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Consumer meat purchase patterns in Japan

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by

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To my parents, Syed Ahmed Raza Tirmizi, Syeda Nighat Sultana

TABLE OF CONTENTS

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CHAPTER 1
INTRODUCTION

The long reign of the first restored Emperor, Meiji, stretched from 1868 to 1912, and he is regarded as the pioneer of westernizing certain parts of Japanese life which made the European world realize for the first time that such a people as the Japanese actually existed (Crocker 1931). The topic of beef consumption in Japan begins with revocation of the prohibition meat against eating in 1882 just after the Meiji restoration. Since before the Emperor Meiji the eating of beef, pork, and meat of other animals had been prohibited for more than a thousand years, mainly because of the Buddhist influence that the killing of the four-legged animal is cruel. The Japanese compensated for this deprivation of a major source of protein by excluding fish and birds from this dietary ban (Simpson et al. 1985).

In a land where for thousands of years the people lived on a diet of rice, vegetables and seafood eaten with "hashi" (chopsticks) meat, especially beef, was a rarity until very recent times (Longworth 1983).

Today the Japanese system is able to produce many items of high quality at a price much lower than the United States is able to offer, and a target of the American press. Similarly, it is difficult to say how much of the trade surplus with America is because of the trade policies or because of Japanese industry's ability to understand and meet their customers needs (Hayes 1989). Due to recent trade developments, some U.S. industries will now have the opportunity to compete with similar Japanese industries on more even grounds. The 1988 Beef Market Access Agreement, which allows for significantly greater amounts of

beef imports into Japan, is expected to affect the Japanese beef market dramatically (Hayes 1989).

In order for this agreement to be successful, attitudes regarding quality control, product development, and private sector/government cooperation will have to be adopted. The United States will also be in direct competition not only with Japanese domestic beef production but also with other exporters such as Australia as well (Hayes 1989).

After World War II Japan initiated a school lunch program patterned after one being used in the United States (Fukutake 1974). This seemed to be the initial step in what is considered to be a change in preferences and consumption patterns of the Japanese diet.

The war time economy taught the Japanese the importance of a stable, self reliant source of food production. This led to enactment of policies that aided the expansion of agriculture, especially the livestock industry. Successful implementation of these government policies helped expand beef, poultry and pork output. The production of beef, however, remained below pork and poultry.

A shift in focus to boost beef production led to the implementation of import quotas, a price stabilization scheme, and self-production subsidies (Hayes 1989). Efforts to achieve self-sufficiency in food were constrained by limited land area, population growth, and rapid urbanization. On the other hand, what is considered as the gradual change of Japanese diet and consumption pattern, traced back to the introduction of the school lunch program, created an overwhelming demand for animal proteins. Though it has increased, consumption of beef lagged behind that of poultry and pork, increasing only four times since 1955. The shortage of

beef is due to two factors. First, the rate of expansion of domestic beef production has been slow compared to the growth of chicken and pork output. Second, beef imports have been tightly controlled by import quotas. As a result, beef has become very expensive in Japan (Longworth 1983).

High price clearly is the reason that beef consumption has lagged behind the other meats. A complex retailing system and import limitations put forth by the Live Stock Industry Promotion Corporation (LIPC) are responsible for high beef prices. The LIPC has set forth other import restrictions as well, including a tariff requirement that imported beef must be frozen (a cost-adding factor) and that imported meat should consist primarily of cheaper cuts (Hayes 1989).

Through research undertaken by the Meat Research Export Center (MERC) at Iowa State University, the LIPC's position has been challenged. MERC's research shows that Japanese domestic beef is considered a separate commodity from American beef, implying that the Japanese are willing to pay a high price for domestic meat, even if they could obtain American beef at the lower cost. It seems then that Japan is ultimately interested in maintaining production control on domestic grounds (Hayes 1989).

MERC research also discovered that there is an enormous potential for U.S. export to the Japanese beef market, because the Japanese import beef only from countries that are free of the virus that causes foot and mouth disease. Until recently, the United States, Australia, New Zealand, Ireland, and the United Kingdom are the only qualified countries, and for

various reasons the United States has been the country of choice from which imports are preferred.

Looking at the potential demonstrated for the Japanese market by MERC and the U.S. Export Federation, U.S. trade representatives convinced the Japanese to liberalize imports, resulting in a recent beef trade agreement (Hayes 1989).

On July 5, 1988 the Japanese and Americans signed the Beef Market Access Agreement (BMAA) that liberalized the importing of beef from the U.S. Under the agreement, Japan agreed to remove import quotas beginning April 1, 1991, which released enormous pent-up demand for beef by 124 million healthy and wealthy Japanese (Hayes 1989). As a result, the Japanese beef imports increased from 216,000 metric tons in 1987 to 589,100 metric tons in 1994. On April 11, 1991, the LIPC formally ended its involvement in the international trading of beef. Henceforth, U.S. and Australian beef producers have been in direct competition. In 1993, Japan imported 235,000 metric tons of beef from the United States, whereas total imports for 1994 were 589,100 metric tons.

As was expected, Japanese beef imports varied during the transitional phase (1987 to 1990) and the post transitional phase (1991 to 1993), when LIPC involvement in Japanese trade ceased. Following that, Japan has imported more high quality cuts and full sets of beef.

The Japanese have been faced with two choices: either to import feed grain to feed Japanese based animals or to import meat to meet the ever increasing consumption. Japanese found it more economical to import beef given the higher labor costs in Japan and relative high efficiency of the U.S. livestock and poultry industry (MERC 1993).

Table 1.1. Pounds of feed grains required to produce one pound of live weight by country

Country	Cattle	Hogs	Poultry
US	7.00	4.00	1.70
Japan	7.58	4.80	3.20

Source: (MERC May 1993)

The second factor that helped U.S. meat exports is the favorable yen/dollar exchange rate. Another contributing factor is the introduction and improvement of the new meat processing technologies (MERC May 1993), as shown in Table 1.1.

It is easy to forecast that the prospective demand will increase, but what is important to consider is what factors contribute to and affect the demand (consumption), such as consumer attitudes and preferences. What is the basis of the preferences and how will a change in them affect consumption.

Following the US-Japan Beef Agreement of 1988, which led to the liberalization of meat imports, this study shows, that Japan will import more beef in order to meet its increasing consumption. However, consumption will be affected by consumer attitudes and preferences, primarily related to health concerns.

Chapter 2 discusses the history of meat consumption and change in Japanese culture and traditions after World War II, beef consumption as a social problem value of money and health concerns.

Chapter three focuses on a description of available data, methodology for analysis and statistical results. The model used and analysis, including maximum likelihood estimates and elasticities, show how various preferences affect the consumption of meat. Binary variables

are formed and scale point variables are used to measure the attitudes and preferences and serve as independent variables. Beef, pork and chicken consumption are the dependent variables. The data come from surveys conducted by the Soken and Burke Corporations in 1988 and 1989, respectively. Finally, in Chapter four, conclusions are presented and discussed with regard to the hypothesis, and suggestions for future research are made.

CHAPTER 2
CHANGE IN DIET, SOCIAL ATTITUDES AND HEALTH AWARENESS IN JAPAN

Background

In 1945, Japan was defeated in the Second World War. The subsequent break down of pre-war Japanese society, ideas introduced through American democracy, and a relatively liberal economic system provided Japan the necessary impetus and the means to rebuild and transform its economy and society (DeMente and Perry 1968). The society was no longer shackled by national goals of international conquest and monolithic nationalism or restricted by their attitudes. The Japanese exploded into a frenzy of economic activity and societal change that has continued since then.

This social freedom has had the most profound effect on women and the younger generation, who have exercised their newly found mandate by repudiating many old values, obligations and taboos. Adapting themselves to new ideas and circumstances has played an important role in the development of contemporary thought and behavior in the post-war era (DeMente and Perry 1968).

For the Japanese, after remaining a closed and isolated society for thousands of years, this was like the transformation which swept through the primitive societies in the valleys of the Tigris, Euphrates, Nile and Indus thousands of years ago. Food preferences and consumption patterns depend on tradition, climate, resource availability and propensity to trade (Simpson et al. 1985). In a land where for millennia the people lived on a diet of rice and

fish eaten with "hashi" (chopsticks), meat, especially beef, was a rarity until very recent times (Longworth 1983).

Geography

Japan has approximately 143,000 square miles of territory, and about 80 percent of this area is composed of steep hills and wild rugged mountains which reduces both arable and habitable area. Japan is comprised of four main islands: Kyushu, Shikoku, Hokkaido and Honshu. The country is further divided into Eastern and Western Japan. Seventy five percent of the total area is regarded as uplands and the remaining area as lowlands. Japan is located in the temperate zone and enjoys all the four seasons.

Ancestors of modern-day Japanese were wet-rice growers, production required land that was fairly flat and that had plenty of rainfall and runoff water to flood the rice paddies. Hence the lowlands became natural centers of population (DeMente and Perry 1968).

Japan is also divided for agricultural purposes into two parts. One part is comprised of the islands of Honshu, Shikoku and Kyushu. Within these areas, the major agricultural regions were Kinki, Tokai, Kanto and Sanyo. Since the war, Kyushu in the west and Tohoku in the east have become major agriculture producers mainly because of the change brought by industrialization of the country. The other major agricultural area is Hokkaido, which also developed rapidly after the war (Simpson et al. 1985).

Large Urban Industrial Centers

Over 60% of the population of Japan lives in giant urban-industrial complexes. These areas are the Keihin area which includes Tokyo and Yokohama; the Tokai area, of which

Nagoya is the main city; Keihanshi, made up of Osaka, Kobe, Kyoto and surrounding areas; and the Kita-Kyushu area which includes Kita-Kyushu city, Kokura and Fukoka. Most of these complexes are located in the warmer Pacific side of Japan.

Characteristics of the Japanese Cities

Large cities in Japan have a number of distinctive features. Most of Japan's large cities developed from castle towns which flourished between 1500 and 1600. The castle was the center of each of these towns, which were laid out to provide for and protect the castle. Roads were generally designed to form a maze to cause hindrance in the approach of enemy. Another characteristic of large Japanese cities is their overwhelming population of young people, attracted by existing and future employment opportunities and also by the big-city style of living (DeMente and Perry 1968).

History of Japanese Thought and Culture

Until the rise of the Tokugawa Shogunate in 1603, feudalism prevailed. Tokugawa Shogunate rule lasted until 1868, when for various reasons, including feudal but mostly economic considerations, its structure and strength caved in and the emperor was restored to power. The reign of the first emperor, Meiji, stretched from 1868 to 1912. His policies brought a brisk change in certain areas of the Japanese life. Europeans came to know for the first time that Japanese existed. Europeans still did not appreciate how long the Japanese people had existed nor that they possessed an unusual and complex civilization. The defeat of Russia in 1902-4 at the hands of Japan left the west astonished (Crocker 1931). It is difficult for a westerner to realize the quality of the culture that has been developed on these islands

off the coast of Asia. The principal religions are Buddhism and Shintoism. Both teach politeness, love of Nature and that bearing pain is a virtue.

Change for the Better

Japan did what it needed to increase prosperity. To achieve progress an under-developed country must rid itself of its old traditions, norms, values, and beliefs, as they often effectively hold back industrial and human progress. The progress transformed the primitive system, society and habits and led to the adoption of new ideas and social norms (Valenzuela and Valenzuela 1981). Others have seen the process of change and adaptation as the actual transformation of the society as a whole (McClelland 1961; Portes; 1976 and Smeler 1976). This process of change is also reflected by changed dietary habits and preferences by the society.

By 1960 the Japanese had begun to distinguish between the consumption for basic survival and consumption for pleasure and comfort. Factors showing a visible change in the daily life of Japanese include:

1. Choice of western-style clothing by the younger postwar generation.
2. The regular appearance of western type food in the national diet.
3. Growing popularity of western habits and ideas.
4. Increasing participation of women in the labor force.
5. Urbanization of farm life.

Rapid urbanization has strained the extended "ie" (which means house) system of family social structure, which comprised of three generations, the grandparents, the husband

and wife and their children, living together under one roof. Under this system the eldest son carried on the occupation of the father and other members directly or indirectly helped to keep the household self-sufficient (DeMente and Perry 1968). World War II was the major factor along with the land reforms that followed, in destroying the family structure and the family's power base. Surviving members started out on their own with whatever was left and a desire took root in the young Japanese to have a home of their own. This led to the emergence of what is called a "nuclear family".

Nuclear Families

A typical urban family is comprised of a husband, and wife together with one, two, or three children. Their focus is "family", but they are willing to pursue independent careers, and to make private consumption decisions in the best interest of the family as well. This practice is quite evident from the increase in the number of the such families and increased women's labor force participation, as shown in Tables 2.1 and 2.2. Both the increased number of nuclear families and increased women's participation contributed to changes in patterns of food consumption and diet.

Table 2.1. Increase in the number of nuclear families (1000's)

Year	No. of Nuclear Families
1975	26,968
1980	28,657
1985	30,013
1990	31,204

Source: Japan Statistical Year Book 1993/1994 .

Table 2.2. Women's labor force participation rates 1970-1992 (percentage)

Year	Women's Labor force participation rate
1970	49.9
1976	45.7
1980	47.6
1985	48.7
1990	50.1
1991	50.7
1992	50.7

Source: Japan Statistical Year Book 1993/1994.

Food-Consumption Psychology and Changes in Diet and Dietary Habits

Consumer research primarily has focused on the decision making process of the individual with regard to the physical product, as well as on psychological attributes that influence consumer decisions (Nicosia and Meyer 1976). In the early 1960's researchers noted that the macro-level study of societal consumption would be useful. However, there has been a general lack of information regarding the consumption patterns of society as a whole (Glock and Nicosia 1976). Consumption patterns are directly affected by cultural values and institutional establishments. To understand the change in consumption patterns it is vital to understand the process of change in the society as a whole(Nicosia and Meyers 1976).

The most fundamental problem in Japan until recently has been getting enough food, and the lack of adequate food has been an important social issue. Not getting enough food leads to hunger and the potential threat of hunger gives rise to what is termed "food insecurity"(Donna et al. 1995).

After the war with U.S. help, Japan was rebuilt. Through this influential rebuilding process, the Japanese selectively assimilated many of the values and norms of U.S. citizens. Thus America has influenced much of the current-day Japanese psyche and has profoundly affected Japanese society, including their values and diet (McCormack and Sugimoto 1988). However, the Japanese, despite all this, have not lost their traditional heritage (Reishaure 1988).

Japanese spending patterns caution us against over generalization about the westernization of Japan, particularly in terms of food consumption. The percentages of the food budget spent on fish, vegetables, cereals and grains (particularly rice) are greater than the percentage spent on meat (O' Rourke 1995).

The Japanese are difficult to predict since according to Japanese culture, training and social setup, each individual has two personalities: one is called "Hone" which means true inner self and the other is called "Tatemae", which means socially interactive outside. Individuals, decisions are greatly affected by family, friends and close relatives. Normally they are used to following a collective decision and do not hesitate to postpone it if it is of minor importance.

