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Away-From-Home Lamb Consumption in the United States: Implications for Australia and New Zealand

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A logit model was developed to investigate the decision to eat lamb away from home in the United States. Using data from the United States Department of Agriculture's 1987-88 National Food Consumption Survey, this study identified several socio-demographic and economic characteristics of consumers who have eaten lamb away from home. The information derived from this study is useful for lamb processors and producers in Australia and New Zealand who wish to anticipate future market changes and derived demands for their products in the United States.

try and fish/shellfish consumption rose 70 and 30 per cent, respectively. Specifically, beef consumption declined about 16 per cent; veal consumption declined by almost 40 per cent; pork consumption fell by nearly two per cent; and lamb consumption fell by almost 50 per cent. On the other hand, chicken and turkey consumption increased 64 per cent and 95 per cent, respectively (Table 1).

1. Introduction

1.1 Meat Consumption Trends

Between the 1970-72 and 1988-89 periods, red meat consumption in the United States (US) declined almost 12 per cent, while poul-

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Table 1. Average, Annual US Per Capita Consumption of Meat and Fish Products, 1970-89 (retail weight equivalent, kg/capita)

Meat	1970-72	1980-82	1988-89
Red Meats	60.44	54.76	53.40
Beef	36.21	32.85	30.40
Veal	0.82	0.59	0.50
Pork	22.46	20.83	22.05
Lamb	0.95	0.45	0.50
Poultry	15.74	19.87	26.81
Chicken	12.71	16.06	20.87
Turkey	3.04	3.81	5.94
Fish/Shellfish	5.40	5.67	7.03

Source: Putnam (1990)

These consumption trends clearly indicate a shift in consumer demand in the US toward poultry products and away from red meat products. Factors that could have caused this consumption shift are changes in tastes and preferences, in relative prices of meat products, and in dietary and health standards.

Consumers are increasingly aware of and concerned about food, nutrition, and health issues. Organisations representing meat producer groups in the US also appear to be very conscious of health and nutrition concerns in the promotion of products (Capps and Schmitz 1991). In fact, the US red meat industry has been taking steps to foster the development of meat products that are not only leaner and low in fat, but also quick, easy and convenient to prepare.

Per capita lamb consumption in the US is far below that of all other meat products, in recent years reaching only half a kilogram in retail weight equivalent (Table 1). In contrast, per capita beef and pork consumption were roughly 30 kilograms and 22 kilograms, re-

spectively, in 1988-89. Per capita chicken and turkey consumption were about 21 kilograms and six kilograms, respectively, and per capita fish and shellfish consumption was about seven kilograms. These figures reflect the very small share of lamb in the US meat market. The low level of US lamb consumption is also apparent when compared to consumption patterns in major lamb consuming countries like New Zealand and Australia. For instance, per capita consumption (retail weight) in New Zealand and Australia are about 18 kilograms and 10.5 kilograms, respectively (Table 2).

1.2 The Food Away from Home Market

Food expenditures are taking a declining share of the disposable income of US consumers. Based on Census Bureau information, the US Department of Agriculture (USDA) estimated that the percentage of disposable income going to food decreased from 16.3 per cent in 1970 to 13.8 per cent in 1989 (Table 3). The percentage of disposable income going to food at home (FAH) also declined from 10.8 per

Table 2. Per Capita Lamb Consumption in Selected Countries, 1975-89 (retail weight equivalent, kg/capita)

Country	1975-79	1980-84	1985-89	Average
Greece	6.30	6.22	6.22	6.26
Ireland	4.35	3.40	3.13	3.63
United Kingdom	3.45	3.27	3.00	3.22
France	1.68	1.86	2.04	1.86
Spain	1.81	1.68	2.45	2.00
Mexico	0.36	0.36	0.45	0.41
Turkey	3.72	3.00	3.00	3.22
Japan	1.09	0.64	0.59	0.77
Australia	9.26	9.03	10.40	9.57
New Zealand	14.90	15.30	17.90	16.00
United States	0.50	0.45	0.45	0.45

Source: USDA (1991b)

cent in 1970 to 7.6 per cent in 1989. In contrast, the percentage of disposable income going to food away from home (FAFH) increased from 5.5 per cent in 1970 to 6.2 per cent a decade later. Since 1980, the proportion of disposable income allocated to away-from-home spending fluctuated within a narrow range (6.0 to 6.4 per cent). Due to the above trends, the proportion of total food expenditure spent away from home increased from 34 per cent in 1970 to 45 per cent in 1989 (USDA 1991a).

