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AN EVALUATION OF BEEF DEMAND IN JAPAN AT A DISAGGREGATED LEVEL

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In this paper demand for beef in Japan is analysed at the wholesale level. The study extends previous research by disaggregating imported beef into four categories. This will lead to a better understanding of Japan's likely import requirements of various beef types, in recognition of the fact that beef is not a homogenous product in Japan. Wagyu beef was found to have the highest price elasticity, followed by the two categories of imported grain-fed beef. Demand for chilled grass-fed beef was found to be the most responsive to expenditure changes.

Introduction

In recent years market liberalisation and growing consumer incomes have contributed to rapid growth in the demand for beef in Japan. As a major supplier to the market Australia has been able to capitalise on this growth. Apart from a downturn in 1991 Australian beef exports to Japan have risen steadily during the 1980's, to the point where in 1992 Japan accounted for 26% of Australian exports compared with 14% in 1982. The indications are that growth in demand and Australian exports will continue in the future due to further liberalisation, rising incomes and efficiency improvements in the distribution system in Japan.

A feature of the Japanese market is that it is differentiated into various segments on the basis of quality and end-use of the beef. Thus beef is by no means a homogenous product in Japan, with different types of beef supplying each segment.

There are three broad segments of the market. The top end of the market is the high quality restaurant and table beef segment and is supplied by Wagyu beef, high grade dairy beef and some imported grain-fed beef. The middle segment, which is by far the largest, consists of supermarkets and butcher shops, department stores, middle range restaurants and the food service sector. This segment is supplied by domestic dairy beef, lower grade Wagyu, imported grain-fed beef and imported chilled grass-fed beef. The bottom segment comprises some fast food outlets, the institutional trade and the meat processing sector. It is supplied by lower grade dairy beef, imported frozen grass-fed beef and some imported frozen grain-fed beef.

* The views expressed in this paper are those of the authors and do not necessarily reflect the views of the AMLC.

Helpful comments from some colleagues are acknowledged.

Australia supplies mainly the middle and lower market segments, with four broad types of product - chilled and frozen grass-fed beef, and chilled and frozen grain-fed beef. Australian exports of each of these categories in the past four years are shown in Figure 1. The United States supplies chilled and frozen grain-fed product, while the Japanese domestic industry supplies Wagyu and dairy beef.

An important issue for the Australian, US and Japanese domestic industries is likely future demand trends in Japan for these various beef categories. This information would be useful as it would enable the beef production and processing industries in those countries to gauge more accurately what types of product (e.g grass v grain-fed, chilled v frozen) are likely to experience the fastest growth in demand, and thus to tailor production and marketing strategies accordingly.

In order to examine this issue it is necessary to model Japanese beef demand at a disaggregated level. There have been several earlier studies of Japanese beef demand, but most have only examined beef demand in aggregate, or split beef into two categories, imported and domestic, or high and low quality. A potential shortcoming of this approach is that it fails to recognise the differentiated nature of the Japanese beef market, and thus masks differences in demand patterns which may exist at a more disaggregated level. One exception to this approach was a 1991 report by ABARE which examined demand for four categories of beef, imported grain-fed beef, imported grass-fed beef, Wagyu and dairy beef, at both the retail and wholesale levels.

The main aim of this paper is to examine wholesale beef demand in Japan at a more disagregated level. Beef is split into six categories - chilled grain-fed, frozen grain-fed, chilled grass-fed, frozen grass-fed, Wagyu and dairy beef. Pork and chicken are also included in the demand system. Thus this paper extends the research of ABARE by examining beef demand at a more disaggregated level.

In the next section the results of previous studies that have analysed demand at a disaggregated level are briefly outlined. A discussion of the data and estimation technique used in the current study is then provided, following this the results are outlined and, finally, implications of the results are discussed.

Previous Japanese Meat Demand Research

A number of earlier studies have examined beef demand in Japan at a disaggregated level. ABARE (1987) attempted to test the assertions that have been frequently made that there is an inverse relationship between the quality of beef and its responsiveness to own-price changes, while a positive relationship exists between quality and sensitivity to changes in consumer income. In this study beef was split into two categories, high quality (Wagyu beef plus US beef imported outside the LIPC frozen tenders) and low quality (all other imported beef plus domestic dairy beef). Statistically satisfactory results for price and income elasticities were obtained for low quality beef but not for high quality beef. Although this led to the conclusion that, with the available data, it is not possible to accurately assess demand parameters in more than one segment of the market, ABARE did conclude that, contrary to prior beliefs, the income elasticity of demand for low quality beef was above that for high quality beef.

Another important conclusion from the 1987 ABARE study was that it is not possible to include high and low quality beef as separate meats in an AIDS model, because the price elasticities obtained were inconsistent with theory.

Hayes, Wahl and Williams (1990) adopted a similar approach to the ABARE study, splitting beef into Wagyu and import quality. Using a LA/AIDS model, it was found that the own-price demand elasticity was much higher for Wagyu beef than import quality beef while for the expenditure elasticities the reverse is true. Another important conclusion from their study was that Wagyu beef and imported beef are not perfect substitutes, implying that each type of beef must be treated as a separate commodity.

Mori and Gorman (1989) analysed demand at the wholesale level for dairy beef, Wagyu and imported beef as part of a meat demand system. It was found that Wagyu had the highest price elasticity while dairy beef demand was slightly more elastic then imported beef demand, although both exceeded unity. Wagyu was also the most responsive to expenditure changes, followed by imported beef. It is of note that Mori and Gorman (1989) concluded that disaggregation into three classes may not be sufficient.

A more recent ABARE study (ABARE, 1991) examined beef demand at a more disaggregated level than the above studies. Beef was broken up into imported grain-fed, imported grass fed, dairy and Wagyu, and demand analysed at both the wholesale and retail levels.