Thus the westernization of the Japanese diet does not imply that Japanese are dropping their traditional diet in favor of western-type meals. What appears to have happened is that as incomes have risen and people learned more about the nutritional value of certain "western" foods, they began to add them as side dishes to their usual diet (DeMente and Perry 1968).

Traditionally the Japanese diet has remained centered around rice, and this results in a food-consumption pattern quite different from the Western diet. Based on a farm and fish society that depended entirely upon its own resources for food, the Japanese diet became standard very early in the history of the country and has changed very little over a thousand years.

Table 2.3. Self-sufficiency rates (percentage)

Year	Beef	Pork	Chicken
1960	96	96	100
1965	95	100	97
1970	90	98	98
1975	81	86	97
1980	72	87	94
1985	72	86	92
1989	54	77	84
1990	51	74	82
1991	52	70	79
1992	49	68	78

Source: Japan Statistical Year Book 1993/94.

Japan's self-sufficiency in livestock products declined from 1960-92 as production lagged behind demand. Before 1960 Japan was self-sufficient in livestock products, but after that self-sufficiency declined. By 1992 Japan imported 51% of its beef supply, 32% of pork and 22% of chicken. The consumption of livestock and poultry have continued to increase, despite rising meat prices, as shown in Table 2.3 and Table 2.4.

Table 2.4. Livestock and poultry retail prices (yen/kg)

Year	Beef	Pork	Chicken
1965	854	745	718
1970	1,370	909	767
1975	2,710	1,550	1,000
1978	3,090	1,570	1,030
1979	3,150	1,500	990
1980	3,390	1,450	1,140
1981	3,360	1,530	1,200
1982	3,420	1,570	1,180
1983	3,510	1,630	1,190
1984	3,570	1,640	1,170
1985	3,510	1,540	1,150
1986	3,530	1,500	1,100
1987	3,550	1,470	1,000
1988	3,550	1,460	1,050
1989	3,650	1,490	1,050
1990	3,830	1,530	1,070
1991	3,910	1,560	1,090
1992	3,970	1,610	1,120
1993	3,950	1,600	1,120
1994	3,940	1,590	1,090

Source: Meat statistics in Japan, March 1995.

Consumption import quotas were used to support Japan's domestic cattle industry and encourage beef production. A complex import quota system was designed to keep the domestic prices artificially above the level of international prices. Through a complicated system of purchasing, storing and releasing frozen beef from the stores, domestic beef prices were stabilized around a target price that was politically and socially acceptable. LIPC used the profit from its market intervention to cover the high cost of domestic beef production.

Consumption Trends

The ultimate objective of gearing up the Japanese livestock industry is to meet the increasing domestic demand, and to supply the product at a price the consumer is willing to pay. Consumption of beef has shown a steady increase, from 1.5 kg in 1960 to 7.2 kg per capita in 1987 and the consumption of pork and poultry has also risen (Hayes 1989).

Consumer demand and purchase preferences for meat and meat products have changed. Some of the changes have arisen due to external forces such as population migration, population mix, rising consumer income, urbanization and westernization. Other changes have been induced through advertisement and promotion, and by introducing changes and innovations in the product.

Japan's rapid economic growth has played an important role in changing the dietary pattern of the Japanese people (Simpson et al. 1985). A taste for wheat-based products developed to some extent due to the forced reliance on wheat during and after the war, and also partly because of the introduction of the school lunch program.

Rapid economic growth raised disposable income considerably. This increase influenced the standard of living, which had a direct effect on eating habits. Rapid industrialization and a growing economy caused large shifts in the geographical location of the population. People moved to cities in search of better pay and socioeconomic benefits. In addition, a high percentage of the individuals living in farm households now commute daily or weekly to city jobs. The urbanization of such a large fraction of the population, including those in traditional farm communities, has strongly influenced the food consumption patterns

The post-war generations have grown up in the ever-changing modern industrial society and their attitudes to food consumption have become different from their parents. (Longworth 1983). Emergence of nuclear families and the introduction of modern kitchen appliances have relieved the modern housewife of the strain of time-consuming cooking. The increased female labour force participation has meant women have little time available for food preparation and cooking and convenience thus have become key factors in determining changes in consumption. Unmarried women and working housewives in the work force frequently eat in snack bars, cafeterias and restaurants. These experiences influence their consumption patterns, and, in turn, those of the family (Longworth 1983).

Changing from a rural to an urbanized society, smaller family size, the participation of housewives in the work force and increases in disposable incomes have influenced and promoted changes in the type of food consumed.

However, an important determinant of beef demand and consumption is the price. High domestic beef prices are attributed to high costs, as shown in Table 2.5 which, have restricted the consumption of beef.

Table 2.5. Livestock production costs (yen)

Year	Cattle/Head	Hogs/Head	Chicken/10kg
1991	861,524	31,075	1,790
1992	863,093	31,490	1,737

Source: Japan Statistical Year Book 1993/94 and 1995

Contemporary lower beef prices are being helped by the favorable yen/dollar exchange rate and the cessation of LIPC involvement in beef imports, beginning April 1, 1991. The yen's appreciation made imports cheaper and boosted the real purchasing power of the Japanese consumer (Hayes 1989). The volatility of the yen/dollar exchange rate is shown in Table 2.6. Another contributing factor to the higher domestic meat prices is the cost of production, shown in Table 2.5.

Table 2.6. Japanese dollar exchange rate, 1970 to May 1995

Year	Yen/$U.S.
1970	360
1975	297
1980	227
1985	239
1990	145
1991	135
1992	127
1993	111
1994	102
1995 Jan	100
Feb	98
March	91
April	84
May	85

Source: International Financial Statistics, July (1995) various issues.

Beef Market Agreement of 1988

Based on historical background and concerns for food security, Japanese beef producers have been protected from the effects of world markets by the price support schemes and trade policies in practice since the early 1960s. The politicization of the Japanese

economy after World War II increased the political influence of the rural population. Concerns about food security gave agricultural producers a large influence upon Japanese food policies and this became the motivating force behind the generally protectionist agricultural policies. By 1954 the foreign exchange situation had improved sufficiently for Japan to adopt an Automatic Approval (AA) System in regard to certain agricultural commodities including beef and animal feed stuffs (Longworth 1983). In September 1955 Japan became a signatory to the General Agreement on Tariffs and Trade (GATT). At that time Japan had tariffs and import restrictions on many agricultural commodities. After this, between the late 1950s and 1972, Japan took many significant steps toward dismantling barriers to agricultural trade.

Beef was one of the products that could be imported without prior approval under the AA system of foreign exchange. It was subject to only a 10 percent ad valorem revenue tariff. With a growing population, in 1957, beef imports surged dramatically and concerned the government. Consequently, in 1958, beef became a restricted import subject to the Fund Allocation (FA) system of foreign exchange control. Under this system the restrictions were on value rather than on physical quantity. This change encouraged the importation of low-quality beef. However, under the charter of the IMF, Japan dropped the FA system and adopted an import quota system on April 1, 1964.

In 1963, Japan participated in the Kennedy Round of Multilateral Trade Negotiations MTN, (1963-1967). At the beginning of the Kennedy Round, Imports of 103 agricultural/forestry/fisheries items were controlled by import quotas. By the end of the Kennedy Round of negotiations in 1967, import quotas applied only to 75 items. The Japanese

government continued the rapid liberalization of the agricultural import trade. As a result, by 1972, only 26 items were still subjected to import quotas (Longworth 1983).

Although Japan had made considerable progress towards liberalization of agricultural imports, in 1973 the United States imposed an export embargo on soybeans to Japan. Japan was totally dependent on imported soybeans for both human and animal feed stuff.
The sudden embargo reminded the Japanese of how vulnerable their country was. Japan called this episode the "Food Shock" or "Soybean Shock". The Japanese economy also suffered a serious blow by the "Oil Embargo", and which further strengthened the fears of vulnerability of the country over food security. Given this, the protectionist agriculture policies became very important in the 1970s (Longworth 1983).

The United States continue to exert pressure on Japan to liberalize agricultural trade. Thus Japan reluctantly agreed in the Tokyo Round of MTN (1973-79) to cut tariffs by an average of 35 percent on about 150 agricultural commodities and to increase import quotas on four agricultural commodities, including beef, oranges, orange juice, and grape fruit juice.

Given world trading conditions, the United States continued to apply pressure at the highest level and, in particular, singled out the import quotas on beef and citrus products. The Japanese government did make some trade concessions on the eve of the economic summit in June of 1982, but these did not include beef or oranges.

Strict quarantine regulations have been a major aspect of the beef trade with Japan. Since Japan is free of foot and mouth disease, bovine brucellosis, bovine tuberculosis, and bovine pleura-pneumonia, all beef destined for Japan (fresh or processed) must satisfy all

quarantine regulations to prevent the possible spread of these diseases. These requirements also effectively limited the importation of live cattle for slaughter, fattening, or breeding (Longworth 1983). It was not until 1984 that the Japanese government agreed to expand beef import quotas, by significant margins over a period of four years.

The General Agreement on Tariffs and Trade (GATT) ruled on the legality of Japan's beef import quota, and other trade issues, in Nov. 1987 in favor of the United States on 10 of the 12 categories challenged, including beef. However the Japanese government did not recognize the GATT ruling until February 1988 (Hayes 1989). Finally, the U.S. trade representative and the Japanese Ministry of Agriculture, Forest, and Fisheries came to terms, leading to an agreement that paved the way for a complete liberalization of Japanese beef imports over six years. The Beef Market Access Agreement (BMAA) was signed in 1988. Under the agreement, Japan was scheduled to increase its import quota by 60,000 tons annually during the first three years, starting in 1988, during the transitional phase.

In the post-transitional phase, the import quotas were scheduled to end completely on April 1, 1991 and then be replaced by a 70 percent tariff. The tariff was to be further reduced to 60 percent in 1992 and to 50 percent in 1993. So, prior to the BMAA, the import quota consisted of a general quota and a special quota. Only 10 percent of the general quota was allocated directly to private traders and 90 percent was controlled by LIPC, which it allocated to certain Japanese trading companies through both a simultaneous buy/sell system (SBS) and a tender system. The SBS allowed Japanese buyers to import beef directly from foreign beef

exports. Under the agreement, the majority of the increase has occurred in the SBS portion (Hayes et al. 1991).

With the phasing out of the import quota system in 1991, the LIPC role in importing meat ceased and the doors were opened wider to exports of high-quality beef. However, the Japanese reserved an emergency adjustment measure that calls for an additional 25 percent tariff that could be implemented if, in any year, beef imports exceeded 120 percent of the previous year's exports. This reservation expired with the provisions of the Uruguay Round of GATT (O'Rourke 1995). The trend in Japanese imports is shown in Tables 2.7, 2.8, and 2.9.

Table 2.7 shows the increase in pork imports over the period. Also in May 1994, total imports were of 40,538 tons, and the U.S. share was 5,806 whereas in May 1995, total imports were of 51,336 tons it was 8,400.

Table 2.7 Japanese pork imports

Fiscal year	Total Imports (tons)	U.S. Share (tons)	Month of May (tons)
1992	467,216	66,968	
1993	454,843	67,981	
1994	503,045	75,279	40,538.
1995 till May.	221,069	33,955 till May	51,336.

Source: LIPC Monthly Statistics, July 1995

Table 2.8 shows that in May 1994 the U.S. share of broiler imports was 10,063 tons of total imports of 32,280 whereas in May 1995, it was 10,646 tons of the total imports of 49,095. The trend in consumption of all three meats is expected to continue to increase. The U.S. share has shown a steady increase over the years.

Table 2.8. Japanese broiler imports

Fiscal year	Total Imports (tons)	U.S. Share (tons)	Month of May (tons)
1992	386,850	109,660	
1993	379,682	113,752	
1994	477,269	126,78	32,250.
1995 till May.	204,459	44,967 till May	49,095.

Source: LIPC Monthly Statistics July 1995

The increased trend in Japan's imports is shown in Table 2.9 for red meat. In the month of May 1994, out of total imports, the U.S. share was 24,481 of a total of 56,654 tons whereas in May 1995, it was 27,766 tons of total imports of 60,014 tons. The process of opening the Japanese market that started in the 1970s was strengthened in the 1980s and has resulted in a steady increase in the U.S. share of the Japanese beef market. The U.S. share increased from 29 percent in 1984 to 35 percent in 1986 and 48 percent in 1988 and it reached nearly 50 percent in 1989 (O'Rourke 1995). According to the.U.S. MERC Trade News, (May 1995), U.S. red meat exports are already up by 31 percent over the same period in 1994.

Table 2.9. Japanese total beef imports

Fiscal year	Total Imports (tons)	U.S. Share (tons)	Month of May (tons)
1992	423,429	182,873	
1993	566,911	243,085	
1994	583,965	248,367	56,654.
1995 till May.	248,221	108,678 till May	60,014.

Source: LIPC Monthly Statistics July 1995

Factors Contributing to U.S. Beef Exports

The increase in the U.S. share of the Japanese beef market has come at the cost of the Australian share, despite heavy Japanese investment, joint ventures, and increased grain feeding in Australia. Among other reasons, the following factors also played a major role in these gains.

Active promotional activity by the U.S. Meat Export Federation.

Breed-specific campaigns such as those for Angus Beef.

Company specified activity, such as IBP's (Iowa Beef Processors) program for selling full carcasses in 22 meat cuts.

Japanese acquisitions in external markets, as in case of Washington Beef Inc.

The favorable yen/dollar exchange rate was the most important contributing factor. The steep rise in the value of the yen had reduced the differential between food prices in Japan and other nations. Secondly, the stronger yen coupled with the given structural limitations of Japanese agriculture, the unattainable goal of self-sufficiency, production costs, and abundance of food stocks in the world markets, helped Japan to overcome the fear for food security and rely on imports (O'Rourke 1995).

With the implementation of the 1988 U.S.-Japan beef agreement, the imports increased further. As anticipated, after the liberalization the prices have declined. Still, the results are not as large as they might be since the state of the art storage facilities built during the hey days of LIPC currently play a role in keeping the prices up (O' Rourke 1995). Table 2.10 shows prices for various cuts of beef.

Table 2.10. Average retail prices yen/100g (normal selling price)

Year	Wagyu Sirloin	Dairy Sirloin	AS Sirloin	US Sirloin	Wagyu Chuck	Dairy Chuck	AS Chuck	US Chuck
1991	1,178	643	406	470	555	350	215	228
1992	1,165	651	413	461	562	352	215	239
1993	1,135	654	388	442	539	338	191	218
1994	1,110	594	363	421	535	314	176	204
1995 Jan	1,109	608	361	398	545	334	167	196
Feb	1,094	603	363	395	528	336	167	193
Mar	1,102	600	359	402	520	333	169	196

Source: PS&D view, USDA 1995

Consumption of Beef in Japan

Japanese cattle are of two primary types. The indigenous breed, called Wagyu, which produced in confined quarters on a small scale and intensively finished on imported (mostly American) feed grains, provide 36 percent of the locally slaughtered beef. Some of the Wagyu produce highly marbled beef known as Kobe-type, famous for its superior meat quality in the world. Japanese enjoy Kobe once or twice a year in their own home. Most of it is used in high-quality restaurants in big cities. Domestic dairy cattle, called Holstein, which provide less marbled dairy beef, accounts for the remaining 64 percent of the national kill.

