牛肉政策

JAPANESE BEEF POLICIES: IMPLICATIONS FOR TRADE, PRICES AND MARKET SHARES

AUSTRALIAN
BUREAU OF AGRICULTURAL
AND RESOURCE ECONOMICS

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Foreword

Japan is the second largest export market for Australian beef. Since the late 1970s the beef trade with Japan has been governed largely by a set of bilateral agreements between the Japanese and the United States and Australian governments. The current agreements expire in March 1988. The arrangements which control the beef trade, and potential changes in them, are a matter of great interest to beef producers, exporters and their respective governments.

In this report, the complex arrangements which determine beef imports into Japan are explained. The purpose of the report is twofold. First, it is intended to provide those concerned with the forthcoming negotiations with information that will assist their understanding of the problems posed by the current trade arrangements. Second, and of more long term concern, it provides a perspective on the evolution of these trade arrangements and examines the factors that have caused major changes in import sourcing since the 1970s.

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Canberra

December 1987

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序文

　この文書は、日豪牛肉貿易関係にとって非常に重要な諸問題について、両国国民が理解をより深めることを意図して作成された。これは、日本の牛肉輸入行政に関する弊局の研究報告である。

　オーストラリアにとって、日本は第2の牛肉輸出市場となっている。1970年代後半より、日本の牛肉輸入は日米および日豪政府間の2国間協定によってほとんど統制されている。現在の協定は1988年3月に期限切れとなる。牛肉貿易をコントロールしている現制度、およびその変化は、牛肉生産者、牛肉輸出入業者そして両国政府にとって重要な関心事である。

　本随時報告の目的は、以下の2つである。まず第1に、現行の貿易協定によって引き起こされる問題についての理解を助ける情報を、新協定の交渉にあたる人々に提供することである。第2に、より長期的な観点から、これらの協定の進展についての展望を行なうとともに、1970年代以降の輸入先の大幅な変更をもたらした要素について考察を加えることである。

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1987年12月

要約

　　１９７９年以降、日本の牛肉輸入政策は、日米および日豪政府間の２国間貿易協定の課
題となっている。この間の主要な関心事は、日本市場におけるオーストラリア産牛肉のシ
ェア低下である。当研究では、牛肉輸入先のこうした変化の主な要因の把握に努めた。

　　分析の結果、牛肉輸入におけるオーストラリアのシェアは、輸入管理制度の組織的な運
営のされかたのために、主として減少していると言えるようである。この管理制度の仕組
みや効果については、本研究において詳細に考察され、本文においても論じられている。
分析の主な結論は、輸入割当制によって生み出された歪みは、数量割当制を従価関税に置
き換えることによって、効果的に克服しえるであろうということである。

背景

　　オーストラリアの牛肉産業は、２国間貿易協定の出現以来、日本の輸入増加量のうちの
ごく僅かの分け前にしか与ってこなかった。牛肉輸入におけるオーストラリアのシェアは
１９７９年の７７％から１９８６年には５９％にまで低下した。一方同時期に合衆国はシ
ェアを１８％から３５％に増加させた。１９７９年以降日本は「高級牛肉」の輸入を増加
させてきた。この高級牛肉とは割当の仕様書において「穀物肥育」と定義付けられている
ものである。合衆国産牛肉は一般に穀物肥育されているのに対して、オーストラリアから
の牛肉はほぼ牧草肥育である。

　　この輸入割合の変化は、消費者の需要動向を反映したものであるというのが、日本の公
式見解（たとえば東京の農政調査委員会による牛肉事情に関する報告－１９８６年）であ
る。このように、輸入における穀物肥育の増加は、オーストラリア産の牧草肥育牛肉より
も、国産牛肉により近いと見なされているこの種の牛肉に対する、消費者の好みに帰せら
れているのである。この議論の妥当性についても本研究において評価されている。

日本の牛肉政策

　　日本の牛肉輸入量は、生産者の所得の安定と向上をねらいとした日本の農業政策の枠の
なかで、ほぼ決定される。日本の牛肉輸入政策の趣旨は、卸売り段階での国産牛価格を安
定化させる手段として、輸入管理を利用することである。この分野の輸入政策は、輸入品
目の構成にわたる特定管理や複雑な割当制度にますます傾斜していっている。

　　畜産振興事業団（ＬＩＰＣ）は，牛肉価格の安定化の任にあたっている日本の機関であ
る。牛肉輸入割り当ての約８０％がＬＩＰＣに割り当てられており、それは様々な方法で
輸入業者に配分されている。分量の点でＬＩＰＣルートとして最も重要なものは、特定の
種類および量の輸入牛肉を供給するための競争入札買い入れである。残りの２０％は民間
の商社による輸入で、その商社は購入する牛肉のタイプや部位について、一定の選択権を
持っている。

ある種の「内臓」については、割当管理が行われておらず、その中のいくつかは牛肉の代替品として商業的に重要になっている。

牛肉の需要

　日本の牛肉需要に関するこれまでの研究によれば、低価格牛肉の需要は高価格牛肉の需要よりも、価格の変化に敏感に反応するされている。さらに高品質牛肉に対する需要は、低品質の牛肉への需要よりも消費者所得の変化に、より敏感であると示唆されている。この意味するところは、日本人の所得の向上に従って、高品質（つまり高価格）牛肉の輸入が低価格のものに比べ、より急速に増加するであろうということである。

　日本で消費される牛肉のうち、国産ものは主として２種類の肉牛からなっている。和牛（在来種）は高価格の牛肉、乳用種はより低価格のものとして、国内市場に供給されている。輸入牛肉に関しては、卸売り価格のデータが、異なったタイプの輸入牛肉が国内牛肉市場のどの等級に対応するかということを決定するために検討された。合衆国産の穀物肥育の高価格品のみが和牛に匹敵し、その他全ての輸入牛肉（牧草肥育のオーストラリア産牛肉を含む）は「乳用種の牛肉」と競合するようである。

　これまでの牛肉需要に関する分析は、ほとんど牛肉一般を対象にしたものであったが、輸入品についての詳細な分析によって個別レベル（つまり牛肉のタイプ、部位別）での分析が可能となった。本研究においては、ほとんどの輸入牛肉が「乳用種の牛肉」と競合関係にあるという点に関して議論されている。牛肉全体の需要関数（消費、価格および消費者所得の関係）と、市場における２種類の牛肉、つまり１つは和牛とある種の合衆国産輸入牛肉よりなる高品質牛肉であり、他方は乳用種と多くの輸入牛肉からなる低品質牛肉のそれぞれの関数とを比較した。

　分析の結果、所得の上昇に伴って低品質牛肉よりも、高品質牛肉に対する需要の伸びが著しい、という事実は見られなかった。実際には、低品質牛肉の需要は牛肉全体の需要に比べ、消費者所得の増大により反応するようである。つまり低品質牛肉に対する需要は著しく増加し、輸入制限がなければそのほとんどがオーストラリア産の牧草肥育牛肉の輸入増大によって賄われるであろうということである。

保護の水準

　日本の牛肉産業は、２５％の輸入関税と輸入数量割当制の組み合わせによって、保護されている。もし関税が唯一の輸入管理方策であるならば、関税率が保護水準となるであろう。しかしながら、数量割当制も導入されていることから、この供給に対する制限効果は関税のみの場合よりも、卸売り価格を上昇させているかもしれない。卸売り価格は、供給に対し数量割当制がどの程度の効果を持つかによって、完全に決定される。課税前の輸入価格に対する卸売り価格の割合として示される保護水準は、「陰伏関税」と見なされる数量割当制の効力と言い換えることもできる。

本研究の保護水準に関する分析においては、これまでと異なった試みを行なっている。すなわち本研究では、穀物および牧草肥育両方の輸入牛肉について、特定の部位ごとの価格と数量に関する詳細なデータに基づいた分析を行なった。こうしたデータによって、LIPCが競争入札で輸入した合衆国産およびオーストラリア産冷凍牛肉の価格と数量の間の徹底的な比較が可能となった。割当のなかのこの競争入札買い入れによる冷凍牛肉は、一部に高価格の部位も含むが、枝肉のうち価格的により安い部位に集中する傾向がある。卸売り段階では、数量割当のこの部分については、合衆国産とオーストラリア産牛肉の卸売り価格に、ほとんど違いは見られない。それとは対照的に、輸入価格についてはかなりの差異がある。つまり牧草肥育牛肉（主にオーストラリア産）の価格は、穀物肥育（主に合衆国産）のものより大幅に低い。

　民間の商社によって、輸入された牛肉についてのデータに基づいた分析によっても、牛肉輸入に対する陰伏関税率は、現行関税率よりもはるかに大きいということが示された。さらに、この陰伏関税は、価格の低いものほど大きいと言える。特に、この陰伏関税（つまり、保護水準）は、牧草肥育牛肉より穀物肥育牛肉でより低くなっている。例えば1983年から1986年までの4年間に、穀物肥育牛肉に対する陰伏的な保護割合は、平均で80％（1984年）から180％（1986年）の間であったが、牧草肥育牛肉に対しては、100％（1983年）から210％（1986年）の間であった。したがって数量割当制は、低価格牛肉を陰伏関税によって、差別する仕組みを作り出しているといえる。こうした牛肉は主にオーストラリアによって供給されているので、オーストラリアにかけられる陰伏関税は、合衆国のそれよりも高いということを意味している。

割当制によるレント

　割当のうち、民間の輸入商社によって直接輸入される部分は、LIPCの競争入札買い入れルートで輸入される牛肉よりも、典型的に高品質、つまり高価格のものである。このように日本の民間輸入業者が高品質牛肉を好む背景には、割当管理制とその牛肉市場に与える価格効果がある。

　割当制は、割当配分を受けた団体に、かなりの「レント」をもたらす。このレント（あるいは超過利潤）は、輸入割当の配分を受けたものだけが取得し、その額は卸売り価格と輸入業者によって支払われた価格（すなわち、輸入価格に25％の関税と国内運送費を加えた額）との差である。前者は、割当によって供給が制限されているため、人為的に高められている。LIPCを含めた牛肉割当枠の保持者に対して生み出されるレント所得総額は、1983年から1986年の間に推定で年間680億円から1580億円と、2倍以上に増加している。パーセントで表される保護水準では、高価格の輸入牛肉ほど低くなるが、レントそれ自体（㌔当たり円）では、高輸入価格のものほど多くなる。LIPCの競争入札買い入れルートの外で輸入される牛肉については、穀物肥育冷凍牛肉の割当レントは、平均で1983年において652円／㌔、1986年では1382円／㌔であった。一方、牧草肥育冷凍牛肉では、それぞれ607円／㌔、748円／㌔であった。したがっ

て、輸入数量は決められているが、品質は選択できる割当枠を持っている民間の輸入商社が、値段の高い部位を購入するのは、経済的な要因からである。

近年「売買同時入札方式」の下で、輸入業者による部位選択の自由が拡大してきた。そのために、割当レントの相対的な大きさが、輸入需要の全体としてのパターンを決定づける要素として、今後ますます重要になることが予想される。実際に牛肉輸入における割当レントの差異は、民間貿易割当の下で見られた輸入パターンの変化と矛盾なく一致する。つまり、民間貿易による輸入需要の構造は、割当レントの相対的な大きさによって決定されると言えるようである。

割当レントは、輸入価格に対する卸売り価格の上昇から生じることから、牛肉の消費者にとっては税金として作用する。それゆえ、レント所得の推定合計額は、日本の消費者から割当の保持者への所得再分配額となる。そして、小売り価格のうちの割当レントにあたる部分は、割当制のために消費者に陰伏的に課せられる税金となるのである。例えば、1986年にはこの割当税は、高品質、低品質両方の牛肉の小売り価格の22%ほどに相当した。高品質牛肉については、この税率は3年間に倍増している。従って、牛肉消費者から輸入割当保持者への所得の移転は、増加しているということになる。

横隔膜牛肉の役割

牛肉輸入で得られる多額のレントの存在は、数量管理から逃れようとする動機を生じさせる。このことはとりわけ、割当によって制限されていない「内臓」に分類されている横隔膜牛肉の輸入を通して起こっているようである。

穀物肥育牛の横隔膜肉は、ある種の使用法においては、牧草肥育の冷凍牛肉の特定部位と代替可能である。横隔膜牛肉を含む「内臓」の輸入は、急速に増加している。1979年に合衆国は日本に3万1千トンの「内臓」を輸出したが、1986年にはその数値は7万4千トンにまで上昇している。合衆国による「内臓」の輸出量は、実際に数量割当制の下での合衆国から日本への牛肉輸出量を上回っている。

1986年における、合衆国産横隔膜牛肉の関税賦課前の輸入価格は、オーストラリア産牧草肥育冷凍牛肉の2倍であった。この結果、そしてまた牧草肥育冷凍牛肉は数量制限下にあることから、この牧草肥育牛肉は引き続き割当レントを取得しつづける。したがって、日本の牛肉輸入管理の構造は、需要増のかなりの部分が合衆国産横隔膜牛肉に占められるように作用していると言えよう。この需要増加部分は、もし割当制限がなかったならば、ほとんどがオーストラリア産冷凍牛肉によって占められると考えられるものである。

結論

本研究における主な成果は、日本の牛肉輸入市場のうち管理された部分において、数量割当制という方法が、いかに輸入供給品目の構成における変化に影響を与えたかを明らか

にしたことである。ＬＩＰＣの割当制は、穀物肥育輸入品の割合を増加させるように変えられてきた。ＬＩＰＣによって輸入される穀物肥育牛肉は、低価格の部位に集中する傾向にあるが、それでもＬＩＰＣの競争入札買い入れの下で輸入される牧草肥育牛肉よりも、輸入段階でより高価である。しかし卸売り段階では、この穀物肥育の部位は牧草肥育ものの部位より、わずかに高価格であるにすぎない。したがって、輸入品に対する保護水準（輸入価格に対する卸売り価格の割合）は、高価格牛肉よりも低価格品に対してより高くなっている。特に陰伏関税は、一般に合衆国産の牛肉に対してよりオーストラリア産の牛肉に多く賦課されている。

しかし輸入先の異なる牛肉に対する保護水準の違いは、一般に高価格の牛肉ほど多くなる「割当レント」（キロ当たり）に関連している。こうした割当レントは、ただ割当権を保持しているということだけから生み出される利潤であり、民間の割当保持者は、最大のレント収入が得られるように牛肉の選択を行なうことになる。したがって、こうした輸入商社は、高値の部位を選択することになる。そして、それは主に合衆国産の穀物肥育牛肉であった。

本研究において展開された議論は、高価な牛肉の輸入ほどより多くの割当レントが取得できるのは、市場においてこの種の牛肉に対する配分が相対的に少ないためであるということである。ＬＩＰＣの買い入れが、穀物肥育牛肉のうち安価な部位に集中していることが、穀物肥育牛肉のより高価な部位に対するレントを高くしている。そうでなければ、この部位に対するレントは、もっと低いものであったであろう。それとは反対に、牧草肥育の冷凍牛肉の輸入に伴うレントは、この牛肉の代替品であり、数量割当の枠外で輸入されている横隔膜牛肉のために、低く押さえられている。横隔膜牛肉に対する割当規制がないために、その輸入価格（それに、この種の牛肉に対する１５％の関税を加えた額）が、安価な牛肉にとって取得可能なレントの天井をなしているのである。

最後に、本研究においてなされた分析から、日本における牛肉輸入制度の構造とその運営によって、穀物肥育牛肉の輸入が飛躍的に増加したことが明らかになった。輸入割当制は、公式には本来別け隔てのないものであるが、本分析が示すように輸入先の違いによって、扱いが異なっていた。オーストラリアからの輸入に対する陰伏関税は、合衆国産牛肉に対するそれよりも高かったのである。さらにＬＩＰＣの行為と、市場末端で安く手に入る、割当制の枠外の横隔膜牛肉の存在によって、高品質穀物肥育牛肉に対する割当レントがより多くなることも、合衆国産牛肉の輸入を有利にしている。

日本の牛肉産業に対する現行の輸入保護の一般的な枠内において、合衆国とオーストラリア産牛肉への保護水準の違いという問題を効果的に克服するには、輸入割当を全てとり去り、従価関税に置き換えること以外にない。このような関税によって、合衆国産牛肉に比べオーストラリア産牛肉に対する保護水準を高くするような相対価格の歪みをもたらすことなく、割当によって現在達成されているのと同様な保護水準を確保できるであろう。

SUMMARY

Since 1979, Japanese beef import policies have been the subject of bilateral trade agreements between the Japanese government and the governments of Australia and the United States. A major concern that has arisen during this period is the declining share of Australian beef in the Japanese market. The present study was undertaken in an effort to determine the principal reasons for this change in the sourcing of beef imports.

