good may in fact work to increase the price. Given the years of artificially high prices, it is natural that prices would be reduced. But I contend that as the market moves closer to clearing, the proprietors who sell the beef products will work harder to provide better variety of meat and "add value" to their products. I would think that there will be varieties of beef which would be considered "less than choice" grade, and hence less expensive, such as hamburger.

I contend that one concern about a normal good is that if the price goes down too much too fast, or if the income of the potential consumer increases quickly, there may in fact be an adverse effect on the consumption of that particular product. An example of this would occur if for example, a restaurant changed its menu or offered price reductions for certain entrees. There would be a strong increase in demand of these entrees and

in the short run the restaurant would increase their business. But in the long run, some of the restaurant's customers may grow concerned about the quality of the food, or the increased crowds and possible reduction of service quality because the restaurant has become so busy. These customers, who have high incomes and are able to afford the food at the original price are now joined by many other persons who, prior to the changes in price, would not have been a customer. These possibly disgruntled customers may subsequently choose to go to another restaurant which has higher prices.

Japanese proprietors, and American exporters must be careful in this regard. Large reductions in the price of a product, though there may no change in the quality of the product itself, may be interpreted to signal a reduction in the quality of the product. The product may have even been improved in quality, but it may not be perceived in this manner. I am concerned that Wahl did not take this into account. He projected that beef would be reduced to around eight dollars a kilogram by 1997. The current price is in the twenty-three dollar range. This would be a decline of two dollars per kilogram per year. My concern is that although a reduction in price of this magnitude would result in higher demand in the short run, it would result in a weaker demand for beef in the long run.

Another concern that I have about the estimations of Wahl is the wide difference in his results between the level of imports under the BMAA and the results under trade liberalization. Of course, if the price levels which he projects are realized, it would seem that there could be a strong increase in consumption. But as mentioned earlier, the strong reduction in price may work to actually alter the price elasticity. It would seem certainly, when

there is such a high demand for beef, as there is now, reductions in price in concert with total liberalization would work in the short run to sharply increase consumption. But in the long run, there is the possibility that the consumption level may taper off. At the very least, it is hard to imagine a doubling of consumption in a mere six year span.

By contrast, Ohga may underestimate the market in terms of beef price and import demand. He only projects a 17% decrease in the import price of beef by the year 2000, in case A. In case B he looks for a stronger reduction, but in case C it is projected that prices would remain at the same level as a decade earlier. The result is still a 100% increase in import demand over the next ten year period at relatively the same prices as in the late 1980's. In other words, Ohga may not consider that increases in supply of imported beef resulting from the BMAA will dictate a strong drop in price. It seems, according to Ohga, Japanese consumers will buy no matter what the price. It would seem that this would occur for a while, but later on there would need to be additional incentive for the Japanese consumer to continue to purchase more beef, like price reductions. Lower prices than Ohga projects would probably increase import demand, though not to the same degree as Wahl's estimation under total liberalization. But by comparison, Ohga shows BMAA import demand by the year 2000 to be similar to the projections of Wahl under the same BMAA structure. At the same time Ohga looks at a price range of nearly double that of Wahl's estimation. It would seem that the true price would occur somewhere in the middle of that range. This could result in higher import demand, without the threat of alterations to the elasticities of demand. In other words, short run price changes should not negatively alter the so called "status" of beef in Japan

as a normal good.

One final interesting part of the Ohga evaluation was the changes in the Japanese self sufficiency ratio. In summary, every concern that was mentioned regarding Japanese fears of dependence on foreign sources for food will be possible over the next ten years with the BMAA. Ohga projects a 50% reduction in the self sufficiency ratio with respect to beef, finishing the year 2000 with a ratio of 32%.

Certainly there can be cause for concern among the Japanese for the above mentioned reasons. On the other hand, the increase in beef demand will still be dwarfed by the consumption of pork, rice, and fish, which maintain a relatively high self sufficiency ratio. But as trends continue, it would seem that if import demand is maintained somewhere between Ohga's lower estimation in the BMAA example, and Wahl's higher estimation in the total liberalization example, the beef self sufficiency ratio will continue to diminish, to a point which can never be reversed. In short, the BMAA and resulting market movements will effectively slam the door on Japanese domestic production as the driving force in Japanese beef consumption, and widen the window of opportunity for the United States and the exporting states.