In Japan both breeds are fed to excessive finish, to provide the required marbling. Only Wagyu attains the supreme, or A, grade by Japanese standards, while domestic dairy beef is graded as B or medium and common. Typically U.S. choice grade (grain-fed) generally falls between these two grades. Grass-fed is more nearly equivalent to the common grade (O'Rourke1995; Miyazaki 1986; Thomas et al. 1991).

Japan is currently importing 52 percent of its total beef demand. Australia supplies approximately 65 percent of this, and the United States approximately 35 percent, thereby making Japan the most important world market of high-quality beef. In Table 2.11 the Japanese consumption trends are shown.

Table: 2.11. Japanese consumption trends of chicken, beef and pork (1000's of tons)

Year	Chicken	Beef	Pork
1965	210	232	407
1975	773	411	1171
1980	1224	590	1676
1981	1235	625	1628
1982	1312	655	1654
1983	1354	686	1660
1984	1414	730	1700
1985	1474	780	1750
1986	1563	830	1860
1987	1667	880	1982
1988	1743	900	2040
1989	1697	986	2057
1990	1689	1073	2069
1991	1688	1142	2083
1992	1752	1190	2087
1993	1708	1272	2062

Source: PS &D View, USDA, 1995

In the post transitional phase, imports increased for all three meats. In 1993 a slight fall in consumption of pork and chicken observed, that could be due to the current sluggish state of the Japanese economy. Total household consumption of chicken, beef and pork showed an total increase of 87.7 percent, 81.8 percent and 80.3 percent over the period 1965 through 1993 for chicken, beef and pork respectively. Thus for foreign exporters, to meet this

increased consumption of meats it is necessary to understand the guiding factors behind the Japanese consumers' attitudes and behavior regarding meat consumption. The focus is mostly on beef, beef dishes and cooking styles.

Japanese Beef Cuisine

Traditional

Historically, consuming the meat of a four legged animal was considered a taboo and even prohibited by law. It was not until the restoration of Meiji rule in 1868 that the ban was lifted. Japan's deficiency in animal protein intake due to a dietary ban previous to the Meiji restoration was compensated for by eating fish, the main source of non-vegetable protein intake, which was supplied in abundance by the surrounding seas (Miyazaki 1986).

Preparation and presentation of food is regarded as an art form. For many dishes there are strict conventions with regard to palatability. The traditional beef dishes because of their unique cooking styles have no counterpart in Western cooking (Longworth 1983).

In sukiyaki, a new beef dish introduced after the ban on meat eating was lifted, the most marbled beef of the highest quality is boiled in a pot of water or broth. Another main feature in sukiyaki preparation is the use of "prime sirloin" sliced like wafers of paper. Such highly marbled beef does not become tough when cooked with moist heat. At high temperature the fat in the muscle melts and covers the outside of the beef, minimizing the loss of natural juices and flavoring it from the inside. When the thin beef slices are boiled together with a variety of vegetables, sugar, and soysauce, much of the taste depends on the marbling

of the beef. Japanese use lower quality wagyu beef in a simple dish called "Nimono". Again in this case marbleness is the key to the taste (Longworth 1983; Miyazaki 1986).

Another famous traditional beef dish is "Shabu-Shabu". In this, one dips a piece of paper-thin sliced and lightly marbled beef into a pot of boiling water for an instant and then eats it. This dish became rather popular in Japan after World War II. The taste also depends on the beef being highly marbled. Further, since the Japanese like to cook these dishes at the table, the odor given off while the beef is cooking must not be offensive. To a Japanese person the cooking smell from grass-fed beef is offensive. They find the yellowish fat unattractive and argue that this is the source of the unpleasant cooking aroma. Thus they feel that the imported grass-fattened beef, with its slightly yellowish fat, is not very suitable for their traditional dishes such as sukiyaki and shabu-shabu.

Modern or Present-Day Beef Dishes

Modern or present-day beef dishes include barbecue, grill (Teriyaki, Teppanyaki), minced meat preparation for frying, stews, curry and hamburgers. Both in the household and in restaurants, cooking is done near or at the table with these forms of cuisine, marbling is not important hence there is less chance that the offensive odor from grass-fed beef will be noticed (Longworth 1983).

Beef of grade A is mostly demanded for traditional cuisine. The beef for barbecue is mostly of B grade. In barbecue uses, people are less concerned about marbling but are more concerned with tenderness. Today, curry rice is very popular. The younger generation especially like it and beef is the most preferred meat in a curry dish. However owing to high

prices of beef, many housewives use pork or chicken as a substitute. Beef used in curry is often common or utility grade.

Beef of lowest quality is used in hamburger dishes by grinding. Hamburgers in Japan are different from those in the U.S. Japanese prefer hamburger more when small pieces of onion as well as up to 50 percent pork are included. The mixture of ground beef and ground pork for hamburgers is viewed more favorably than ground beef by itself (Miyazaki 1986; Longworth 1983).

Diversification in Cooking Styles

Japanese have eaten pork in various ways from earlier times. Traditionally there are pork and chicken recipes that are used as side dishes with boiled rice. Other pork dishes are similar to those found in the U.S., typically cooked by broiling, roasting or frying.

Traditionally chicken was consumed by boiling, much like sukiyaki or shabu-shabu. After World War II, the U.S. army introduced roast or broiled chicken to the Japanese. Gradually consumption of roast and broiled chicken began to increase and now occupies a large share of poultry dishes (Simpson et al. 1985; Miyazaki 1986).

With the increased supply of domestic dairy beef and imported grass-fed beef in the late 1960s, beef consumption began to increase. The increase in beef consumption was also influenced by the diversification of pork and chicken cooking methods. Another important factor was the introduction and extension after World War II of a Korean dish "Yakiniku", a type of meat dish. The special feature of this dish is to grill or barbecue (indoors) small pieces of meat (not so thin as wafers) with heavy sauce containing red pepper.

Most grass-fed imported beef is consumed in dishes of this type. Changes in cooking styles have had an effect on the types of retail cuts available. Gradually, the Japanese have begun to enjoy beef cooked by methods similar to those used for pork and chicken. This trend was further accelerated by the introduction and extension of cooking facilities such as grills, ovens and ranges in households and by rapid economic growth (Miyazaki 1986; Simpson et al. 1985). The dishes and grades of beef used are summarized in Table 2.12.

Supreme or Superior are the grades for which it is very difficult for the domestic dairy and imported beef to make these grades (Wahl et al. 1991). U.S. prime competes against the Excellent grade. For Medium grade, the competition is from U.S. High and Medium U.S. Choice. Low Choice or High U.S. Good generally competes against the Common grade by Japanese standards (Miyazaki 1986).

Table 2.12. Japanese beef dishes and beef grades

Dish	Beef Grade
Sukiyaki	Supreme, Superior
Sukiyaki	Superior, Excellent, Medium
Barbecue	Excellent, Medium, Common
Hamburger	Medium, Common

Source: Miyazaki 1986

Changes in consumption habits and rapid urbanization have also helped to increase beef consumption. More meals are now consumed outside the home in restaurants, snack bars, and cafeterias. Almost half of the people interviewed in 1989 reported eating away from home rather often or very often, see Table 2.13.

The increase in the number of working women and increase in the frequency of families dining out also contribute to the increased beef consumption. The meat most often consumed outside home is beef, followed by pork and to a much lesser extent poultry and processed meat (Hayes 1989).

Table 2.13. Frequency of eating away from home.

	Very Often	Rather Often	Rather Seldom
Burke 1989	11.6	38.3	25.4
Soken 1988	7.5	29.1	21.2

Source: Soken Corporation Ltd. 1988; Burke Corporation 1989

Japanese Beef Submarkets

Basically the Japanese beef market is classified into three segments: top quality beef, popular beef and beef for processing. Imported beef generally falls into the popular beef and processed beef categories (Hayes 1989).

Top Quality Beef

This segment of the market accounts for 6 percent of the total Japanese beef market. Supreme and superior grades of the beef are also called Kobe, Matsusaka, Omi beef or super beef, and are which is highly marbled. A good deal of this type of beef is sold to the luxury hotels and high class restaurants, primarily to be used for "Sukiyaki", "Shabu-Shabu" or other traditional Japanese beef dishes. Top quality beef is considered a luxury item and its consumption is generally unaffected by the changes in income and prices (Hayes 1989; Longworth 1983; Wahl et al. 1991).

Popular Beef

This segment of the market makes up to 65 to 70 percent of the total Japanese beef market. It can further be subdivided into two sub-markets.

The first sub-group is made up of the Wagyu Beef that did not reach the supreme or superior grades or super beef status and of the dairy beef that reach this status. U.S. prime beef, which is grain-fed, meets the standards of this market and competes against the second grade Wagyu. International hotels, high class restaurants and airlines often substitute this High Quality for Wagyu and are the main customers. Imported beef makes up 40 to 50 percent of the total meat purchases by these customers and is generally frozen (Hayes 1989; Soken Company Ltd. 1988)

The second-sub group of the popular beef market is simply referred to as the popular beef. It includes the less desirable cuts of the high quality beef, US Choice beef, imported chilled grass-fed beef and domestic dairy beef that receives a grade of Medium or Lower. Demand for popular beef is sensitive to beef prices since pork and poultry are close substitutes (Longworth 1983).

Super-markets and some fast-food restaurants or family restaurants are the main users in this group of popular beef. Super-markets sell beef in the form of thin slices, cubes, or minced meat. Restaurants use U.S. beef for steak, hamburger steak, and Japanese barbecue (Hayes 1989)

Processed Beef

This segment of the market consists of beef for processing into forms such as sausage and meat loaf, pressed ham and salami. It comprises about 30 percent of the total beef market. The beef types used for processed products are low grades of beef: imported, frozen grass-fed beef and other undesirable cuts from the carcass (Longworth 1983).

U.S. Beef Export Market

Looking at the usage and market position of the U.S. beef and given the fact that Japanese customers have shown a strong inclination to consume more beef as their incomes increase, there exists a good market potential for U.S. high quality beef. However, there is a need to further improve the image of the U.S. beef. The U.S. Meat Export Federation (MEF) is making efforts in this regard. Due to misconceptions and lack of knowledge of the source of meat purchased, the Japanese consumers often equate U.S. beef with imported beef in general, thus efforts are currently being directed to make U.S. grain-fed beef into a differentiated product. The Japanese consumer's image of American beef has often been formed from taste experience of Australian beef (Soken Company Ltd. 1988).

Changing consumption patterns and specialized market segmentation have profoundly affected the demand for beef. Most of the beef exported to Japan is in frozen form. It is sliced (paper thin) and into different cuts and sold at the retail level. There is a belief that most of U.S. beef after thawing does not remain "firm" enough to be used in much of Japanese traditional cuisine such as sukiyaki, shabu-shabu and even for , which are prepared near the table. U.S. exporters need to provide chilled rather than frozen beef (Hayes 1989; Mori 1986).

Consumer Awareness and Concerns

In affluent post-industrial societies quality and not quantity has become a goal. According to Ritchie (1979), we know that the food habits and diet are an integral part of any country's cultural fabric. Cultures have foods surrounded by particular preferences, norms, mores and even taboos that fit into their social and ideological system of life. Hence food habits are influenced by social and cultural factors as well as by the desire to meet health and nutritional concerns and needs. For example assessing the quality of beef by the marbling is primarily cherished by old traditional meat traders. However, most Japanese consumer's today, especially the younger generation, now prefer lean beef (Mori 1986). After the war Japan has become one of the wealthiest nations in the world. In the 1970s, its economy attained one of the highest growth rates in the world. The improved economic conditions affected the diet of the average Japanese, who with increased disposable income, on the average, began to consume more meat and other livestock products (Longworth 1983).

Table 2.14. Supply of protein per capita per day (grams)

Year	Meat	Eggs	Dairy Products	Sub-total	Fish & Shellfish	Vegetables
1965	3.6	3.8	3.0	10.4	15.5	49.1
1970	6.1	4.9	4.0	15.0	15.2	47.2
1975	8.4	4.6	4.2	17.3	17.7	45.1
1980	11.0	4.8	5.2	21.1	18.1	43.9
1985	12.4	5.0	5.6	22.6	18.5	43.1
1990	14.2	5.6	6.8	26.6	18.8	42.3
1991	14.3	5.8	7.0	27.1	18.5	42.4
1992	14.7	6.0	6.9	27.5	18.5	42.6
1993	14.9	6.0	6.9	27.7	18.9	41.8

Source: The Meat Statistics in Japan, March 1995 Tokyo Japan.

As shown in Table 2.14, the protein intake from meat sources has increased from 3.6g in 1965 to 14.9g in 1993, showing an increase of 76 percent over the years. Protein intake from fish & shellfish and from vegetable sources declined over the same period. This swing to the consumption of more animal protein has changed the national average protein-fat-carbohydrates (P-F-C) ratio. The trend towards meat and other livestock products such as milk, butter and eggs has not only doubled the ratio of the proportion of fat in the Japanese diet but it also has sharply changed the balance between saturated (mainly from livestock products) and unsaturated fats (mainly from vegetables products).

Japanese Consumer and Incidence of Heart Disease

Although evidence is still being debated in the medical circles, it is widely believed that there is a strong correlation between the high levels of saturated fat intake and coronary heart disease in affluent advance societies (Longworth 1983). Disease of the vascular system, cardiovascular and cerebrovascular diseases, currently account for a larger proportion of the morbidity and mortality in industrialized countries (Gurr 1995).

Japan has a slowly rising incidence of coronary heart disease. Influential people are now suggesting that beef and other livestock products rich in saturated fats may become a major hazard to public health. They argue that under the circumstances, further dietary changes which might move the P-F-C ratio closer to that of the U.S. patterns should be officially discouraged (Longworth 1983). There have been large increases in meat and fat consumption. The average energy intake derived from fat has increased each year and reached 24 percent in 1980. Intakes from rice fell substantially during 1960's and 1970's with a

marked increase in fruit consumption as well as in milk intake. Changes in nutrient intake and selected foods are summarized in Table 2.15. The medical argument against higher levels of animal fats in the human diet might in the long run have a profound impact on the future Japanese diet. In fact, the anti-fat school may already be having an important effect.

Table 2.15. Changes in daily per capita intakes of nutrients and major groups of foods in Japan: 1850-1987

Nutrient/Food	1850	1952	1980	1987
Energy (Kcal)	<1800	2109.0	2119.0	2075.0
Protein (g)	<50	700.0	78.7	78.9
Animal Protein (g)	<20	22.6	39.2	40.1
Total fat (g)	<10	20.1	55.6	56.6
Animal fat (g)	<5	7.0	26.9	27.9
Carbohydrates (g)	<380	412.0	309.0	295.0
Rice (g)	<350	352.0	225.0	212.0
Meat (g)	<5	10.6	17.9	70.8
Milk (g)	0	10.6	115.2	117.9
Fish (g)	<60	82.3	92.5	90.5

Source: World Health Organization Technical Report series, 797, 1990

In recent years, there appears to be a greater consumer awareness and a change in buying preferences. For instance the Japanese housewives have started rejecting pork carrying excessive quantities of fat. This change in preferences is a reflection of the supposed link between the consumption of animal fat and heart disease. This is also clear from the survey results reported in Table 2.16. It is also clear from the Table 2.16, that a large number of the respondents agreed and preferred leanness. The medical argument against further increases in livestock product also has its roots in history. From ancient times, seaweed had remained an

integral part of the Japanese diet. Modern medical research, though not at an advanced stage, has through some preliminary results supported the long-standing Japanese beliefs about the medicinal value of seaweed. Research has shown that sea vegetables do contain antifungal, antibacterial, antiviral, antiprotozoal, and antiseptic elements.