In the wholesale model, using a translog cost function specification, Wagyu beef was found to be easily the most responsive to own price changes, dairy beef the least responsive, and imported grain and grass fed beef had similar elasticities. All the own-price elasticities were less than unity. In terms of income elasticities, imported grain-fed was found to have the highest elasticity, more than double that of the next highest Wagyu, and again dairy beef had the lowest elasticity. It should be noted that several complementary relationships between the various beef types were found.

The results obtained for the retail level analysis, using an LA/AIDS model, were similar to those obtained at the wholesale level, although the own-price elasticities were significantly higher.

On the basis of their results, ABARE concluded that consumption of imported grain-fed beef would grow at a faster rate than that of imported grass-fed, as the former had higher price and income elasticities of demand.

In conclusion, most of the previous research has refuted the assertion that consumption of high quality beef (i.e. Wagyu) is less responsive to changes in its price than lower quality or imported beef, but more responsive to changes in income. However, the recent ABARE study did find that there are significant differences in elasticities between imported grain-fed, grass-fed and dairy beef. This paper aims to extend this research further by examining demand for different types of grain and grass-fed beef, as well as domestic beef.

Estimation Procedure

In this paper a system of demand equations is estimated using the linear approximate AIDS (LA/AIDS) specification. This specification has been used in several previous studies of meat demand, both in Japan and Australia. It is popular because it can be estimated easily and, in addition, satisfies the axioms of choice.

The specification of the LA/AIDS model is:

$$Wi = \alpha i + \Sigma j \; bij \log Pj + \delta i \log (E/P) \qquad (1)$$

where Wi is the share of aggregate expenditure of the i th good, Pj is the price of the jth good, E is per capita total expenditure on the group of goods being analysed and P is a price index. In the LA/AIDS specification the price index (P) is generally a Stone's price index, $\log P = \Sigma i \; Wi \log Pi$.

In applying this specification to a meat demand system a number of important issues arise. First, is the issue of separability, which relates to the number of goods that should be included in the demand system. If a group of goods is weakly separable from other good(s) then only prices and aggregate expenditure on that group of goods need to be included in equation (1). For example, in the case of a meat demand system, the assumption of weak separability means that only prices and expenditure on the relevant meat types are required. Should the assumption of weak separability not hold the estimation procedure becomes more burdensome as it means that prices of, and expenditure on, other goods must also be included in each equation.

The assumption of separability in the Japanese meat market was tested by Hayes et al (1991). It was found the assumption that meat (beef, pork and chicken) is weakly separable from seafood could not be rejected. Therefore, in this study only beef, at a disaggregated level, chicken and pork were included in the demand system.

The other major issue in the modelling approach is whether the theoretical restrictions of homogeneity, Slutsky symmetry and adding up should be imposed on the system. The advantage of imposing these restrictions, apart from the fact that they are consistent with consumer theory, is that they reduce the number of parameters that need to be estimated. In general, these set of restrictions have been imposed in other studies of Japanese meat demand (e.g. ABARE, Hayes et al), and in fact, Hayes et al (1990) tested and accepted the imposition of Slutsky symmetry.

In terms of the parameters of equation (1), the restrictions are:

$\Sigma j \; bij = 0$	homogeneity
$bij = bji$	Slutsky symmetry
$\Sigma i \; \alpha i = 1, \Sigma i \delta i = \Sigma i \; bij = 0$	adding up

The LA/AIDS model with the above restrictions imposed was used to estimate a system of eight demand equations. As outlined in the previous section, beef was disaggregated into six categories - imported chilled grass-fed, imported chilled grain-

fed, imported frozen grass-fed, imported frozen grass-fed, domestic Wagyu beef and domestic dairy beef. Pork and chicken were also included in the demand system.

The estimation procedure used was similar to that adopted by Cashin (1991) in a model of disaggregated demand for meat in Australia and Chalfant (1987) in a model of US meat demand. Maximum likelihood estimates of the parameters were obtained using the iterative, non linear seemingly unrelated regression procedure of SHAZAM version 6.1. As is standard practice, one equation was arbitrarily deleted (in this case the Wagyu equation) from the system since otherwise the covariance matrix is singular. The parameters of the omitted equation can be calculated using the adding up and homogeneity restrictions. The parameter estimates in the system are invariant to the equation that is deleted.

Dummy variables for the traditionally strong demand months of April, November and December were also tested in the system. However, it was found that in many cases these variables were not significant so it was decided to omit seasonal dummies. A possible reason for this lack of significance is that seasonality of demand may exist for certain categories of beef but not for others. This would mean that seasonality is important for beef in aggregate but not in all cases at a disaggregated level.

Data

As discussed above, this study advances previous research into the Japanese market by disaggregating imported beef into both chilled and frozen beef, for both grain-fed and grass-fed beef. The earlier research has recognised the need to do this but data limitations have been a constraint.

In this study monthly data covering the period January 1990 to September 1992 are used.

(i) Quantities

The procedures used to derive quantity sold at the wholesale level are outlined below. Frozen grass-fed beef sales were derived by subtracting frozen grain-fed exports from Australia, lagged by one month, from Japanese imports of Australian frozen beef, with a further adjustment being made for stock changes. The small quantity of Australian frozen grain-fed exports means that errors caused by the estimated lag are likely to be small. Changes in stocks were allocated to Australian frozen grass-fed beef in proportion to their share of total frozen imports.

Frozen grain-fed sales were derived in a similar way. That is, Japanese imports of frozen beef from the United States were adjusted for stock changes by allocating changes in stocks in proportion to the share of US frozen imports in total frozen imports.

Sales of Australian chilled grain-fed beef were derived by lagging Australian chilled grain-fed exports by one month. For sales of this category of beef from the US Japanese imports of US chilled beef were used. Note that this method assumes that all chilled beef imports, both from Australia and the US, are sold directly on the wholesale

market rather than going into frozen stocks. This is likely to be a reasonable assumption given that putting chilled product into frozen stocks entails a significant loss in value of the product.