The FAFH market is composed of commercial foodservice establishments (i.e. restaurants, fast food places, cafeterias) and noncommercial outlets (i.e. school or military dining rooms, child care centres). Although noncommercial outlets serve more food to more people, they account for only 30 per cent of the total retail value of FAFH. The majority of the FAFH sales in the past came from conventional restaurants. However, fast food eating

establishments have more than tripled in number since the early 1960s. The fast food industry has started placing outlets in locations not previously served such as schools, military bases and international markets. In addition, menus are being enlarged to include items such as salad bars, soups, baked potatoes and whole grain buns. Franchised restaurants are now also facing growing competition from within the industry, from supermarkets and other food stores that prepare take-out food and from hotels that offer dining room service and catering.

Most supermarkets now have a variety of on-site bakeries, delicatessens with a wide array of freshly prepared and ready to eat foods, expanded sections of frozen-prepared foods ready for heating in the microwave oven, salad and juice bars and even natural food centres. These developments forced many full-service restaurants to experiment with lighter dishes and emphasise freshness, quality, regional

Table 3. Per cent of Disposable Personal Income (Total Food Expenditure) Spent for All Food; Food at Home; Food Away from Home: Selected Years, 1970-1989

Year	All Food	Food at Home		Food Away from Home	
1970	16.3 ^a	10.8 ^a	(66.2) ^b	5.5 ^a	(33.8) ^b
1975	16.5	10.5	(63.8)	6.0	(36.2)
1980	16.0	9.7	(60.6)	6.3	(39.4)
1981	15.5	9.3	(60.1)	6.2	(39.9)
1982	15.3	9.1	(59.4)	6.2	(40.6)
1983	15.2	8.9	(58.8)	6.3	(41.2)
1984	14.7	8.6	(58.3)	6.1	(41.7)
1985	14.3	8.3	(57.9)	6.0	(42.1)
1986	14.2	8.1	(57.0)	6.1	(43.0)
1987	14.4	8.0	(55.5)	6.4	(44.5)
1988	14.0	7.7	(54.8)	6.3	(45.2)
1989	13.8	7.6	(55.0)	6.2	(45.0)

^a Per cent of disposable personal income.

^b Per cent of total food expenditures.

Source: USDA (1991a)

cooking and seasonality to increase customer traffic. Some full-service establishments are also launching gourmet take-out foods to boost volume. This trend toward more variety, products and services will continue in the future as long as consumers' demand for speed and convenience continue in the next few years (Nayga and Capps 1992). Also, customers' use of self-service restaurants has become more common in the last decade and a great deal of more self-service type enterprises seems likely to surface throughout the food service industry as labour costs and labour shortages increase.

1.3 Demographics and Lifestyles

The demographic characteristics of the US population are undergoing dramatic changes that have major implications for the lamb industry. In particular, changes in consumer lifestyles are prompting a significant move toward eating out. Some of the socio-economic and demographic trends that have emerged are: a growing number of women in the work force; an increasing importance of convenience in eating out; more families living on two incomes; more advertising and promotion by large food service chains; and more people in the age group of 25 to 44 who are inclined to eat out often (Putnam and Van Dress 1984). Only about seven per cent of all households now fit the old stereotype family of a working husband, a wife who does not work for wages, and two children (Kinsey 1990).

More women in the labour force are increasing the demand for convenience in home prepared food, for home delivered food and for FAFH. In fact, over 70 per cent of women aged 25-44 are in the labour force, and notably about 75 per cent of these women work full time. Moreover, the labour force participation rate of women increased from 52 per cent in 1980 to 58 per cent in 1990 (Waldrop and Exter 1991).