Table 2.16. Current consumer preferences for meat (percentage of respondents)

Statement	Agree (strongly/somewhat)	Disagree (strongly/somewhat)
Tasty meat is well marbled[a]	70.90	9.80
I like to eat well marbled meat even it is expensive[a]	55.80	22.30
When buying meat I try to buy lean meat[a]	71.40	8.80
When selecting I try to select meat with less fat[a]	74.30	6.40
I am limiting the use of meat for health reasons[a]	41.80	35.30
I try to avoid foods that are high in fat[b]	75.00	25.00
I try to avoid foods high in cholesterol[b]	65.00	34.00
I plan to cut down on the amount of red meat I eat for health reasons[b]	34.00	64.00

Source: a Soken survey 1988.
b Burke survey 1989.

Japanese believe that sea vegetables help in reducing blood cholesterol, blood anti-coagulant, are effective against preventing tumors, and are a source of antibiotics, fungi and viruses (Seibin et al. 1983). Japan has the highest life expectancy in the world (appendix A Table A1). This may be due to the high intake of fish and shell fish (which are rich in unsaturated proteins), and general improvement of the diet over the years.

Given the current changes in the P-F-C ratio and a progressive increase in mortality from cancer, diabetes, and heart disease, the Japanese Dietetic Association called for the development of dietary guidelines and nutrition policies in Japan. They particularly noted the adverse trends in fat consumption, and proposed the avoidance of excess intakes of salt, fat and energy. They also promoted an increase in the consumption of unrefined cereals, vegetables, legumes mushrooms and seaweed (WHO Technical Report series 797, 1990).

Feed Additives and Hormonal Residue

Initially believing that the reservoirs of animal and human bacteria were essentially separate, there was little concern about adding antibiotics to feed. Biologists and clinicians have become concerned about the problem. There were aware that the practice of feeding antibiotics to livestock "sub-therapeutically", that is at dose levels below those required to treat an actual disease, promotes weight gains.

Their concerns are not new to the Japanese. In 1955, a Japanese woman returned to Tokyo from Hong Kong with a case of dysentery caused by a bacteria called S. dysenteriae. When doctors try to treat her, they found that the causative bacteria was drug resistant to all four antibiotics. Faced with the possibility that resistance generated in animals could transfer itself by means of plasmids to bacteria that cause human disease led to the re-evaluation of continuing use of those antibiotics that are important in human therapy as animal-feed additives. Another school of thought immediately argued that the evidence of significant animal-to-man plasmid transfer is not enough. From the industry's perspective the benefits of

antibiotics should not be denied to farmers, who presumably passed those benefits on to the consumer in the form of lower prices (Schell 1984).

The Office of Technology Assessment, a research arm of the U.S. Congress, issued a report in 1979 noting that virtually all the commercially raised poultry, 70 percent of the beef cattle and veal calves, and 90 percent of the swine reared in this country consumed such additives as part of their daily feed. Very recently the Food and Drug Administration (FDA) approved the use of sarafloxacin an antibiotic against bacterial infections in poultry. Concerns are being expressed that the move will make sarafloxain ineffective against human disease. Bacteria in poultry will become resistant and could pass on the trait to human bacteria (Business Week 1995).

Similarly, an increasing variety of natural and synthetic sex hormones are being used in raising livestock and poultry. The use of hormones can both be beneficial and harmful, and since they are now widely used in the production of livestock as well as in human therapy, this fact has caused health concerns. The synthetic estrogen used in human therapy is an ideal livestock-feed additive since, unlike other natural estrogen, they are capable of being absorbed through the gastrointestinal tract after oral administration. Some studies using a radioisotope and gas-liquid chromatography techniques have shown that hormonal residue might find its way into the heart, liver, muscle and kidneys of the beef cattle.

Safety of the Product

Safety of all meat products is of major concern to many Japanese consumers, especially the safety of imported meat. Extensive testing is required of all meat imports to

check for agricultural, chemicals, antibiotics residues and other synthetic antibacterial agents, food-additives and preservatives. To assure the consumer of the safety of the product the U.S. MEF in their advertizements (Food Magazine Tanto 1995) uses not only the local nutritionist and dietitian but also says that its safety is guaranteed by USDA, which has a very strict line of federal procedures and regulations of inspection from pens to slaughter house. It also ensures the consumer that the amount of feed additives used and any chemical or other residue does not exceed the prescribed limits of the U.S. Food and Drug Administration (FDA).

The issue to be addressed here is what factors effect food choices. Some factors are obvious, such as appearance, smell, color, taste, texture, and health concerns. Others include economic factors such as price, relative price and income With contemporary efforts and improvement in technology, research, and exchange of information at a greater scale than ever, the younger generation plays an important role in learning what is the appropriate choice of consumption.

CHAPTER 3
METHODOLOGY, DATA ANALYSIS AND RESULT EXPLANATION

In recent years, increased consumer awareness regarding the health-related aspects of food have played an important role in consumption. This study attempts to evaluate the influence of health and nutritional information on the consumption of meat, particularly beef.

The literature review showed that the effect of income and prices have been studied but not much attention has been paid to the influence of health-related information on consumption decision. In this study, the overview and extensive review of history and culture provide background. Recent changes include an increase in meat consumption and changes in dietary habits over the years, especially after World War II.

Following the 1984 Beef Agreement and while negotiations for complete liberalization of beef imports have entered their final stage, the Japanese consumer consciousness of imported meat in general and of American meat in particular has increased along with the increase in volume of imports. This trend is expected to intensify further.

The Soken Corporation conducted a qualitative survey in 1988 with emphasis on Japanese consumption patterns and attitudes. The objective of the survey was to analyze the general consumer's purchase patterns of meat, their image and evaluation of meat producing countries and to ascertain how Japanese consumers perceive American meat and how they intend to buy in the future.

The survey was conducted in seven different areas of Japan which include Sapporo, Sendai, Tokyo, Nagoya, Osaka, Hiroshima and Fukuoka. Sapporo, Tokyo and Sendai are located

in eastern Japan, and Nagoya, Osaka, Hiroshima and Fukuoka in western Japan. A total of 1,043 housewives aged 20 to 59 were randomly selected and interviewed in person by the enumerator at the respondent's house. Table 3.1 shows the breakdown of the total survey sample for the 1988 study.

Table 3.1. Breakdown of Soken total survey sample

Area	Saporro	Sendai	Tokyo	Nagoya	Osaka	Hiroshima	Fukuoka
Sample	110	108	316	103	206	100	100

Source: Soken Corporation Ltd 1988

A year later another marketing research firm called Burke also conducted a qualitative consumer survey along similar lines to observe consumer preferences and attitudes concerning meat consumption. A total of 800 housewives aged 29 to 59 were randomly selected and interviewed in person, the breakdown of the survey sample is given in Table 3.2.

Table 3.2. Breakdown of Burke total survey sample

City	Tokyo	Osaka	Nagoya	Sapporo	Fukuoka
Sample	200	200	200	100	100

Source: Burke Corporation Ltd 1989

The survey was conducted in five different areas which included Tokyo, Osaka in eastern Japan, and Nagoya, Sapporo, Fukoka in western Japan. For area details see appendix C. Essentially both the studies were designed to examine consumer attitudes and preferences towards meat consumption, particularly beef.

Model Development

The consumer is faced with a choice, to consume more or not, and the choice depends on the characteristics of the product. Given the discrete (binary) nature of the decision this study relies on the use of qualitative choice models to assess the relative impact of the attitudinal and socioeconomic factors on the consumption of meat. Since we are not sure how the consumer will act, a more plausible objective is to predict the likelihood that an individual will consume more given the influence of factors. Hence the use of a qualitative choice models enables us to determine the probability that an individual with a given set of attributes will make a certain choice rather than the alternative. To make it more clear, a suitable model is one which will allow us to make statements of the following type: "The probability that an individual with an income of $15,000 will vote yes on the upcoming bond issue is 0.6". To simplify things we assume that the probability of an individual making a choice is a linear function of the attributes.

Alternative specifications of the qualitative choice models include the linear probability model, the probit model and the logit model. The linear probability model suffers from the three notable deficiencies: heteroscedasticity, nonnormality of the error term and no guarantee that the prediction lies in the unit interval [0,1]. The probit and logit models circumvent the deficiencies of the linear probability model. Since probit and logit provide almost the same results in the case of binary choice models, the logit specification is arbitrarily chosen for this research study.

Consumer preferences to consume may depend upon perceived product quality, health and nutrition information about the product characteristics. The relationship may be described as

$$q_i = f(p_i, y_i, x_i)$$

where q_i is the quantity consumed of the ith commodity, p_i is the price of the ith commodity, y_i is the income, and x_i is the set of sociodemographic and attitudinal factors. The relationship between consumption of the product/preference/attitudinal variables can be positive or negative. Perceptions and information about the product characteristics influence consumer's decision on consumption of a particular product.

It is hypothesized that knowledge about health and nutritional value alters the consumer's attitudes and hence affects consumption. The consumer's awareness about health-related product characteristics is assumed to be exogenous to the actual decision of consumption as usually the consumer's beliefs and attitudes are pre-structured. Hence the probability of consumption of meat is specified through a logistic function

$$P(c) = \frac{\exp^{(\beta i Xi)}}{1+\exp^{(\beta i Xi)}} + e$$

Where c is the variable measuring meat consumption with values 0 or 1. where 1 indicates being a high consumer of the respective meat. X is the set of socioeconomic and personal characteristics of the individual and attitudinal factors. β is the vector of the parameters to be estimated and e is the disturbance term.

Construction of the Variables

In addition to the characteristics of the household two categories of questions formed the basis for constructing variables. The first category related to questions on the importance of the product characteristics. The second was concerned with whether the consumer agreed or disagreed about meat preference/attitude related to health. Individual responses to the importance questions selected were recorded on a scale of 1 to 6. The agreement/disagreement questions were recorded on a scale from 1 to 5 for the Soken data set. In the Burke data set the questions falling in the agreed/disagreed category for the individual's response were recorded on a scale of 1 to 4. For both categories, a binary variable was created for each of the questions selected, taking a value of 1 if important or agreed and 0 otherwise.

The frequency of meat consumption served as the dependent variable in analysis of surveys. The individual responses were recorded on a scale of 1 to 7 for the Soken data set and on a scale of 1 to 9 for the Burke data set. A dependent binary variable was also created for the dependent variable as specified below. This analysis is centered on the hypothesis that several variables including health related attitudes/preferences affect meat consumption. The variables used and constructed for both the data sets are described below.

Soken Corporation Ltd. Data Set 1988

C(Q01)	1 if the consumer consumes meat everyday or 2-3 times a week; 0 otherwise (dependent variable)
FAGE	Age of the housewife
INCOME	Annual household income
NUMKID	Number of children
AREA	1 if the consumer resides in Tokyo; 0 otherwise
FOCC	1 if the consumer is employed full or part time; 0 otherwise

Freshness	1 if it is very important or relatively important to the consumer; 0 otherwise
Marbling	1 if it is very important or relatively important to the consumer; 0 otherwise
Domestic	1 if it is very important or relatively important to the consumer; 0 otherwise
Low Price	1 if it is very important or relatively important to the consumer; 0 otherwise
Health	1 if the consumer strongly agreed or rather agreed; 0 otherwise
Leanness	1 if the consumer strongly agreed or rather agreed; 0 otherwise
Less Fat	1 if the consumer strongly agreed or rather agreed; 0 otherwise

In the case of pork and chicken the variable "Domestic" is dropped from the model.

The same model was run for consumption of imported beef specifically with C(Q04) (=1 if the consumer purchases imported beef; 0 otherwise as the dependent variable), with explanatory variables remaining the same.

Burke Corporation Data Set 1989

C(Q01)	1 if the consumer consumes meat (pork, chicken) 4-or more times 2-3 times a week, once a week; 0 otherwise (dependent variable)
FAGE	Age of the housewife
INCOME	Annual household income
NUMKID	Number of children
CITY	1 if the consumer resides in Tokyo; 0 otherwise
FOCC	1 if the consumer is employed full or part time; 0 otherwise
Low Fat Content	1 if the consumer agreed strongly; 0 otherwise
Nutritious	1 if the consumer agreed strongly; 0 otherwise
Low Salt Content	1 if the consumer agreed strongly; 0 otherwise
Taste	1 if the consumer agreed strongly; 0 otherwise
Price	1 if the consumer agreed strongly; 0 otherwise
Tenderness	1 if the consumer agreed strongly; 0 otherwise
Freshness	1 if the consumer agreed strongly; 0 otherwise

The same model was also run for consumption of beef using attributes pertaining particularly to beef.

C(Q01)	1 if the consumer consume beef 4 or more times, 2-3 times a week, once a week; 0 otherwise (dependent variable)
FAGE	Age of the housewife.
INCOME	Annual household income .
NUMKID	Number of children
CITY	1 if the consumer resides in Tokyo; 0 otherwise
FOCC	1 if the consumer is employed full or part time; 0 otherwise
Nutritious	1 if the consumer agreed strongly; 0 otherwise
Leanness	1 if the consumer agreed strongly; 0 otherwise
Preference	1 if the consumer agreed strongly; 0 otherwise
Choice of Beef	1 if the consumer agreed strongly; 0 otherwise
Beef is Safe	1 if the consumer agreed strongly; 0 otherwise

The same model was run for the different set of variables from Q08 (see appendix A Table A 2.). Table 3.3 gives descriptive statistics for the Soken survey and Table 3.4 provides information on selected variables for the Burke survey.

Table 3.3. Descriptive statistics; Soken Corporation 1988

Variable	Mean	Standard Deviation
Q01bf	2.659	0.873
Q01ch	2.601	0.784
Q01pk	2.399	0.779
Q04	1.726	0.710
FAGE	40.337	9.596
INCOME	6.092	3.080
NUMKID	1.695	0.938
AREA	3.797	1.758
FOCC	0.335	0.472
Freshness	0.836	0.370
Marbling	0.429	0.495
Domestic	0.521	0.499
Low Price	0.686	0.465
Health	0.416	0.493
Leanness	0.716	0.453
Less Fat	0.747	0.435

The descriptive statistics indicate a slight fall in average number of children per household, similarly there is a slight fall in the average income. Age has shown a slight increase. The fall in average household size and income can be attributed to the sluggish Japanese economy which began to take effect in the late 80s and become drastic in the beginning of the 90s, and possibly the different sample.