Wholesale market sales of the two domestic categories of beef, Wagyu and dairy, were derived by converting domestic production to a retail weight basis and then adjusting for changes in stocks of domestic beef. Stock changes were allocated in proportion to the shares of each category in total production.

Figures 2 to 4 show wholesale market sales of the imported and domestic beef categories.

Pork and chicken sales were obtained by adding imports to domestic production and adjusting for stock changes.

(ii) Prices

For each meat type, an indicative or representative price was used as the price variable. The prices of chilled grass-fed and grain-fed fullsets were used as the price indicators for the chilled grass-fed and grain-fed categories respectively (sourced from the Japanese newspaper, Chikusan Nippo). Frozen grass-fed and grain-fed beef were represented by prices of chuck and blade, and square cut chuck respectively. Note that these indicative prices were also used in the ABARE study.

For domestic dairy beef the price of dairy steer B2/B3 was used as the indicator price while for Wagyu beef the price indicator was the A5 steer price. Pork and poultry prices were represented by the wholesale carcase price at Tokyo and the Tokyo wholesale broiler price respectively.

Wholesale prices for imported and domestic beef are shown in Figures 5 and 6.

Results

The estimated parameter coefficients of the demand system are set out in Table 1.

Marshallian (uncompensated) own and cross price elasticities and expenditure elasticities are shown in Table 2. Wagyu beef is easily the most responsive to own price changes. Chilled and frozen grain-fed have very similar price elasticities, each being close to unity. Both types of grass-fed, chilled and frozen, are inelastic with respect to own price changes, with chilled grass-fed having a slightly higher elasticity (in absolute terms) than imported frozen grass-fed beef.

Dairy beef has an extremely low own-price elasticity, as does chicken. Pork's price elasticity, however, is higher and is similar to that of chilled grass-fed beef.

As has been found in most other studies of Japanese meat demand, several complementary relationships were found to exist between the various beef types, and chicken and pork. This was particularly the case for pork which was found to be a

complement with all categories except imported chilled grass-fed beef. Chicken also displays complementarity with all meats except chilled grass-fed beef and Wagyu beef.

In contrast, both Wagyu and chilled grass-fed beef appear to have more substitutes than other beef types. It is notable that Wagyu has a relatively high cross-price elasticity with respect to grain-fed beef, both chilled and frozen. Chilled grass-fed beef has low cross-price elasticities with most meats, except frozen grain-feed beef for which the cross-price elasticity is much higher.

The high incidence of complementarity relationships between the meat categories suggests the presence of strong expenditure effects. That is, the effects of price changes on consumption are outweighed by the effect on consumption of real expenditure changes caused by the price changes. This is consistent with the significant price changes that occurred in Japan over the period analysed. Due to liberalisation of the Japanese beef market since 1990, imported beef and, to a lesser extent domestic beef, prices have fallen significantly. Consequently, consumption of beef has also grown rapidly. The complementarity relationships identified in this study indicate that this increased consumption has been due not only to the lower prices but also the increased expenditure available for meat consumption as prices have fallen.

This is borne out by the compensated price elasticities reported in Table 3. These indicate that once allowance is made for expenditure effects many, but not all, of the complementarity relationships disappear, and many of those that remain are low.

In terms of expenditure elasticities, the results indicate clearly that the imported beef categories are more responsive to changes in group expenditure than are either of the domestic beef categories. In fact, all imported beef types could be regarded as luxuries as they all have expenditure elasticities in excess of one. Chilled grass-fed beef is easily the most sensitive to expenditure changes. Again, frozen grain-fed and chilled grain-fed beef have very similar expenditure elasticities, both well in excess of one. Of the imported beef types frozen grass-fed has the lowest expenditure elasticity, although it is still high in absolute terms.

Also of note is that pork has a much higher expenditure elasticity than either chicken or domestically produced beef.

The elasticity results obtained in this study are broadly in line with the elasticities found at the wholesale level for the period 1984 (1) to 1990 (4) in the 1991 ABARE study which examined beef demand at a more aggregated level, although the magnitude of the elasticities are much higher than in the ABARE study. In terms of own-price elasticities, both studies found that Wagyu beef was the most responsive to price changes while domestic dairy beef was the least responsive. ABARE's results show than imported grain-fed beef has a higher price elasticity than imported grass-fed beef, a result that was also obtained in this study, although chilled grass-fed was found to have a higher price elasticity than frozen grass-fed beef. Another similar finding to the ABARE study is that pork has a much higher price elasticity than chicken.

One notable difference from the ABARE results is in relation to the cross-price elasticities for Wagyu. ABARE found that Wagyu beef had a higher cross-price

elasticity with respect to grass-fed beef than grain-fed beef, whereas in this study the cross-price elasticities were higher for the grain-fed categories than for grass-fed, which in fact were both negative. It would be expected that Wagyu beef would be more closely substitutable with grain-fed than grass-fed beef, as the results of this study suggest.

In regard to the expenditure elasticities, there are some significant differences from the ABARE study, possibly due to the greater degree of disaggregation. As outlined above chilled grass-fed beef had the highest expenditure elasticity, while, of the imported beef types, frozen grass-fed had the lowest. The expenditure elasticities for both types of grain-fed were found to be very similar, but lower than that of chilled grass-fed beef. The aggregation by ABARE of the two types of grass-fed beef may mask the significant differences that exist between the expenditure elasticities for its two components, thus leading to their conclusion that grain-fed beef has a higher elasticity than grass-fed beef.

The other major differences between the two studies is that ABARE concluded that pork has a lower expenditure elasticity than chicken, whereas in this study the reverse was found to be the case.

In another comparable study, Hayes et al, the Wagyu own-price elasticity is very similar to that reported here, as is the pork own-price elasticity. The price elasticity reported by Hayes et al for aggregate imported beef, however, is much lower than the elasticities obtained for the individual components of imported beef in this study. The expenditure elasticity for Wagyu reported by Hayes et al is much higher than that obtained in this study, and the expenditure elasticity for aggregate import quality beef is also much higher than the elasticities that were obtained in this study for the various components of imported beef. Also in contrast to this study, Hayes et al found that the expenditure elasticity for chicken is much higher than it is for pork.

