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Forum

The Singapore Pork Market: a Preliminary Assessment of the Potential for Australian Exports

Symon G. Brewis-Weston and Philip E.T. Lewis*

Australian pig producers, facing a limited domestic market, need to make inroads into export markets. The predominantly Chinese city state of Singapore provides the potential to be a valuable source of demand. The distribution system in Singapore is considered from the perspective of a potential entrant. The potential for Australian producers to take advantage of the Singapore markets are examined, together with the likely impediments to achieving this potential.

1. Introduction

The market for pig meat in Australia, it has been argued (Gardner, Dunkin and Lloyd), is heading towards saturation. The consumption of pig meat has only increased from 13.5kg per head in 1970 to 18kg per head in 1993. In order for Australia's pig industry to expand, export markets must be developed. One obvious potential market is Singapore. Pork is a major dietary component of the Chinese who make up almost 80 per cent of the 2.9 million population (Price Waterhouse). Further, an important feature of the Singapore market is that, because of the high income per head, the demand is for high quality lean cuts of pork. In addition, Singapore is a potential bridge for expansion into other countries of South East Asia.

Singapore currently imports and slaughters 1.2 million head of pigs per year with an average weight of 80kg live weight (Department of Statistics, Singapore). Suppliers, mainly in Malaysia and Indonesia, produce a very lean meat, an extremely desirable quality in Singapore. Australia, with its efficient farm management techniques, quality breeding stock and availability of quality feed, is able to provide a product that meets the specification of the Singapore market.

However, in order for Australian producers to take advantage of the potential market it is important to understand the peculiarities of the distribution system

and pricing in the Singapore market. In this paper the factors affecting demand, price adjustment and distribution are examined and the potential for Australia assessed.

2. Demand for Pork

Pork and poultry are the two most important types of meat consumed in Singapore, accounting for more than 89 per cent of total meat consumption, with pork alone representing 38 per cent. Table 1 shows changes in meat consumption over time. Only a moderate increase in the total meat consumption, 10 per cent, for the period 1972-1982 was recorded. However, the decade 1982-92 saw a rapid increase in the consumption of meat, from 147,832 tonnes to 217,359 tonnes, an increase of 51.7 per cent.

In the period 1972 to 1982 pork consumption decreased by 20 per cent. During this same period, the consumption of poultry meat increased by 53.6 per cent or 25 575 tonnes. Consumption of beef rose by 35 per cent, whereas the consumption of mutton fell by 9 per cent. During this decade the increase in total meat consumption is mainly attributed to the increase in consumption of poultry meat. It is likely that the decrease in the consumption of pork from 1972-1982 was a result of the relatively higher retail prices of pork relative to chicken during this period, particularly towards the end of the decade.

* Department of Economics and The Asia Research Centre, Murdoch University, Perth.

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Table 1: Meat Consumption in Singapore 1972-92 (tonnes)					
	1972	1977	1982	1987	1992
Pork	69,235 (53.2)	65,221 (46.7)	55,298 (38.3)	71,446 (38.6)	82,226 (37.8)
Beef	5,982 (4.5)	7,216 (5.2)	8,195 (5.7)	12,138 (6.5)	14,713 (6.7)
Mutton	7,176 (5.6)	6,960 (4.99)	6,550 (4.57)	6,640 (3.55)	7,765 (3.57)
Poultry	47,648 (36.6)	60,067 (43.1)	73,223 (51.1)	96,118 (51.5)	112,665 (51.8)
Total Consumption	130,141	139,464	143,266	186,342	21,7369
Note: Figures in parentheses are the percentage of total meat consumption, which may not add up to 100 due to rounding.					
Source: FAO Production and Trade Yearbooks, various years.					

In the period 1982-92 pork consumption increased by 48.6 per cent; poultry consumption increased by 53.8 per cent, and beef consumption also had a significant rise of 79 per cent. Mutton consumption increased only marginally from 6,550 tonnes to 7,765 tonnes, a moderate increase relative to the other major meats. Much of this increase in total consumption during this decade has been attributed to higher incomes per head and resulting shifts in dietary consumption patterns (Mirror, 1985, 1993).