Table 3.4. Descriptive statistics (selected variables only); Burke Corporation 1989

Variable	Mean	Standard Deviation
Q01bf	2.817	1.068
Q01ch	2.618	0.915
Q01pk	2.402	0.934
FAGE	40.358	9.521
INCOME	6.071	3.027
NUMKID	1.297	1.021

The Age factor conforms with the age index, which indicates that the Japanese have the highest life expectancy in the world (see appendix A Table A 1.).

Explanation of Interaction Tables of Soken and Burke

In order to better understand the underlying relationships in the data a Pearson Chi-square test was used to look at the association of the selected variables with the dependent variable, which in this case is the consumption of meat for both the surveys. The formula used is:

$\chi^2 = \Sigma_l \Sigma_k \frac{(ó_{ij} - e_{ij})^2}{e_{ij}}$ where l varies from 1 to r and k varies from 1 to c with d.f = (r-1)(c-1) and where $e_{ij} = \frac{A_i B_j}{n}$ and n is the total number of observations.

Table 3.5. Summary of variable interaction for both surveys

Interaction of the variables	Pearson chi-square value
Numkid x Beef[a]	54.661**
Numkid x Chicken[a]	70.785**
Numkid x Pork[a]	88.321**
Income x Beef[a]	72.376**
Income x Chicken[a]	54.657
Incomex Pork[a]	39.623
Fage x Beef[a]	50.868
Fage x Chicken[a]	52.179
Fage x Pork[a]	120.758**
Numkid x Beef[b]	37.241
Numkid x Chicken[b]	30.478
Numkid x Pork[b]	53.978**
Income x Beef[b]	70.885
Income x Chicken[b]	85.006**
Income x Pork[b]	66.260
Fage x Beef[b]	52.973
Fage x Chicken[b]	65.644
Fage x Pork[b]	81.645**
Fage x Imported Beef[a]	22.844**
Income x Imported Beef[a]	29.033**
Numkid x Imported Beef[a]	21.910**

Source: a Soken Corporation Ltd. 1988
b Burke Corporation Ltd. 1989
** indicate significance level at 5 percent.

The association (interaction) of the selected variables is shown Table 3.5. For the Soken survey "Numkid" show a significant association with the consumption of all three meats. Age has shown a significant general association with pork.. Income has shown a significant association with beef. It is logical given high beef prices and that beef is the meat of choice traditionally. In case of the Burke Survey, only the "Numkid" shows significant association with consumption of pork. Age is significant for pork and associated only the

younger population tending to eat more meat. Income on the other hand showed a significant association for chicken. Area and decreased disposable incomes due to a economic slow down could be the reasons behind the observed differences. When these variables are incorporated into the model they may catch the effect of the other variables in the model. In the case of imported beef specifically "Numkid", Fage, and Income are all showing a positive significant association at 5 percent significance level. For details see appendix A (Table A 3. to A 20.).

Given the awareness of the consumer about health-related information, the responses are observed for both the surveys. Table 2.16 clearly provide us with a possible trend. It is quite clear that the preference and attitudes regarding health concerns are persistent thus showing a small degree of increased awareness over time, though only with small changes.

Table 3.6. Concerns for safety of meat (percentage of respondents)

Statement	Nitrite	Antibiotics	Additives/ preservatives	Hormonal Residue
Awareness	20	49	64	35
Not Aware of	58	35	23	41
It is a problem with U.S meat	69	74	78	77

Source: Burke Corporation 1989

In relation to this and given the expected import liberalization at the time of the survey, the consumers expressed concerns about the safety of meat and particularly pointed to concerns about the hormonal residue and feed-additives. About 67 percent of the housewives are highly conscious of the safety issue of meat in general and 60 percent expressed concerns

about the safety of U.S meat in particular, since they are well informed via the mass media (Soken 1988). These concerns got further strengthened, as evident from Table 3.6. A high percentage of consumers expressed their concerns about the safety of U.S meat regarding the four commonly known types of practices listed.

This evidence suggests that those with exposure to imported beef, particularly to the U.S. meat, are inclined to be aware of these issues and think that safety concerns are more of a problem with U.S. meat. Concerns about hormones and antibiotics may become more important over time, thus may become an important determinant of meat consumption.

The maximum likelihood estimates for the logit analysis are shown in Table 3.7 for Soken data and Table 3.8 for Burke data. In Table 3.7, parameter estimates for beef in general and imported beef are exhibited.

Age (female age) is only a contributing factor for chicken meat consumption (1988 data set) as shown in Table 3.8. Because meat is of lean nature, at older ages, food with less fat may be preferred. As shown in Table 3.9 and 3.10, the results for the 1989 data show that age affects the consumption of pork and beef significantly. It means older consumers are less likely to consume more beef or pork.

As will be seen in the 1989 survey (Table 3.9 and Table 3.10) income also had a significant positive effect on the consumption of all three meats. Its impact is statistically significant at the 5 percent level for pork. It could be because meat (Niku) in Japanese is taken as beef in western Japan, and the sample (500 respondents) is slightly biased towards areas (Nagoya, Hiroshima, Fukuoka and Osaka).

Table 3.7. Maximum likelihood parameter estimates, Soken 1988

Variable	Beef Coefficient	Beef Standard Error	Imported Beef Coefficient	Imported Beef Standard Error
Fage	0.007	0.009	-0.003	0.008
Income	0.059*	0.025	0.066**	0.024
Numkid	0.0247**	0.085	0.216**	0.077
Area	-0.738**	0.176	-0.193	0.157
Focc	0.106	0.160	-0.065	0.147
Freshness	0.516*	0.234	0.283	0.199
Marbling	0.504*	0.153	-0.157	0.143
Domestic	0.611*	0.159	-0.250*	0.156
Low Price	-0.201	0.166	0.656**	0.145
Health	-0.632**	0.161	-0.402**	0.145
Leanness	0.209	0.194	-0.164	0.175
Less Fat	0.031	0.202	0.302*	0.183
Concordant	70.0%		64.5%	
-2log L.hood	105.574**		62.080**	
Chi-sq (df)	99.3893**(12)		59.732**(12)	

* Indicates significance at 10 percent level.
** Indicates significance at 5 percent level.

"Numkid" for 1988 affected the consumption of all the three meats rather significantly as shown in Table 3.7 and Table 3.8. Counter to expectations, in 1989 "Numkid" only has a negative but not significant effect on the consumption of beef (Table 3.10). The average number of children fell from 1.7 in 1988 to 1.3 in 1989 (see Table 3.3 and 3.4), though in 1989 a greater percentage of women become economically active (36.6 percent compared to 30 percent in 1988). Traditionally, a majority of women in Japan feel that it is the duty of the wife to put her children and housework above her own personal desires (DeMente and Perry 1968).

Table 3.8. Maximum likelihood parameter estimates Soken 1988

Variable	Pork Coefficient	Pork Standard Error	Chicken Coefficient	Chicken Standard Error
Fage	-0.001	0.009	0.014*	0.008
Income	-0.011	0.024	-0.018	0.024
Numkid	0.421**	0.078	0.305**	0.077
Area	0.391*	0.078	0.365*	0.153
Focc	-0.103	0.153	0.133	0.146
Freshness	-0.104	0.146	0.391*	0.220
Marbling	0.004	0.195	0.046	0.139
Low Price	0.124	0.151	0.113	0.153
Health	-0.429**	0.143	0.067	0.144
Leanness	0.104	0.174	0.185	0.174
Less Fat	0.094	0.181	0.093	0.182
Concordant	63.2%		60.3%	
-2log L.hood	56.909**		32.245**	
Chi-sq (df)	55.477**(11)		31.477**(11)	

* Indicates significance at 10 percent level.
** Indicates significance at 5 percent level.

Also a comparison of the labour force participation rates as shown earlier in Table 2.2 for women in Japan and US (for 1984) indicates Japanese women tend to leave the workforce while they bear and rear children. During this time, the role of housewife assumes great importance. This includes an emphasis on both careful meal preparation and aesthetic presentation of the food. Many housewives shop daily, preferring fresh meat, fish, vegetables and fruit (O'Rourke 1995). The decreasing effect of the variable "Numkid" and the sluggish economy may cause the opposite effects.

As seen income in the 1988 survey (see Table 3.7) positively affected the consumption of beef in general and rather strongly the consumption of beef in particular since an increase in disposable income or a fall in beef prices increases its affordability.

Tokyo, an urban center, is selected to consider the effects of "Area/City" for both 1988 and 1989 surveys respectively. Households in Tokyo have a value set equal to 1, otherwise area is 0. For the 1988 data set, the Tokyo area affected the consumption of all three meats rather significantly as shown in Table 3.7 and 3.8. Although Tokyo is located in eastern Japan, it represents an economically active area with an influx of labour from the nearby vicinities and an expatriate population. Hence the traditional eastern character along with these factors shows a positive effect on consumption of pork and chicken, while it also shows that beef consumption is lower in the Tokyo areas rather than other more rural areas. As the negative sign indicates that as we move out of the urban center the beef consumption might decline. This fact is also consistent for the 1989 data set indicating a negative sign, but it is not significant. Focc, occupation status of the housewife in both surveys (1988 and 1989) has no statistically significant effect on meat consumption. The negative sign on higher beef consumption is inconsistent with expectations and may reflect the lact of variation in the dependent variable as higher frequency levels of beef consumption per week.

Discussion of the Variables Specific to Soken Survey, 1988.

As shown in Table 3.7 and 3.8 variable "Freshness" shows a positive effect on the consumption of chicken and beef in general. Counter to expectations, it is not statistically significant in case of imported beef in particular. "Marbling" is only significant in the case of

beef in general because of traditional beef cusines, it is not significant in the case of pork, chicken or imported beef. The variable "Domestic", a variable used only for beef and imported beef, showed a positive effect on consumption of beef in general but possibly because of safety issue of beef, a negative effect in the case of imported beef, since consumers may doubt the safety of the meat. "Price" as expected is highly significant in case of imported beef as it is considered cheaper compared to domestic beef, hence affordability plays a role. "Health" is highly significant in the case of beef and pork. It has a strong negative effect on consumption. This is true, as consumers are increasingly aware of the health-related information regarding high meat consumption, and possible linkages to coronary heart diseases.

"Leanness" does not show a significant association with consumption. "Less Fat" shows a positive and statistically significant effect in the case of imported beef. Increased consumer awareness and the fact that U.S grain-fed beef is lean and has less fat, may make U.S beef consumption more likely in the future.

Looking at Table 3.7 and Table 3.8 the concordance is relatively high 70 percent for beef in general, 64.5 percent for imported beef, and 63.2 percent and 64.5 percent for pork and chicken, respectively. This indicates a reasonably good fit. The chi-square values 99.398 (12) and 59.732(12) for beef in general and imported beef, and 55.477 (11) and 31.477 (11) for pork and chicken, respectively, are significant at the 5 percent level of significance.

Discussion of the Variables Specific to Burke Survey, 1989.

As expected " low fat content" in case of pork (see Table 3.9) has a statistically significant effect on consumption and purchase of pork. Health conscious consumers will be

looking for leaner pork as mentioned earlier. However, it is not significant for chicken meat (see Table 3.9). This may be because of the understanding on the part of the Japanese consumer that the term "fat" is associated more with beef and pork and that there is not a "fat" problem with chicken. Japanese traditionally consider beef as more nutritious (Table 3.10) than pork. This coupled with the increased affordability of beef and resistance to fatty pork have led to "low fat" having a significant negative effect on the consumption of pork. "Low salt content" does not show any statistical significance in case of pork, but is significant in the case of chicken meat as shown in Table 3.9.

Table 3.9. Maximum likelihood parameter estimates Burke 1989

Variable	Pork Coefficient	Pork Standard Error	Chicken Coefficient	Chicken Standard Error
Fage	-0.040*	0.023	-0.003	0.028
Income	0.178**	0.069	0.112*	0.065
Numkid	0.060	0.216	0.180	0.197
City	-0.700*	0.423	-0.518	0.400
Focc	-0.404	0.370	0.190	0.327
Low Fat	-1.590*	0.660	0.308	0.378
Nutritious	-0.714*	0.398	0.458	0.512
Low Salt	-0.031	0.734	-1.597*	0.637
Taste	0.986**	0.284	1.187**	0.285
Price	0.947	0.666	-0.059	0.572
Tenderness	-0.439	0.585	1.396*	0.686
Freshness	0.361	0.523	-0.666	0.423
Concordant	75.4%		72.4%	
-2log L.hood	36.866**		30.732**	
Chi-sq (df)	35.660**(12)		30.325**(12)	

* Indicates significance at 10 percent level.
** Indicates significance at 5 percent level.

"Taste" as expected is highly significant in case of chicken and pork 0.986 and 1.187 at the 0.05 significance level respectively, as shown in Table 3.9. "Price" (good value for money) is not statistically significant since pork and chicken are already cheap and affordable."Tenderness" does not show any significant link to consumption in the case of pork, as it is associated more with beef in western Japan.

"Tenderness" it has a positive effect on the probability of consumption of chicken meat. Contrary to a priori expectations, "Freshness" is not significant in determining consumption of both pork and chicken as shown in Table 3.9.

Similarly, as shown in Tables 3.9 and 3.10, the concordance, which is 75.4 percent for pork, 72.4 percent for chicken and 65.6 percent for beef, indicates a reasonably good fit and also the chi-square values 35.660 (12) and 30.325 (12) for pork and chicken and 38.668 (10) for beef are significant at 5 percent level of significance.

Variables Specific to Beef: Burke Survey, 1989

For beef a different but close in meaning and related set of variables is used to observe the possible effects on consumption probability of beef. Beef is "Nutritious" is statistically significant and shows a positive effect on beef consumption (Table 3.10.) The Lean aspect in this case is compatible to "Low fat content" and is highly significant and gives the same information. If the meat is lean it will positively affect the consumption of beef.

"Preferences for beef" (When buying meat) is highly significant, since traditionally beef is the meat of choice. "Choice of Beef" (When eating out) does not show any statistically significant relation to the consumption of beef. This result could be due to the effect of the

other variables in the model. The safety aspect of beef, "Beef is Safe" (safe to eat), is also significant and shows a negative effect on probability of beef consumption. Domestic beef is more likely to be considered safe since Japanese may think that satey of domestic and imported beef are two different issues (Table 3.10).

Table 3.10. Maximum likelihood parameter estimates, Burke 1989

Variable	Beef Coefficient	Beef Standard Error
Fage	-0.019*	0.012
Income	0.065*	0.033
Numkid	-0.129	0.102
City	-0.110	0.222
Focc	-0.152	0.188
Nutritious	0.474*	0.263
Leanness	0.606**	0.225
Preference	2.152**	0.757
Choice of Beef	0.497	0.369
Beef is Safe	-0.943*	0.439
Concordant	65.6%	
-2log L.hood	47.039**	
Chi-sq (df)	38.668**(10)	

* Indicates significance at 10 percent level.
** Indicates significance at 5 percent level.

Elasticities for Soken and Burke Corporations Ltd.