In addition to these changes, US per capita income has been rising. In 1982 dollars, per capita income increased over 43 per cent between 1970 and 1989, and by 6.6 per cent in 1989 (Kinsey 1990). However, there is also a growing gap between the poor and the rich. Uneducated and poor households (mostly nonwhites and single women) with incomes under US\$15,000 per year now account for about a third of the households (Kinsey 1990). These households have a budget share for food of about 50 per cent and are mostly participants in food assistance programmes (e.g. food stamp programme) (Kinsey 1990). In contrast, households with annual incomes over US\$35,000 spend less than eight per cent of their income on food (Kinsey 1990). For this group, price will be less important than food safety, quality, taste and experience.

Aging is another important demographic force affecting food consumption. Due to the aging of the baby-boom population, the median US age has increased from 30 in 1980 to 33 in 1990 (Noah 1991). By 2020, about half of the US population will be aged 50 or more (Noah 1991). Also, due to information about the linkages between longevity and health and diet, older people are changing their diets and the make-up of the foods they eat (e.g. less fat and sodium, more grains, fruits and vegetables). A consequence of an aging population is the shrinking of the labour pool of young adults who provide much of the work force in the fast food sector. The demand for labour is not expected to ease in the near future. In fact, employment for food preparation and service positions is expected to grow 37 per cent between 1986 and 2000 (USDA 1989-90).

The US population is more ethnically diverse than ever. As in the 1980s, the growing ethnic diversity will create new challenges for food marketers especially in the FAFH sector. In the early 1980s, less than 20 per cent of Americans belonged to an ethnic group (Waldrop and Exter 1991). By 1990, nearly 25 per cent belonged to an ethnic minority. Specifically,

numbers of Americans of "other races" (e.g. not white or black) grew seven times faster than the overall population in the 1980s (Waldrop and Exter 1991). Between 1980 and 1990, the percentage change in numbers was greatest for Asians/Pacific Islanders at 108 per cent followed by the hispanics at 53 per cent. The white and black populations only increased six and 13 per cent, respectively (*Business Week* 17 June 1991). By 2005 there will be an equal number of blacks and hispanics in the US, and they will make up over one quarter of the population (*Business Week* 17 June 1991). These trends will mean that the overall make-up of consumer needs and preferences are likely to change.

1.4 Objective of the Study

Lamb competes with a wide variety of meat and other food products for a share of the US consumer's dollar. Lamb also faces a rapidly changing marketplace within which consumers are spending their food dollars. With over 70 billion food service meals served each year in the US (TAMRC Lamb Study Team 1991), excellent opportunities may be available for Australasian lamb to command a larger share of the dollar in the FAFH sector. Little is known, however, about the demographic and socio-economic characteristics of individuals in the US who have eaten lamb away from home. In fact, no studies as yet have analysed the effect of socio-demographic and economic factors on the decision to eat lamb away from home. Considering the potentially important opportunity that the US food service industry presents for lamb, the Australian and New Zealand lamb industries would benefit from a study that analysed these consumers.

This research attempts to fill this information void by using the Individual Intake phase of the USDA 1987-88 National Food Consumption Survey (NFCS). This study attempts to identify the demographic and socio-economic characteristics of individuals in the US who

have eaten lamb away from home, and to draw some implications for the Australasian lamb industries.

2. Model Development

The FAFH market is most appropriately analysed within the theoretical context of household production economics (McCracken and Brandt 1987, p. 275). Household production theory implies that household time as well as market goods and services enter the assumed utility maximisation process. The household is assumed to maximize a utility function whose arguments are commodities produced by the household subject to the usual budget constraint and additional production and time constraints (see Becker 1965, Lancaster 1966 and Gronau 1977 for details).

Several studies on FAFH (e.g. Prochaska and Schrimper 1973, Redman 1980, Kinsey 1983, McCracken and Brandt 1987) based their analysis on household production theory. Many of these studies on FAFH have focused their analyses on sociodemographic and economic factors affecting away-from-home food consumption using cross-sectional data. Common sociodemographic factors considered were income, sex, age, household size, urbanisation, race, region, education and employment.