To more fully describe the important factors affecting demand for pork a simple model was constructed. The dependent variable is the consumption of pork in tonnes (PORK). The independent variables are the price of pork relative to beef (PPORK), the price of poultry relative to beef (PPOULTRY), the price of mutton relative to beef (PMUTTON) and real expenditure on food (EXPEND). All prices are expressed in relative terms, with beef as the numeraire, to impose homogeneity in the demand equation. Data are annual observations between 1977 and 1992 and are taken from the Singapore Yearbook of Statistics (various years). All variables are measured in logarithms.

The results, excluding the price of pork relative to mutton, the coefficient of which was not significant, are given below.

$$\text{PORK} = 2.94 - 0.64 \text{PPORK} + 0.77 \text{PPOULTRY} + 0.14 \text{EXPEND}$$

(8.38) (5.01) (7.63)
(2.52)

$$R^2 = 0.84$$

$$DW = 2.15$$

$$\text{Serial Correlation } (\chi^2_1) = 0.11$$

$$\text{Functional Form } (\chi^2_1) = 1.23$$

$$\text{Normality } (\chi^2_2) = 0.81$$

$$\text{Heteroscedasticity } (\chi^2_1) = 0.79$$

Figures in parentheses are absolute t-values.

The coefficients all have the expected signs indicating that pork and poultry are substitutes and that pork is a normal good. The coefficients, because variables are measured in logarithms, can be interpreted as elasticities. They show that the demand for pork is relatively inelastic with respect to both own price and expenditure. The elasticity of demand for pork with respect to the price of beef can be derived as the negative of the sum of the pork and poultry coefficients. The value of -0.13 implies a relatively inelastic response of demand for pork with respect to beef prices.

Forecasting demand for pork in the future is fraught with difficulties. However, if the trend consumption of the 1980s and early 1990s is extrapolated to 2005 the total demand for pork is estimated to be 118 thousand tonnes.

In summary, pork will remain an important source of meat supply in Singapore into the next century, as it is a major dietary item of the Chinese. Price is an important factor in influencing its consumption, as too is income.

3. Price Adjustment

Prices perform essential signalling functions in a market system. How the price mechanism functions will depend, to some extent, on the quality and availability of efficient information, the relative bargaining power of the individual parties involved in the system and on how they exercise their bargaining power. In this section, the trends in pig prices will be discussed in conjunction with the problems caused by fluctuations in prices.

3.1 Trends in Ex-farm Pig Prices

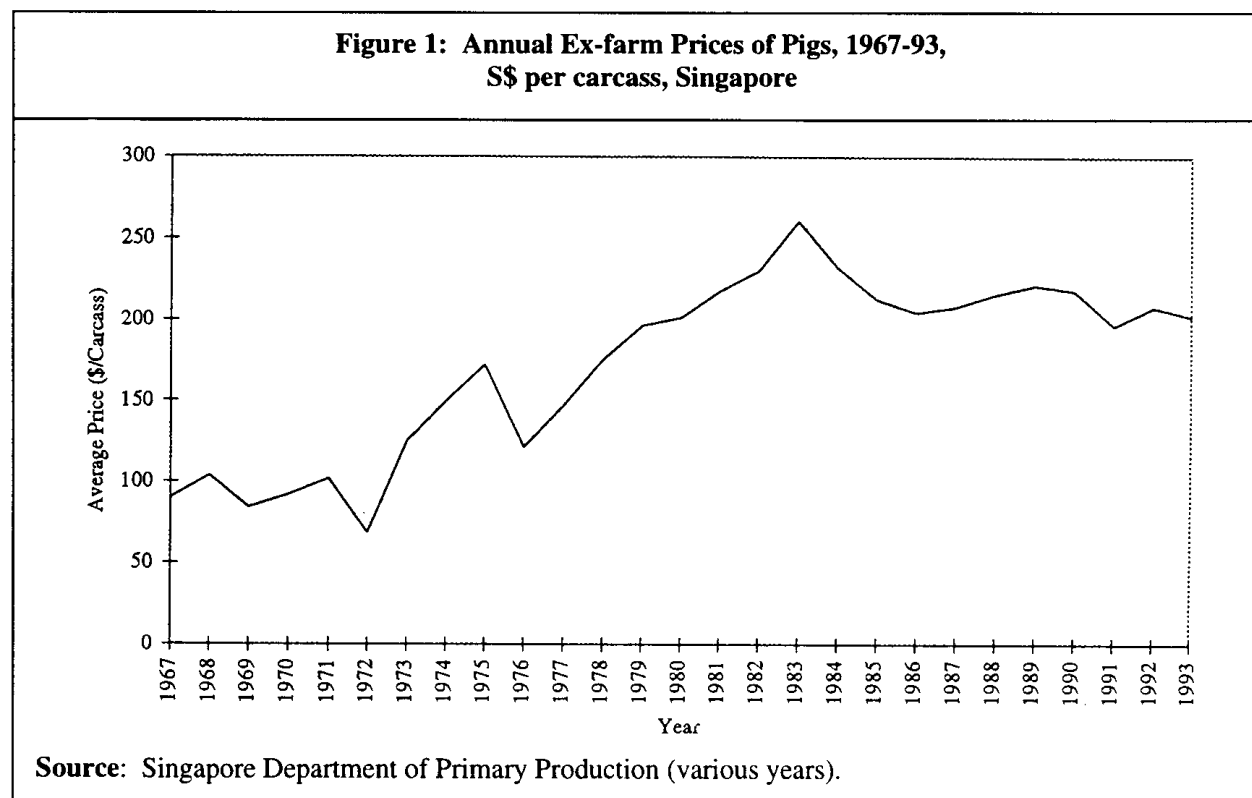
The first marketing problem in the production of pigs is to accurately determine, each year, what the de-