The marginal effect is any change in the independent variable which causes a change in the dependent variable; the elasticity provides the absolute percentage change in the dependent variable caused by a percentage change in the independent variable. Hence elasticities are preferred measures and are calculated at the means by using the formula:

$$E_j = \beta_j * X_i * \frac{\exp(\beta_j X_i)}{1 + \exp(\beta_j X_i)}$$

where X_i is the mean value of the variable X . For details see appendix B. The elasticities calculated for all the three meats for the Soken survey, 1988 and for the selected variables in the case of Burke survey, 1989 are presented in Tables 3.11, 3.12, and 3.13.

Table 3.11. Elasticities of beef, Soken survey, 1988.

Variable	Elasticity of Beef	Elasticity of Imported Beef
Numkid	0.304**	0.211**
Income	0.296*	0.225**
Fage	0.257	-0.096
Area	1.370**	-0.073
Focc	0.035	-0.012
Freshness	0.209	0.141
Marbling	0.144**	-0.034
Domestic	0.175**	-0.065
Low Price	-0.120	0.246**
Health	-0.202**	-0.091**
Leanness	0.127	-0.069
Less Fat	0.047	0.139*

Source: Soken survey, 1988.

* Indicates significance at 10 percent level.

** Indicates significance at 5 percent level.

As shown in Table 3.11 in the case of beef in general, the elasticities of "Numkid", "Income", "Area", "Marbling" and "Health" are significant. A one percent change in "Numkid"and "Income", will increase the consumption probability of beef by 0.304 and 0.296 percent respectively. Whereas a change in "Health Consciousness" is associated with decreasing the consumption by 0.202 percent.

Specifically in the case of imported beef consumption, as shown in Table 3.11, the elasticities of the variables "Numkid", "Income", "Domestic", "Health" are significant. A change in "Numkid"and "Income" will increase the consumption probability of imported beef by 0.211and 0.225 percent respectively. A in the "Health Consciousness" will decrease the consumption. In case of pork (Table 3.12), a change in "Numkid" by one percent will increase the probability of consumption by 0.32 percent. Whereas a change in and "Health Consciousness" will decrease the consumption. The other variables also cause a change in the consumption probability but the change is not significant. For chicken meat "Numkid", "Fage", "Freshness" affect the probability of consumption positively. A one percent change in "Numkid" and "Fage" will increase the consumption by 0.311 and 0.371 percent respectively. In contrast , a change in "Age" will decrease the consumption by 0.154 percent.

Table 3.12. Elasticities of pork and chicken, Soken survey, 1988.

Variable	Pork	Chicken
Numkid	0.320**	0.311**
Income	-0.024	0.620
Fage	-0.004	0.370*
Area	-0.414**	-0.154
Focc	-0.016	0.025
Freshness	0.012	0.213*
Marbling	0.011	0.010
Low Price	0.044	0.060
Health	-0.086**	0.009
Leanness	0.036	0.083
Less Fat	0.001	0.010

Source: Soken survey, 1988.

* Indicates significance at 10 percent level.

** Indicates significance at 5 percent level.

The "Numkid", "Income" and "Fage" elasticities are significant in case of chicken meat (Table 3.13). A one percent change in "Numkid" and Income will increase the probability of consumption by 0.46 and 0.91 percent whereas a change in age will decrease the consumption probability by 0.174 percent. In case of pork only income significantly affects the probability of consumption positively. A one percent change in income will cause a 0.07 percent change in the consumption of pork.

Table 3.13. Elasticities of selected variables for 1989 Survey data

Variable	Chicken	Pork
Numkid	0.046*	0.011
Income	0.091*	0.070*
Fage	-0.174*	-0.0518

Source: Burke Corporation data set (1989)
* Indicates significance at 10 percent level.

There are several inherent limitations in the way the questionnaires were designed and surveys were conducted. Basically the surveys were conducted by specialized marketing firms with a focus on traditional market oriented information. As such, pure marketing instruments probably were not sensitive to the underlying cultural, regional and psychological aspects of the target population. In order to understand the consumer preferences and expectations, a marketing study insensitive to these aspects may not provide us with accurate predictions.

The way the variables and opinions statements were outlined and depicted are very close in meaning. Additionally, for a person whose native language is not English, no matter how well they were translated, the meaning would not be exactly translated. For example

"lean meat" and "meat with less fat" are quite close and convey almost the same sense. Hence, if this is the case, variables may catch the effect of the other variables and thus give rise to the problem of multi-collinearity. Hence, despite the best efforts, there is a possibility the results may be slightly biased or counter the expectations as was the case with some of the variables.

CHAPTER 4
CONCLUSION AND RECOMMENDATIONS

Conclusions

Food consumption in Japan recovered from a difficult situation at the end of World War II when it was hard to obtain food. As the Japanese economy developed, meat consumption steadily increased over the years. The major changes in food consumption are: decrease in the use of cereal based foods; decline in the consumption of fish and shellfish; and an increase in the consumption of livestock products, processed foods and eating food away from home.

This study uses qualitative consumer surveys and shows that health concerns are a primary consideration in the consumption decision and choice of meat. The model and qualitative nature of the variables necessitated the creation of dichotomous variables. Secondly, attitudes/opinions and health consciousness are psychological factors and it is difficult to get an accurate numerical value for such factors. Factors such as number of children (Numkid) are significant and showed a greater impact on the increased meat purchases. The number of children indicates social and psychological aspects as well as need for more food.

Similarly, age plays an important role in the consumption of meat since the survey results indicate that there exists a tendency among the younger generation to consume more meat. However, by looking at the age index (see appendix A Table A.1.), the population of older people is increasing and the current fall in the average number of children will undermine the consumption in the years to come.

In 1988 the preference for lean meat was 71.4 percent which in 1989 increased to 75.1 percent. This is an evidence of universal health consciousness. The most important factors that affect the purchase decisions are safety, freshness, leanness, no drip, low price, and tenderness as shown in Table 4.1. Also, 64 percent of the respondents express their awareness of the problem of feed additives and 70 percent identified it as a problem with U.S. beef.

Table 4.1. Factors influencing purchase decision

Burke (1989)	Percentage Response	Soken (1988)	Percentage Response
Safe to eat[a]	79.0	Fresh color/Nice Gloss[b]	83.7
Freshness[a]	81.0	Not having drip[b]	71.1
Taste appeal[a]	63.0	Low price for grade[b]	67.7
Apeal to my family[a]	59.0	Meat is lean[b]	69.6
Nutritional value[a]	38.0	Tender[b]	83.4
Value for money[a]	39.0	Being Domestic[b]	52.3
Low Cholesterol content[a]	34.0		
Low salt content[a]	31.0		

Sources: a Burke Corporation Ltd. 1989
b Soken Corporation Ltd. 1988

Japan will import more beef, pork and chicken because of increasing population, changed consumer attitudes and preferences, and also high domestic cost of production, natural limitations in terms of land area and high domestic beef prices. The results further indicate that ever increasing health consciousness on the part of consumers, increasing number of coronary heart diseases and an increasingly older population will also affect the consumption of meat.

Suggestions and Recommendations

The advertizement and promotional aspects of the campaign by U.S. exporters should be vigorously pursued. Beef advertizements in popular food magazines, which explain the nutritional value, safety of the product guaranteed by the USDA, endorsed by a dietitian and a nutritional expert should appear more frequently. This is likely to be very effective since the Japanese have good reading habits. This was also evident in the survey results, where a large number of respondents said they saw the advertisement in a newspaper or a magazine.

The areas that need attention are product quality, shelf life, size of packaging, and cuts according to the Japanese standards and preferences. It is also pointed out in the survey that the shelf-life for U.S. meat is shorter compared to Australian meat. Efforts should be directed to improve this. Countries like Denmark have already adjusted and improved their meat cutting and packaging technology so that it perfectly matches the Japanese standards. On the other hand, Australia is also in the phase of technology adjustment to suit the Japanese standards. Also Australia is making efforts to substitute the traditional practice of raising cattle on the pasture with grain feeding in the feed lots.

Also given the fact that Australia is a natural competitor, the U.S. also needs to make efforts to improve and adjust its existing processing and packaging technology to further suit the Japanese standards to reap the real benefits of complete import liberalization. It is suggested that the new packaging technique called "Modified Atmospheric Packing" should be adopted to extend the shelf-life. Use of refrigerated containers that can be loaded at the

plant and shipped via truck to trains that carry the containers to ship (with the reversal of this process in Japan) will also be helpful in extending the shelf-life.

Similarly, most of the meat exported is in frozen form which upon thawing does not remain firm enough to be used in traditional Japanese dishes. There is a preference for chilled meat. It is also observed from survey based results, that consumers prefer that the expiration date should be replaced by the "Use Before" date; also product labeling which contains the nutritional facts is preferred. Since the Japanese government also recently passed a product liability law the industry should comply with it too. Concerns about the feed additives and hormonal residues were expressed particularly about the imported beef and hence efforts should be made to assure the consumer that the meat is safe, since psychologically only domestic beef is perceived to be the safest.

Since LIPC's role in the importation of beef has ceased and loosened the grip of the traditional meat traders, this provides an opportunity to work with local institutions to inform the consumers of the overstated importance of marbling to further provide a foothold in the market.

The use of curing agents such as salt and nitrite are also a cause of concern, as indicated in the survey. The purpose of curing has changed from preservation to the development of unique color, flavor, texture and palatability properties (Forrest et al. 1975). The main concern is that the use of nitrite lead to the formation of chemicals which are a potential carcinogenic agents. In this regard it is suggested that the system of food irradiation should be used as it leaves no detectable unwanted residue. Also through innovative

technology the surface contact area in the slaughterhouse should be reduced to further limit the microbial contamination.

When designing a new survey, it should be kept in mind that factors like the influence of family/friends, traditional psyche, and region (east, west) may have an indirect effect on the consumption which is difficult to catch by just simple survey questions. Also, the questionnaire should have cross-check questions such that the important information like household size, employment status, income may be correctly assessed.

Other statistical tools like cluster analysis, expectation models, which incorporate and explain the cause and effect relationship more precisely, may provide better predictions. A more dynamic analysis may be done to get a more precise picture of the change in elasticity of consumption when the consumer changes its present state of consumption.

And finally more qualitative surveys should be conducted to exactly see the impact of import liberalization over time so that based on the changes in consumer attitude and preferences observed, better predictions for the industry can be made.

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APPENDIX A
ADDITIONAL TABLES

Table A.1. Population and age index.

Year	Total(1,000)	65 & over (1,000)
1920	55,963	2,941
1925	50,737	3,021
1930	64,450	3,064
1935	69,250	3,225
1940	73,075	3,454
1945	71,998	3,700
1950	83,200	4,109
1955	89,276	4,747
1960	93,419	5,350
1965	98,275	6,181
1970	103,720	7,331
1975	111,940	8,865
1980	117,060	10,647
1985	121,049	12,468
1990	123,611	14,895
1991	124,043	15,582
1992	124,452	16,242
1993	124,764	16,900

Source: Japanese statistical year book, 1993/94.

Table A 2. Maximum likelihood estimates specific to beef using variables of Q08.

Variable	Parameter Estimate	Standard Error
Fage	-0.0192*	0.012
Income	0.0599*	0.033
Numkid	-0.1232	0.103
City	-0.1916	0.223
Focc	-0.1059	0.189
Q0803BF	0.2783	0.202
Q0807BF	0.5092*	0.220
Q0809BF	0.4063*	0.232
Q0810BF	0.1414	0.310
Q0812BF	0.2199*	0.133
Q0813BF	-0.2006	0.276
Q0814BF	0.0533	0.250
Concordant=	64.8%	
-2log L=	782.487	
Chi-sq(df)=	36.871 (12)	

Table A.3. Interaction of fage and consumption of beef (Soken 1988)

Frequency Percentage	Almost Every day	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Less Often	Hardly ever
20-24	1.00	7.00	10.00	4.00	5.00	0.00	2.00
	0.10	0.67	0.96	0.38	0.48	0.00	0.19
25-29	1.00	28.00	39.00	23.00	11.00	10.00	9.00
	0.10	2.68	3.74	2.21	1.05	0.96	0.86
30-34	3.00	50.00	45.00	34.00	17.00	8.00	10.00
	0.29	4.79	4.31	3.26	1.63	0.77	0.96
35-39	0.00	61.00	46.00	35.00	18.00	10.00	14.00
	0.00	5.85	4.41	3.36	1.73	0.96	1.34
40-44	6.00	65.00	45.00	29.00	13.00	7.00	10.00
	0.58	6.23	4.31	2.78	1.25	0.67	0.96
45-49	3.00	59.00	32.00	25.00	8.00	7.00	5.00
	0.29	5.66	3.07	2.40	0.77	0.67	0.48
50-54	3.00	38.00	40.00	23.00	11.00	6.00	8.00
	0.29	3.64	3.84	2.21	1.05	0.58	0.77
55-59	0.00	16.00	30.00	22.00	12.00	9.00	10.00
	0.00	1.53	2.88	2.11	1.15	0.86	0.96

* indicate significance level of 5 percent

Chi-sq (df) = 50.868 (42).

Table A.4. Interaction of fage and consumption of pork (Soken 1988)

Frequency Percentage	Almost Every day	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Less Often	Hardly ever
20-24	0.00	15.00	12.00	1.00	0.00	0.00	1.00
	0.00	1.44	1.15	0.10	0.00	0.00	0.10
25-29	2.00	62.00	38.00	11.00	3.00	1.00	4.00
	0.19	5.94	3.64	1.05	0.29	0.10	0.38
30-34	3.00	90.00	52.00	10.00	8.00	1.00	3.00
	0.29	8.63	4.99	0.96	0.77	0.10	0.29
35-39	9.00	105.00	46.00	18.00	2.00	0.00	4.00
	0.86	10.07	4.41	1.73	0.19	0.00	0.38
40-44	22.00	94.00	33.00	15.00	5.00	2.00	4.00
	2.11	9.01	3.16	1.44	0.48	0.19	0.38
45-49	7.00	74.00	29.00	14.00	3.00	5.00	7.00
	0.67	7.09	2.78	1.34	0.29	0.48	0.67
50-54	2.00	61.00	34.00	14.00	4.00	0.00	14.00
	0.19	5.85	3.26	1.34	0.38	0.00	1.34
55-59	3.00	32.00	28.00	17.00	11.00	2.00	6.00
	0.29	3.07	2.68	1.63	1.05	0.19	0.58

* indicate significance level of 5 percent

Chi-sq (df) = 120.758* (42).

Table A.5. Interaction of fage and consumption of chicken. (Soken 1988)

Frequency Percentage	Almost Every day	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Less Often	Hardly ever
20-24	1.00	6.00	13.00	2.00	4.00	0.00	3.00
	0.10	0.58	1.25	0.19	0.38	0.00	0.29
25-29	2.00	43.00	44.00	18.00	7.00	4.00	3.00
	0.19	4.12	4.22	1.73	0.67	0.38	0.29
30-34	3.00	63.00	69.00	18.00	8.00	2.00	4.00
	0.29	6.04	6.62	1.73	0.77	0.19	0.38
35-39	3.00	65.00	67.00	31.00	10.00	3.00	5.00
	0.29	6.23	6.42	2.97	0.96	0.29	0.48
40-44	8.00	68.00	63.00	18.00	7.00	2.00	9.00
	0.77	6.52	6.04	1.73	0.67	0.19	0.86
45-49	9.00	58.00	48.00	10.00	7.00	4.00	3.00
	0.86	5.46	4.60	0.96	0.67	0.38	0.29
50-54	4.00	45.00	51.00	13.00	7.00	2.00	7.00
	0.38	4.31	4.89	1.25	0.67	0.19	0.67
55-59	0.00	32.00	33.00	14.00	11.00	2.00	7.00
	0.00	3.02	3.16	1.34	1.05	0.19	0.67

* indicate significance level of 5 percent

Chi-sq (df) = 52.179 (42).