Finally, the price elasticities obtained in this study are lower than those reported by Mori and Gorman (1989). Also, that study found that while Wagyu had the highest price elasticity, dairy beef had a higher own-price elasticity than imported beef, which contradicts most other studies, including this one.

Another contrast with this study was that Wagyu had a higher expenditure elasticity than imported beef.

Discussion

The results reported above indicate that significant differences do appear to exist in demand parameters for the various categories of imported beef. These differences have been masked in previous studies which have only analysed beef demand at a more aggregated level than was the case here. Thus the results confirm that any analysis of Japanese beef demand should treat beef as a heterogeneous product.

Differences are particularly apparent for the two categories of grass-fed beef. Chilled and frozen imported grain-fed beef have similar price and expenditure elasticities, but again they are quite different to the elasticities for the other categories.

The results also broadly confirm earlier research that generally found a positive relationship between the products value/quality and its own-price elasticity of demand. That is, higher-priced products have higher elasticities than lower-priced products. There are some exceptions to this, however, notably dairy beef and frozen grain-fed beef.

The expenditure elasticities obtained in this study are generally quite different from those reported in the 1991 ABARE study. This presumably reflects differences in the time period analysed, the data used, the estimation technique and the level of aggregation.

Also there does not appear to be a close correlation between a product's value and its expenditure elasticity, as has been hypothesised. For example, chilled grass-fed beef has the highest expenditure elasticity even though it sells for less than both Wagyu adn chilled grain-fed beef.

In regard to the implications of this analysis for Japanese beef imports and Australian production, the results indicate that grain-fed beef (both chilled and frozen) is likely to experience faster growth in demand than other imported beef categories as wholesale prices fall in response to further tariff cuts and other factors. Both types of grain-fed beef are likely to experience similar growth rates in response to price and expenditure changes.

The results also suggest that consumption of chilled grass-fed beef will increase as prices fall, but not to the same extent as grain-fed beef consumption. However, chilled grass-fed beef will benefit more than any other category of beef from increases in consumer expenditure allocated to meat purchases.

The high expenditure elasticities, particularly for imported beef, indicate the importance of growth in Japanese consumer incomes for future beef consumption levels. That is, as consumer incomes grow the expenditure allocation to meat will increase, and imported beef will be a major beneficiary of this.

Due to the fact that it has the lowest price and expenditure elasticities of all the imported beef types, consumption of frozen grass fed beef is likely to grow less rapidly than consumption of other beef. From the Australian industry's viewpoint, this emphasises the importance of continuing to focus on the production and marketing of grain-fed and chilled grass-fed products for the Japanese market. It is also apparent that it is important for the Australian industry to maintain, and where possible expand, access to traditional and new markets for frozen grass-fed product, as the results suggest that Japan may not have a great capacity to absorb large quantities of this product without significant price falls. This is a concern given the threat of ongoing access problems in the United States, which is by far Australia's largest market for frozen grass-fed beef.

Another notable implication of the results is that Wagyu beef consumption is likely to increase more than the other categories from falls in its price. However, it should be

noted that on the basis of these results Wagyu beef consumption will not benefit as much from increases in expenditure as other beef categories.

The apparently strong substitutability between Wagyu and the two grain-fed categories (as is evident from the relatively high positive cross-price elasticities) also has some interesting implications. This relatively strong substitution effect implies that as grain-fed beef wholesale prices fall (e.g. in response to tariff cuts) Wagyu beef consumption will fall. This could be exacerbated by the high production costs for Wagyu and the floor price system, which will both act to keep Wagyu prices high, even if imported beef prices fall. However, it should be noted that the high own-price elasticity for Wagyu suggests that if Wagyu prices do fall, the increase in quantity consumed will offset the effect of price falls, thereby leading to increased revenue for Wagyu producers.

Dairy beef consumption will, on the basis of these results, not increase significantly in response to falls in its price, however the low cross-price elasticities imply that dairy beef consumption may not be affected greatly by falls in the price of other types of beef.

The results also indicate that Australia should be able to at least maintain its market share in Japan, given the increased emphasis in Australia on feedlotting and chilled grass-fed beef production. One possible area of concern, however, is the frozen grass-fed market for which growth in Japan is likely to be lower than for other imported beef categories.

Some caution needs to be exercised in drawing conclusions from these results, for a number of reasons. First, deficiencies and inaccuracies in the data, particularly in relation to the measurement of chilled beef sales, are likely to affect the results. Previous researchers have found that results are sensitive to factors such as the price indicators that are used for the price variable. This is also likely to be the case in this study. Another deficiency in the data is the use of the assumption that all chilled beef is sold directly onto the wholesale market and is not frozen and put into stock. In reality, this is unlikely to be the case, although the commercial loss involved suggests that only small quantities would be put into stock. The use of a one month lag factor for Australian exporters would also introduce inaccuracies.

The assumption that Australian chilled grain-fed product is identical to US chilled grain-fed is also unlikely to be realistic. The lack of data on prices for US chilled grain-fed beef in Japan prevented the disaggregation of this category into US and Australian product. This would be a useful avenue for further research.

A second potential problem relates to the use of the assumptions of separability, homogeneity and symmetry. There is still some uncertainty about whether beef demand in Japan can be modelled separately from other meats. In this study it was assumed that domestic and imported beef is weakly separable from seafood but not from pork or chicken. It is clear that more analysis needs to be carried out to test the accuracy of this assumption. The presence of several high negative and positive cross-price elasticities, particularly for Wagyu, also cast doubts on the data and assumptions.

Finally, it should be kept in mind that over the period analysed there were unprecedented changes in the Japanese beef market as liberalisation took place. These changes are likely to have led to changes in the structure of the market and in meat demand, which would cast further uncertainty on the results.