mand, supply and price for pigs are likely to be. Pig prices at auction in Singapore have fluctuated rather dramatically since 1967 (see Figure 1). A certain proportion of imported livestock are required to be sold by this method (see Figure 3). The average ex-farm price of pigs was as low as S\$62.89 per carcass in 1972 and in 1975 reached S\$172.33 per carcass. More recently the price reached S\$261 per carcass in 1983 and has since fallen to S\$202 per carcass in 1993 (Average carcass weight is 62.4 kg).

The cycles in pig prices are due to characteristics inherent in the pig industry, namely the relative ease of expansion and contraction of the individual pig enterprise; the length of time from breeding to market maturity of the pig; and the tendency of pig producers to respond to current prices, rather than prospective prices.

When prices are high and profit margins larger, pig farmers tend to increase their stock. This increase will result in a cobweb effect with an oversupply of pigs to the market in proceeding months and cause the subsequent price of pork to fall. This is evidenced in 1989 with higher prices for pork, resulting in large supply responses in 1990-91 and as a consequence the price of pork fell some 14 per cent during this period (Singapore, Department of Statistics).

Figure 1: Annual Ex-farm Prices of Pigs, 1967-93, S\$ per carcass, Singapore



The fall in prices may cause some farmers to move out of the market, it will certainly cause investment to be scaled back and, as a result, supply falls, the price rises and so the process starts all over again.

The price fluctuations are further heightened because producers and current suppliers in Malaysia and Indonesia are unable to hold stocks back in times of over-production and low price, as pigs are desired in the market at a particular weight. If pigs are not sold when they reach their marketable weight, more feed and labour will need to be utilised, but the heavier pigs would fetch a lower price per kilo. Thus, there is a major disincentive to withdraw pigs from the market at their desirable weight (Lee).

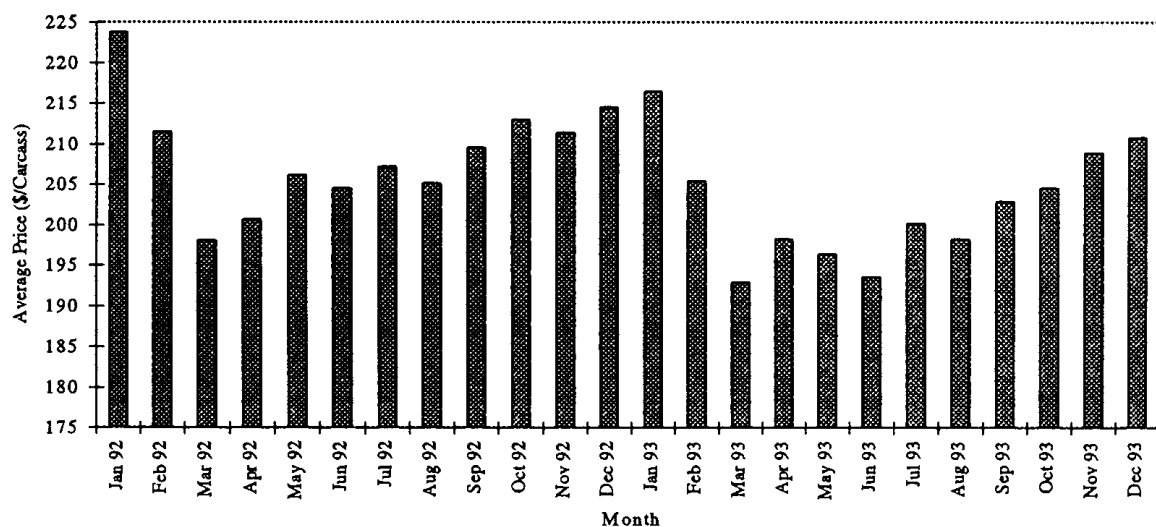
Pig prices are quite seasonal in Singapore. The average seasonal pattern of pig prices for the two year period 1992-93 are shown in Figure 2. Moderate fluctuations are observed even over this short period, with prices in 1992 being relatively higher than those in 1993. The higher prices in both periods correspond to the last quarter of each calendar year and the first two months of the first quarter of the year. The reason that price increases relative to the rest of the year is because of the Christmas festive season and the Chinese New Year celebrations where pork is served as a traditional dish (Lee).