From the results of the analysis, it appears that Australia's share of beef imports has declined largely because of the manner in which the import control system has been structured and administered. The operation and effects of this control system were examined in detail in the course of the study and are discussed in the main body of the report. The main conclusion of the analysis is that the distortions created by the use of quotas could be effectively overcome by replacing them with an *ad valorem* tariff.

The Australian beef industry has participated only modestly in the growth that has been allowed in Japanese imports since the advent of the bilateral trade agreements. Australia's share of beef imports has fallen from 77 per cent in 1979 to 59 per cent in 1986, while that of the United States has risen from 18 per cent to 35 per cent. Since 1979, Japan has imported increasing quantities of 'high quality' beef, which in the quota specifications is defined as being 'grain fed'. US beef is generally grain fed, in contrast to the almost entirely grass fed beef from Australia.

It is the official Japanese view (as expressed, for example, by the Tokyo based Agricultural Policy Research Committee in its 1986 report on the beef situation) that the changing composition of imports reflects consumer demand. Thus, the growth in the grain fed component of imports is attributed to an increasing Japanese consumer preference for this type of beef, which is regarded as a much closer substitute for domestic beef than is Australian grass fed beef. The validity of this argument was assessed in the study.

Japanese beef policy

The quantity of beef imported by Japan is determined largely within the framework of Japanese agricultural policy aimed at stabilising and increasing the incomes of rural producers. The intention of Japanese beef import policy is to use controls on imports as a means of stabilising domestic cattle prices at the wholesale level. Import policy in this area has moved toward increasingly specific controls on import composition and increasingly complex quota arrangements.

The Livestock Industry Promotion Corporation (LIPC) is the organisation in Japan charged with stabilising beef prices. Approximately 80 per cent of the beef import quota is allocated to the LIPC, which distributes it among importers in a variety of ways. The most important LIPC channel, in volume terms, is the acceptance of tenders for the supply of imported beef of specified kinds and quantities. The remaining 20 per cent is imported by private traders having some degree of choice as to the types and cuts of beef they purchase.

There are no quota controls on certain classes of 'offal', some of which are of commercial importance since they are close substitutes for beef.

Demand for beef

Previous studies of the demand for beef in Japan have suggested that the demand for low priced beef is more sensitive to changes in price than is demand for high priced beef; and that demand for beef of higher quality is more sensitive to changes in consumer income than is demand for beef of lower quality. The implication is that as Japanese incomes rise, demand for high quality (that is, high priced) beef imports should rise faster than that for low priced imports.

Of the beef consumed in Japan, that produced domestically is supplied from two broad types of cattle; wagyu (a native breed) supplies the more expensive sector of the domestic market, while dairy cattle provide the less expensive beef. As regards imported beef, data on wholesale prices were examined to determine which of these segments of the Japanese beef market the different types of imports fit into. It appears that only a higher priced category of the grain fed beef from the United States competes with wagyu beef, and that all other imports (including Australian beef, which is grass fed) compete with 'dairy beef'.

A detailed examination of imports enabled the demand for beef to be analysed at a disaggregated level (that is, distinguishing different types and cuts of beef) as well as at the aggregate level used in most previous studies. It is argued in the paper that most imports compete in the 'dairy beef' sector of the market. The demand function (the relationship between consumption and prices and consumer income) for beef in total was compared with the functions for two segments of the market: a high quality segment, comprising wagyu beef and certain US imports, and a low quality segment, comprising dairy beef and the bulk of imports.

The analysis revealed no evidence that, as incomes rise, demand for high quality beef is likely to increase faster than that for low quality beef. In fact, the demand for low quality beef appears more responsive to increases in consumer income than is demand for beef in general. It follows that there is a substantial growth in the low quality market sector, which in the absence of import controls could be met largely by increased imports of Australian grass fed beef.

Rates of protection

Protection of the Japanese beef industry is achieved by the combination of a 25 per cent tariff on imports and a system of import quotas. If tariffs were the only import control device the tariff rate would be the rate of protection. However, when quotas are also used, the effect of this restraint on supply may be to increase wholesale prices by more than would be the case with the tariffs alone. Wholesale prices are then determined entirely by the effect of the quota on supply. The rate of protection — the ratio of wholesale to (pre-tariff) import price — is then also an effect of the quota; it may be referred to as an 'implicit tariff'.

The analysis of rates of protection in this study differs from most previous attempts in that it uses detailed data on prices and quantities of different specific cuts of imported beef from both grain and grass fed cattle. The data allow close comparisons among prices and quantities of US and Australian frozen beef cuts imported by the LIPC under tender. This 'frozen tender' segment of the quota tends to be concentrated on the cheaper cuts in the carcass, although it includes some high priced cuts also. At the wholesale level, in this quota segment, there is very little difference between the wholesale prices of US and Australian beef. The import prices, in contrast, differ appreciably, those of grass fed beef (supplied mainly by Australia) being substantially less than those of grain fed beef (supplied mainly by the United States).

Subsequent analysis, using data on beef imported by private traders also, showed that the implicit tariff on beef imports is very much greater than the actual tariff. Furthermore, the implicit tariff is greater, the lower the import price. In particular,

the implicit tariff (that is, the rate of protection) is lower on grain fed than on grass fed beef. For example, in the four years from 1983 to 1986, the average implicit rate of protection against grain fed beef ranged between 80 per cent (1984) and 180 per cent (1986), while that against grass fed beef ranged from 100 per cent (1983) to 210 per cent (1986). Thus, the quota controls have resulted in an implicit tariff structure that discriminates against cheaper beef. As such beef is supplied mainly by Australia, the implication is that the implicit tariff faced by Australia is higher than that faced by the United States.

Quota rents

That part of the total quota imported directly by private traders is typically of higher quality, and hence higher priced, than that imported under tender by the LIPC. It can be shown that an incentive for such a quality preference on the part of Japanese private importers is provided by the system of quota controls and its price effects on the beef market.

The quota controls provide considerable 'rent' to holders of quotas. This rent (or extra profit), which is earned solely by possession of an import quota, is the difference between the wholesale price and the price paid by the importer (that is, the import price plus the 25 per cent tariff and local transport). The wholesale price is artificially high due to the quota limit on supply. The estimated total rental income accruing to beef quota owners, including the LIPC, more than doubled between 1983 and 1986, from about ¥68 billion a year to ¥158 billion. Whereas it was found that percentage rates of protection are lower for beef of higher import price, rents (in yen per kilogram) proved to be greater for higher import prices. For beef imported outside LIPC tender, the quota rents on frozen grain fed beef averaged ¥652/kg in 1983 and ¥1382/kg in 1986, while for frozen grass fed beef they were, respectively, ¥607/kg and ¥748/kg. Thus, a private trader, holding a quota specified in tonnes and able to choose which imports to buy, has an economic incentive to buy the more expensive cuts.

In recent years, under the 'simultaneous buying and selling' system, importers have had increased freedom to choose cuts. The relative sizes of quota rents would be expected, therefore, to play an increasingly important part in determining the overall pattern of import demand. In fact, the differences among the quota rents on beef imports are consistent with the observed changes in the pattern of imports under private quota. That is, it is likely that the structure of import demand by the private trade has been determined by the relative size of the quota rents.

Since quota rents arise from the elevation of wholesale prices relative to import prices, they act as taxes on beef consumers. Thus, the estimated total amount of rental income is a measure of the redistribution of income from Japanese consumers to quota owners, and the proportion of the retail price accounted for by the quota rent is a measure of the tax implicitly imposed on the consumers by the operation of the quota system. In 1986, for example, the quota tax was some 22 per cent of the retail price, for both high and low quality beef. For high quality beef this tax rate had doubled in three years. Thus, the transfer of incomes from beef consumers to the owners of import quotas has been increasing.

The role of diaphragm beef

The large rents available on beef imports create incentives to evade the quantitative controls. This appears to have occurred particularly through increased imports of diaphragm beef, which is classed as 'offal' and is not limited by quota.

Diaphragm beef from grain fed cattle can, in some uses, be substituted for certain cuts of grass fed frozen beef. The 'offal' imports within which diaphragm beef is included have expanded rapidly. In 1979 the United States exported 31 kt of 'offal' to Japan; by 1986 the figure had risen to 74kt. US exports of 'offal' are in fact larger than US beef exports to Japan under quota.

The pre-tariff import price of US diaphragm beef in 1986 was twice that of Australian frozen grass fed beef. As a

consequence of this, and because frozen grass fed beef is under quantitative restriction, this grass fed beef continues to earn a quota rent. Thus, the structure of Japanese beef import controls has ensured that a significant share of demand growth, which in the absence of quota limits could reasonably have been expected to go largely to Australian frozen beef, has been channelled to US diaphragm beef.

Conclusions

The major contribution of the study is to show how, in the controlled sector of the Japanese beef import market, the methods of quota allocation have effected changes in the composition of import supply. The LIPC quota has been altered to increase the proportion of grain fed imports. The LIPC imports of grain fed beef tend to be concentrated in the cheaper cuts, which are nevertheless more expensive at the import level than the grass fed beef imported under LIPC tender. At the wholesale level, however, these grain fed cuts sell for only a modest premium relative to grass fed cuts. In consequence, the rate of protection against imports (the ratio of wholesale to import price) is higher for lower priced than for higher priced beef. In particular, a higher implicit tariff is in general imposed on beef from Australia than on beef from the United States.

The different rates of protection for beef from alternative sources have, however, been associated with 'quota rents' (per kilogram) which are generally higher on higher priced beef. These quota rents — the profits accruing merely from the ownership of an import quota — give owners of private quotas a strong incentive to choose the beef with the highest rental return. Hence, such traders typically choose the more expensive cuts, which happen to be mainly grain fed beef sourced from the United States.

The argument advanced in this study is that the larger quota rents obtained by importing the more expensive beef are caused by the relatively small quota allocation to that sector of the market. The concentration of LIPC purchases in the cheaper cuts of grain fed beef allows the

rents on the more expensive cuts of grain fed beef to be higher than they might otherwise be. Rents on imports of frozen grass fed beef, in contrast, are constrained by the availability of diaphragm beef, which is a close substitute and is imported outside quota. The lack of any quota restriction on imports of diaphragm beef ensures that its import price (plus the 15 per cent tariff on such beef) acts as a ceiling on the rents available on cheaper beef.

Finally, from the analysis presented in this paper, it is clear that the structure and administration of the Japanese beef import system has encouraged a very substantial increase in the proportion of grain fed imports. While the import quotas are formally global in nature, the analysis shows that they have not resulted in uniformity of treatment between sources of imports. The implicit tariffs on imports from Australia are higher than on beef from the United States. Furthermore, the larger quota rents on high quality grain fed beef, due to LIPC activities and the availability of diaphragm beef outside quota at the cheaper end of the market, also favour the import of US beef.

Within the present general framework of import protection for the Japanese beef industry, the problem of different rates of protection on US and Australian beef could be effectively overcome only by removing import quotas altogether and replacing them with an *ad valorem* tariff. Such a tariff could be designed to give a level of protection similar to that currently achieved by quotas, but without the distortion of relative prices which gives rise to the higher rates of protection against Australian beef compared to that from the United States.

1. Introduction

Japanese agricultural policy, as it affects that country's beef industry, is designed to foster a relatively high degree of self-sufficiency in beef. Through the control of beef imports by quotas, it has been possible to maintain beef prices at high levels so as to encourage domestic production. This study focuses on aspects of the import control system and their effects on domestic supply and demand for beef and on beef imports.

The Japanese beef market has been extensively analysed over the years, with major studies by, for example, the BAE (1975, 1981), Longworth (1983) and Simpson, Yoshida, Miyazaki and Kada (1985). The present study extends this previous work in three major respects. First, a detailed decomposition of imports enables the nature of demand for beef in Japan to be analysed at a disaggregated level — distinguishing types and cuts — instead of only in aggregate. Second, an analysis is provided of the rates of protection on different types of beef from different countries of origin. Third, the profits an importer can earn merely from holding an import quota — the 'quota rent' — are calculated for beef from different sources.

Domestic beef is supplied from two broad types of cattle. Wagyu, the principal native breed, supplies the more expensive sectors of the market, of which 'kobe' or 'super' beef is the most expensive. The dairy herd is the other source of domestically produced beef. Imported beef comes mainly from Australia and the United States; Australian cattle are almost entirely grass fed, while the US product is predominantly from grain fed animals.

A major factor in the beef trade is the existence, since 1979, of bilateral beef import agreements between Japan and its major suppliers, the United States and Australia. Under its current agreement with the United States, Japan undertook to increase its imports of 'high quality' beef (from all sources) by 6.9 kt a year in the period 1984–85 to 1987–88. In this agreement, the definition of 'high quality' includes a specified period of grain feeding. The current agreement with Australia provides for total quota-limited beef imports (again, from all sources) to increase by 9 kt a year in the same four-year period (Coyle 1986, p.1).

The growth in the importance of US beef can be seen from table 1, which shows the imports of beef into Japan by country of supply for 1979 (when the bilateral agreements commenced) and 1986. It also shows the figures for 'offal', a category which (with some exceptions) is not limited by quota. Of the beef imports, it can be seen that whereas Australia supplied 77 per cent by volume in 1979, by 1986 this share had declined to 59 per cent, while the United States' share rose from 18 per cent to 35 per cent.