V. INTRODUCTION OF THE ECONOMETRIC SPECIFICATIONS:

This section considers whether the above projections are in line with aggregate imports. The fifth section deals empirically with an aggregate import demand model, working to evaluate and investigate the factors which affect changes in aggregate imports among the Japanese. It would

seem that if the model, which will be introduced, shows that income and prices strongly influence changes in aggregate demand, this would agree in spirit of the empirical studies which were reviewed in the previous section.

The following specific standard log-linear specifications, replicated from a paper written by Augustine Arize in 1991, will be identified and empirically tested, using the Ordinary Least Squares procedure.

$$Mt = Mt(Pt, Yt, Mt\text{-}1)$$

$$Mt = Mt(Pmt, Pdt, Yt, Mt\text{-}1)$$

$$Mt = Mt(Pt, Y^*t, Yt/Y^*t, Mt\text{-}1)$$

$$Mt = Mt(Pmt, Pdt\ Y^*t, Yt/Y^*t, Mt\text{-}1)$$

WHERE:

M is real quantity of imports of Japan, P is the ratio of the unit value of imports to the domestic price level of Japan, Pm is Japanese unit value of imports, Pd is Japan's wholesale price level, Y is the real gross national product of Japan, Y* is the trend value of Y (logs of predicted values of Y regressed against time and time squared), Y/Y* is the ratio of GNP to the trend value, also known as the "output gap," and Mt-1 is the lagged dependent variable and implies a partial adjustment process, (Arize, 1991, p. 80).

EXPLANATIONS AND SPECIFICATION RATIONALE

The first equation evaluating the Japanese demand for aggregate imports includes three explanatory variables. The Pt variable represents the ratio of Unit Value of Imports to the Wholesale Price Index. The Pt variable is used to get a real price for imports, assuming that the change in prices must be considered when evaluating increasing unit value of imports. Y refers to the real gross national product in Japan and the rationale to this equation is that imports would increase as income increases and prices decrease.

Equation two includes four explanatory variables. The first variable is real GNP. In the second equation, two new variables are introduced, standing alone. First is the measurement of import price, which is represented by the "Unit Value of Imports." Import prices would be expected to have a strong inverse relationship with the level of imports, since increases in import prices would decrease import demand. The second new variable introduced in this equation is a measurement of the domestic price level, represented by the "Wholesale Price Index." It is difficult to see a strong direct relationship between the level of imports and domestic wholesale prices. It would seem that domestic price increases would result in increased demand for imports since consumers would look for lower priced alternatives to the domestically manufactured products which are rising in their country.

Equation three includes four explanatory variables. The relative price variable is reintroduced. Equation three also introduces two new variables.

The first is the "Trend Value", which represents the direction of the real GNP. The "Output Gap" is the ratio of real GNP to the Trend Value.

Equation four considers all of the variables introduced except the Pt variable. The trend value and output gap are used to represent other factors which cannot be accounted for in the relatively simple OLS method of this model, (Arize, 1991, p. 82). Certain non-price factors like delivery lags, levels or marketing and advertising activities, and terms of credit are considered in these two variables which work to give more credence to the model.

The functional form are linear-in-logs so that short run elasticities can be considered directly from the regression results The long run elasticities are most significant for evaluation of the model because the effects of import changes are most important to consider in the long run as far as exporters are concerned. This long run elasticity is calculated as the coefficient of the particular variable divided by the coefficient of the speed of adjustment of the lagged dependent variable. I will test for structural stability, and serial correlation in my results, and will incorporate the following Japanese economic data, listed by category and source; Total Imports, Domestic Wholesale Prices, Unit Value of Imports, GNP Price Deflator, and Gross National Product, provided by various quarterly issues of International Financial Statistics, over the years 1960 to 1990.

Since the frequency of data which will be used is quarterly, and since I am interested in whether there may be seasonal changes in the behavior of the Japanese people with respect to Aggregate Import demand, I will incorporate the use of three seasonal dummy variables, representing changes in the quarter of the year. It would seem that demand for various materials may be seasonal.

The procedure in the regression analysis will be to specify a dummy to take on the value of each quarter, and zero otherwise. The result will show the degree to which the relationship shifts during the first quarter, compared to the other three, by magnifying the constant term in the equation. These dummy variables will be included in each of the regressions, evaluated and tested for statistical significance.