Thus, the demand for the product rises during this period and prices also increase. In addition, demand in the domestic markets of the major suppliers, with ethnic Chinese populations of about 12 million in Malaysia and Indonesia combined, has the same seasonal pattern. The difficulty for the pork production houses is that in meeting this increased demand they need to acquire additional breeding stock. As this stock would be unnecessary to meet demand requirements for the following months of the year, it is not economically viable for most production houses to vastly increase their breeding stock. Thus, the price of the product rises during the last quarter of the year peaking in December and January.

3.2 Institutional Factors

Between 1980 and 1983 the ex-farm and subsequent retail price of pork rose quite rapidly. It was during this period that the Singaporean Government was phasing out the local production of pork in Singapore due to environmental factors and the reliance of the piggeries on a large water supply from Malaysia. Thus in 1984 when all local production was to cease, the Singaporean government introduced the Essential Price Control Act of 1983, which was established to ensure that a staple food of the Singaporean people did not increase beyond the affordability of the majority

Figure 2: Monthly Average Prices of Pigs, 1992/93, S\$ per carcass, Singapore



Source: Singapore Department of Primary Production (various years).

of families. Under the Act, 20 per cent of all imported live pigs are required to be sold at the auction market (Lee).

The auction market acts as a price signal to all other market participants. It is through this market that the Singapore Government has attempted to avoid monopolisation of the pork industry by way of one or two large foreign suppliers controlling the industry from production to retail distribution. The Singaporean government has also actively supported small independent wholesalers in Singapore, to encourage greater competition and diversification within the industry. The auction market also provides efficient information to producers and buyers of pork from a central location, enabling price to act as an efficient signal as to the levels of supply and demand in the market.

The current major suppliers to the Singaporean market are large production houses such as Singapore Food Industries (SFI), who own and produce pigs in Malaysia, and the KMP Food group who produce pigs in Indonesia for the Singaporean market. Between the two, they account for 90 per cent of the fresh pork supplied to the Singaporean market (Primary Production Department).

4. The Singapore Distribution System

Distribution in the local pig industry involves both merchant middlemen and agents. At the wholesale level, pork merchants purchase the pigs from the farmers and sell them to retailers, to the food processing industry, to commercial enterprises such as supermarkets, hotels, restaurants and to institutions such as the armed services and university restaurants. At the retail level, butchers and supermarkets sell fresh pork direct to the consumer at various public markets and shopping centres located throughout Singapore. There are also agents who act on behalf of both the wholesalers and the retailers (in the latter case, the agents or selectors choose the pigs on behalf of the butchers who are purchasing their pigs from pork merchants). Included in the distribution network is the role played by the Abattoir Division of the Primary Industries (Pte) Ltd, a wholly owned Singaporean government enterprise.

In the Singapore market there are roughly 30 different retail cuts of pork being sold in the market and practically every part of the pig can be consumed. For the purpose of this discussion, the major focus will be on the two most popular retail cuts, namely lean pork and

rib bones. To obtain a clearer view of the operational aspects of the local distribution network within the pig industry, it is convenient to trace the sequence of activities from the wholesale to the retail level.