The trend toward sourcing more imports from the United States is, however, more pronounced than the figures for beef imports alone suggest. This is because they exclude diaphragm beef, which is classified as offal but is a substitute for some grades of Australian beef. Most imported diaphragm beef comes from the United States. From the figures in this table it is evident also that in 1986 (though not in 1979) the average import price of offal from each source was higher than the average price of beef from the same source. When beef and offal imports are combined, the Australian share of total imports in 1986 was lower than that of the United States.

Since beef imports from Australia are typically cheaper than those from the United States the erosion of Australia's share of the Japanese beef market is even more dramatic in value terms. Australia's share of the value of beef and offal imports into Japan fell from 56 per cent in 1979 to

1 Australian and US shares in Japanese imports of beef and 'offal'

Year c and source	Beef imports a		Offal imports b		Total	
	Shipped weight	Value d	Shipped weight	Value d	Shipped weight	Value d
	kt	¥b	kt	¥b	kt	¥b
1979						
Australia	100.4 (77)	63.6 (72)	10.7 (22)	6.4 (17)	111.1 (62)	70.0 (56)
United States	23.5 (18)	20.9 (24)	31.3 (65)	26.1 (72)	54.9 (31)	47.0 (38)
Other	5.7 (5)	4.3 (5)	6.4 (13)	3.9 (11)	12.1 (7)	8.2 (7)
Total	129.7	88.8	48.5	36.4	178.1	125.2
1986						
Australia	105.2 (59)	47.4 (51)	7.2 (8)	3.9 (6)	112.3 (42)	51.2 (32)
United States	63.4 (35)	40.3 (43)	74.3 (84)	57.2 (88)	137.7 (51)	97.5 (61)
Other	10.5 (6)	5.7 (6)	7.2 (8)	4.1 (6)	17.7 (7)	9.8 (6)
Total	179.1	93.4	88.7	65.2	267.8	158.6

a Import categories 02.01-111, 02.01-119, 02.01-121 and 02.01-129. b Import categories 02.01-131 and 02.01-139. c Trade statistics. d Pre-tariff import values.
Note: Figures in parentheses are percentage shares.
Source: Japan Tariff Association (1986).

32 per cent in 1986, with the share of the United States rising from 38 per cent to 61 per cent. Thus, in value terms, Australia's share of the Japanese beef market is now approximately half that of the United States.

The objective of the study was to determine why there has been this marked shift in the composition of Japanese imports from Australian toward US beef. Two, markedly different, explanations have been advanced for the decline in the Australian share of the Japanese beef market. The first is that put forward by authors such as Simpson and Farris (1982, p.239), who regard the growth in US beef exports as the result of increasing Japanese demand for high quality (hence, grain fed) beef. The second explanation, advanced by George (1983, 1984) and Mori and Gorman (1984), is that the growing US share of the Japanese market is a deliberate policy goal resulting from political pressure by the United States, rather than a consequence of Japanese consumers' preferences for grain fed beef.

To assess the validity of these explanations, it was first necessary to gain some familiarity with the framework within which the Japanese beef import system operates. Thus, in chapter 2, the price stabilisation objective underlying beef policy is explained and the organisation of import quotas is examined, as a background to the subsequent analysis.

In chapter 3, the analysis of the detailed import data is reported and the nature of beef demand in Japan examined. In particular, the question whether imported grain fed and grass fed beef fit into different segments of the Japanese market is addressed.

The role of import controls as a protective device is examined in chapter 4. Estimates of the implicit rates of protection against imported beef are presented, and the extent of the 'rents' accruing to quota holders is assessed. The 'tax' on Japanese consumers (in the form of increased prices) due to the operation of the beef import controls, and the role of quotas in stimulating demand for diaphragm beef (not subject to quota limits), are also examined in this chapter.

2. Japanese beef policy and imports

The main policy instrument used in regulating the beef market is import quotas, the setting of which is linked to a scheme for domestic price stabilisation. The operation and development of the quota system is examined in this chapter.

2.1 The price stabilisation policy

The intention of Japanese beef policy is to support incomes of beef producers by stabilising beef prices. This stabilisation objective is specified by the setting of upper and lower bounds for both wagyu and dairy beef wholesale prices.

Figures A and B show the price stabilisation bands and the actual prices for dairy and wagyu beef, respectively. Since the inception of the scheme in 1975 neither price has approached the floor, but both have exceeded the ceiling and the price of wagyu beef has been close to or above the ceiling for most of the 1980s. Although prices of both wagyu and dairy beef have risen since 1984, the dairy stabilisation band has been lowered.

The major policy instrument whereby the Japanese authorities influence these

prices is the quota limits on beef imports. Beef imports are also subject to a 25 per cent tariff, but (as will be shown in chapter 4) wholesale prices are in fact dictated by the effects of the quota limits on supply, and thus are not influenced by the tariff.

2.2 Japan's beef import arrangements

Longworth (1983, p.41) notes that between 1964 and 1972 the number of agricultural imports (including forestry and fisheries products) on which Japan imposed quotas was reduced from 103 to 26. Beef was one of the commodities that remained subject to quota control; indeed, policy on beef has moved counter to the general trend to liberalisation. From 1954 to 1957 beef imports were uncontrolled; between 1958 and 1964 beef imports were controlled in terms of value; and in 1964 beef became subject to the present (volume) import quota system. Since 1964 the system of quantitative controls on beef imports has grown steadily more complicated.

The Livestock Industry Promotion Corporation (LIPC), the organisation

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A Wholesale price and stabilisation band: dairy beef

ABARE chart

(Medium grade dairy steer)
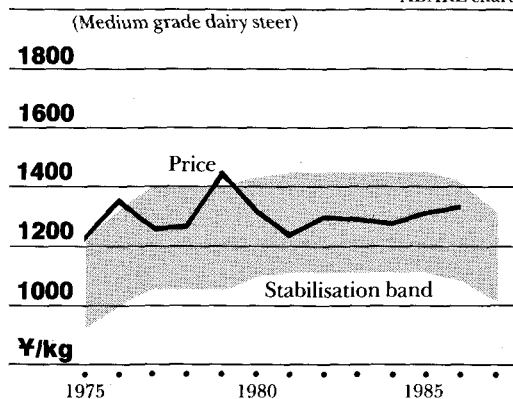
B Wholesale price and stabilisation band: wagyu beef

ABARE chart

(Medium grade wagyu steer)
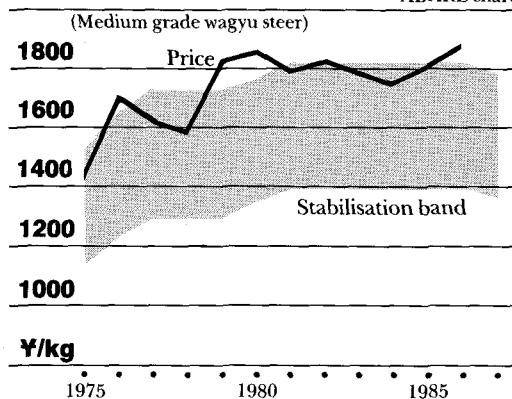
responsible for stabilising beef prices, has exercised increasing control within a complex range of quota categories and arrangements. Although the LIPC was established in December 1961 it did not become involved with beef until 1966. Since 1975 the LIPC has been empowered to buy and sell both imported and domestic beef with the objective of stabilising prices.

A breakdown of Japanese beef import quotas into their component parts for the period since 1960 is given in table 2. Within the global quota, any country is allowed to supply beef provided it meets certain health requirements. The global quota is initially divided between a general quota (about 90 per cent) and various special quotas which are allocated to specific organisations (about 10 per cent). The general quota is then divided between the LIPC and private importers. The LIPC's share of the general quota is approximately (in recent years, exactly) 90 per cent. Thus, the LIPC is responsible for about 80 per cent of the imports governed by quota. The 'high quality' quota shown in the table is not an additional quota category. Rather, it results from a governmental undertaking that, within the global quotas, Japan will import the

2 Japan's beef import quotas a

Japan fiscal year b	General			Special					Grand total	High quality c
	LIPC	Private	Total	Hotel	School lunch	Okinawa	Boiled and canned	Demand develop- ment		
	t	t	t	t	t	t	t	t	t	t
1960	–	4 200	4 200	–	–	–	–	–	4 200	–
1961	–	3 000	3 000	–	–	–	–	–	3 000	–
1962	–	3 000	3 000	–	–	–	–	–	3 000	–
1963	–	5 000	5 000	–	–	–	–	–	5 000	–
1964	–	3 000	3 000	–	–	–	–	–	3 000	–
1965	600	9 500	10 100	–	–	–	–	–	10 100	–
1966	5 000	5 000	10 000	–	–	–	–	–	10 000	–
1967	6 000	13 000	19 000	–	–	–	–	–	19 000	–
1968	2 738	18 000	20 738	–	–	–	700	–	21 438	–
1969	5 000	17 000	22 000	500	–	–	700	–	23 200	–
1970	12 000	12 200	24 200	500	–	–	700	–	25 400	–
1971	22 000	14 000	36 000	500	–	–	700	–	37 200	–
1972	57 500	14 000	71 500	1 000	–	4 330	1 000	–	77 830	–
1973	146 000	14 000	160 000	1 000	–	6 455	2 000	–	169 455	–
1974	0	0	0	0	–	5 650	0	–	55 650	–
1975	69 900	5 100	75 000	1 000	1 000	5 500	2 500	–	85 000	–
1976	71 000	9 000	80 000	1 000	3 000	5 500	7 000	–	96 500	–
1977	73 000	7 000	80 000	2 000	2 200	5 200	3 100	–	92 500	–
1978	86 500	8 500	95 000	3 000	3 000	5 600	5 400	–	112 000	–
1979	105 600	10 900	116 500	3 000	2 500	5 806	6 700	–	134 500	16 800
1980	106 800	12 200	119 000	3 000	2 250	5 850	4 700	–	134 800	20 800
1981	99 900	11 100	111 000	3 000	2 250	5 850	4 700	–	126 800	24 100
1982	107 280	11 920	119 200	3 000	2 250	5 800	4 700	–	135 000	27 400
1983	112 680	12 520	125 200	3 000	2 250	5 850	4 700	–	141 000	38 800
1984	119 880	13 320	133 200	4 000	2 250	5 850	4 700	–	150 000	37 700
1985	127 260	14 140	141 400	4 000	2 250	5 850	4 700	800	159 000	44 600
1986	134 460	14 940	149 400	4 000	2 250	6 050	4 500	1 800	168 000	51 500
1987									214 000	na

a The figures are announced quotas, not actual imports. b April of the year indicated to March of the year following. c Defined as cattle at least 30 months old which have, for at least 100 days prior to slaughter, received a 'balanced diet' including at least 70 per cent grain. na Not available.
Sources: Coyle (1986, appendix table 4 and table 1); Johnson (1987).

specified amount of 'high quality' beef, in the sense used in the agreement with the United States (see footnote to table 2).

An important distinction within both the general and special quotas given in table 2 is between frozen and chilled beef. Chilled beef is supplied mainly by Australia, and comprised 26 per cent of imports in 1985. Some of the beef which enters Japan as chilled beef is classed as frozen beef by the LIPC: this is, what in Japan is termed 'aged beef'. It is chilled beef which is snap frozen on arrival. A commitment regarding the expansion of this beef is included in the Australia–Japan bilateral agreement (Johnson 1987, p.4). This treatment of aged beef is one example of changes to the system whereby various subcategories have been created within the formal quotas as shown in table 2.

The LIPC imports and sells its share of the quota mainly by four different methods, which vary in the amount of freedom of choice delegated to others; they are set out by Johnson (1987). (There is a fifth, the 'quota for international co-operation', but this is of no quantitative significance.) The first is LIPC purchase, by tender, of frozen beef of closely specified characteristics. This 'LIPC frozen tender' segment — as it will be termed in this report — includes aged beef. Some of this beef is sold by auction. These auction sales are the source of the wholesale price data used in this study, and hence of the estimates of rates of protection by cut. (Auction sale is only one means of disposing of LIPC's tendered beef; others include resale by tender and resale at set price.)

The second method by which the LIPC can dispose of its quota is by 'one touch' purchase and resale. The term 'one touch' refers to the fact that authorised importers sell directly to designated distributors, with the LIPC only supervising the transaction (on which it collects a levy). This system, which applies to chilled beef, is discussed by Longworth (1983, pp.185–6). The system has been changed several times since its inception in 1970. Currently the 'one touch' system supplies meat only to an LIPC promotion scheme termed the 'designated stores' program. (This

program is also entitled to purchase frozen beef, via other routes.)

The third method of disposal by the LIPC of its quota, which also is used largely for chilled beef, is purchase and resale by set price tender. The fourth method is the 'simultaneous buying and selling system'. This method is by far the most important recent development of the import control system, and is described more fully in the next section.

2.3 Recent developments in quota controls

In the 'simultaneous buying and selling' system, which was introduced in the second half of the 1984 Japanese financial year, importing agents are able to negotiate directly with overseas suppliers with respect to the type of beef they require, its price, the quantity to be imported, and specifications such as packaging. One of the stated objectives of the system was to provide greater responsiveness to buyer demand. At present the system is applied to 10 per cent of the total LIPC quota (Australian Meat and Live-stock Corporation 1985) — that is, about 8 per cent of the global quota.

The administration of the simultaneous buying and selling system is extremely complex. Bids for tonnages of the quota are put in 'simultaneously' by foreign suppliers and by specific importers and 'end users' (wholesalers) designated by the LIPC. Although the way in which the quota is allocated among the bidders is not clear, the LIPC has indicated that it decides between competing bids in a two-stage process. In the first stage, it rejects any bids that are not consistent with a pre-set, but unannounced, price band. This price band is defined by a maximum price for the purchase of beef from importers and a minimum price for its sale to the user organisations. The difference between these prices (which are essentially for the same transaction) is an implicit levy by the LIPC. In the second stage (if it is necessary), bids are awarded in descending order, commencing with the highest purchase price offered by an end user.

There is some doubt about whether such an allocation process is necessary, as there appear to be restrictions which ensure that entitlements to bid are actually limited to the extent of the quota. The extent of restrictions on the right to bid will clearly influence the excess profits or 'rents' accruing to those who obtain quotas (see next section). As will be shown in chapter 4, there is considerable indirect evidence that rights to bid for entitlements to import are highly restricted: the rents available on high priced beef prove to be large relative to the implicit levy imposed by the LIPC.

The simultaneous buying and selling system is not the only recent innovation in the quota system. Since 1985 a new special quota termed a 'demand development' quota has been introduced, to provide imported beef to specified outlets. The rationale advanced by the Japanese authorities for this quota has been that it is necessary to improve consumer perception of imported beef, which is alleged to be seen by consumers as greatly inferior to domestic beef. This quota, which amounted to only 1800 t in 1986, has been dominated by grain fed beef, ostensibly because only high quality beef is seen to be worth promoting if consumer perceptions regarding imported beef are to be improved. (Thus the Japanese authorities argue, on the one hand, that imported beef requires promotion due to adverse consumer perceptions and, on the other, that demand for it is such that strict quotas must be maintained to prevent erosion of domestic prices.)

2.4 Economic effects of quotas and levies

The use of quotas, rather than tariffs, to protect domestic prices has important implications for the structure of the import market.