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Table 1: Estimated Parameters for Disaggregated Beef Model		
Parameter	Estimate	Standard Error
$\alpha 1$	-0.976	0.233
$\alpha 2$	0.738	0.211
$\alpha 3$	0.742	0.228
$\alpha 4$	-0.299	0.124
$\alpha 5$	0.771	0.299
$\alpha 6$	-0.917	0.747
$\alpha 7$	1.437	0.389
b11	0.011	0.013
b12	0.004	0.014
b13	0.014	0.012
b14	-0.011	0.006
b15	0.073	0.013
b16	0.009	0.008
b17	0.010	0.015
b22	0.001	0.025
b23	-0.018	0.012
b24	0.020	0.007
b25	-0.116	0.014
b26	-0.010	0.008
b27	-0.028	0.016
b33	0.117	0.018
b34	0.007	0.007
b35	-0.061	0.013
b36	0.044	0.009
b37	-0.033	0.023
b44	0.008	0.006
b45	0.028	0.012
b46	-0.002	0.005
b47	-0.004	0.008
b55	0.001	0.030
b56	-0.018	0.013
b57	-0.065	0.024
b66	0.122	0.046
b67	-0.062	0.015
b77	0.149	0.036
$\delta 1$	0.039	0.022
$\delta 2$	-0.078	0.023
$\delta 3$	0.034	0.018
$\delta 4$	0.001	0.011
$\delta 5$	0.030	0.029
$\delta 6$	0.154	0.094
$\delta 7$	-0.112	0.031

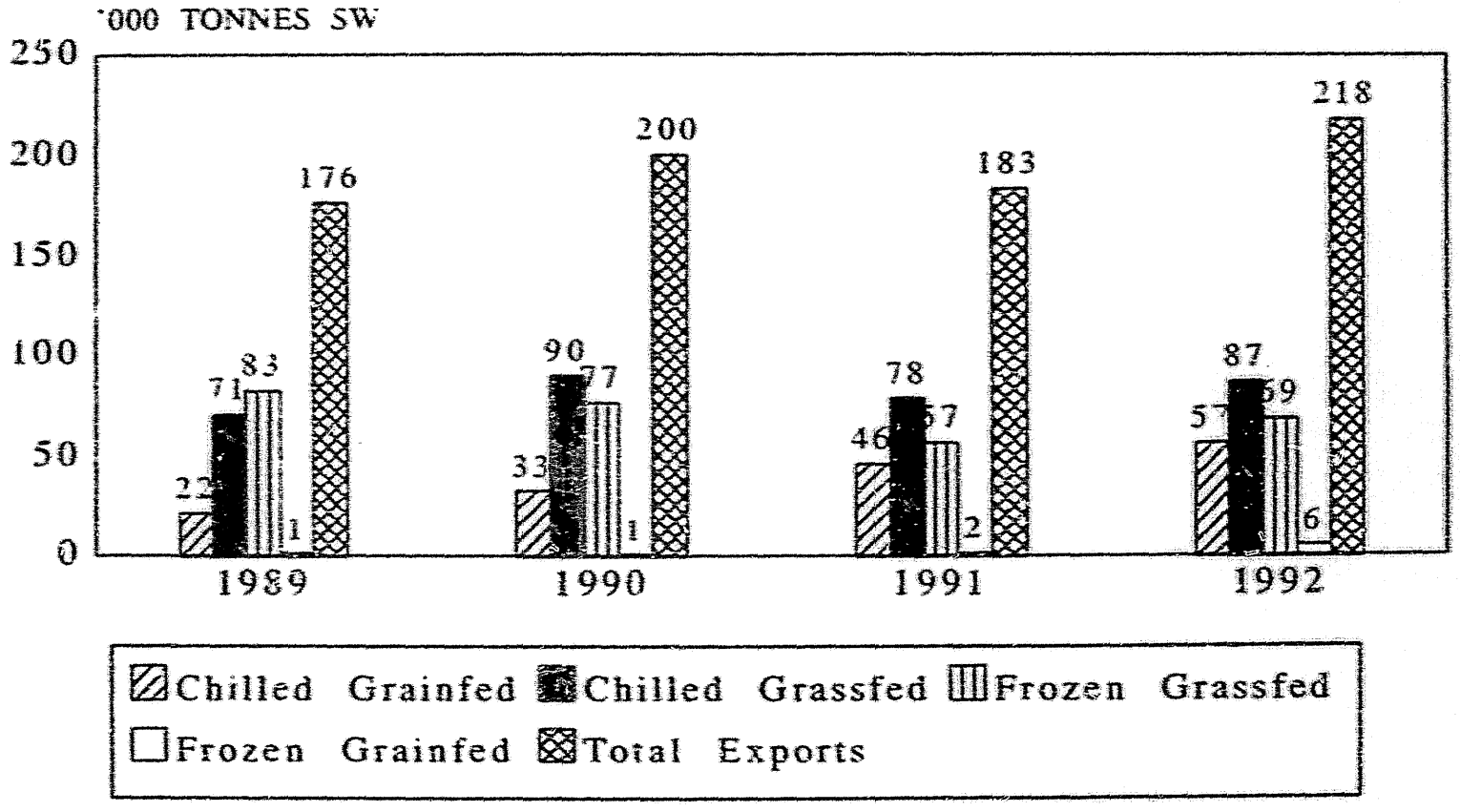
The notation is as follows: 1 = Chilled grass-fed beef, 2 = chilled grain-fed beef, 3 = dairy beef, 4 = frozen grass-fed beef, 5 = frozen grain-fed beef, 6 = pork, 7 = chicken