Using an extension to household production theory, Redman (1980) analysed the effects of various socio-economic variables on FAFH expenditure in the US, where family income, family size, age of woman, region, race, employment of woman, and place of residence were significant explanators. Prochaska and Schrimper (1973) found that the value of homemakers' time was an important factor affecting FAFH consumption. Kinsey (1983) disaggregated the households by intensity of the wife's labour force participation and by income and found that income earned by

wives working full time did not increase the marginal propensity to consume FAFH. Consistent with other studies, McCracken and Brandt (1987) found that income, time value, household size and composition, time of week of consumption and other sociodemographic variables had significant effects on FAFH expenditure. Given their significance in past studies, the effect of sociodemographic and economic factors on the likelihood of eating lamb away from home is analysed in this study in the context of household production theory.

A number of studies on FAFH (e.g. Redman 1980, Lee and Brown 1986, Horton and Campbell 1991) included an employment status variable in their analyses as a measure of the opportunity cost of time. Household production theory suggests that an individual's employment could cause a shift away from consumption of time-intensive toward goods-intensive commodities (Horton and Campbell 1991). Based on this theory and due to the increased attention given to the value of time as a determinant of away-from-home consumption, the employment status of the individual is included in the analyses as a measure of the opportunity cost of time. Certainly, the number of hours worked per week or per year is an alternative to employment status as a measure of the opportunity cost of time. However, because of incomplete reporting of hours worked by the sample of individuals in this study, the employment status of the individual is used.

As noted in the introduction, health issues, through changing tastes and preferences, are considered an important determinant of the changing trends in meat consumption. Within the data set, information is available on whether or not an individual is on a special diet and this is used as a proxy for those who consider the "healthiness" of a product in the purchase decisions.

Based on the theory of household production economics, the model specifications found in

the literature and data availability, the model is specified as follows:

$$(1) \text{ PROB} = b_0 + b_1\text{urban1} + b_2\text{urban2} + b_3\text{region1} + b_4\text{region2} + b_5\text{region4} + b_6\text{race2} + b_7\text{race3} + b_8\text{race4} + b_9\text{hispl} + b_{10}\text{sex1} + b_{11}\text{employ1} + b_{12}\text{fstamp1} + b_{13}\text{diet1} + b_{14}\text{hsize} + b_{15}\text{logage} + b_{16}\text{logincome} + b_{17}\text{weekend} + b_{18}\text{quarter1} + b_{19}\text{quarter3} + b_{20}\text{quarter4};$$

where PROB is equal to 1 if the individual consumed lamb away from home and 0 otherwise during the three-day survey period. The independent variables refer to the following:

urban1 = 1 if individual resides in a central city; 0 otherwise;

urban2 = 1 if individual resides in a suburban area; 0 otherwise;

region1 = 1 if individual is in the Northeast; 0 otherwise;

region2 = 1 if individual is in the Midwest; 0 otherwise;

region4 = 1 if individual is in the West; 0 otherwise;

race2 = 1 if individual is black; 0 otherwise;

race3 = 1 if individual is Asian or Pacific Islander; 0 otherwise;

race4 = 1 if individual is of some other race; 0 otherwise;

hispl = 1 if individual is hispanic; 0 otherwise;

sex1 = 1 if individual is male; 0 otherwise;

employ1 = 1 if individual is employed; 0 otherwise;

fstamp1 = 1 if individual is receiving food stamps; 0 otherwise;

diet1 = 1 if individual is on a special diet; 0 otherwise;

hsize = household size;

logage = the logarithm of age;

logincome = the logarithm of income;

weekend = 1 if the three-day intake of the individual occurred mostly during a weekend; 0 otherwise; and

quarter1, quarter3, and quarter4 = correspond to a set of binary variables that measure seasonality, (quarter1=1 if January -March; quarter3=1 if July-September; quarter4=1 if October-December).

One classification is eliminated from each group of categorical variables for estimation purposes. The base group are individuals who satisfy the following description: reside in a nonmetro area (urban3); in the South (region3); white (race1); nonhispanic (hisp2); female (sex2); not employed (employ2); not participating in the food stamp program (fstamp2); not on a special diet (diet2); the three-day intake occurred mostly during a weekday (weekday); and in quarter 2 (April-June).

The variable depicting the presence or absence of hispanics (hisp1) is separated from the race variables because hispanics as a group are defined by USDA as an ethnic group rather than a race. Therefore, a hispanic can be white, black or some other race.