VI. ESTIMATION RESULTS AND DIAGNOSTIC TESTING

EQUATION ONE

APPENDIX #6 shows that relative price would be expected to have a strong inverse relationship with the level of real imports, since increases in relative price would be met with reduction in the level of imports. As expected, the relative price coefficient is negative and statistically significant at the 5 percent level. Since the model is linear-in-logs, the short run elasticity is calculated as the coefficient. In this case it is measured at -0.13. The long run relative price elasticity is -0.67. Both elasticities suggest that the quantity demanded is relatively unresponsive with regard to the relative price changes, i.e. "relative price inelastic."

The second variable in the first equation represents the Real Gross National Product for Japan. Evaluation of the coefficient of this variable would measure income elasticity. Income would be expected to have a strong positive relationship with the level of real imports, since increases in income would allow for increased imports. As expected, the Real GNP coefficient is positive and statistically significant at the 5 percent level. The short run elasticity of 0.24 suggests unresponsiveness, but the long run

income elasticity is 1.26, suggesting that over an indicated range of income and imports, a 1 percent increase in income will cause approximately a 1.26 percent increase in the demand for imports. This would be considered "income elastic."

The results are generally good with significant t-values and an R-squared of .985. The Durbin- Watson statistic for the equation is 1.716, but since there is a lagged dependent variable in the equation, there is need for evaluation of the Durbin H statistic to measure serial correlation. In the first equation, the Durbin H statistic is 1.887 which is not statistically significant at the 5 percent level, which cannot reject the null hypothesis of no serial correlation. The estimated speed of adjustment is .194 which shows a slow response time by the Japanese to changes in the variables to desired levels.

There is a significant problem in the results of the first equation which ultimately renders it unusable in the model. The variable Pt, which is the ratio of the logs of the Unit Value of Imports and the Wholesale Price Index, compute results which are equal in magnitude and opposite in signs. This is similar to the Arize model in that "ceteris paribus", a given percentage decrease in import prices has the same effect on real imports as an equivalent percentage increase in domestic prices, (Arize, p. 79, 1991). Therefore, the variable is unusable, even though the variable is statistically significant at the five percent level.

EQUATION TWO

As expected, the real GNP coefficient is positive and statistically significant at the 5 percent level. The short run elasticity is 0.34, similar to the results of the first equation and suggesting unresponsiveness. But as also occurred in the first equation, the long run income elasticity in equation two is 1.46 suggesting a 1.46 percent increase in imports in response to a 1 percent increase in income in the long run.

As expected, the UVI coefficient is negative and statistically significant at the 5 percent level. The short run elasticity is shown as -0.07, suggesting that the quantity demanded is relatively unresponsive to changes in import price in the short run. The long run import price elasticity is -0.31, suggesting that the quantity demanded is relatively unresponsive with regard to the import price changes, or "import price inelastic."

As expected, the WPI coefficient is positive but is not statistically significant at the 5 percent level. The short run relative price elasticity shows a 0.013, showing unresponsiveness by the Japanese to changes in relative price. The long run domestic price elasticity is 0.057, also suggesting that the quantity demanded is relatively unresponsive with regard to the relative price changes, or "domestic price inelastic."

On the other hand, the long run income elasticity is 1.46, suggesting that over an indicated range of income and imports, a 1 percent increase in income will cause approximately a 1.46 percent increase in the demand for imports. This would be considered "income elastic."

The results are favorable with significant t-values, with the exception of the WPI variable. The Durbin Watson statistic for the equation is 1.729, and the Durbin H statistic is 1.835, which is not statistically significant at the 5 percent level, which cannot reject the null hypothesis of no serial correlation. The estimated speed of adjustment is .233 continuing to show a slow response time by the Japanese to changes in the variables.

EQUATION THREE

The relative price coefficient is negative and significant to the 5 percent level. The short run relative price elasticity is -0.12, which shows that the quantity demanded is relatively unresponsive to changes in relative price. The long run relative price elasticity is -0.60, which suggests that the quantity demanded is relatively unresponsive with regard to the relative price changes, or "relative price inelastic."

The results are expected to be, and in fact are, similar to the results of the Real GNP regression in the first equation. The "Trend Value" coefficient is positive and statistically significant at the 5 percent level. It is expected that the value of this coefficient would be strongly positive, and the higher "gap" would represent a lower speed of adjustment in the lagged dependent variable. This thought holds true as the coefficient is strongly positive and statistically significant at the 5 percent level.