Table 2: Uncompensated Demand Elasticities

Consumption of:	with respect to price of:								Meat Expenditure:
	Chilled grass-fed	Chilled grain-fed	Frozen grass-fed	Frozen grain-fed	Dairy	Wagyu	Pork	Chicken	
Chilled grass-fed	-0.75	0.06	-0.31	1.87	0.23	-3.06	-0.10	0.06	2.03
Chilled grain-fed	0.05	-1.01	0.39	-2.40	-0.46	2.87	-0.43	-0.71	1.69
Frozen grass-fed	-0.29	0.91	-0.64	1.27	0.32	-2.09	-0.09	-0.18	1.00
Frozen grain-fed	1.59	-2.61	0.61	-1.03	-1.45	3.06	-0.26	-1.57	1.66
Dairy	0.12	-0.10	0.06	-0.42	-0.06	0.24	-0.13	-0.13	0.43
Wagyu	-0.58	0.82	-0.24	0.80	0.14	-1.81	0.05	0.25	0.64
Pork	0.01	-0.05	-0.02	-0.03	-0.19	-0.13	-0.78	-0.28	1.47
Chicken	0.07	-0.11	-0.01	-0.30	-0.09	0.27	-0.12	-0.13	0.64

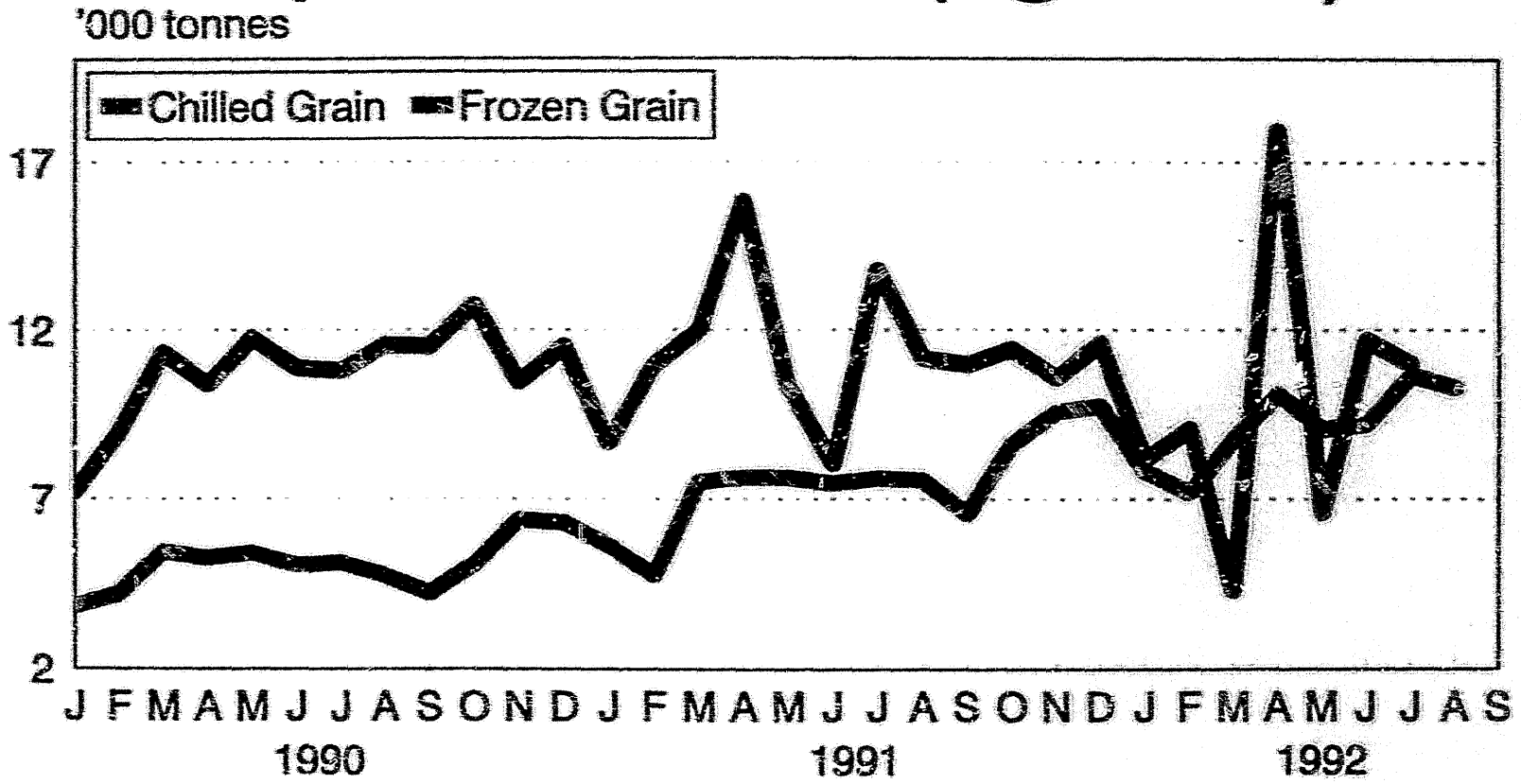
Table 3: Compensated Demand Elasticities								
Consumption of:	with respect to price of:							
	Chilled grass-fed	Chilled grain-fed	Frozen grass-fed	Frozen grain-fed	Dairy	Wagyu	Pork	Chicken
Chilled grass-fed	-0.67	0.16	-0.27	1.97	0.51	-2.69	0.57	0.46
Chilled grain-fed	0.12	-0.93	0.43	-2.32	-0.23	3.18	0.13	-0.37
Frozen grass-fed	-0.25	0.96	-0.62	1.32	0.46	-1.91	0.24	0.02
Frozen grain-fed	1.66	-2.53	0.64	-0.95	-1.22	3.36	0.29	-1.24
Dairy	0.14	-0.08	0.07	-0.40	-0.01	0.31	0.01	-0.04
Wagyu	-0.55	0.85	-0.23	0.83	0.23	-1.75	0.26	0.38
Pork	0.07	0.02	0.01	0.03	0.01	0.14	-0.30	0.01
Chicken	0.09	-0.09	0	-0.28	-0.03	0.34	0.02	-0.04

Composition of Australian Beef/Veal Exports to Japan (Fig 1)