First, a quota, if it remains fixed, has the effect that any increase in demand will increase domestic prices, and hence domestic supply. Second, from the consumer's standpoint the increase in price is a tax; in the absence of the quota, the difference between import and wholesale price would simply be transport costs within the importing country. Third, there are effects on the mix of imports.

Under free trade, domestic and world prices equalise, but a protective system drives a wedge between them. Where quota limits are used, the difference between the domestic price and the price paid by importers is referred to as the 'quota rent' accruing to the importers. The distribution of this rent among beef market participants depends on their relative degrees of control over the amounts and kinds of beef they can import. The extent of the LIPC's control of its import quota differs according to the importing mechanism used. Beef imported under the tender system is wholly under LIPC control, whereas under the 'simultaneous buying and selling' system LIPC influence is exercised only indirectly.

Where the LIPC completely controls imports, it can itself gain the full quota rent. If others are authorised to import, then the benefits will accrue to them, less any 'taxation'. There are three forms of taxation on imports which strongly influence income distribution to, and among, importers. The first is the 25 per cent tariff; the second is any levy imposed on importers; and the third is the levy implicit in the operation of the simultaneous buying and selling system described in the previous section. The tariff ensures that some of the income gain from importing accrues to the Japanese government. The effect of the levies is more complicated.

The LIPC currently collects fixed levies on beef imported under the 'one touch' system for the designated stores program. Longworth (1983, p.199) has argued that since these levies do not depend on quality, they provide an incentive for participants in the program to import higher quality beef, as the levy then constitutes a smaller impost relative to turnover.

Levies are imposed also by a trade association, the Japanese Meat Conference (JMC), which is empowered to collect levies on beef imported under the general private quota and certain special quotas (Longworth 1983, p.203). Longworth argues that these levies too, since they are not *ad valorem*, tend to encourage

importers to seek high quality beef. In a similar vein, George (1984, p.33) has argued that 'the levies set by the JMC ... have been imposed in such a way that wholesalers can extract greater profits from importing the higher value grain fed beef cuts from the United States rather than chilled grass fed full sets from Australia'.

The argument advanced here by both Longworth and George is that the importer will choose that cut for which the levy is the smallest impost relative to the price of the cut. However, it can be argued that the importer will try not merely to minimise relative taxation but to maximise total rental return after tax. If levies are set so that they alter the relative returns to the importer from different cuts (that is, so that the rents on them net of the levy are ranked differently from their rents gross of the levy) then the levies will affect the choice of imports. This effect does not depend simply on whether or not the levies are *ad valorem*. Note that such rent seeking behaviour in the selection of imports can occur only to the extent that importers have freedom of choice: that is, it will be characteristic of private traders operating outside the LIPC 'frozen tender' system.

Thus, quota rents provide income to the owners of the quotas, and their relative sizes may influence the relative demands for different imports. They also act as taxes on consumers of beef. All these aspects of rents are considered in chapter 4, which provides data on total rental incomes, the relative sizes of rents and the implicit tax imposed on beef consumers.

3. Demand for imported beef in Japan

Three issues are examined in this chapter. The first is how imports fit into the structure of beef demand in Japan. In particular the question is posed whether imports of grain fed and of grass fed beef contribute to different domestic market sectors. The second issue considered is whether the pattern of demand is such as to explain the growth in grain fed beef imports. Third, the analysis of beef demand employed here is evaluated in the light of the observation that there is a wide range of qualities of beef available in Japan.

3.1 Structure of demand for beef in Japan

It has frequently been stated that the domestic Japanese beef market can be divided into several distinct segments. The Bureau (BAE 1975, pp.34–5; see also BAE 1981, p.88) has argued that it is useful to distinguish three broad categories of demand for beef in Japan: 'a fairly restricted, very high priced and prestigious segment; a large middle area representing the more general or popular demand for table beef and covering a wide spectrum of qualities; and a very substantial demand for lower priced cuts and qualities for use in processed meat products and cheaper butchers' lines'.

A very similar analysis of how the beef market is segmented is given by Longworth (1983, pp.18–21). He argues that the middle segment, traditionally termed the 'popular beef' trade, is the one that has grown most rapidly since the early 1970s. Further, 'since about 1980, the "popular" beef market seems to have split into two different but overlapping sub-markets. The upper end of the "popular beef" trade is now referred to as the "high quality beef" or "HQ" market while the lower quality sub-market has retained the "popular beef" label.' Longworth argues

that the import trade in grain fed beef from the United States contributes to the 'high quality' market segment.

Longworth (1983, p.19) argues that demand for 'kobe beef' or 'super beef', which is at the top end of the Japanese market, should be relatively insensitive to changes in its price but highly sensitive (in the long run) to income changes. At the other end of the quality spectrum, demand for processing beef (which is about 30 per cent of all beef consumed in Japan) has been relatively sensitive to income in the past, he states, but can be expected to become less so as real incomes rise. Furthermore, Longworth argues that demand for processing beef should be highly sensitive to changes in its own price and in the prices of substitute foods. The remaining, 'popular' market segment should be relatively sensitive both to price and to income changes.

Broadly, the market segmentation hypothesis advanced by the BAE (1975, 1981) and Longworth (1983) can be characterised as asserting that there is an inverse relationship between the price (that is, quality) of a type of beef and the sensitivity of demand for it to changes in its price; and that there is a positive relationship between quality and the sensitivity of demand to changes in the income of consumers. This interpretation of the beef market clearly opens up the possibility that, as Japanese incomes rise, the growing proportion of US imports can be explained by the higher dependence of this demand growth on income changes, relative to the lower quality Australian beef.

3.2 Changes in import composition

If it is true that imported grain fed beef (almost all from the United States) is of higher quality than imported grass fed

3   Wholesale prices and quantities of imported beef in Japan, by category a

Category of beef	Wholesale price				Quantity b			
	1983	1984	1985	1986	1983	1984	1985	1986
	¥/kg	¥/kg	¥/kg	¥/kg	t	t	t	t
Chilled (including aged)	1 714	1 720	1 705	1 761	38 985	39 364	41 353	46 724
Imported under LIPC tender								
Frozen grain fed	1 250	1 161	1 315	1 211	26 098	29 612	27 914	35 898
Frozen grass fed								
(excluding aged)	1 038	1 154	1 169	1 100	40 684	42 724	41 835	48 582
Imported outside LIPC tender								
Frozen grain fed	2 722	2 610	2 774	2 713	9 927	11 069	16 508	23 970
Frozen grass fed	1 744	1 883	1 843	1 552	21 187	22 031	22 082	22 407
All grain fed	1 656	1 555	1 857	1 812	36 025	40 681	44 422	59 868
All grass fed	1 448	1 522	1 521	1 448	100 856	104 119	105 268	117 713
Total	1 503	1 531	1 621	1 571	136 881	144 800	149 690	177 581

a Derivation explained in appendix A. b Boneless basis.

beef (mainly from Australia and New Zealand), it would be reasonable to expect that at the retail, and hence wholesale, market level in Japan, the former would be more expensive than the latter. In order to assess whether this is in fact the case, quality price differentials were examined, both at the level of different cuts and by comparing prices of grass fed with grain fed beef.

Table 3 shows wholesale prices of all imported beef, and the quantities imported, for the years 1983 to 1986. The sources of the data and the manner of calculation of the wholesale prices are given in appendix A.

Chilled imports have been distinguished from frozen imports. The chilled imports here include what the Japanese term 'aged beef' (see section 2.2), which is here excluded from the 'LIPC tender' figures. Within the frozen beef category two distinctions are made. First, grain fed beef is separated from grass fed; second, a distinction is made between beef imported under the LIPC frozen tender and other beef. The latter includes both other beef imported via the LIPC and beef imported by private traders under the special quotas.

The distinction between LIPC tender and other frozen beef is made for two reasons. The first is that wholesale data are available directly only for LIPC tenders. The second is that rent seeking by private traders and owners of 'simultaneous buying and selling' quotas is possible only outside the LIPC tender mechanism. Thus, when rents are discussed in the following chapter, the distinction between LIPC tender and other beef is of importance.

The questions considered in this section are how import composition has been changing and whether grain fed imports compete in a higher priced segment than grass fed imports. It is seen that between 1983 and 1985 total imports increased by 12.8 kt, of which 8.4 kt (approximately 65 per cent) was grain fed. In 1986 beef imports jumped a further 28 kt, an amount much larger than intended under the bilateral trade agreements with the United States and Australia. This market growth appears to have occurred mainly in the cheaper types of imports.

It is apparent from the wholesale price data presented in table 3 that the distinction between LIPC tendered and other beef is important. In LIPC tenders, grain and grass fed beef are very similarly priced products. Both sell for less than Australian chilled beef. Part of this difference is due to the premium earned by chilled relative to a frozen product. It is

possible to assess this premium by comparing the wholesale price of chilled beef with that of 'aged beef', as the only difference in that case is the premium available on a chilled product relative to a frozen one. Such prices are available from *Chikusan Nippo* (Livestock Daily) and indicate that in 1985 the premium was 10 per cent — a correction that is applied in the subsequent analysis.

Beef imported outside the LIPC frozen tender is more expensive than that under the tender. For grain fed beef the price ratio is more than 2:1. Thus, grain fed imports outside of tender can reasonably be viewed as contributing to the high priced section of the domestic market. Though the quantity of grain fed beef imported outside tender, as a proportion of total imports, doubled between 1983 and 1986, it still constituted only 13 per cent of imports in the latter year.

3.3 Demand for beef in Japan

The sensitivity of the demand for beef to changes in consumer incomes or in price (either of beef or of any substitute food) can be measured as an 'elasticity'. For example, the own-price elasticity of demand is the percentage change in consumption which occurs when the product's own price changes by 1 per cent. The variation of consumption with the price of a substitute food is termed a cross-price elasticity.

In this section and in appendix B, new measurements of the price and income elasticities of Japanese demand for beef are reported. There are two types of data that can be used: final consumption data, such as that used in the studies surveyed by Coyle (1983) and Saxon (1975); and data on production and imports. The second set of data is essential for estimating disaggregated demand functions and testing hypotheses about the relationship between income and price elasticities of demand for beef in high and low priced segments of the market.

Most previous empirical work on the demand for beef in Japan has treated beef in aggregate. Details of these studies and

some reasons for the large range of results that have been obtained are given in appendix B, where it is concluded that if an aggregate specification is used the evidence suggests a price elasticity of about −1, and an elasticity with respect to aggregate consumption expenditure (a convenient income measure) of 1.3.

It can be hypothesised that such an aggregate specification conceals significantly different price and income elasticities at the disaggregated level. The appendix reports some analysis undertaken as part of this study, in which price and income elasticities of demand were estimated for two broad quality segments of the domestic Japanese beef market, distinguished on the basis of price. In disaggregating the market, all imported beef, except that imported from the United States outside the LIPC frozen tender system, was treated as 'low quality' in the sense that it sells in the wholesale market at prices similar to (at most) that of second grade dairy steer. Imports of offal were also included in this category. Wagyu production plus US beef imported outside the LIPC frozen tender comprised the 'high quality' segment of the market. (*Grain fed beef imported outside of LIPC tender sells at an average price intermediate between 'medium' and 'excellent' grade wagyu — that is, close to the mid-point of the Japanese grading scale for that type of beef.*) In figure C the consumption of low and high quality beef

C **Consumption of low and high quality beef per person**

ABARE chart

(Boneless weight)

Occasional paper 102
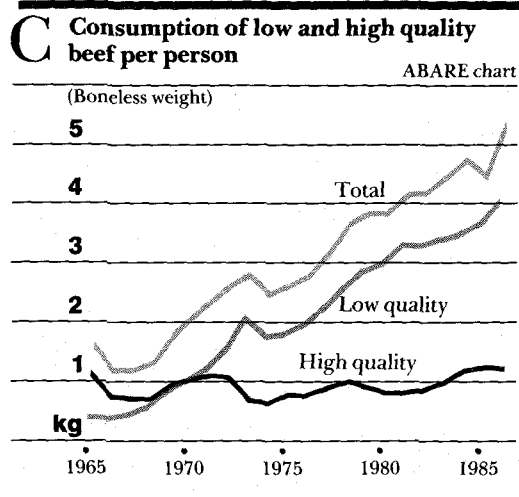
per person is shown. Retail prices for these categories are shown in figure D.

The retail prices used for low and high quality beef were, respectively, the official retail price series for beef given by the Ministry of Agriculture, Forestry and Fisheries (1986) and a retail price series for loin and strip loin (Bureau of Statistics 1985). The official retail price series is described by LIPC (1986) as the prices for 'medium' quality cuts prior to January 1985, and for shoulder clod from then onwards. The use of this series to represent prices of low quality beef can be justified on the ground that the beef cut referred to in the Ministry definition is well within the definition of low quality beef used in this study. The price series for high quality beef is for one cut only, and therefore may not be representative. However, this is the only high quality retail price series — indeed, the only other retail price series of any kind — that is available.

The results reported in appendix B for the disaggregate demand functions (table 13, equations 2 and 3) give statistically satisfactory results for price and income elasticities of demand for low quality beef but not for high quality. As discussed in appendix B, this may be due to problems in measuring retail prices. In terms of the overall ranking of the demand elasticities, however, the results obtained here with retail prices are consistent with other estimates. Wahl, Hayes and Williams (1987) used wholesale based prices for low

and high quality beef to estimate a demand system. They found, just as was found here, that the income elasticity of demand for low quality beef was above that for high quality beef.

Figure C shows that consumption growth has been concentrated in the low quality sector of the market. Over the past twenty years, as incomes have risen, the consumption of high quality beef per person has increased only slightly. It is apparent from figure D that the real price of beef has generally been falling since 1976. If the demand for high quality beef had been rapidly increasing — as is often suggested — then, given the static supply, one would expect an evident sustained rise in its real price over the whole period.

3.4 High and low quality beef in Japan

In the previous section it was shown that neither the data nor econometric estimates provide any support for the notion that demand for high quality beef in Japan has a higher income elasticity than low quality beef. In fact demand growth has been concentrated in the low quality sector, where the income elasticity is estimated to be around 2.4, which is appreciably higher than the corresponding elasticity for beef demand as a whole (1.3) (table 13 in appendix B).

It might be argued that these findings fail to capture important distinctions within the Japanese market and are therefore misleading. For example, Longworth (1983, pp.12–14) argued that one of the distinctive features of beef consumption in Japan is the substitution of some better quality dairy beef cuts for wagyu. Thus it might be argued that it is an error to employ wagyu production as a measure of 'wagyu consumption', as has been done here. Much more 'wagyu' can be consumed at retail than is produced, if certain cuts from the best dairy steer carcasses and some imported US cuts are presented to the consumer as 'wagyu beef'. Likewise, some imported chilled cuts from Australia might be sold as 'dairy steer beef' — the Australian meat being regarded as indistinguishable from the domestic

D **Real retail prices for beef in Japan**

ABARE chart
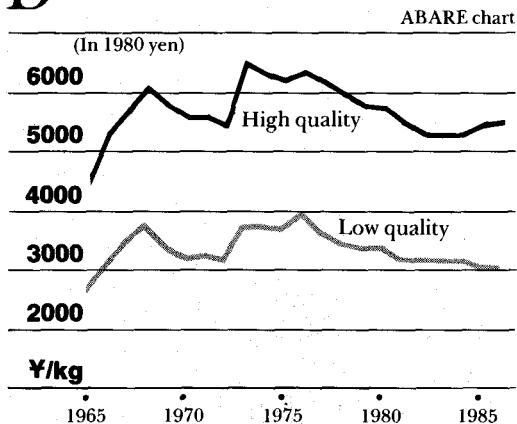
product when presented as thinly sliced beef in a butcher's shop or as a steak in a restaurant.