It is hypothesized that individuals residing in a central city or suburban area are more likely

to eat lamb away from home than individuals residing in a nonurban area because there are more FAFH establishments in urban and suburban areas than nonurban areas. Based on the results from previous studies, it is expected that the likelihood of eating lamb away from home would be greater for ethnic individuals (e.g. individuals of other races) than whites or blacks. Employed individuals and food stamp non-recipients are expected to have a higher probability of eating lamb away from home than their counterparts. Food stamp recipients are generally less affluent than food stamp non-recipients.

Given the poor health perceptions towards lamb in the US, it is expected that the variable diet1 would be negatively related to the decision to eat lamb away from home. Based on past studies of FAFH consumption, age and income are hypothesized to be positively related to the probability of eating lamb away from home. In addition, it is expected that individuals are more likely to eat lamb away from home during the weekends than during the weekdays. Household size is also expected to be negatively related to the likelihood of eating lamb away from home.

Since the dependent variable in the model is discrete (binary), the analysis relies on the use of a qualitative choice model. The linear probability model, the probit model, and the logit model are the alternative specifications of qualitative choice models (Pindyck and Rubinfeld 1991). The linear probability model is given by:

$$(2) \quad Y_i = X_i' B + E_i$$

where Y_i is 1 if the i th decision maker selects the first alternative and 0 if the i th decision maker selects the second alternative; X_i' is the i th row of the $n \times p$ matrix of regressors, $i = 1, \dots, n$ (n refers to the sample size and p refers to the number of coefficients); B is a $p \times 1$ vector of parameter coefficients; and E_i is the i th

independently and identically distributed random variable with zero expectation.

Logit and probit analyses, however, are preferred to the linear probability model since the latter suffers from a number of deficiencies. The variance of the disturbance term of the model is heteroscedastic and, therefore, the standard errors of the ordinary least squares parameter estimates are biased. Further, the disturbance term is not normally distributed. The classical statistical tests are therefore not applicable. Another deficiency of the linear probability model is that it allows the predicted values (probabilities) to fall outside the interval between 0 and 1, which is inconsistent with the interpretation of the conditional expectation as a probability.

A logit or probit specification circumvents these difficulties by the use of monotonic transformations to guarantee that predictions lie in the unit interval. A logit model is employed in this study. This model is based on the cumulative logistic probability function and is specified as (Pindyck and Rubinfeld 1991):

$$(3) \quad P = F(Z) = \frac{F(X_i' \beta)}{1 + e^{-X_i' \beta}} = \frac{1}{1 + e^{-Z}}$$

where Z is a theoretical index determined by a set of explanatory variables X ; $F(Z)$ is the cumulative logistic function; e represents the base of natural logarithms (approximately equal to 2.718); and P is the probability that an individual will make a certain choice, given the knowledge of X .

The most suitable technique of estimation when using logit is maximum likelihood. Although this technique requires the use of an iterative algorithm, this procedure assumes the large-sample properties of consistency and asymptotic normality of the parameter estimates so that conventional tests of significance are applicable.

3. Data Source and Description

The 1987-88 NFCS is the most recent of the national household food consumption surveys conducted by USDA. Data collection for this data set started on April 1987 and continued through August 1988. The sample was designed using a multistage, stratified, area probability sampling method. The stratification plan took into account geographic location, degree of urbanisation and socio-economic considerations. The data set provides data on three days of food intake by individuals of all ages surveyed in the US. These individuals were asked to provide three consecutive days of dietary data. The first day's data were collected using 24-hour dietary recall and in-home personal interviews. The second and third days' data were collected using a self-administered two-day dietary record.

As in any cross-sectional study, several issues arise in handling the data set. The original number of respondents in the survey was 11,045. However, the number of days in which food intake information was available varied across individuals. Thus, for some individuals the information was provided for only a two-day or a one-day period. Due to the different interview processes employed in each of the three days of intake, only individuals who had completed three-day intakes are included in the analysis. Consequently, after deleting observations with missing individual relevant socio-economic and demographic information, the data set contained 6276 observations.