The Durbin Watson statistic for the equation is 1.699, and the Durbin H statistic is 2.103, which is statistically significant at the 5 percent level, rejecting the null hypothesis of no serial correlation. Therefore correction of this equation is suggested. The estimated speed of adjustment is .205,

continuing to show a slow response time by the Japanese to changes in the variables. The speed is even slower than in the previous two equations, probably due to the introduction of the "Output Gap" variable. The output gap will be explained later.

There is a problem in equation three with the Pt variable as in equation one, since the ratio of the log is the difference between WPI and UVI, and since the variables are equal in magnitude and opposite in signs, the composite variable, Pt, is unusable and therefore the equation three, as equation one, cannot be used.

EQUATION FOUR

The import price variable, as expected is negative and statistically significant at the 5 percent level. In the short run, the import price elasticity is -0.08, suggesting unresponsiveness in import demand to changes in import price. The long run relative price elasticity is -0.36, close to the result obtained in equation two, and again suggests that the quantity demanded is relatively unresponsive with regard to the relative price changes, or "import price inelastic."

The effects of domestic price changes on imports are also evaluated in this equation. Again, as expected, the WPI coefficient is positive but is not statistically significant at the 5 percent level. In the short run, relative price elasticity is -0.02, again showing unresponsiveness. The long run relative price elasticity is 0.097, again suggesting that the quantity demanded is relatively unresponsive with regard to the relative price changes, or "relative price inelastic." But in this case, the elasticity is higher than in the second

equation. The stability concerns reflected by the low t-value raises suspicions about the real effects on imports by changes in domestic prices in Japan.

The "Trend Value" variable is again evaluated in equation four. The "Trend Value" coefficient is again positive and statistically significant at the 5 percent level. The "Output Gap" is again measured in equation four. The coefficient is again strongly positive and statistically significant at the 5 percent level, though not as dominant as in equation three. It was mentioned above that the high output gap would concur with a low speed of adjustment. Evidence of this idea is clear since the speed of adjustment of the lagged dependent variable is higher in equation four than equation three, .219 as compared to .205.

The results are generally good with significant t-values, with the exception of the coefficient of the WPI. The Durbin Watson statistic for the equation is 1.753, and the Durbin H statistic is 1.719, which is not statistically significant at the 5 percent level, which cannot reject the null hypothesis of no serial correlation.

VALIDITY TESTING

Of the four equations tested, the best equation turned out to be either equation two or equation four. Since equations one and three contained the import price ratio problems earlier mentioned, they were eliminated. The remaining equations would certainly work, but there are some important criticisms which need to be addressed in each equation. The use of the lagged dependent variable, simply put, is for the purpose of considering the

effect of last quarter's demand on this quarter's demand. Since the rest of the variables in the equation are contemporaneous, there could certainly be criticism that one or more of these variables, which in the equation are shown to be exogenous, could in fact be endogenous. If this would in fact be the case, other regression procedures would have to be used. Therefore both equations two and four were tested for validity.

The diagnostic test results for equation two are shown in **APPENDIX #7,** and are explained as follows: Equation two would be originally adjusted by replacing Yt with a lagged variable for Yt. In addition, variables representing four ensuing lags of the Pm variable, (UVI) are introduced, replacing the Pm variable. Finally, variables representing two ensuing lags of the Pd variable, (WPI) are introduced, replacing the Pd variable, and retaining the lagged dependent variable. The results of the first stage of this diagnostic test is shown as equation #2 in the appendix. I evaluated each variable and tested them for statistical significance and considered the long run elasticities.

The original dynamic adjustment shows all of the variables to be statistically significant at the 5 percent level. It is of interest that each lagged variable's coefficient is opposite in sign with respect to the next lag of the same variable. In addition, compared with the second equation in the original model, the GNP variable is opposite in sign, but both the Pm and Pd variables are the same sign as their first lags in this equation.

The next step of the test was to run another regression adding another lag to the Yt variable, keeping all of the other variables the same as in the original dynamic adjustment. The results of this test are shown as Equation #2A. It is important to note that results of the UVI and WPI lags are very

similar to the results in the first equation. On the other hand, the t-values of the coefficients of the two lags in GNP are both insignificant at the five percent level. Also the coefficients of both of them are positive and the long run elasticity of 0.50 suggests unresponsiveness in import demand to changes in income.