However, if imported chilled beef can substitute for the better dairy steer beef while the best of the dairy steer can substitute for wagyu, the implication is not that finer distinctions should be made but, on the contrary, that distinctive sectors of the domestic market do not exist: that there is a continuous spectrum of beef quality.

Assertions of the importance of disaggregation may be taken as implying that an aggregate beef demand equation cannot adequately explain the data. As shown in appendix B, this is not the case; the disaggregate equations perform no better than the aggregate ones. (It remains to be seen, of course, whether different disaggregations might have greater explanatory power, but the work reported here employed the only quality distinctions that can in practice be made using presently available data.)

Indeed, attempts to take full account of the range of various quality segments within the Japanese beef market may distract attention from the behaviour of the bulk of the market. For example, in table 3 the wholesale prices of beef imports in 1986 are shown to range from ¥1100/kg to ¥2713/kg. However, this large range hides the fact that 87 per cent of imported beef was wholesaled at prices between ¥1100/kg and ¥1585/kg (if chilled beef

prices are adjusted by 10 per cent to make them comparable with those of the frozen product — see section 3.2 above). Thus, nearly all imports competed within quite a small price range.

The importance of quality differentials as influences on beef carcass prices in Japan has been investigated by Jarratt and Longworth (1987). The major finding of their paper is that the most important factors explaining price differentials are grade (there are six grades, based on eight characteristics), breed and sex. However, whereas nearly 90 per cent of the variation of wagyu carcass prices was explained by these authors' models, only about 60 per cent of the variation of dairy carcass prices was thus explained. Only two grade characteristics (marbling and texture) had a significant influence on dairy carcass prices. Thus, whereas quality characteristics are of evident importance in the wagyu sector, this is less clear in the dairy sector, which is the sector of the market which has expanded most rapidly between 1976 and 1986 (figure E). While total supply of beef rose from 438 kt to 830 kt (carcass weight), 51 per cent of this increase was dairy beef and only 16 per cent wagyu beef.

An analysis of beef imports might in principle be undertaken with greater discrimination of quality than has been done here. Such an analysis, however, is not practicable given current data limitations, and the above discussion

E **Japanese beef consumption, by category**

(Carcass weight)

ABARE chart

1976: 438 kt

Wagyu 131 kt
Imports 136 kt
Other 7 kt
US frozen 10 kt
Chilled 60 kt
Australian frozen 59 kt
Dairy **a** 171 kt

1986: 830 kt

Wagyu 195 kt
Other 14 kt
Imports 263 kt
US frozen 90 kt
Chilled 69 kt
Australian frozen 90 kt
Dairy **a** 372 kt

a Domestic beef other than wagyu.
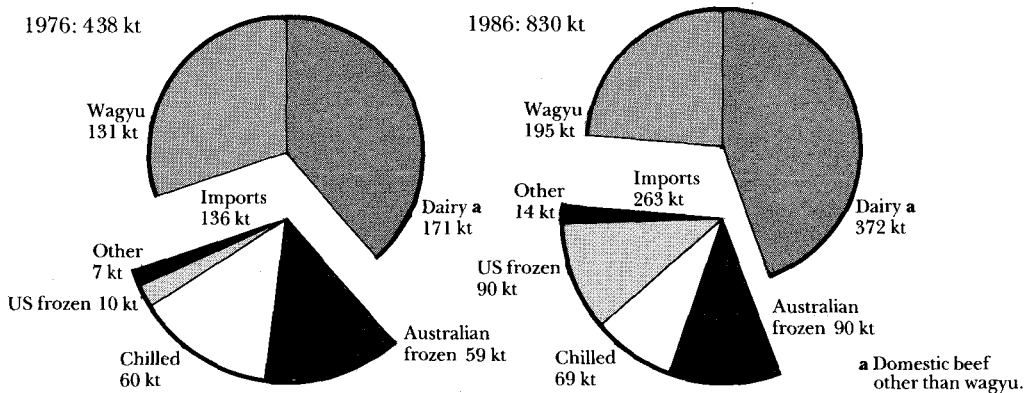
suggests that it might not be justified in relation to the most significant imports. It would be unlikely to improve understanding of the central relationship between maintenance of domestic prices at relatively high levels and the limitation of import growth. The observed high income elasticity of demand implies that imports would have expanded very rapidly if quota limits had not instead ensured prices sufficiently high to induce a rapid expansion of domestic beef output. Such high prices reflect the relatively high costs of producing beef domestically.

4. Import controls as a protective device

When quotas, rather than tariffs, are used to protect against imports, the extent and distribution of the resulting protection are not self-evident. The intention in this chapter is to show the nature of the protective system established by Japan against beef imports. One respect in which a quota control system differs from a uniform tariff is that it can be operated so as to constitute in effect a discriminatory tariff regime. The rates of protection estimated in this study indicate that this has been the result of the Japanese quota system.

The quota system was outlined earlier, in chapter 2; here, its effects are set out in detail. The implicit rates of protection imposed on imported beef of various prices are documented, as are the quota rents associated with these rates of protection, the total rental incomes in different segments of the import market, and the magnitudes of the taxes thus imposed on consumers of different qualities of beef. Finally, the way in which the quotas generate demand for diaphragm beef is examined.

4.1 Rates of protection

Previous analysis of the rate of protection has focused either on the market in aggregate (Anderson, Hayami, Honma, Saxon and Shei 1986) or on specific segments of the market such as chilled beef (Longworth 1983, p.197). An extension of this earlier work, in which the rate of protection is considered at a more disaggregate level, is presented in this section.

The data used and calculations of the 'tariff equivalent' rates of protection on cuts of beef imported into Japan under the LIPC frozen tender can be found in appendix A. Figure F, derived from that work, shows how the rate of protection varies with the (pre-tariff) import price of beef. It is apparent that rates of protection

4 Prices and rates of protection of imported beef in Japan, by category a

Category of beef	Import price (pre-tariff)				Rate of protection b			
	1983 ¥/kg	1984 ¥/kg	1985 ¥/kg	1986 ¥/kg	1983 ratio	1984 ratio	1985 ratio	1986 ratio
Chilled (including aged)	863	821	767	564	1.986	2.095	2.223	3.122
Imported under LIPC tender								
Frozen grain fed	642	559	592	378	1.947	2.077	2.221	3.204
Frozen grass fed (excluding aged)	507	484	410	298	2.047	2.384	2.851	3.691
Imported outside LIPC tender								
Frozen grain fed	1 625	1 688	1 520	1 044	1.675	1.546	1.825	2.599
Frozen grass fed	878	899	921	622	1.986	2.095	2.001	2.495
All grain fed	913	866	937	645	1.814	1.796	1.982	2.809
All grass fed	723	699	657	465	2.003	2.177	2.315	3.114
Total beef	773	746	740	526	1.944	2.052	2.191	2.987

a Derivation explained in appendix A. b Ratio of wholesale price to import price.

F Rates of protection and import prices for grass and grain fed beef, 1983–1986

Protection rate (ratio of wholesale to import price)   ABARE chart
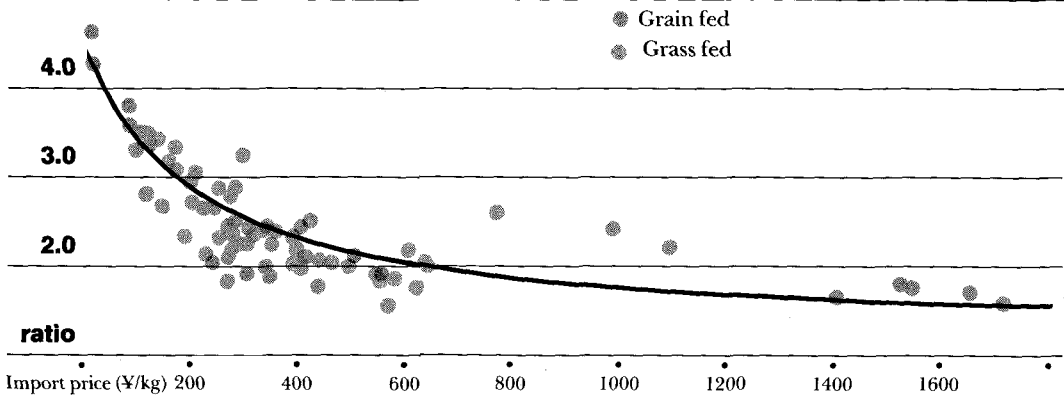
Import price (¥/kg)

against beef imports are higher the lower the import price of the beef. Analysis of this relationship (see appendix C) shows that a 10 per cent rise (fall) in the import price is associated with a 5 per cent fall (rise) in the rate of protection. Rates of protection can vary from as high as 360 per cent to as low as 50 per cent.

One consequence of this relationship is that rates of protection vary depending on whether the beef is grass fed or grain fed. Using the same classification as in table 3, the results presented in table 4 show a higher rate of protection against grass fed beef than against grain fed beef in each year. Given that grain fed beef is nearly all imported from the United States, and that Australia dominates in the supply of grass fed beef, it is evident that a higher tariff equivalent rate of protection is imposed on beef from Australia than on beef from the United States.

The observation that different rates of protection apply to Australian and US beef is not new. The findings of Mori and Gorman (1985, table 1) are reproduced in table 5. The similarity in the results between tables 4 and 5 is striking. Combined, these tables show the extent of the implicitly discriminatory tariffs imposed against Australian beef since 1980.

Tables 4 and 5 show the rate of protection over a relatively short period. The variations of the rates of protection over a longer period can be estimated by comparing imputed wholesale prices of

imported beef with the known import prices for the same meat. Past wholesale prices for beef imported under the frozen tender and for chilled imports were imputed by assuming they averaged 73 per cent of second grade dairy steer beef prices (the average ratio observed in recent years). As can be seen from figure G, the estimated rates of protection of Japanese dairy beef against competing imports have been highly variable in the period from 1965.

Such a high degree of variability in protection is to be expected from a system of import quotas in which one of the objectives is to stabilise domestic prices. The fall and subsequent levelling in the estimated rate of protection from 1977 to

G Estimated rate of protection of 'dairy' beef

ABARE chart

(Ratio of imputed wholesale price to import price)
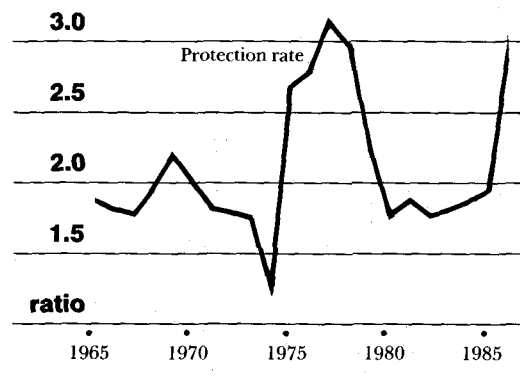
Prices and rates of protection of imported beef in Japan, by source

Category and source	Item	Unit	1980	1981	1982
Frozen					
Australia	Wholesale price a	¥/kg	1 364.6	1 196.1	1 153.0
	Landed price b	¥/kg	869.8	797.4	834.6
	Difference	¥/kg	494.8	398.7	318.4
	Rate of protection c	ratio	2.1	2.0	1.9
United States	Wholesale price a	¥/kg	1 614.6	1 375.9	1 460.5
	Landed price b	¥/kg	1 264.7	1 089.1	1 312.2
	Difference	¥/kg	349.9	286.8	148.3
	Rate of protection c	ratio	1.7	1.7	1.5
Chilled					
All	Wholesale price a	¥/kg	1 779.5	1 750.3	1 702.1
	Landed price b	¥/kg	1 219.7	1 050.2	1 125.6
	Difference	¥/kg	559.8	700.1	576.5
	Rate of protection c	ratio	2.0	2.2	2.0

a Weighted average of 'purveyor's prices', Kanto area, by estimated proportions of various primal cuts imported, according to *Chikusan Nippo* (Livestock Daily). b Average cif import price × 1.35 (25 per cent tariff plus 10 per cent import charges etc.). c Ratio of wholesale price to cif import price.
Source: Mori and Gorman (1985, table 1), converted to ¥/kg, with calculated rates of protection added.

1985 accords with initially falling, then stable, domestic prices combined with rising import prices (partly due to the sourcing of imports from a higher priced exporter). The substantial rise in the rate of protection since 1985 reflects the marked appreciation of the Japanese yen and consequent lowering of import prices in domestic currency terms.

4.2 Quota rents as incentives to import

The way in which the Japanese quota system provides incentives, in the form of quota rents, for private traders to import certain types of beef is considered in this section. This rent, on any cut of imported beef, is defined as the difference between the wholesale price and the cost of that cut to the import trader. The cost to the trader is the import price plus transport costs plus the tariff.

In the previous section it was shown that the rate of protection generally varied inversely with import price. Figure H illustrates how, in contrast to the (percentage) rate of protection, quota rents

(per kilogram) are greater on beef of higher import price. This relationship is investigated in more detail in appendix C. In each year the relationship is strongly positive.

It was argued above (section 2.4) that it is for beef imported outside LIPC tender that rent seeking is of importance. Calculations of the rents available on these (frozen) beef imports in the years 1983–86

H **Variation of beef quota rent with import price**

ABARE chart

Distribution and estimated least squares fit
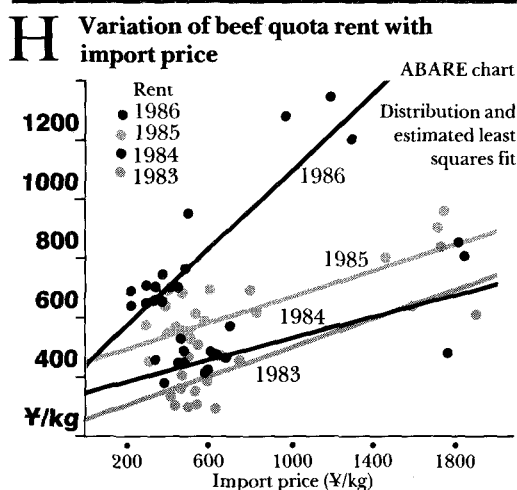
6 Quota rents and implicit tariffs on frozen beef imports outside of LIPC tender a

Item	Unit	1983	1984	1985	1986
Grain fed					
Import price	¥/kg	1 625	1 688	1 520	1 044
Tariff (25 per cent)	¥/kg	406	422	380	261
Domestic transport cost	¥/kg	39	37	37	26
Price to importer	¥/kg	2 070	2 147	1 937	1 331
Wholesale price	¥/kg	2 722	2 610	2 774	2 713
Quota rent b	¥/kg	652	463	837	1 382
Implicit tariff c	ratio	1.68	1.55	1.83	2.60
Grass fed					
Import price	¥/kg	878	899	921	622
Tariff (25 per cent)	¥/kg	220	225	230	156
Domestic transport cost	¥/kg	39	37	37	26
Price to importer	¥/kg	1 137	1 161	1 188	804
Wholesale price	¥/kg	1 744	1 883	1 843	1 552
Quota rent b	¥/kg	607	722	655	748
Implicit tariff c	ratio	1.99	2.09	2.00	2.50

a Derivation explained in appendix A. b Wholesale price minus price to importer. c Ratio of wholesale to import price.

are provided in table 6. The quota rent was higher on the grain fed than on the grass fed beef in three out of the four years. In particular, the finding that in 1985 and 1986 quota rents were higher for grain fed beef is consistent with the declining proportion of Australian (grass fed) beef in the 'simultaneous buying and selling' quota and with private traders moving to source more imports from the grain fed sector of the market.