There has been controversy about the validity of the 1987-88 NFCS. The US General Accounting Office (1991) has publicly criticised these data on two grounds: (1) the data collected may not be accurate because of quality control problems and (2) only 34 per cent of the households provided individual intake data. However, the 1987-88 NFCS is the only

current data set available in the US on household and individual food consumption.

The descriptive statistics of the variables used in the regression analyses are exhibited in Table 4. About 21 per cent of the sample reside

Table 4. Descriptive Statistics of the Variables Used in the Analysis

Variable	Mean	Std. Dev.	Range
Urbanisation			
Central City	0.21	0.4044	0-1
Suburban Area	0.49	0.5000	0-1
Non-metro Area ^a	0.30	0.4567	0-1
Region			
Northeast	0.20	0.3997	0-1
Midwest	0.27	0.4452	0-1
South ^a	0.35	0.4762	0-1
West	0.18	0.3843	0-1
Race			
White ^a	0.86	0.3380	0-1
Black	0.10	0.2970	0-1
Asian/Pacific Islander	0.01	0.0906	0-1
Other race	0.03	0.1571	0-1
Origin			
Hispanic	0.04	0.1855	0-1
Non-Hispanic ^a	0.96	0.1855	0-1
Sex			
Male	0.45	0.4968	0-1
Female ^a	0.55	0.4968	0-1
Employment Status			
Employed	0.58	0.4935	0-1
Unemployed ^a	0.42	0.4935	0-1
Food Stamp Participation			
Recipient	0.05	0.2219	0-1
Non-recipient ^a	0.95	0.2219	0-1
Special Diet			
Yes	0.14	0.3495	0-1
No ^a	0.86	0.3495	0-1
Week Variable			
Weekend	0.16	0.3682	0-1
Weekday ^a	0.84	0.3682	0-1
Seasons			
Quarter1	0.29	0.4554	0-1
Quarter2 ^a	0.41	0.4899	0-1
Quarter3	0.14	0.3508	0-1
Quarter4	0.16	0.3689	0-1
Age	43.30	18.37	15-99
Household Size	3.03	1.46	1-12
Income	29621.80	23927.8	3-300000

^a Refers to the omitted category in the analysis.

in central city areas; 49 per cent in suburban areas; and 30 per cent in nonmetro areas. Most of the individuals (35 per cent) included in the sample come from the South. Eighty six per cent are white; 96 per cent are non-hispanic; 45 per cent are male; 58 per cent are employed; 95 per cent are non-recipients of the food stamp programme; 14 per cent are on a special diet; and about 16 per cent ate food mostly on a weekend during the three-day survey period. Moreover, the average age of the individuals is about 43 years while the average household size is approximately three persons. Average household annual income is close to US\$30,000.

Based on the 1988 US population, this sample is probably underrepresentative of individuals located in the northeast and west and overrepresentative of individuals located in the south. In addition, the sample is not uniformly distributed across seasons. The sample is probably underrepresentative of the number of employed individuals. The average age of individuals in the sample and the average household size are also above the national average. However, the distribution of individuals by urbanisation, race, origin, sex, food stamp participation, special diet status and income seems representative of the US population in 1988.

4. Empirical Results

The maximum likelihood estimates for the logit analysis are exhibited in Table 5. The significance level chosen for this analysis was 0.05. Based on the statistically significant coefficients and the changes in probabilities, the results indicate that individuals of "other" races are more likely to consume lamb away from home than either whites or blacks. A significant positive association also exists between age and the probability of consuming lamb away from home. The same is true with income. Moreover, recipients of the food

stamp programme are less likely to consume lamb away from home than individuals who are not recipients of the food stamp programme.

Although not statistically significant at 0.05, some other trends are apparent where the parameter estimates exceed their standard errors. Individuals from the Northeast are more likely to eat lamb away from home than individuals from the South. This result is not surprising considering the high number of ethnic individuals in the Northeast compared to the South (TAMRC Lamb Study Team 1991). Males are more likely to eat lamb away from home than females. Likewise, employed individuals are more likely to consume lamb away from home than unemployed individuals. Assuming that employed individuals have higher opportunity costs of time than unemployed individuals, this result implies that the higher the opportunity cost of time of an individual the more likely he or she will eat lamb away from home.