Table A.6. Interaction of income and consumption of beef.(Soken 1988)

Frequency Percentage	Almost Every day	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Less Often	Hardly ever
less than 3 mil.	1.00	8.00	6.00	8.00	10.00	4.00	12.00
yen	0.11	0.86	0.65	0.86	1.08	0.43	1.29
3-4 mil. yen	1.00	40.00	40.00	21.00	20.00	14.00	20.00
	0.11	4.31	4.31	2.26	2.15	1.51	2.15
4-5 mil. yen	4.00	50.00	64.00	48.00	19.00	10.00	11.00
	0.43	5.38	6.89	5.17	2.05	1.08	1.18
5-6 mil. yen	1.00	61.00	51.00	33.00	15.00	8.00	9.00
	0.11	6.57	5.49	3.55	1.61	0.86	0.97
6-7 mil. yen	3.00	39.00	42.00	30.00	7.00	3.00	4.00
	0.32	4.20	4.52	3.23	0.75	0.32	0.43
7-8 mil. yen	2.00	30.00	18.00	8.00	5.00	7.00	1.00
	0.22	3.23	1.94	0.86	0.54	0.75	0.11
8-10 mil.yen	0.00	27.00	20.00	18.00	7.00	2.00	4.00
	0.00	2.91	2.15	1.94	0.75	0.22	0.43
10-12 mil.yen	1.00	13.00	11.00	4.00	1.00	2.00	0.00
	0.11	1.40	1.18	0.43	0.11	0.22	0.00
12 mil. yen and	0.00	14.00	7.00	6.00	3.00	1.00	0.00
Over	0.00	1.51	0.75	0.65	0.32	0.11	0.00

* indicate significance level of 5 percent

Chi-sq (df) = 72.376* (48).

Table A.7. Interaction of income and consumption of pork.(Soken 1988)

Frequency Percentage	Almost Every day	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Less Often	Hardly ever
less than 3 mil.	1.00	23.00	15.00	6.00	1.00	0.00	3.00
yen	0.11	2.48	1.61	0.65	0.11	0.00	0.32
3-4 mil. yen	5.00	84.00	41.00	14.00	5.00	0.00	7.00
	0.54	9.04	4.41	1.51	0.54	0.00	0.75
4-5 mil. yen	10.00	112.00	53.00	16.00	7.00	2.00	6.00
	1.08	12.06	5.71	1.72	0.75	0.22	0.65
5-6 mil. yen	7.00	92.00	49.00	16.00	4.00	2.00	8.00
	0.75	9.99	5.27	1.72	0.43	0.22	0.86
6-7 mil. yen	5.00	65.00	31.00	19.00	5.00	1.00	2.00
	0.54	7.00	3.34	2.05	0.54	0.11	0.22
7-8 mil. yen	8.00	39.00	13.00	6.00	1.00	0.00	4.00
	0.86	4.20	1.40	0.65	0.11	0.00	0.43
8-10 mil.yen	5.00	40.00	18.00	7.00	3.00	2.00	3.00
	0.54	4.31	1.94	0.75	0.32	0.22	0.32
10-12 mil.yen	3.00	15.00	6.00	2.00	2.00	1.00	3.00
	0.32	1.61	0.65	0. .22	0.22	0.11	0.32
12 mil. yen and	0.00	15.00	8.00	4.00	1.00	0.00	3.00
Over	0.00	1.61	0.86	0.43	0.11	0.00	0.32

* indicate significance level of 5 percent

Chi-sq (df) = 39.623 (48).

Table A.8. Interaction of income and consumption of chicken (Soken 1988)

Frequency Percentage	Almost Every day	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Less Often	Hardly ever
less than 3 mil.	0.00	15.00	16.00	7.00	5.00	1.00	5.00
yen	0.00	1.61	1.72	0.75	0.54	0.11	0.54
3-4 mil. yen	4.00	60.00	54.00	13.00	8.00	3.00	14.00
	0.43	6.46	5.81	1.54	0.86	0.32	1.51
4-5 mil. yen	6.00	74.00	77.00	26.00	14.00	4.00	5.00
	0.65	7.97	8.29	2.80	1.51	0.43	0.54
5-6 mil. yen	7.00	64.00	72.00	23.00	7.00	3.00	2.00
	0.75	6.89	7.75	2.48	0.75	0.32	0.22
6-7 mil. yen	2.00	51.00	41.00	21.00	7.00	2.00	4.00
	0.22	5.49	4.41	2.26	0.75	0.22	0.43
7-8 mil. yen	4.00	26.00	27.00	8.00	1.00	2.00	3.00
	0.43	2.80	2.91	0.86	0.11	0.22	0.32
8-10 mil.yen	5.00	25.00	32.00	7.00	4.00	2.00	3.00
	0.54	2.69	3.44	0.75	0.43	0.22	0.32
10-12 mil. yen	1.00	17.00	6.00	5.00	3.00	0.00	0.00
	0.11	1.83	0.65	0.54	0.32	0.00	0.00
12 mil. yen and	0.00	11.00	14.00	5.00	1.00	0.00	0.00
Over	0.00	1.18	1.51	0.54	0.11	0.00	0.00

* indicate significance level of 5 percent

Chi-sq (df) = 54.657 (48).

Table A.9. Interaction of numkid and consumption of beef (Soken 1988)

Frequency Percentage	Almost Every day	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Less Often	Hardly ever
Pre-School	0.00	22.00	41.00	31.00	15.00	11.00	12.00
	0.00	2.11	3.93	2.97	1.44	1.05	1.15
Primary	5.00	75.00	69.00	45.00	26.00	17.00	20.00
School	0.48	7.19	6.62	4.31	2.49	1.63	1.92
Junior	11.00	166.00	124.00	82.00	48.00	20.00	29.00
High	1.05	15.92	11.89	7.86	4.60	1.92	2.78
School							
High	0.00	53.00	45.00	35.00	5.00	5.00	7.00
School	0.00	5.08	4.31	3.36	0.48	0.48	0.67
University/	1.00	6.00	8.00	2.00	1.00	4.00	0.00
College.	0.10	0.58	0.77	0.19	0.10	0.38	0.00
Adult/	0.00	2.00	0.00	0.00	0.00	0.00	0.00
Work	0.00	0.19	0.00	0.00	0.00	0.00	0.00

* indicate significance level of 5 percent

Chi-sq (df) = 54.661*(30).

Table A.10. Interaction of numkid and consumption of chicken (Soken 1988)

Frequency Percentage	Almost Every day	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Less Often	Hardly ever
Pre-School	2.00	37.00	41.00	18.00	15.00	3.00	16.00
	0.19	3.55	3.93	1.73	1.44	0.29	1.53
Primary	9.00	77.00	104.00	30.00	21.00	8.00	8.00
School	0.86	7.38	9.97	2.88	2.01	0.77	0.77
Junior	14.00	185.00	186.00	51.00	23.00	5.00	16.00
High	1.34	17.74	17.83	4.89	2.21	0.48	1.53
School							
High	4.00	72.00	49.00	22.00	1.00	2.00	0.00
School	0.38	6.90	4.70	2.11	0.10	0.19	0.00
University/	1.00	8.00	7.00	3.00	1.00	1.00	1.00
College.	0.10	0.77	0.67	0.29	0.10	0.10	0.10
Adult/	0.00	1.00	1.00	0.00	0.00	0.00	0.00
Work	0.00	0.10	0.10	0.00	0.00	0.00	0.00

* indicate significance level of 5 percent

Chi-sq (df) = 70.785*(30).

Table A.11 Interaction of numkid and consumption of pork (Soken 1988)

Frequency Percentage	Almost Every day	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Less Often	Hardly ever
Pre-School	2.00	42.00	38.00	21.00	30.00	4.00	12.00
	0.19	4.03	3.64	2.01	1.25	0.38	1.15
Primary	9.00	110.00	79.00	32.00	9.00	4.00	14.00
School	0.86	10.55	7.57	3.07	0.86	0.38	1.34
Junior	28.00	276.00	119.00	32.00	10.00	1.00	14.00
High	2.68	26.46	11.41	3.07	0.96	0.10	1.36
School							
High	9.00	92.00	30.00	12.00	3.00	2.00	2.00
School	0.86	8.82	2.88	1.15	0..29	0.19	0.19
University/	0.00	11.00	6.00	3.00	1.00	0.00	1.00
College.	0.00	1.05	0.58	0.29	0.10	0.00	0.10
Adult/	0.00	2.00	0.00	0.00	0.00	0.00	0.00
Work	0.00	0.19	0.00	0.00	0.00	0.00	0.00

* indicate significance level of 5 percent

Chi-sq (df) = 88.121*(30).

Table A.12. Interaction of fage and consumption of beef.(Burke 1989)

Frequency Percentage	4 or more times a week	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Once every 2-3 months	Once every 4-6 months	Less often	Never
18-24	3.00	5.00	8.00	2.00	0.00	0.00	0.00	0.00	0.00
	0.38	0.63	1.00	0..25	0.00	0.00	0.00	0.00	0.00
25-29	4.00	29.00	27.00	15.00	8.00	2.00	0.00	3.00	2.00
	0.50	3.63	3.38	1.88	1.00	0.25	0.00	0.38	0.25
30-34	3.00	40.00	44.00	17.00	13.00	3.00	2.00	2.00	2.00
	0.38	5.01	5.51	2.13	1.63	0.38	0.25	0.25	0.25
35-39	8.00	57.00	48.00	23.00	7.00	0.00	1.00	2.00	3.00
	1.00	7.14	6.02	2.88	0.88	0.00	0.13	0.25	0.38
40-44	11.00	49.00	30.00	21.00	15.00	4.00	0.00	2.00	1.00
	1.38	6.14	3.76	2.63	1.88	0.50	0.00	0.25	0.13
45-49	9.00	30.00	38.00	16.00	6.00	1.00	1.00	3.00	3.00
	1.13	3.76	4.76	2.01	0.75	0.13	0.13	0.38	0.38
50-54	4.00	32.00	24.00	12.00	10.00	2.00	2.00	0.00	4.00
	0.50	4.01	3.01	1.50	1.25	0.25	0.25	0.00	0.50
55-59	3.00	23.00	31.00	10.00	5.00	1.00	2.00	2.00	5.00
	0.38	2.88	3.88	1.25	0.63	0.13	0.25	0.25	0.63

* indicate significance level of 5 percent

Chi-sq (df) = 52.973 (56).

Table A.13. Interaction of fage and consumption of chicken.(Burke 1989)

Frequency Percentage	4 or more times a week	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Once every 2-3 months	Once every 4-6 months	Less often	Never
18-24	4.00	6.00	7.00	4.00	0.00	0.00	0.00	0.00	0.00
	0.50	0.75	0.88	0.50	0.00	0.00	0.00	0.00	0.00
25-29	1.00	37.00	38.00	13.00	1.00	0.00	0.00	0.00	1.00
	0.13	4.63	4.75	1.63	0.13	0.00	0.00	0.00	0.13
30-34	6.00	54.00	47.00	13.00	4.00	0.00	1.00	1.00	0.00
	0.75	6.75	5.88	1.63	0.50	0.00	0.13	0.13	0.00
35-39	11.00	56.00	53.00	22.00	4.00	0.00	1.00	0.00	2.00
	1.38	7.00	6.63	2.75	0.50	0.00	0.13	0.00	0.25
40-44	7.00	52.00	47.00	17.00	7.00	0.00	0.00	3.00	1.00
	0.88	6.50	5.88	2.13	0.88	0.00	0.00	0.38	0.13
45-49	7.00	57.00	30.00	11.00	1.00	0.00	0.00	0.00	1.00
	0.88	7.13	3.75	1.38	0.13	0.00	0.00	0.00	0.13
50-54	8.00	37.00	29.00	60.00	5.00	1.00	1.00	0.00	3.00
	1.00	4.63	3.63	0.75	0.63	0.13	0.13	0.00	0.38
55-59	9.00	27.00	29.00	9.00	5.00	0.00	1.00	0.00	2.00
	1.13	3.38	3.63	1.13	0.63	0.00	0.13	0.00	0.25

* indicate significance level of 5 percent

Chi-sq (df) = 65.644 (56).

Table A.14. Interaction of fage and consumption of pork (Burke 1989).

Frequency Percentage	4 or more times a week	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Once every 2-3 months	Once every 4-6 months	Less often	Never
18-24	5.00	6.00	8.00	2.00	0.00	0.00	0.00	0.00	0.00
	0.63	0.75	1.00	0..25	0.00	0.00	0.00	0.00	0.00
25-29	7.00	45.00	22.00	13.00	3.00	0.00	0.00	0.00	1.00
	0.88	5.63	2.75	1.63	0.38	0.00	0.00	0.00	0.13
30-34	13.00	78.00	24.00	4.00	1.00	2.00	0.00	0.00	3.00
	1.63	9.76	3.00	0.50	0.13	0.25	0.00	0.00	0.38
35-39	21.00	77.00	33.00	12.00	3.00	0.00	0.00	0.00	3.00
	2.63	9.64	4.13	1.50	0.38	0.00	0.00	0.00	0.38
40-44	16.00	66.00	28.00	13.00	3.00	2.00	1.00	2.00	3.00
	2.00	8.26	3.50	1.63	0.38	0.25	0.13	0.25	0.38
45-49	8.00	56.00	31.00	9.00	1.00	1.00	0.00	0.00	1.00
	1.00	7.01	3.88	1.13	0.13	0.13	0.00	0.00	0.13
50-54	6.00	47.00	17.00	7.00	8.00	2.00	0.00	1.00	2.00
	0.75	5.88	2.13	0.88	1.00	0.25	0.00	0.13	0.25
55-59	5.00	29.00	22.00	12.00	5.00	2.00	0.00	2.00	5.00
	0.63	3.63	2.75	1.50	0.63	0.25	0.00	0.25	0.63

* indicate significance level of 5 percent

Chi-sq (df) = 81.645*(56).

Table A.15. Interaction of numkid and consumption of beef.(Burke 1989)

Frequency Percentage	4 or more times a week	2 to 3 times a week	Once week	2 to 3 times a month	Once a month	Once every 2-3 months	Once every 4-6 months	Less often	Never
None	11.00	70.00	82.00	23.00	23.00	6.00	4.00	3.00	9.00
	1.38	8.77	10.28	2.88	2.88	0.75	0.50	0.38	1.13
Pre-School	13.00	57.00	59.00	32.00	12.00	4.00	1.00	5.00	4.00
	1.63	7.14	7.39	4.01	1.50	0.50	0.13	0.63	0.50
Elementry	16.00	113.00	84.00	42.00	21.00	3.00	3.00	5.00	6.00
School	2.01	14.16	10.53	5.26	2.63	0.38	0.38	0.63	0.75
Junior	5.00	24.00	24.00	15.00	9.00	0.00	0.00	1.00	1.00
High	0.63	3.01	3.01	1.88	1.13	0.00	0.00	0.13	0.13
School									
Senior high	0.00	1.00	1.00	4.00	2.00	0.00	0.00	0.00	0.00
School	0.00	0.13	0.13	0.50	0.25	0.00	0.00	0.00	0.00

* indicate significance level of 5 percent

Chi-sq (df) = 37.241 (32).