Rents per kilogram (and total rental incomes) for beef imports in the 1983–86 period are shown in table 7, in the same format as tables 3 and 4. The rent that accrued to the chilled beef category is estimated at some ¥1030/kg in 1986. For the aggregate grain and grass fed categories it was estimated that the rents available in 1986 amounted to some ¥980/kg and ¥841/kg respectively.

The analysis based on tables 6 and 7 assumes that the whole (or some fixed proportion) of the quota rent accrues to the trader. In fact, there should be some downward adjustment in the estimated rents to allow for the effects of import levies and the implicit levy associated with the operation of the 'simultaneous buying and selling' system.

The LIPC levies are confined to a limited amount of chilled beef imports. Of more importance, therefore, are those set by the Japan Meat Conference. Longworth (1983, p.204) gives data on Conference levies from 1978 to 1983. In 1983 the levy on a boneless full-set chilled carcass was ¥200/kg, and on frozen beef the largest levy was ¥210/kg. Longworth (1983, p.200) also gives data for LIPC levies on 'one touch' chilled beef: in 1983 the levy on a full-set boneless carcass was ¥90/kg.

The levy implicit in the quotas for simultaneous buying and selling is the difference between the price paid by importers and that paid by wholesalers. As described in chapter 2, the system involves wholesalers bidding for the right to import. If the rights to bid for import entitlements are restricted by the LIPC, the wholesalers' quota profits are likely to be large relative to the implicit levy. Although no official information is available, trade sources in Tokyo have indicated that in mid-1986 the implicit levy on beef imported under simultaneous buying and selling was ¥300/kg to ¥400/kg.

The small size of the implicit levies on imports under this system relative to the quota profits obtained suggests that

	Rent				Total rental income b			
Category	**1983**	**1984**	**1985**	**1986**	**1983**	**1984**	**1985**	**1986**
	¥/kg	¥/kg	¥/kg	¥/kg	¥b	¥b	¥b	¥b
Chilled (including aged)	596	657	709	1 030	23.2	25.8	29.3	48.1
Imported under LIPC tender								
Frozen grain fed	408	425	538	712	10.6	12.6	15.0	25.6
Frozen grass fed								
(excluding aged)	365	512	619	701	14.8	21.9	25.9	34.1
Imported outside LIPC tender								
Frozen grain fed	652	463	837	1 382	6.5	5.1	13.8	33.1
Frozen grass fed	607	722	655	748	12.9	15.9	14.5	16.8
All grain fed	475	435	647	980	17.0	17.6	28.7	58.7
					(79.5)	(84.6)	(172.1)	(518.7)
All grass fed	505	611	663	841	50.9	63.6	69.7	99.0
					(237.9)	(305.6)	(417.9)	(874.8)
Total	497	562	659	887	67.9	81.2	98.4	157.7
					(317.4)	(390.2)	(590.0)	(1 393.5)

a Derivation explained in appendix A. b Figures in parentheses are rental incomes in $Am.

private traders capture much of the quota rent on these imports. Since such profits could not occur in a competitive market, it is reasonable to infer that rights to bid for entitlement to import are restricted. It is also clearly possible that, within the quota for simultaneous buying and selling (where importers' freedom of choice is greatest), the higher quota profits to be earned on imports of high priced cuts are responsible for the increased demand for grain fed beef.

4.3 Rental income from quotas

In addition to assessing the incentives provided to private traders by the quota system, it is possible to show the total magnitude of the quota incomes available from different types of beef to all quota owners (including the LIPC).

From table 7, it can be seen that a major increase in the amount of quota rent available occurred in 1986. Two factors underlay this change. The first was the major revaluation of the yen between 1984 and 1986. The effect was a fall in average import prices (denominated in yen) of 30 per cent between 1984 and 1986.

The second was a rise in both wholesale and retail prices of beef, attributable to increased domestic demand (see figures A and B for wholesale prices). This rise led the LIPC to increase imports. It was able to do so because, although the quotas are formally set in advance, there remains an element of discretion as to the level of imports. Normally, tenders are called once each month to maintain a steady flow of product into Japan. In 1986, however, tenders were brought forward, to such an extent that the year's imports exceeded the intended quota level. Total beef imports on a calendar year basis increased by 19 per cent — by far the largest annual increase since 1979. Even with this rise in import supply, the demand increases were sufficient to induce higher prices.

The combination of rising wholesale prices, falling import prices and rising import volumes resulted in the very large rises in total rental incomes shown in table 7. The major change in the source of rental incomes over the four year period examined has been in beef imported

outside of LIPC tender. In 1983 frozen grain fed beef outside LIPC tender contributed 9.6 per cent of rental income. By 1986 the proportion had increased to 21 per cent. Thus the high rental incentives documented in the previous section combined with the large volume rises in this category (see section 3.2) have provided the basis for rapid rises in rental income in this sector of the market.

4.4 Quota rents as taxes on consumers

It was argued in chapter 2 that quota rents have three aspects. They provide income to quota owners and perhaps differential incentives to import and they act as taxes on consumers of beef. It is this last aspect which is considered in this section.

The implicit tax rates on the consumption of imported beef attributable to quota rents are shown in table 8. Quota rents were calculated for 'high quality' and 'low quality' imports as those terms are defined in chapter 3. Thus, the only rent included in the high quality sector is that on grain fed beef imported outside LIPC tender. The rent on 'low quality' beef has been calculated as the weighted average of the rents on all other beef imported under quota control.

In percentage terms, the implicit tax on consumers of high quality beef appears consistently lower than that for low quality beef. In both categories the tax has been increasing since 1983.

4.5 The role of diaphragm beef

The rents available on beef in Japan are so large that there is a considerable incentive to evade the quantitative controls on imports. The most important method by which the intention of the controls on beef imports appears to have been evaded is by an increase in imports of US diaphragm beef, which according to the Australian Meat and Live-stock Corporation (1983) comprises 80–90 per cent of imported offal.

Imports of US offals have increased substantially, from 31 kt in 1979 to 74 kt in 1986 (table 1). In general, beef in this category is not included under the import quota system and so has no quantity restriction applying to it. However, diaphragm beef, which is defined by the Australian Meat and Live-stock Corporation as the thick skirt (hanging tender) and the thin skirt (outside skirt) which are the pillars and the costal section of the diaphragm, respectively, attracts a tariff which is currently set at 15 per cent. Grain fed diaphragm beef from the United States is channelled into the Japanese retail market while pasture fed diaphragm beef from Australia is used mainly in the manufacturing sector (Australian Meat and Live-stock Corporation 1983). Both the Corporation and Longworth (1983) assert that US grain fed diaphragm beef substitutes for Australian grass fed beef in Japan.

8 Implicit taxes on beef consumers due to quota rents

Item	Unit	1983	1984	1985	1986
High quality beef a					
Consumer price b	¥/kg	5 800	5 940	6 240	6 360
Rent c	¥/kg	652	463	837	1 382
Tax rate	%	11.2	7.8	13.4	21.7
Low quality beef a					
Consumer price d	¥/kg	3 510	3 570	3 510	3 526
Rent (weighted average) e	¥/kg	487	572	632	809
Tax rate	%	13.9	16.0	18.0	22.9

a For quality categories, see section 3.3. b Bureau of Statistics (1985). c Rent on frozen grain fed beef outside LIPC tender, table 7. d LIPC (1986). e Weighted average of rents on all other beef imported under quota.

I   **Australian frozen beef and US 'offal' import prices to Japan**
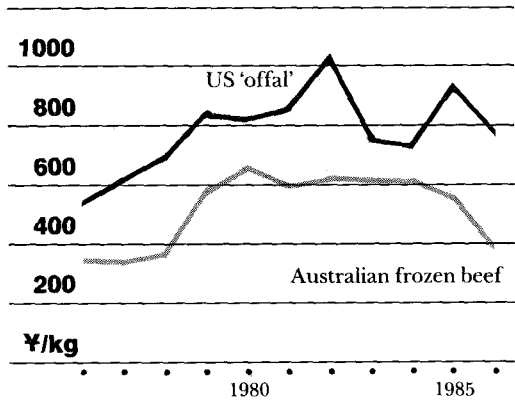
It might be asked why the unrestricted import of diaphragm beef has not eliminated the quota rents in the market in which it competes. If diaphragm beef were available at an import price no greater than that of Australian frozen beef, and were a perfect substitute for it, the allowance of diaphragm imports outside the quota would effectively remove any role for a quota in this sector of the market.

There are two reasons why imports of diaphragm beef have not eliminated quota rents in the low quality end of the market. First, as illustrated in figure I, US diaphragm beef is imported at prices substantially above those of Australian frozen beef imports. Second, although diaphragm beef substitutes for a wide range of cuts in the market segment where Australian beef competes, the substitutability is not perfect.

The fact that US diaphragm beef, which is outside quota control, substitutes for imports of frozen grass fed beef, which is controlled, has an important implication for the way the protection system for beef operates in the lower quality segment of the market. This is that the market structure that has been set up ensures that demand growth which, in the absence of quota limits, would be likely to go largely to Australian frozen beef is in fact channeled to US diaphragm beef. Thus, the nature and size of Japanese import quotas at the cheaper end of the market have been a major factor contributing to the increase in demand for imported US diaphragm beef.

Appendix A Disaggregated import data

Sources

This appendix documents the data used as the basis for the disaggregated analysis of Japanese beef imports in chapter 3 and the derivation of the rates of protection and rents which are the subject of chapter 4.

Four sources of data have been used.

(a)   Data provided to the Bureau by the Australian Meat and Live-stock Corporation: wholesale auction prices and quantities, by cut, of frozen imported beef sold by the LIPC.

The wholesale prices used in this study for frozen beef imported under the LIPC tender system are average prices from thirty-one Japanese wholesale beef auctions. The figures presented are the annual averages of monthly observations provided for twelve cuts of grain fed beef and ten cuts of grass fed beef. It should also be noted that while grass and grain fed beef cuts are not classified into cuts identically, it is still possible to obtain a degree of comparability across some of the cuts.

(b)   *Chikusan Nippo* (Livestock Daily): wholesale prices of chilled beef.

(c)   Australian Meat and Live-stock Corporation (1986): import prices and quantities, by cut, of frozen and chilled beef imported under the LIPC tender.

The LIPC frozen beef tender system provides the most readily accessible figures for a comparison between wholesale and import prices. It also accounts for a significant proportion of frozen beef imports under the quota. In 1986 about 64 per cent of total frozen beef imports under the quota system were imported under the LIPC tender system (table 3).

(d)   Japan Tariff Association (1986): shipped weights of imports of beef and offal by geographical origin. Since 1976 these data have been divided into frozen and chilled beef categories.

Prices, quantities and protection rates, by cut

Table 9 shows the annual average of the monthly wholesale prices (from source a) and import quantities (from source c) for beef imported by the LIPC. The average wholesale prices shown are weighted by import quantities.

Table 10 shows the annual averages of the monthly import prices from source c, and the implicit rates of protection on beef imports, by cut. The rate of protection, which is the implicit tariff on the beef cut, is defined as the ratio of wholesale to import price.

The Japanese commodity by country statistics for beef import quantities and values (source d), have been combined with LIPC frozen tender data (source c), to derive import prices and quantities for beef imported outside of LIPC tender.

The chilled beef category is also included in tables 9 and 10. Australia supplied 94 per cent of this category of imports in 1986 (Japan Tariff Association 1986). The wholesale prices shown for chilled beef are the annual average prices for a full set (on a boneless basis) as quoted in source b for the wholesale market. The import prices shown in table 10 are the unit values of Australian and US chilled beef imports (source d above).

The figures presented in table 11 are the rents per cut and the rental income for the cuts data in tables 9 and 10. Though these data were not used to derive the figures of tables 6 and 7, the weighted averages obtained from them are close to those shown. The differences arise from slight differences in weighting between wholesale and import prices.

Partial aggregation

The tables below provide the basis for the presentation of Japanese beef imports in the categories used in tables 3, 4 and 7.

9 Wholesale prices and quantities of imported beef, by cut

Category and cut	Wholesale price a				Quantity b			
	1983	1984	1985	1986	1983	1984	1985	1986
	¥/kg	¥/kg	¥/kg	¥/kg	t	t	t	t
Frozen grain fed beef, LIPC tender								
Ribeye roll	3 038	3 152	3 093	2 847	178	414	843	573
Shoulder clod	1 337	1 364	1 363	1 288	3 361	5 050	3 397	3 980
Square cut chuck	1 198	1 184	1 196	1 124	4 771	8 822	5 806	8 303
Chuck roll	1 733	1 753	1 698	1 595	284	20	45	164
Brisket	1 176	1 217	1 213	1 150	3 970	1 835	2 492	2 663
Short plate	907	900	890	987	9 961	12 693	9 517	14 081
Knuckle	na	na	1 403	1 289	na	na	1 640	1 734
Top round	na	na	1 427	1 328	na	na	1 607	1 812
Bottom round	na	na	1 303	1 203	na	na	126	368
Strip loin	2 676	2 730	2 672	2 511	1 813	405	1 085	924
Top sirloin butt	1 727	1 731	1 671	1 542	50	20	76	236
Full tenderloin	3 053	3 164	3 185	2 840	330	246	790	673
Skirt plate	na	na	na	na	1 380	107	490	387
Total					26 098	29 612	27 914	35 898
Weighted average	1 250	1 161	1 315	1 211				
Other frozen beef, LIPC tender								
Crop	1 036	1 101	1 127	1 070	368	230	180	182
Chuck/blade	1 069	1 150	1 175	1 091	8 584	6 257	6 721	8 571
Chuck	1 046	1 126	1 236	1 085	25	987	311	144
Clod	969	1 142	1 164	1 112	544	1 274	723	292
Brisket	897	931	990	946	4 726	5 092	4 382	4 992
Topside	1 134	1 314	1 332	1 243	5 288	5 855	4 340	5 292
Thick flank	1 239	1 292	1 314	1 236	2 998	5 008	3 660	5 182
Cowmeat	990	1 053	1 094	1 031	4 178	4 566	7 547	9 206
Aged full sets	1 433	1 494	1 493	1 393	8 748	10 579	10 997	12 504
Silverside	1 142	1 198	1 230	1 146	515	791	486	641
Fores and hind	na	na	na	na	11 442	9 274	8 179	8 151
Manufacturing beef	na	na	na	na	1 866	2 189	2 789	2 891
Boneless beef CL90	–	na	na	na	0	330	420	495
Manufacturing hind	na	na	na	na	75	325	805	572
Trimmings	na	na	na	na	75	546	1 292	1 971
Total					49 432	53 303	52 832	61 086
Weighted average	1 149	1 242	1 259	1 178				
Chilled beef c	1 714	1 720	1 705	1 761	38 985	39 364	41 353	46 724

a Japanese domestic wholesale (LIPC) auction prices (source *a* — see text). Weighted averages are derived from prices and quantities imported under LIPC frozen tender, by cut. b Weight calculated on boneless basis; source *c* (see text). c Includes the aged beef listed above. Prices are yearly averages of end-of-month figures, from source *b* (see text). **na** Not available.