The third step of the diagnostic test is to take out the second Yt lag, and replace it with a third lag in the Pd variable. The results of this new regression is shown as Equation #2B. It is interesting to note at first glance that there is now a significantly stronger long run elasticity in GNP than was shown in the original dynamic adjustment. The results of the Pm lags are, again, similar to the other equations. The problem arises in the evaluation of the lags of Wholesale Prices. Although the first and second lags of the WPI are similar to the previous two equations, the third lag of the WPI is statistically insignificant at the five percent level, therefore, the regression cannot be used.

Finally, the results of regression #2C, show the combination of the second lag in GNP and the third lag in WPI added to the original dynamic adjustment. When the results of this regression is considered, it is evident that there are problems. The coefficients of both lags in GNP contain t-values which are statistically insignificant. In addition, the t-value of the coefficient of the third lag of the WPI variable is statistically insignificant at the five percent level.

The evaluation of all of these equations validates the original dynamic adjustment of equation two in the model. Before comparing this adjustment to the equation in the model, the exact procedure would be considered in equation four of the model.

When the attempt was made to set up the diagnostic test for equation four in the same manner which was set up with equation two, the SAS program rejected the model because it was not in full rank and that the estimation is biased, that is, the expected value of the estimator will be different from the true value of the parameter. Given the framework of this research, it cannot be guaranteed that equation #4 would be valid.

MODEL CONCLUSION

The result of the diagnostic testing for validity of equations #2 and #4 show that the best equation which can be evaluated for the purposes of this thesis is equation #2, which, for review, is formulated as follows:

$$Mt = Mt(Pmt, Pdt, Yt, Mt\text{-}1)$$

Where: M is real quantity of imports of Japan, Pm is Japanese unit value of imports, Pd is Japan's wholesale price level, and Mt-1 is the lagged dependent variable. The results can be reviewed in **APPENDIX #6.**

According to the equation, the explanatory variables which significantly influence import demand among the Japanese are real income and import prices. The income variable is statistically significant and with a short run elasticity of 0.34, and a long run elasticity of 1.46, shows that Japanese demand for imports are significantly influenced by the ability of the Japanese to increase their standard of living, which we will demonstrate they have been able to maintain consistently since the end of World War II.

On the other hand, the statistical significance of the import price variable exists, with a very inelastic short run result of -0.072, yet points to a long run elasticity of -0.312, which suggests that Japan increases imports, regardless of import prices, especially taking into account the highly elastic real GNP elasticity.

The estimated speed of adjustment is .233 in equation two, which is measured as (1 - the coefficient of the lagged dependent variable). The median lag and mean lag are 2.609 and 3.286, respectively, with the median lag calculated as [ln(.05)/coefficient of the lagged dependent variable,] and the mean lag calculated as [the coefficient of the lagged dependent variable divided by the speed of adjustment,] (Arize, 1991, p. 86). This suggests that Japan incorporates imports strongly in their efforts to increase their GNP. In other words, a strong percentage of imports by the Japanese are in the area of raw materials which are used to manufacture "value-added" products.

VII. THESIS CONCLUSION

This thesis considered the international relationship between the United States and Japan from a trade perspective in general, and the beef trade in particular. It was established that using the measurement of the current account balance, the United States is less competitive than the Japanese in the area of international trade. It was offered that one way that the United States could improve their current account balance is to increase its beef exports to Japan. By considering consumption statistics among the Japanese and the United States, it was established that beef

consumption is on the decline in the United States while consumption is on the rise among the Japanese, validating the concept that increased beef exports should be encouraged from the United States to Japan.

The largest obstacle to this otherwise natural strategy for the United States has been the history of import restrictions by Japan of the import of beef. Japan has done this over the years for mainly political reasons involving the support of domestic beef producers. The Beef Market Access Agreement of 1988, which was explained and evaluated, has given the beef producers around the world, and the United States in particular, a strong opportunity to increase their imports to Japan.

In order to evaluate the effects that the BMAA would have on Japanese beef demand, which has been thought to be stifled over the years because of the import restrictions, an aggregate import demand model of Japan was introduced, tested and evaluated. It was concluded that variables which significantly influence import demand among the Japanese are real income and import prices.

It would seem that with these results and the above considered economic trends in real income in Japan, the price reductions which would ensue as a result of the lifting of beef import restrictions would lead to the increase in Japanese demand for imported beef, but to what extent this increase would occur was unclear.

The results of the aggregate import demand model were compared with the results of several different studies which projected Japanese beef demand in the next several years as a result of the BMAA, and consideration of total liberalization of the Japanese beef import market. Before this, a survey of the Japanese people with respect to beef was summarized.