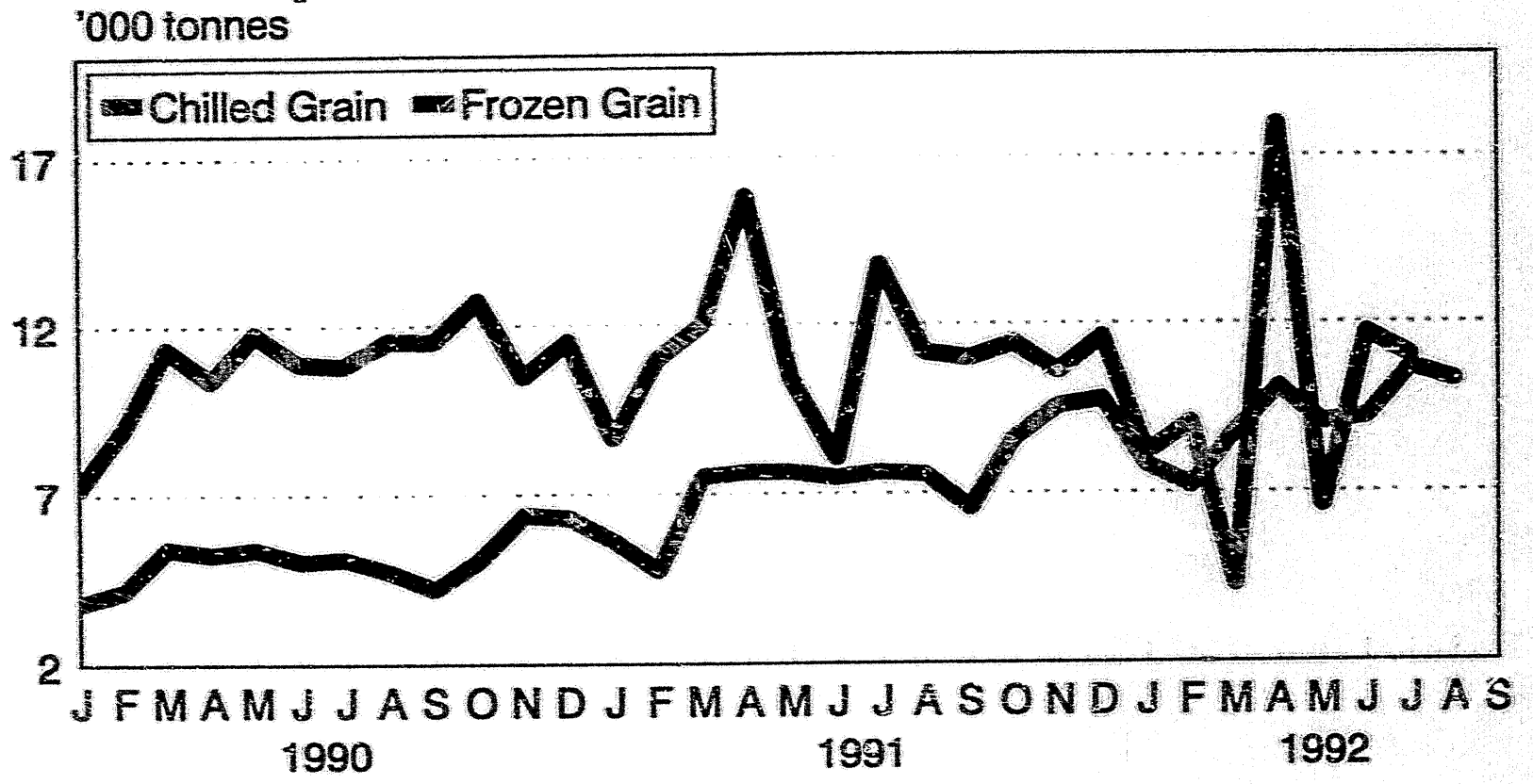


Source: AMLC

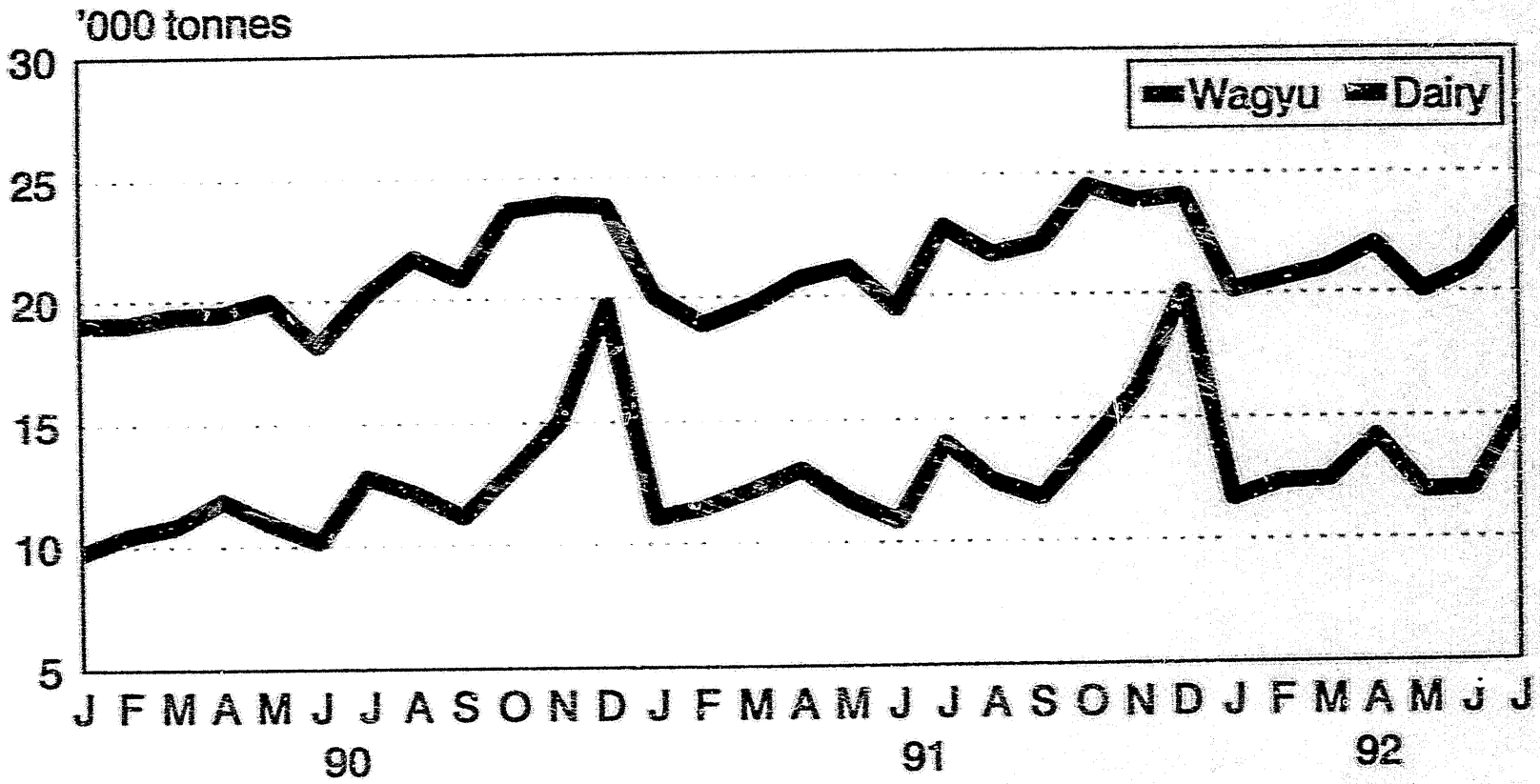
Wholesale Market Sales of Imported Beef (figure 2)