Results also indicate that the probability of consuming lamb away from home is negatively related to household size. This finding implies a decreasing likelihood of eating lamb away from home as household size increases. In addition, individuals are more likely to eat lamb away from home during the weekends than during the weekdays.

The McFadden R-squared (goodness of fit measure) shown in Table 5 is 0.0820. Although this value is low, it is reasonable considering the type of data (survey of individuals) used in the analysis. Another measure of goodness-of-fit is the correct classification of individuals as either consuming or not consuming lamb away from home on the basis of the regression results. With a 50-50 classification scheme, approximately 99.5 per cent of the individuals in the sample were correctly classified as either consuming or not consuming lamb away from home using the logit specification.

Table 5. Maximum Likelihood Estimates of the Logit Model

Variable	Estimate	Std. Error	Changes in Probability ^a
Intercept	-17.710*	3.736	-0.039
Urban1	0.232	0.650	0.0005
Urban2	0.530	0.540	0.001
Region1	0.598	0.490	0.001
Region2	0.036	0.564	0.0001
Region4	0.027	0.589	0.0001
Race2	0.100	0.805	0.0002
Race3	-5.809	5.901	-0.013
Race4	1.999*	1.092	0.004
Hisp1	-7.135	22.770	-0.016
Sex1	0.393	0.381	0.0008
Employ1	0.527	0.475	0.001
Fstamp1	-1.952*	0.879	0.004
Diet1	0.237	0.475	0.0005
Hsize	-0.263	0.167	-0.0006
Logage	1.084*	0.576	0.00005
Logincome	0.735*	0.293	0.55-07
Weekend	0.557	0.427	0.001
Quarter1	0.376	0.441	0.0008
Quarter3	0.227	0.598	0.0005
Quarter4	0.188	0.552	0.0004
% of Right Predictions		99.5	
R Statistic ^b		0.1880	
McFadden R ²		0.0820	
Likelihood Ratio Tests			
Urbanisation		1.11	
Region		1.98	
Race		2.39	
Season		0.73	
Number Of Iterations		8	

* Indicates statistical significance at the 0.05 level

^a Equal to the product of the parameter estimate times the value of the logistic density function. At the sample means, the value of this density function ($f(z)$) is 0.0022 while the value of z is -6.1017.

^b The R statistic is similar to the multiple correlation coefficient in the normal setting, after a correction is made to penalise for the number of parameters estimated (SAS Institute Inc. 1983).

5. Implications for the Australian and New Zealand Lamb Industries

Australian and New Zealand lamb shipments to the US from 1981 to 1990 are presented in

Table 6. New Zealand lamb shipments peaked in 1981 when it exported more than 12000 tonnes. Since 1981, however, New Zealand's shipments have been significantly lower each year with the exception of 1985. On the other hand, Australian lamb exports were less than

Table 6. New Zealand and Australian Lamb Exports to the US, by Volume (in tonnes), 1981-90

Year	New Zealand	Australia
1981	12,701	1,361
1982	6,804	1,361
1983	6,804	1,361
1984	7,258	907
1985	11,793	2,722
1986	6,350	6,350
1987	3,629	9,525
1988	5,443	8,165
1989	5,443	7,711
1990	4,536	5,897

Source: New Zealand Meat Producers Board (1991)

Table 7. Percentage of the Total Lamb Imports by the US: 1981-90

Year	New Zealand	Australia
1981	90.3	9.7
1982	83.3	16.7
1983	83.3	16.7
1984	88.9	11.1
1985	81.2	18.8
1986	50.0	50.0
1987	27.6	72.4
1988	40.0	60.0
1989	41.4	58.6
1990	43.5	56.5

Source: New Zealand Meat Producers Board (1991)

2000 tonnes in 1981. However, Australia has since significantly increased its exports, reaching a peak in 1987 when it exported about 9500 tonnes.