10 Import prices and rates of protection of imported beef, by cut

Category and cut	Import price a				Rate of protection b			
	1983	1984	1985	1986	1983	1984	1985	1986
	¥/kg	¥/kg	¥/kg	¥/kg	ratio	ratio	ratio	ratio
Frozen grain fed beef, LIPC tender								
Ribeye roll	1 909	1 845	1 718	1 182	1.59	1.71	1.80	2.41
Shoulder clod	659	688	586	449	2.03	1.98	2.33	2.87
Square cut chuck	591	586	479	355	2.03	2.02	2.50	3.17
Chuck roll	800	na	832	493	2.17	na	2.04	3.24
Brisket	599	601	514	336	1.96	2.02	2.36	3.42
Short plate	424	385	316	214	2.14	2.34	2.82	4.61
Knuckle	na	na	741	534	na	na	1.89	2.41
Top round	na	na	776	9551	na	na	1.84	2.41
Bottom round	na	na	594	514	na	na	2.19	2.34
Strip loin	1 598	1 766	1 464	966	1.67	1.55	1.83	2.60
Top sirloin butt	na	na	835	618	na	na	2.00	2.50
Full tenderloin	1 738	1 816	1 748	1 288	1.76	1.74	1.82	2.21
Skirt plate	753	na	825	370	na	na	na	na
Weighted average	642	559	592	378	1.95	2.08	2.22	3.20
All frozen US beef c	913	866	937	645				
Other frozen beef, LIPC tender								
Crop	550	489	427	306	1.89	2.25	2.64	3.50
Chuck/blade	539	468	398	286	1.98	2.46	2.95	3.81
Chuck	476	477	405	324	2.20	2.36	3.05	3.35
Clod	503	505	441	318	1.93	2.26	2.64	3.50
Brisket	441	347	299	221	2.03	2.68	3.31	4.28
Topside	638	638	541	409	1.78	2.06	2.46	3.04
Thick flank	552	614	473	371	2.24	2.10	2.78	3.33
Cowmeat	469	453	404	288	2.11	2.32	2.71	3.58
Aged full sets	751	705	608	483	1.91	2.12	2.46	2.88
Silverside	507	589	509	372	2.25	2.03	2.42	3.08
Fores and hind	469	449	394	284	na	na	na	na
Manufacturing beef	402	378	346	242	na	na	na	na
Boneless beef CL90	–	na	447	na	–	na	na	na
Manufacturing hind	582	588	517	340	na	na	na	na
Trimmings	431	431	373	276	na	na	na	na
Weighted average	550	528	451	336	2.09	2.35	2.79	3.51
All frozen Australian beef c	614	610	555	379				
Chilled beef c d	863	821	767	564	1.99	2.10	2.22	3.12

a Derived (with the exceptions indicated) from LIPC frozen tender results published in source *c*; weighted average prices derived from price and quantity by cut. **b** Ratio of wholesale to import price. **c** Derived from source *d*. **d** Includes the aged beef listed above. **na** Not available.

First, total beef imports are divided between chilled and frozen. Then frozen imports are divided between grain and grass fed. Finally, within each of these categories beef imported under LIPC tender is distinguished from other beef.

The partially aggregated data presented in tables 3 and 4 were derived as follows.

(a) Chilled beef

The wholesale and import prices and the import quantities were taken directly from tables 9 and 10.

(b) Frozen grain fed beef imported under LIPC tender

The weighted average wholesale and import prices and total import quantities for frozen grain fed beef were derived from the cuts data in tables 9 and 10.

(c) Frozen grass fed beef imported under LIPC tender

The data used are the weighted average wholesale and import prices and total import quantities of the 'other frozen beef'

11 Rents on beef imported under LIPC tender, by cut

Category and cut	Rent				Rental income			
	1983	1984	1985	1986	1983	1984	1985	1986
	¥/kg	¥/kg	¥/kg	¥/kg	¥m	¥m	¥m	¥m
Frozen grain fed beef								
Ribeye roll	613	809	908	1 343	109	335	766	770
Shoulder clod	475	467	593	700	1 596	2 358	2 015	2 787
Square cut chuck	421	415	560	654	2 008	3 659	3 253	5 434
Chuck roll	694	na	621	953	614	na	28	156
Brisket	388	428	534	704	1 541	786	1 330	1 876
Short plate	338	382	458	693	3 366	4 844	4 359	9 761
Knuckle	na	na	439	596	na	na	721	1 033
Top round	na	na	420	614	na	na	674	1 112
Bottom round	na	na	523	534	na	na	66	197
Strip loin	639	485	805	1 277	1 159	196	873	1 180
Top sirloin butt	na	na	590	743	na	na	45	175
Full tenderloin	841	857	963	1 204	228	211	761	810
Total					10 619	12 389	14 890	25 290
Weighted average	416	421	520	712				
Other frozen beef								
Crop	309	453	556	661	114	104	100	120
Chuck/blade	356	528	641	708	3 055	3 302	4 306	6 067
Chuck	412	493	693	654	10	486	215	94
Clod	301	473	576	688	164	603	416	201
Brisket	306	460	579	643	1 448	2 341	2 538	3 212
Topside	297	479	618	706	1 573	2 806	2 684	3 712
Thick flank	510	488	686	746	1 528	2 443	2 510	3 865
Cowmeat	365	450	552	645	1 524	2 053	4 164	5 936
Aged full sets	456	576	696	764	3 985	6 096	7 656	9 548
Silverside	469	424	557	655	242	336	271	419
Total					13 641	20 571	24 861	33 176
Weighted average	379	506	632	706				

na Not available.

cuts in tables 9 and 10, with one exception: aged beef was excluded from this frozen category and included in the chilled category.

(d) Frozen grain fed beef outside of LIPC tender

To derive an import price for this category, the total quantity and value of frozen grain fed beef imported under LIPC tender was first deducted from the total quantity and value of frozen beef imports from the United States (source d), which was assumed identical with total grain fed imports. The import price used was the unit value for this residual category. A wholesale price was calculated using the fact that this unit price was similar to the import price of frozen strip loin imported under LIPC tender. To obtain a wholesale price, the rate of protection for strip loin was applied to the unit import price for this category.

(e) Frozen grass fed beef outside of LIPC tender

Similarly, the unit value for this category was derived by deducting the total quantity and value of grass fed beef imported under LIPC tender (excluding aged beef) from the total quantity and value of frozen beef imports (source d). A wholesale price was derived by applying to the unit import price the chilled beef rate of protection on imports for 1983 and 1984, and the top sirloin butt rate of protection for 1985 and 1986, these cuts again being chosen as having a similar import price to this category in those years.

(f) Grain fed beef

The wholesale and import prices used are a weighted average of categories (b) and (d); the quantity is the total of these categories.

(g) Grass fed beef

The wholesale and import prices are a weighted average of categories (a), (c) and (e); the quantity is the total of these categories.

Quota rents

The quota rents shown in table 7 on each beef category were calculated as follows:

Quota rent = Wholesale price — (Import price + tariff + domestic transport).

The tariff is 25 per cent, and the price of domestic transport was taken to be 5 per cent of the overall beef import price.

The rental income on any beef category was calculated as the rent (table 7) multiplied by the quantity imported (table 3).

This appendix provides a survey of the work on the prices and income elasticities of demand for beef in Japan, and reports the statistical analysis underlying the estimates of these elasticities used in chapter 3.

Previous studies

There have been numerous quantitative studies of the beef market in Japan, giving widely differing estimates of price and income elasticity. In twelve studies surveyed by Coyle (1983), the income elasticities of demand range from 0.5 to 1.9 with a median value of 1.2, and there is a similarly large range for the price elasticity of demand, from –0.8 to –2.2 with a median of –1.5. Among the highest estimates for both income and price elasticity are those of Sanderson (1978). Coyle's survey quotes from the Sanderson estimates an income elasticity of 1.78 and a price elasticity of –2.18; estimates of 2.56 and –2.22, respectively, are obtained when the price of poultry is included in the Sanderson equation.

Saxon (1975) provides a survey of income and price elasticities for a range of agricultural commodities. The aggregate income elasticity given for beef is 1.6, and the price elasticity –1.9: both considerably larger than the medians of the estimates surveyed by Coyle. The Saxon study (which is included in Coyle's survey) is a report of work on food demand undertaken by the Japanese Ministry of Agriculture and Forestry (as it then was) in the early 1970s. This work used data from two annual surveys by the Ministry: food balance sheets, and family income and expenditure. Of these two sources, Saxon argues, the food balance sheet approach is the more relevant to the assessment of both income and price elasticities, as its coverage is broader. In particular, it includes beef consumed outside the home, which has become increasingly important.

The studies surveyed by Coyle (1983) and the Japanese study reported by Saxon (1975) all use a single-equation approach to estimating the elasticities. Thus, in principle, differences between the results should be due to differences in definitions of the variables, in the sample periods used in estimation, in data (due to data revisions) or in specifications. Alternatives of specification include functional form (that is, linear or logarithmic), dynamic specification and the inclusion of various cross-price terms.

Some of the results surveyed by Coyle are not readily available and some do not appear to be based on empirical research. For the present purpose, three studies have been chosen which are based on empirical work and appear to be among the most comprehensive available: Sanderson (1978), Saxon (1975) and Kagatsume and Zwart (1983). The elasticity estimates of these authors, and the elasticity ranges and medians from Coyle (1983), are shown in table 12, along with the estimates obtained in the present study. The equations of Sanderson, Saxon and Kagatsume and Zwart were first re-estimated with currently available data, to discover whether the authors' results could be reproduced. In the light of this experience, modified equations were adopted and estimated for the period 1966–85.

The Sanderson (1978) study specified two aggregate demand equations, in linear form (as distinct from log linear). The first used as explanatory variables real income per person (rather than, as is more usual, aggregate consumption expenditure per person) and real beef prices, the latter deflated by a cost of living index; the second included real chicken prices. Using Sanderson's income variable but the relative price terms defined for this study (see below), it was not possible to reproduce either the income or price elasticity reported in his study. The source

Source	Period	Income	Own price	Pork price	Chicken price	Fish price
				Elasticity relative to:		
Sanderson (1978)	1963–74	1.78	–2.18			
		2.56 a	–2.22 a		2.14 b	
Saxon (1975)	1963–72	1.6	–1.93			
Kagatsume and Zwart (1983)	1960–79	1.5				
Coyle (1983) Range		0.5 to 1.89	–0.77 to –2.18	0.15 to 1.02	0.19 to 1.14	–0.20 to 0.44
Median		1.2	–1.5	0.2	1.04	0.27
Present study						
Single-equation model	1966–1986	1.26	–1.13	0.47	0.24	0.58
'Almost ideal demand system' model	1966–1985	1.31	–0.87	0.15	–0.13	0.59

a Including chicken price as an independent variable. b Estimated from Sanderson (1978, tables 5.7 and 5.8).

of the divergence may be that Sanderson's deflator (which was not clearly defined) was not the consumer price index, which is used in the present work.

Using aggregate consumption per person as the income term in Sanderson's equations, an expenditure elasticity very much closer to those reported was obtained. The price elasticity, however, using either income definition, was then found to be about –1.1, which is half of those reported by Sanderson.

Kagatsume and Zwart (1983) also estimated an aggregate demand equation in linear terms, the explanatory variables being personal consumption expenditure (which is the 'income' variable employed in the remainder of this appendix) and a weighted beef price term made up of 1/3 wagyu price and 2/3 dairy beef price. From this equation a long run and a short run income elasticity were reported. It was possible to reproduce the Kagatsume and Zwart result for the estimate of the income elasticity fairly closely. However, in neither their study nor the re-estimation was the price term significant.

The estimates by the Japanese Ministry of Agriculture and Forestry (Saxon 1975), which were obtained using log-linear functions, are of particular importance as they provide the basis for the projections carried out for policy purposes in Japan. It is possible, using current data, to reproduce the results reported by Saxon very closely, obtaining for the period 1963–72 an income elasticity of 1.5 and a price elasticity of –1.9. The latter result is consistent with the supposition that the large price elasticity reported by Sanderson (1978) is due to the use of a price deflator other than the consumer price index. Saxon employed regressions with and without the real prices of chicken and pork as explanatory variables. The inclusion of these variables alters the values of the income and own-price elasticities (the above figures being for the simpler form) but does not result in significant estimates for the cross-price elasticities.

The conclusion that seems justified from these comparisons is that the Saxon (1975) estimates, which are those used by the then

Ministry of Agriculture and Forestry, best reflect the data in the period up to the early 1970s. The Saxon estimates — an income elasticity of 1.6 and an own-price elasticity of −1.9 — though smaller than those of Sanderson (1978) are nevertheless large within the range of results in Coyle (1983).

Single-equation estimates of demand

In all the runs reproducing earlier studies there was evidence of high collinearity between the explanatory variables. This increases the uncertainty of the estimates. In the next stage of the study, a preferred specification was sought. First, a general specification, suggested by these previous studies, was used: namely, a log-linear specification in which the explanatory variables were beef price, consumption expenditure per person, and the prices of pork, fish and chicken, with prices and expenditure deflated by the consumer price index. The result was an equation showing own-price and income elasticities of −0.8 and 1.7, respectively, with no cross-

price terms significant. However, there was again evidence of considerable collinearity as well as problems of dynamic specification.

To overcome both the collinearity problem and the autocorrelation in the residuals, the log-linear specification was re-estimated in first difference form. The result was a greatly improved equation in terms of dynamic specification, stability and the removal of much of the collinearity in the explanatory variables. In accordance with the purpose of the present study the definition of beef was changed to include diaphragm beef. Further, to ensure that a system of demand equations for beef and fish could be estimated on a uniform data set, the definition of beef quantity consumed was changed to a net food basis.