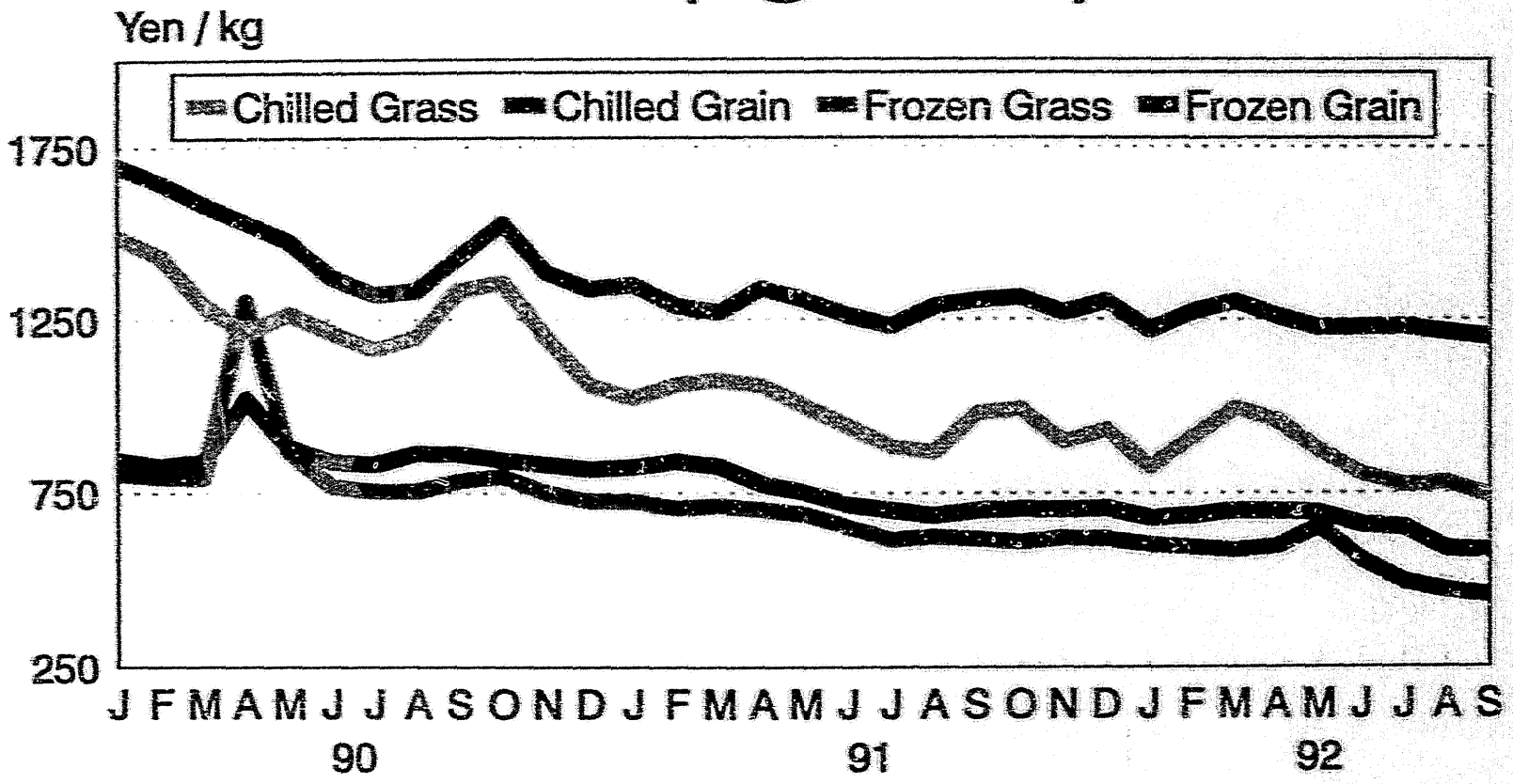
Wholesale Market Sales of Imported Beef (figure 3)



Wholesale Market Sales of Domestic Beef (figure 4)



Wholesale Prices of Imported Beef (figure 5)



Wholesale Prices of Domestic Beef (figure 6)