The percentage of lamb imports into the US coming from either Australia or New Zealand is shown in Table 7. In 1981, New Zealand's share of total lamb imports into the US was 90 per cent compared to only about 10 per cent for Australia. Increased US domestic production, strong competition from Australian exporters and decreased New Zealand lamb production, however, have displaced New Zealand lamb (*Sheep and Wool Review* 1991). Moreover, the New Zealand lamb industry has for too long concentrated on a very limited product range, namely frozen lamb (Wilkinson 1985). Consequently, Australia and New Zealand have switched places in their dominance of lamb imports to the US. By 1986 Australia was already exporting half of the total lamb imports by the US.

The US food service sector presents a potentially important market opportunity for Australian and New Zealand lamb due to the

increased consumer emphasis on meals eaten away from home. In fact, New Zealand already occupies about 60 per cent of the US food service market for lamb (American Sheep Industry Council 1991). Lamb in the US is traditionally served only in full-service restaurants. However, the Australasian lamb industries should encourage its processors and marketers to introduce more lamb cuts that can be added to the menus of restaurants already serving lamb as well as to menus of restaurants currently offering no lamb.

The Australasian lamb industries should also encourage a product diversification strategy that should include chilled lamb, products aimed at the fast food and ethnic restaurants as well as products aimed at frozen entree markets. Within the food service sector, the fast food segment is the most rapidly growing area. Although lamb is being served in US full-service restaurants, it has not generally been promoted to any extent to fast food restaurants in any form (TAMRC Lamb Study Team 1991). Other red meats, chicken and fish commodity groups have been more aggressive in terms of their fast food service marketing efforts and

spending. The Australian and New Zealand lamb industries should tap into this market by developing lamb menu concepts for national fast food chains like McDonalds, Wendy's and Burger King.

One of the results of this study indicates that ethnic individuals, which comprise a small but growing portion of the US population, are more likely to eat lamb away from home than either whites or blacks. The growing economic importance of Muslim Americans, for instance, could stimulate the consumption of lamb (Meat and Livestock Commission 1991). Australian and New Zealand lamb's promotional programmes, therefore, should be designed not only to encourage ethnic individuals to increase consumption of lamb but also to persuade whites and blacks to experiment with lamb. This initiative should not only help build consumer awareness of Australian and New Zealand lamb, but also help obtain wider exposure of the product to the general American public. Australian shipments, for instance, have already been heavily supported by a A\$3-\$4 million annual promotion, called the Fresh Australian Range Lamb campaign, by the Australian Meat and Livestock Corporation (*Sheep and Wool Review* 1991).

The Australasian lamb industries should also promote and introduce leaner lamb to the American public, given the emphasis by consumers on healthier diets. New Zealand lamb, for instance, is perceived by many consumers as lacking versatility, sometimes being tough and being excessively fatty with an unattractive appearance compared to poultry and other red meats (Ministry of Agriculture and Fisheries 1983). A number of measures have been adopted to increase lean lamb production. These include the production of ram lambs, using lean sire breeds, increasing stocking rates, and increasing lambing percentages.

There should also be increased emphasis on branding New Zealand lamb products. Aus-

tralia has certainly improved its export prospects for lamb in the US market by putting more emphasis on their branded "Fresh Australian Range Lamb" product (Agribusiness and Economics Research Unit 1992).

The results, therefore, generally suggest a two-pronged strategy to lamb marketing in the US FAFH sector. First, marketing efforts should be directed at individuals who have a higher probability of consuming lamb away from home. These marketing efforts should include targeting food service outlets that cater for ethnic groups. Since the results indicate that the probability of consuming lamb away from home is positively related to income, lamb marketers in Australia and New Zealand should target food outlets (e.g. restaurants) that cater to higher income groups. The second strategy would be to target those individuals who have lower probabilities of eating lamb away from home to increase exposure of the product as well as to broaden the consumer base.

6. Concluding Remarks

A logit model was developed to investigate the decision to eat lamb away from home in the US. This model provided a profile, in terms of the socio-demographic characteristics, of consumers who were more likely to eat lamb away from home. The identification of these types of consumers is essential in analysing consumer behaviour and in developing specific marketing programmes. Moreover, a complete understanding of away-from-home lamb consumption in the US is needed to keep up with the recent trends in consumer demand. In particular, the information derived from this study is useful for processors and producers in Australia and New Zealand who want to anticipate future market changes and derived demands for their lamb products.

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