The areas highlighted in this survey were Japan as an agricultural nation, its history with respect to food production and consumption in general, and then in the production and consumption of beef in particular. Japan as an importer of beef was then evaluated, especially in reference to the apparent and peculiar influence that Japan's agricultural community has had over the years.

There was a short comparison of Japanese beef production, demand and prices with the current conditions in the United States, and its beef consumption trends, again highlighting the opportunity for the United States to increase exports.

Before the general literature review and the specifics of the two models by Keiji Ohga and Thomas Wahl, the history of Japanese trade restrictions with respect to beef were considered. The mechanisms of Japanese protection were evaluated, i.e., the reasons for using the quota system as opposed to the use of an ad valorem tariff. The history and effectiveness of the Livestock Industry Promotion Council was also studied and also how this effectiveness would phase out with the advancements in the BMAA.

When the particular models of Ohga and Wahl were evaluated, it was evident that both models projected price reductions and subsequent increases in beef demand. There were significant differences in the magnitude of these price reductions between the two models. It was offered that perhaps Ohga, who only projects a 17% reduction in import beef price, may not consider market forces and the apparent fact that beef demand has increased over the years, in the face of higher quotas over the years. Demand has met the quotas even though prices have remained high. On the other hand, Wahl may give too much credit to the Japanese consumer

because his price reductions are in the 50% range over the next five years. It would seem that drastic reductions, such as the ones Wahl projects could compromise the Japanese consumer's perception of beef as a normal good. It was offered that, perhaps, the final results would show the prices and import levels somewhere in the middle of the spectrum established by the two models. The aggregate specification result that import prices were fairly inelastic in the long run and gave little support to either of these extremes. The most important aspect of the evaluation is, of course, the fact that Wahl, Ohga and others concur in principle with the aggregate import demand model which was tested later in the thesis. Given these results and evaluations, it is quite evident that the United States has a great opportunity to strongly expand its beef exports to Japan over the next several years.

VIII. RECOMMENDATIONS FOR FURTHER STUDY

It would seem that if the large oak door of trade restrictions for Japanese beef imports has swung open, there is still a plate glass patio door in place, ready to stymie all challengers. There is great import potential, easily seen and untapped, yet mysterious and difficult to tackle.

This thesis has merely worked to validate other model presentations, which only validate the potential for increased imports. There are two significant areas of study which should be strongly considered to get a better strategy in place for increased imports by the Japanese.

One area is in econometric study. The works of Ohga and Wahl were both completed in the 1989-1991 timeframe. The BMAA has been in effect

since April of 1991. Though there is only one year of evidence to consider, it would be wise to estimate both models, based on the additional year of data. This may work to modify the projections of both Ohga and Wahl. The results may help U.S. beef producing companies to make better export decisions. In addition, annual adjustments should be made to the models for the purposes of constant updates and better direction to the companies who are exporting beef.

These efforts must be achieved in conjunction with relentless beef quality market research. There are many different ways that the processes of beef exporting may be achieved. Beef product quality and inventory control, as well as financing and shipping considerations are very important when companies are looking to expand exports.

The research in this paper and the summaries show that there is wide potential for increased trade. At the same time, one could project some real danger if the companies who attempt to take advantage of the changing situations do a poor job trying to develop target markets, evaluate products and improve market share.

For example, if a particular company decides to price its product higher than the market, it needs to be certain that the product is easily distinguishable from the competition, and in a positive way so that the potential customer will feel good about spending more money on this particular product.

This is a good opportunity for a combination of marketing and econometric research to give American exporters the most accurate trend projections. Competition will continue to get stronger from other nations. To compete, there must be superior product quality relative to the needs of Japan, not the market assumptions of the exporters. To remain successful,

meat exporters need to continually search out new product and market ideas. Awareness of the customer's requirements is the key for success, as it is in the domestic market, (Skold, 1987, p. 97). Further econometric and marketing research can help achieve these very important objectives. The future of the beef industry in the United States depends in part on the success of this research.