4.1 Abattoir Level

The live pigs, when they reach Singapore, have attained their marketable weight in either Indonesia or Malaysia and are then transported to Singapore. As discussed above, 20 per cent must, under legislation, be sold at the auction market which sets the prevailing price for pork. All live pigs must be slaughtered in a licensed abattoir and in Singapore there are two such places owned and run by the government-owned enterprise Primary Industry (Pte) Ltd. The pigs are slaughtered in line with Singaporean health regulations, generally in the evening due to fact that 90 per cent of the meat is sold the following day in the wet markets where cold storage is not generally available.

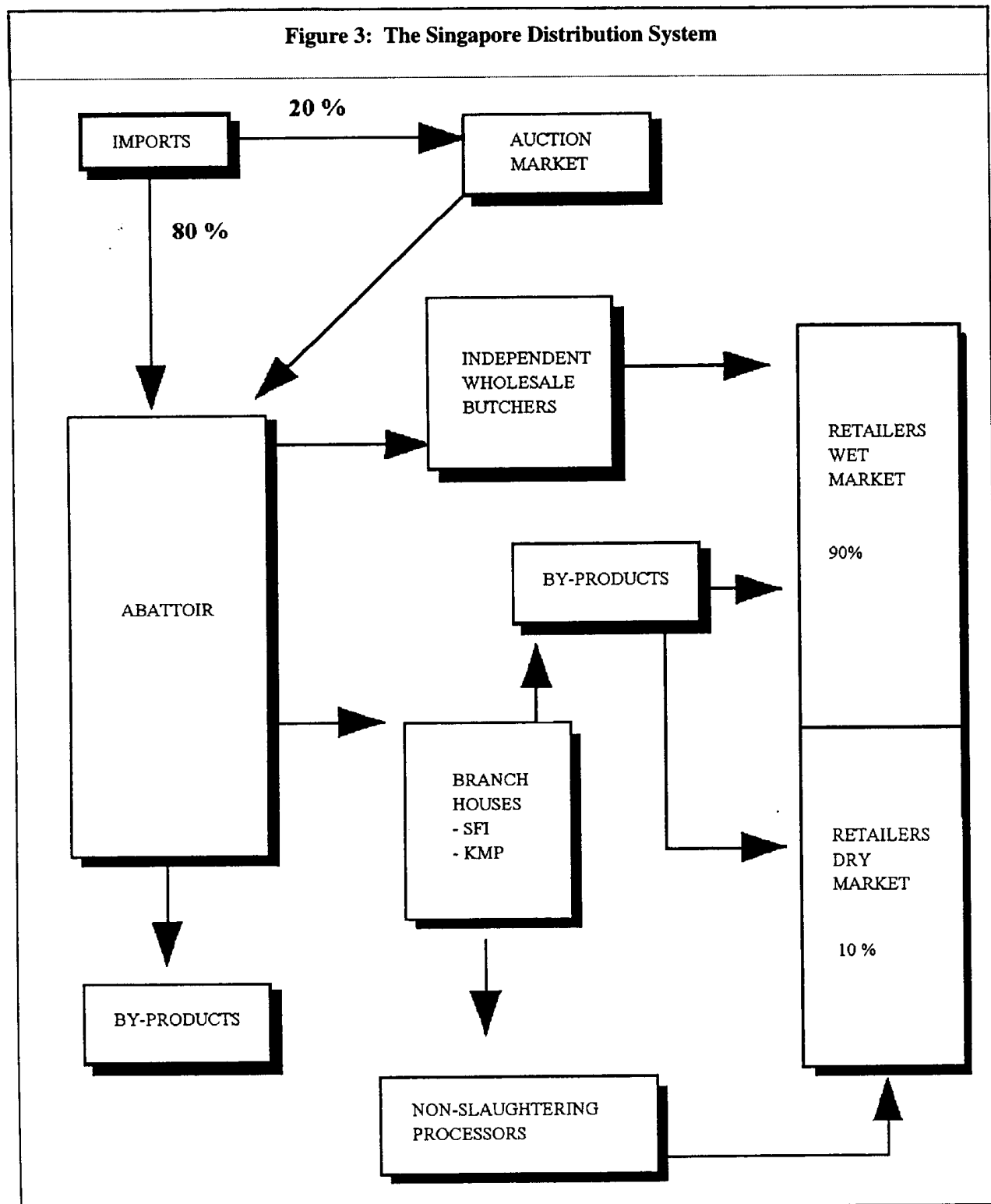
From the abattoir, the carcass is taken by wholesale butchers, generally small sole proprietors, who prepare the carcass for sale in the wet market or by the large wholesalers (SFI and KMP) who both have cold storage facilities. The butchers then chop the meat into the required cuts for both the dry and wet markets.