In the equations reported in table 13, aggregate beef is defined as the sum of high and low quality beef in the sense explained in section 3.3. In the aggregate equation, it was found that the estimates of own-price and income elasticities did not depend on which definition of beef was used. The changed definition of the dependent variable did, however, alter the

13 Regression results for beef demand in Japan, 1966–86

Equa-tion	Dependent variable	Constant	Beef price Low quality a	Beef price High quality b	Consumption expenditure per person	Pork price	Chicken price	Fish price
(1)	Consumption of beef per person	0.02 (0.72)	−1.13 (−5.15)	– –	1.26 (2.34)	0.47 (2.19)	0.24 (0.70)	0.58 (1.73)
	$\bar{R}^2 = 0.66$; DW = 2.04; Cond. = 4.44; SER = 0.065; $F(5,11) = 2.905$; $Q(12) = 5.10$.							
(2)	Consumption of high quality beef per person	0.02 (0.47)	−1.11 (−1.47)	−0.74 (−0.82)	−0.23 (−0.28)	0.83 (2.57)	−0.16 (−0.32)	0.77 (1.51)
	$\bar{R}^2 = 0.68$; DW = 1.33; Cond. = 6.68; SER = 0.094; $F(6,9) = 0.766$; $Q(12) = 20.98$.							
(3)	Consumption of low quality beef per person	0.02 (0.68)	−1.65 (−2.94)	1.48 (2.21)	2.36 (3.98)	0.29 (1.22)	0.49 (1.28)	0.59 (1.57)
	$\bar{R}^2 = 0.62$; DW = 1.52; Cond. = 6.68; SER = 0.069; $F(6,9) = 1.123$; $Q(12) = 10.94$.							

a The retail price index for 'medium' quality cuts of beef (brisket, clod, etc.) (Ministry of Agriculture, Forestry and Fisheries 1986). b The retail price of loin and strip loin in Tokyo (Bureau of Statistics 1985). Not used in equation (1).
All variables are defined as first differences of logarithms. Prices and expenditures are deflated by the consumer price index. t-statistics are shown in parentheses below the coefficients; DW, Durbin–Watson statistic; SER, standard error of the residuals; Cond., the condition number; F, the F-statistic related to the Farley–Hinich (Farley, Hinich and McGuire 1975) test for parameter stability; the Q-statistic is the Ljung–Box test for randomness of the residuals.

estimates of the cross-price elasticities. As the new definition is to be preferred to the official one, being more comprehensive in its coverage, it is used in all the estimations reported below.

In table 13, equation (1) is the preferred equation for the aggregate demand for beef. As the equation is specified in log form (using first differences of logarithms for all variables), the coefficients may be interpreted as elasticities. Thus it can be seen that the price and income elasticities are −1.1 and 1.3, respectively. There is no evidence of first order autocorrelation from the Durbin–Watson statistic. The critical value for the Farley–Hinich F-statistic (at the 1 per cent level) is 5.32, suggesting that the equation is stable (a conclusion supported by both the cusum-squared test and the cusum test). The Ljung–Box statistic supports the hypothesis of no higher order autocorrelation.

The results, though not sensitive to whether the dependent variable is defined to include offal, are sensitive to the definition of beef price. The price used here was the 'retail price series' deflated by the consumer price index. When instead a weighted average of high and low quality beef prices was used, the income elasticity obtained was very much lower than that reported here. The specification using the official price indexes failed to show significant coefficients for the prices of fish and chicken, whereas these variables were significant when the weighted average retail price was used.

Equations (2) and (3) represent the disaggregation of consumption into high and low quality beef, respectively. The coefficient on consumption expenditure per person in equation (2) is insignificant (and not of the expected sign). This result may be due either to collinearity between the income and price variables or to measurement problems, or may constitute further evidence of the importance of the price definitions.

In order to check for collinearity, the equation was re-estimated setting the price coefficients, singly and in all possible combinations, to zero. The consumption expenditure variable in each case

remained insignificant and 'incorrectly' signed, thus ruling out collinearity between the income and price variables.

The second possible explanation is measurement error in the dependent variable. The high quality consumption variable is the (per person) sum of the domestic beef production classified as 'wagyu' and imports that, on the basis of price, appear to compete in this sector of the market. The import data from which the latter component of imports is derived are available at a sufficiently disaggregated level to give confidence that this component is accurate. The most likely source of measurement error in the dependent variable is substitution in consumption between high quality dairy beef and low quality wagyu beef (see section 3.4).

The extent of any 'leakage' of high quality dairy beef into 'wagyu consumption' is difficult to estimate, partly because only about 50 per cent of beef is graded, but it seems that such leakages would be quite small. In 1985, less than 1 per cent of the slaughtered dairy breed animals that were graded were placed in the upper three of the six grades ('excellent' or better) (Ministry of Agriculture, Forestry and Fisheries 1986, table 29). It is probable that the ungraded beef is lower in average quality than that graded. It appears therefore that at most about 1 per cent of dairy production could arguably compete in the wagyu sector. Thus, though the figures used here for the consumption of high quality beef may omit some competing dairy beef, the resulting underestimation is likely to be of minor significance.

A third explanation for the lack of statistical significance and for the 'incorrect' signs for the consumption expenditure (and also the cross-price) elasticity could be measurement error in the retail price series. To examine the possibility that the retail price series, being of limited coverage, was not adequately representative, the high and low quality retail prices in equation (2) were replaced with the corresponding wholesale prices. In this case, both the cross-price and consumption expenditure terms were of

the expected sign, but both remained statistically insignificant; the estimate of consumption expenditure elasticity remained small — approximately 0.2.

Diaphragm beef imports do not enter high quality consumption, and therefore cannot be contributing to the unsatisfactory equation (2) results. The aggregate and low quality equations, on the other hand, might be sensitive to the inclusion of diaphragm beef, and this sensitivity was tested. Upon re-estimating these equations with diaphragm beef omitted, it was found that the estimates of the consumption expenditure and price terms changed only slightly.

One inference that could be drawn from these results is that, with the available price and consumption data, it is not possible to measure price and income elasticities of demand in more than one segment of the beef market. As is noted in chapter 3, there have been frequent assertions about the magnitudes of these elasticities, although without empirical evidence. For the purposes of this study the most important question is the size of the expenditure elasticity in the segment of the market in which Australian beef competes, which is the low quality segment. The estimates in table 13 indicate that this elasticity is unlikely to be below the aggregate estimate of 1.3. Thus there is no basis for the view that, in a time of rising incomes, there is a lack of consumer demand for lower quality beef, such as is supplied by Australia.

A 'demand system' for meat

A second inference that might be drawn from the analysis presented so far is that single-equation methods are an inadequate basis for modelling beef demand. To address this possibility the 'almost ideal demand system' proposed by Deaton and Meullbauer (1980) was applied to meat and fish expenditures in Japan.

The meat and fish categories of consumption included in the system were beef (initially aggregate beef), chicken, fish and pork. Data for pork and chicken were available from Ministry of Agriculture, Forestry and Fisheries (MAFF) (1986) and were changed to a net food basis using information from MAFF (1985). Data for

fish consumption expenditure were collected from MAFF (1985).

The estimated model was of the following form:

$$W_i = \alpha_i + \sum_j \gamma_{ij} \log P_j + \beta_i \log (X/P)$$

$$\log P = \sum_i W_i \log P_i$$

where W_i is the share of each component in expenditure on total meat and fish; P_i (also P_j) is the price of beef, chicken, fish or pork; and X is total expenditure on meat and fish.

Table 14 shows the results from estimating this demand system over the period 1966–85. A dummy variable was included for 1973 as, although the coefficient on this variable was not significant, simulations of the model were thereby improved. Also, additivity, homogeneity and symmetry were imposed on the system. Therefore:

$$\sum_i \alpha_i = 1; \sum_i \beta_i = 0; \sum_i \gamma_{ij} = 0; \sum_j \gamma_{ij} = 0;$$

and $\gamma_{ij} = \gamma_{ji}$.

14 **Estimated parameters for 'almost ideal demand system' analysis of meat and fish consumption, 1966–85**

Parameter a	Estimate	Standard error
α_1	0.11	0.20
α_2	0.08	0.14
α_3	0.85	0.35
γ_{11}	0.004	0.026
γ_{12}	−0.032	0.014
γ_{13}	0.042	0.031
γ_{22}	0.052	0.013
γ_{23}	0.002	0.020
γ_{33}	0.041	0.052
β_1	0.021	0.045
β_2	0.021	0.032
β_3	−0.097	0.070
Dummy for 1973	0.009	0.006

a 1 = beef, 2 = chicken, 3 = fish, 4 = pork.

15	Uncompensated price and income elasticities from 'almost ideal demand system' analysis of meat and fish consumption, 1966–85			

Elasticity of consumption of:	Relative to price of:			
	Beef	Chicken	Pork	Fish
Beef	–0.87	–0.13	0.15	0.59
Chicken	–0.15	–0.52	0.07	0.34
Pork	0.03	–0.02	–0.27	–0.03
Fish	0.19	0.08	0.08	–0.55

Measure of income	Income elasticity of consumption of:			
	Beef	Chicken	Pork	Fish
Meat and fish expenditure per person	1.12	1.15	1.21	0.81
Final private consumption expenditure per person	1.31	1.34	1.41	0.95

These constraints allowed the parameter estimates not reported in the table (α_4 etc.) to be inferred.

The percentage root mean square errors of a simulation of consumption over the sample period were: for beef, 5.1 per cent; chicken, 3.9 per cent; fish, 2.6 per cent, pork, 3.6 per cent. Thus, beef consumption was the least well predicted variable. Overall, however, the system appears to predict the variables of interest well.

The uncompensated price and income elasticities implicit in the model are reported in table 15. These results were obtained by simulating the model. The consequences of a change in the beef price can be read down the first column of table 15. The consequences for beef of price changes in all commodities can be read along the first row; these results are directly comparable with those reported in table 13, equation (1). The uncompensated own-price elasticity for beef of –0.87 from the 'almost ideal demand system' model is not significantly different from the single-equation estimate of –1.13. The cross-price effects from the model for chicken and pork, but not that for fish, differ from the point estimates obtained by using the single-equation approach.

To derive expenditure elasticities from the 'almost ideal demand system' model, it is necessary to derive total consumption expenditure from expenditure on meat

and fish (the expenditure variable used in the share equations). Table 15 gives elasticities with respect to both expenditure measures. The estimate for the expenditure elasticity for beef is very close to the single-equation estimate reported in table 13.

An attempt to extend the 'almost ideal demand system' model by including high and low quality beef as separate meats was not successful. The price elasticities obtained were inconsistent with theory, and the expenditure elasticity for low quality beef was too high to be used with any degree of confidence in the ensuing analysis.

In summary, it can be said that this extension of previous work on the demand for beef in Japan demonstrates that beef demand can be successfully integrated into a system of demand equations. The 'almost ideal demand system' estimates of own-price and consumption expenditure elasticities are consistent with the single-equation estimates used for the analysis of beef demand in chapter 3.

Appendix C Rates of protection, rents and import prices

In section 4.1 it is noted that there is evidence of an inverse relationship between the quality of imported beef, as measured by its price, and the rate of protection (ratio of wholesale to import price). In section 4.2 it is asserted that quota rents increase with import prices. This appendix gives the evidence for these assertions.

Protection rates

The data in table 10 on import prices and implicit rates of protection, by cut, for frozen beef imported under LIPC tender were used for this analysis. The relationship between rate of protection and import price for the years 1983 to 1986 taken together (figure F) is roughly hyperbolic. If import price is replaced by its reciprocal the relationship is very nearly linear.

Regressions were performed on the data sets for each year from 1983 to 1986, and for the pooled data for the period 1983–86, as follows:

$$Y_i = a + br_i$$

where Y_i is the rate of protection and r_i is the reciprocal of the import price (kg/¥).

The results are presented in table 16. For each year, the coefficient b is positive and is highly significant. Both for individual years and in aggregate, there is thus strong evidence that there is higher protection for cheaper cuts of beef than for more expensive cuts.

This result may also be presented as an elasticity. Over the period 1983–86, a 10 per cent increase in import price (at the sample mean) was associated with a 5 per cent fall in the rate of protection levied.

16 Regression results for rates of protection in Japan, 1983–86

Equation	Dependent variable	Constant	Reciprocal of import price
(1)	Protection 1983	1.57 (16.03)	252.32 (4.83)
	$\bar{R}^2 = 0.52$; DW = 2.21; SER = 0.134; Cond. = 6.08.		
(2)	Protection 1984	1.43 (23.14)	406.60 (11.91)
	$\bar{R}^2 = 0.90$; DW = 1.50; SER = 0.091; Cond. = 5.41.		
(3)	Protection 1985	1.40 (15.44)	547.06 (11.98)
	$\bar{R}^2 = 0.87$; DW = 1.06; SER = 0.157; Cond. = 5.20.		
(4)	Protection 1986	1.66 (13.59)	574.82 (12.80)
	$\bar{R}^2 = 0.89$; DW = 2.31; SER = 0.214; Cond. = 5.15.		
(5)	Protection 1983–86	1.21 (14.60)	633.13 (16.24)
	$\bar{R}^2 = 0.77$; DW = 0.85; SER = 0.296; Cond. = 4.76.		

t-statistics are shown in parentheses below the coefficients; DW, Durbin–Watson statistic; SER, standard error of the residuals; Cond., the condition number.

17 Regression results for quota rents in Japan, 1983–1986

Equation	Dependent variable ¥/kg	Constant ¥/kg	Import price
(1)	Rents 1983	250.9 (5.61)	0.27 (5.39)
	$\bar{R}^2 = 0.62$; DW = 2.15; SER = 96.9; Cond. = 3.64.		
(2)	Rents 1984	357.18 (9.63)	0.20 (4.90)
	$\bar{R}^2 = 0.59$; DW = 2.17; SER = 83.1; Cond. = 3.39.		
(3)	Rents 1985	449.87 (11.76)	0.24 (5.08)
	$\bar{R}^2 = 0.54$; DW = 0.87; SER = 92.0; Cond. = 3.62.		
(4)	Rents 1986	443.76 (8.81)	0.65 (7.41)
	$\bar{R}^2 = 0.72$; DW = 1.94; SER = 117.4; Cond. = 3.76.		
(5)	Rents 1983–1986	465.90 (11.97)	0.20 (4.07)
	$\bar{R}^2 = 0.17$; DW = 0.81; SER = 186.0; Cond. = 3.43.		

t-statistics are shown in parentheses below the coefficients; DW, Durbin–Watson statistic; SER, standard error of the residuals; Cond., the condition number.

Quota rents

In figure H the quota rents (using nominal, not deflated, prices) on frozen beef cuts imported under LIPC tender are plotted against the import prices of these cuts, for the period 1983–86. To test the apparent positive relationship, a regression of the following form was estimated:

$$R_i = a + bP_i$$

where R_i is the quota rent and P_i is the import price.

This equation was estimated for each year from 1983 to 1986, and for the pooled data set. The results are presented in table 17.

It can be seen that the coefficient b is positive and significant in each case, confirming a roughly linear relationship between rents and import prices: quota rents available on LIPC tendered beef are higher at higher import prices.

From comparison of successive years, it appears that there may have been a significant shift in this relationship. The 1986 measurements suggest not only an upward shift in the level of rents but an alteration in the rent structure.

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