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APPENDIX #1

YEAR	NATIONAL INCOME billion yen	CONSUMER PRICE INDEX 1985 = 100
1960	14,179.9	
1961	28,233.3	21.2
1970	59,152.7	28.3
1971	74,601.0	36.9
1972	91,823.1	39.3
1973	109,060.8	41.2
1974	121,025.9	46.0
1975	137,119.6	56.7
1976	151,395.2	63.3
1977	167,571.7	69.3
1978	180,707.3	74.9
1979	195,048.7	78.1
1980	205,523.8	81.0
1981	216,038.6	87.3
1982	224,422.6	91.5
1983	237,321.8	94.1
1984	251,233.8	95.8
1985	262,034.3	98.0
1986	270,427.3	100.0
1987	286,518.6	100.6
1988	310,300.0	100.7
1989	326,900.0	101.4
1990	288,911.0	103.7

Source: International Financial Statistics

APPENDIX #2

YEAR	CURRENT ACCOUNT JAPAN	CURRENT ACCOUNT U.S.A.
	billion dollars	
1960	0.06	3.82
1961	-0.33	3.38
1970	0.21	2.33
1971	0.57	-1.45
1972	0.66	-5.78
1973	3.65	7.07
1974	1.35	1.94
1975	4.94	18.06
1976	9.80	4.18
1977	17.14	-14.49
1978	25.30	-15.40
1979	1.85	0.20
1980	2.13	1.20
1981	19.96	7.26
1982	6.85	-5.86
1983	20.80	-40.18
1984	35.00	-98.99
1985	49.17	-122.25
1986	85.83	-145.42
1987	87.00	-162.22
1988	79.59	-128.99
1989	56.99	-106.41
1990	35.87	-92.16

Source: International Financial Statistics

APPENDIX #3

	HOUSEHOLD BEEF CONSUMPTION	HOUSEHOLD PORK CONSUMPTION
	grams	
1965	9,631	9,834
1970	7,511	14,754
1971	7,996	15,765
1972	8,259	16,403
1973	7,605	18,040
1974	7,920	19,317
1975	8,210	18,892
1976	8,560	19,553
1977	8,903	20,143
1978	9,946	20,298
1979	10,103	20,986
1980	9,639	21,356
1981	9,891	20,195
1982	10,288	20,147
1983	10,214	19,332
1984	10,537	19,381
1985	10,357	18,583
1986	10,422	18,699
1987	10,914	18,208
1988	11,098	17,797

Source: Ministry of Agriculture Forestry and Fisheries

APPENDIX #4

	JAPANESE MEAT PRODUCTION	JAPANESE PORK PRODUCTION
	metric tons	
1965	216,261	407,238
1970	278,010	734,294
1971	296,173	843,244
1972	317,445	885,306
1973	245,769	970,520
1974	321,071	1,097,924
1975	352,664	1,039,642
1976	297,881	1,056,229
1977	361,175	1,169,465
1978	403,340	1,284,473
1979	401,665	1,429,928
1980	418,062	1,475,005
1981	470,717	1,395,843
1982	480,962	1,427,626
1983	494,938	1,428,824
1984	536,061	1,424,204
1985	555,256	1,521,914
1986	558,620	1,551,651
1987	566,458	1,582,014

Source: Ministry of Agriculture Forestry and Fisheries

APPENDIX #5

DATE	JAPANESE BEEF PRICES	JAPANESE PORK PRICES
	yen/kilograms	
1960		
1965	854	745
1970	1,370	909
1971	1,470	930
1972	1,510	992
1973	1,980	1,120
1974	2,450	1,240
1975	2,710	1,550
1976	3,160	1,680
1977	3,150	1,590
1978	3,090	1,570
1979	3,150	1,500
1980	3,390	1,450
1981	3,360	1,530
1982	3,420	1,570
1983	3,510	1,630
1984	3,570	1,640
1985	3,510	1,540
1986	3,530	1,500
1987	3,550	1,470
1988	3,550	1,460