Table A.16. Interaction of numkid and consumption of chicken (Burke 1989)

Frequency Percentage	4 or more times a week	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Once every 2-3 months	Once every 4-6 months	Less often	Never
None	18.00	95.00	76.00	20.00	13.00	1.00	2.00	0.00	7.00
	2.25	11.88	9.50	2.50	1.63	0.13	0.25	0.00	0.88
Pre-School	10.00	71.00	70.00	27.00	5.00	0.00	1.00	1.00	2.00
	1.25	8.88	8.75	3.38	0.63	0.00	0.13	0.13	0.25
Elementry	17.00	127.00	99.00	39.00	7.00	0.00	1.00	3.00	1.00
School	2.13	15.88	12.38	4.88	0.88	0.00	0.13	0.38	0.13
Junior	8.00	29.00	32.00	8.00	2.00	0.00	0.00	0.00	0.00
High	1.00	3.63	4.00	1.00	0..25	0.00	0.00	0.00	0.00
School									
Senior high	0.00	4.00	3.00	1.00	0.00	0.00	0.00	0.00	0.00
School	0.00	0.50	0.38	0.13	0.00	0.00	0.00	0.00	0.00

* indicate significance level of 5 percent

Chi-sq (df) = 30.478 (32).

Table A.17. Interaction of numkid and consumption of pork (Burke 1989)

Frequency Percentage	4 or more times a week	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Once every 2-3 months	Once every 4-6 months	Less often	Never
None	13.00	102.00	60.00	24.00	16.00	5.00	0.00	3.00	9.00
	1.63	12.77	7.51	3.00	2.00	0.63	0.00	0.38	1.13
Pre-School	23.00	90.00	49.00	18.00	1.00	2.00	0.00	1.00	3.00
	2.88	11.26	6.13	2.25	0.13	0.25	0.00	0.13	0.38
Elementry	31.00	156.00	66.00	26.00	5.00	2.00	1.00	1.00	5.00
School	3.88	19.52	8.26	3.25	0.63	0.25	0.13	0.13	0.63
Junior	12.00	51.00	9.00	4.00	2.00	0.00	0.00	0.00	1.00
High	1.50	6.38	1.13	0.50	0.25	0.00	0.00	0.00	0.13
School									
Senior high	2.00	5.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
School	0.25	0.63	0.13	0.00	0.00	0.00	0.00	0.00	0.00

* indicate significance level of 5 percent

Chi-sq (df) = 53.978*(32).

Table A.18. Interaction of income and consumption of beef.(Burke 1989)

Frequency Percentage	4 or more times a week	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Once every 2-3 months	Once every 4-6 months	Less often	Never
Under 25,000 Yen	2.00	6.00	8.00	6.00	4.00	1.00	0.00	1.00	3.00
	0.30	0.91	1.21	0.91	0.60	0.15	0.00	0.15	0.45
25,000 - 49,999	4.00	35.00	47.00	16.00	8.00	3.00	1.00	3.00	2.00
	0.60	5.29	7.10	2.42	1.21	0.45	0.15	0.45	0.30
50,000 - 74,999	8.00	49.00	51.00	19.00	13.00	2.00	2.00	3.00	5.00
	1.21	7.40	7.70	2.87	1.96	0.30	0.30	0.45	0.76
75,000 - 99,999	5.00	44.00	31.00	15.00	8.00	4.00	1.00	1.00	2.00
	0.76	6.65	4.68	2.27	1.21	0.60	0.15	0.15	0.30
100,000 - 124,999	4.00	38.00	18.00	10.00	7.00	2.00	3.00	1.00	1.00
	0.60	5.74	2.72	1.51	1.06	0.30	0.45	0.15	0.15
125,000 - 149,999	6.00	21.00	26.00	11.00	4.00	0.00	0.00	1.00	0.00
	0.91	3.17	3.93	1.66	0.60	0.00	0.00	0.15	0.00
150,000 - 174,999	4.00	25.00	10.00	9.00	0.00	0.00	0.00	1.00	0.00
	0.60	3.78	1.51	1.36	0.00	0.00	0.00	0.15	0.00
175,000 - 199,999	2.00	6.00	7.00	2.00	5.00	0.00	0.00	0.00	1.00
	0.30	0.91	1.06	0.30	0.76	0.00	0.00	0.00	0.15
200,000 - 249,999	1.00	10.00	10.00	1.00	1.00	0.00	1.00	0.00	0.00
	0.15	1.51	1.51	0.15	0.15	0.00	0.15	0.00	0.00

* indicate significance level of 5 percent

Chi-sq (df) = 70.885 (64).

Table A.19. Interaction of income and consumption of chicken (Burke 1989)

Frequency Percentage	4 or more times a week	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Once every 2-3 months	Once every 4-6 months	Less often	Never
Under 25,000 Yen	1.00	13.00	11.00	4.00	2.00	0.00	0.00	0.00	0.00
	0.15	1.96	1.66	0.60	0.30	0.00	0.00	0.00	0.00
25,000 - 49,999	4.00	49.00	45.00	18.00	1.00	0.00	0.00	1.00	2.00
	0.60	7.38	6.78	2.71	0.15	0.00	0.00	0.15	0.30
50,000 - 74,999	8.00	52.00	60.00	22.00	4.00	0.00	4.00	1.00	2.00
	1.20	7.83	9.04	3.31	0.60	0.00	0.60	0.015	0.30
75,000 - 99,999	7.00	55.00	26.00	12.00	8.00	0.00	0.00	1.00	2.00
	1.05	8.28	3.92	1.81	1.20	0.00	0.00	0.15	0.30
100,000 - 124,999	6.00	30.00	27.00	16.00	5.00	0.00	0.00	0.00	0.00
	0.90	4.52	4.07	2.41	0.75	0.00	0.00	0.00	0.00
125,000 - 149,999	4.00	34.00	26.00	3.00	2.00	0.00	0.00	0.00	0.00
	0.60	5.12	3.92	0.45	0.30	0.00	0.00	0.00	0.00
150,000 - 174,999	3.00	22.00	17.00	5.00	0.00	1.00	0.00	0.00	1.00
	0.45	3.31	2.56	0.75	0.00	0.15	0.00	0.00	0.15
175,000 - 199,999	3.00	8.00	9.00	1.00	0.00	0.00	0.00	0.00	2.00
	0.45	1.20	1.36	0.15	0.00	0.00	0.00	0.00	0.30
200,000 - 249,999	3.00	8.00	8.00	1.00	3.00	0.00	0.00	0.00	1.00
	0.45	1.20	1.20	0.15	0.45	0.00	0.00	0.00	0.15

* indicate significance level of 5 percent

Chi-sq (df) = 85.006* (56).

Table A.20. Interaction of income and consumption of pork.(Burke 1989)

Frequency Percentage	4 or more times a week	2 to 3 times a week	Once a week	2 to 3 times a month	Once a month	Once every 2-3 months	Once every 4-6 months	Less often	Never
Under 25,000 Yen	1.00	11.00	7.00	6.00	3.00	1.00	0.00	0.00	2.00
	0.15	1.66	1.05	0.90	0.45	0.15	0.00	0.00	0.30
25,000 - 49,999	9.00	59.00	35.00	8.00	1.00	3.00	1.00	1.00	3.00
	1.36	8.89	5.27	1.20	0.15	0.45	0.15	0.15	0.45
50,000 - 74,999	18.00	73.00	38.00	16.00	5.00	1.00	0.00	0.00	2.00
	2.71	10.99	5.72	2.41	0.75	0.15	0.00	0.00	0.32
75,000 - 99,999	17.00	60.00	21.00	6.00	3.00	1.00	0.00	1.00	2.00
	2.56	9.04	3.16	0.90	0.45	0.15	0.00	0.15	0.30
100,000 -124,999	7.00	41.00	16.00	10.00	6.00	1.00	0.00	0.00	3.00
	1.05	6.17	2.41	1.51	0.90	0.15	0.00	0.00	0.45
125,000 -149,999	6.00	34.00	18.00	8.00	0.00	0.00	0.00	0.00	3.00
	0.90	5.12	2.71	1.20	0.00	0.00	0.00	0.00	0.45
150,000 - 74,999	5.00	26.00	13.00	3.00	0.00	0.00	0.00	1.00	1.00
	0.75	3.92	1.96	0.45	0.00	0.00	0.00	0.15	0.15
175,000 -199,999	2.00	12.00	3.00	3.00	2.00	0.00	0.00	1.00	0.00
	0.30	1.81	0.45	0.45	0.30	0.00	0.00	0.15	0.00
200,000 -249,999	2.00	14.00	5.00	1.00	0.00	1.00	0.00	0.00	1.00
	0.30	2.11	0.75	0.15	0.00	0.15	0.00	0.00	0.15

* indicate significance level of 5 percent

Chi-sq (df) = 66.260 (56).

APPENDIX B
DERIVATION OF ELASTICITY

Elasticity at means

$P_i = 1/\ 1+\exp^{(-Zi)}$ Where i=1...n

Where $Z_i = \beta_0 + \beta_1 + \beta_2 + \ldots + \beta_k X_k$.

$Pi = [\ 1+(\ 1+\exp^{(\beta jXi)})]^{-1}$

Where i=1..n and j=1..m

$$\frac{dP_i}{dX_i} = \frac{(-1)(-\beta j)\exp^{(\beta jXi)}}{(1+\exp^{(\beta jXi)})^{-2}}$$

Where $1/(\ 1+\exp^{(-\beta jXi)})^{-1} = P_i$ and the expression $\dfrac{\exp^{(\beta jXi)}}{(1+\exp^{(\beta jXi)})^{-1}} = 1 - P_i$

$\frac{dP_i}{dX_i} = \beta j * Pi * (1 - Pi)$ multiplying this expression by $\frac{Xi}{Pi}$

$\frac{dP_i}{dX_i} = \beta j * Pi * (1 - Pi)$ This expression alone gives us the Marginal Effect.

$\frac{dP_i}{dX_i} * \frac{X_i}{P_i} = \beta_j * X_i * (1 - P_i)$

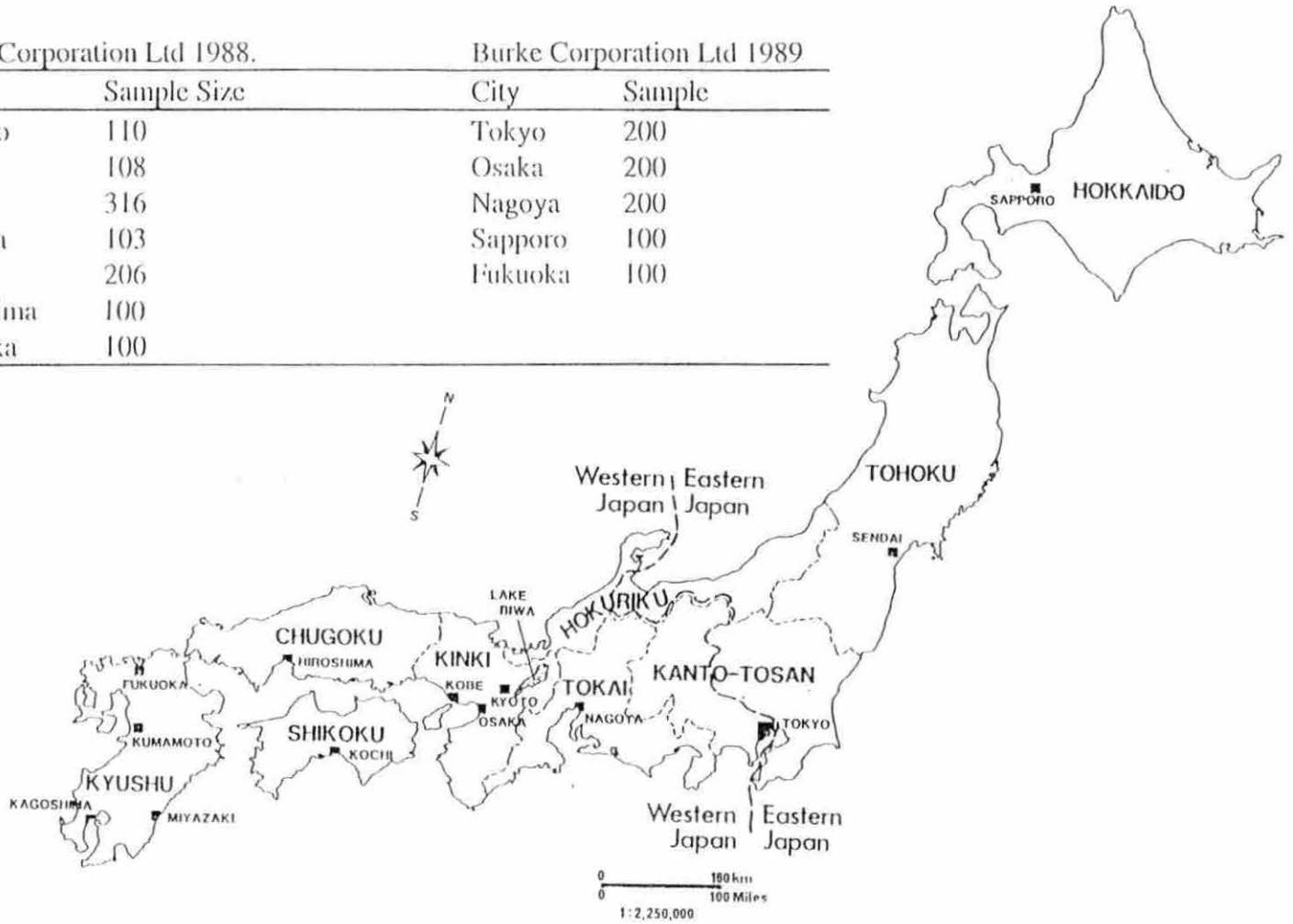
The expression on the left hand side is the Elasticity which is equal to the expression on the right hand side. thus we can write it as:

$$E_j = \beta_j * X_i * \frac{\exp^{(\beta jXi)}}{1 + \exp^{(\beta jXi)}}$$

where X_i is the mean value of the X variable

APPENDIX C
MAP OF JAPAN

Soken Corporation Ltd 1988.		Burke Corporation Ltd 1989	
Area	Sample Size	City	Sample
Saporro	110	Tokyo	200
Sendai	108	Osaka	200
Tokyo	316	Nagoya	200
Nagoya	103	Sapporo	100
Osaka	206	Fukuoka	100
Hiroshima	100		
Fukuoka	100		



Map 1 Agricultural Regions of Japan (excluding Okinawa)