Source: Ministry of Agriculture Forestry and Fisheries

Results	Equation #1	Equation #2	Equation #3	Equation #4
Sample Size	134	133	133	133
Intercept	-1.0078	-1.4634	-2.7386	-2.5628
Pt	-0.1302	*	-0.1245	*
t-value	(-4.907)	*	(-3.965)	*
Long Run E	-0.6723	*	-0.6066	*
Yt	0.2458	0.3411	*	*
t-value	(4.443)	(4.917)	*	*
Long Run E	1.2693	1.4622	*	*
Pm	*	-0.0728	*	-0.0806
t-value	*	(-1.981)	*	(-2.198)
Long Run E	*	-0.3120	*	-0.3690
Pd	*	0.0134	*	-0.0214
t-value	*	(-0.192)	*	(-0.295)
Long Run E	*	0.0574	*	0.0979
Y*	*	*	0.2596	0.3306
t-value	*	*	(4.127)	(4.745)
Long Run E	*	*	1.2645	1.5113
Y/Y*	*	*	1.6837	1.1232
t-value	*	*	(1.928)	(1.254)
Long Run E	*	*	8.2007	5.1392
Mt -1	0.8063	0.7667	0.7946	0.7814
t-value	(19.01)	(16.87)	(-3.965)	(16.08)
Dum2	0.0256	0.0249	0.0255	0.0250
t-value	(2.111)	(2.080)	(2.095)	(2.082)
Dum3	-0.0256	-0.0251	-0.0257	-0.0250
t-value	(-2.126)	(-2.116)	(-2.127)	(-2.099)
Dum4	0.0271	0.0261	0.0267	0.0267
t-value	(2.239)	(2.188)	(2.195)	(2.231)

Results	Equation #1	Equation #2	Equation #3	Equation #4
Speed of Adjustment	0.194	0.233	0.205	0.219
Mean Lag	4.164	3.286	3.871	3.576
Median Lag	3.220	2.609	3.016	2.811
R-Squared	0.9858	0.9964	0.9962	0.9964
F Value	5614.141	4961.741	4777.032	4311.782
Std. Error	0.30965	0.29799	0.30947	0.29767
Dep. Mean	1.46726	1.46726	1.46726	1.46726
% Std. Error	0.21	0.20	0.21	0.20
D.W.	1.716	1.729	1.699	1.753
Durbin H	1.887	1.835	2.103	1.719

Results	Equation #2	Equation #2A	Equation #2B	Equation #2C
Sample Size	131	131	133	133
Intercept	-1.9575	-1.9581	-1.8416	-2.5628
RGNP t-1	-0.1302	0.4425	0.4370	*
t-value	(-4.907)	(1.280)	(4.676)	*
Long Run E	-0.6493	*	1.3898	*
RGNP t-2	*	0.0219	*	*
t-value	*	(0.065)	*	*
Long Run E	*	0.5081	*	*
UVI t-1	-0.4429	-0.4426	-0.4602	*
t-value	(-3.878)	(-3.857)	(-3.923)	*
UVI t-2	0.6080	0.6078	0.6810	-0.0806
t-value	(3.567)	(3.550)	(3.368)	(-2.198)
UVI t-3	-0.4344	-0.4343	-0.4887	-0.0214
t-value	(2.844)	(-2.831)	(-2.826)	(-0.295
UVI t-4	0.2070	0.2067	0.2073	0.2070
t-value	(2.444)	(2.429)	(2.442)	(2.444)
Long Run E	0.3510	0.3502	0.3914	0.8451
WPI t-1	1.5865	1.5824	1.7047	1.1232
t-value	(4.554)	(4.453)	(4.363)	(1.254)
WPI t-2	-1.6228	0.7667	0.7946	0.7814
t-value	(-4.677)	(-4.586)	(-2.929)	(1.254)
Long Run E	-3.2762	*	*	*
WPI t-3	*	*	0.2889	1.1232
t-value	*	*	(0.675)	(1.254)
Long Run E	*	*	0.5973	*
M t-1	0.6662	0.6661	0.6855	0.7814
t-value	(11.360)	(11.308)	(10.488)	(16.086)

Results	Equation #2	Equation #2A	Equation #2B	Equation #2C
Dum2	0.0212	0.0213	0.0212	0.0250
t-value	(2.005)	(1.998)	(1.992)	(2.082)
Dum3	-0.0198	-0.0198	-0.0191	-0.0250
t-value	(-2.126)	(-1.866)	(-1.792)	(-2.099)
Dum4	0.0291	0.0291	0.0290	0.0267
t-value	(2.724)	(2.713)	(2.712)	(2.231)
Speed of Adjustment	0.334	0.334	0.314	0.219
Mean Lag	1.996	1.996	2.180	3.576
Median Lag	3.220	2.609	3.016	2.811
R-Squared	0.9858	0.9964	0.9962	0.9964
F Value	5614.141	4961.741	4777.032	4311.782
Std. Error	0.30965	0.29799	0.30947	0.29767
Dep. Mean	1.46726	1.46726	1.46726	1.46726
% Std. Error	0.21	0.20	0.21	0.20
D.W.	1.716	1.729	1.699	1.753
Durbin H	2.193	2.100	2.642	1.719