The costs of slaughtering pigs in Singapore is \$A14 per head. This includes the inspection charges of the health inspectors and is a flat rate charge (Primary Production Department). Singapore's costs compare favourably with those in Australia where slaughter costs, plus inspection fees are currently \$A15 per head. However, the Australian producers have further levies charged to them amounting to a further \$A2.40 per head. The levies are for promotion of pork, research and development and prevention of exotic diseases.

4.2 Wholesale Level

The distribution system from the abattoir to the retail level in Singapore is a complicated process (Figure 3). The major reason for this has been the support for the small wholesale butchers by the Singapore government.

The wholesale butchers purchase their pigs from the auction market. The large wholesalers/importers of pork (SFI and KMP) both have the pigs they repurchase from the auction market and the remaining pigs that are not sent to the auction market.



The wholesale butchers have been in the distribution system of pork in Singapore for many years. They prepare pork predominantly for the retail butchers in the wet markets. They also do not generally have the resources to provide cold storage for meat and thus operate entirely in the wet market system. Due to the small scale operation that each individual wholesale

butcher has, they handle, on average, 50 carcasses a day, making their handling costs uncompetitive with the two large wholesale firms. Their costs for dissemination and delivery of the carcass vary and depend upon negotiation between the wholesale and retail butcher. However the government subsidises small scale operators as they are seen as of cultural signifi-

cance in Singapore and have few skills to move into other sectors of the economy (Primary Production Department, Singapore).

The majority of the pork is prepared for the retail market by the two large wholesale organisations present in Singapore. SFI and KMP meat is prepared by these wholesale companies for both the dry and wet markets. As cold storage and warehousing facilities exist at both companies, the amount of wastage of meat is minimised and they can take advantage of economies of scale not available to the individual wholesaler.

For the wet markets the carcasses are cut into sections and sold to the retail butchers in this market. For the dry market, the meat requires further dissemination. From the various retail cuts the meat is generally packaged into 100-200gm portions. Due to the extra processing and packaging the retail cuts sold to the dry markets are more expensive. However a benefit of the dry markets is the small amount of waste meat, as the product has a much longer shelf life than the product in the wet markets.

4.3 Retail Level

Fresh pork is either sold in the dry or wet markets. Sales of pork in the wet markets constitute some 90 per cent of total pork sales. Sales of pork (fresh) in the dry markets with cold storage facilities account for a further 6 per cent of total consumption with the remaining proportion being in either frozen or processed form.

The development of the dry markets, (supermarkets etc) has led to an increase in consumption of pre-packaged fresh chilled pork. In 1984 when the local production of pigs was phased out by the Singaporean government, purchases of either frozen or chilled meat made up an insignificant part of the market. However, a concerted government advertising campaign alerting people to the availability, convenience and the nutrition of the chilled product, coupled with the changing domestic demographics within Singapore, i.e. towards more convenience foods, has meant that the consumption of chilled and frozen pork products has increased.

In 1993, it was noted that the scope for dry markets was very large and in fact, their use was preferred by a majority of respondents under the age of 35 (*Singapore Business Monthly, September*). However, due to the increase in the number of two income families with

children, much of the shopping is still conducted by one of the parents of the working couple and their preference is still to purchase the pork meat from the wet market in the traditional manner.

4.4 Wholesale and Retail Prices

In 1993, the latest year for which data are available, the wholesale price of pork in Singapore was 324 cents per kilogram. The retail price was 622 cents per kilogram implying a marketing margin of 48 per cent. The relevant price for Australian exporters is the wholesale price. In the next section the costs of exporting pig meat from Australia are estimated to see how the price compares to the required price of 324 cents per kilogram.

5. Australia's Potential for Export

5.1 Overview

The past decade has seen a period of expansion for the Australian pig industry while the total meat eaten in Australia as pork increased from 11 to 19 per cent. This development has occurred while the total number of domestic pigs has increased only marginally. This has happened because pig farmers have been able to obtain substantially larger quantities of meat from the same number of pigs due to a large increase in productivity. This has been achieved in two major ways.

First, more pigs are sold per unit of breeding stock. Hope reported that the number of pigs sold per sow per year had increased by 11 per cent between 1976 and 1988. Second, the average carcass weight of market pigs has increased steadily in recent years resulting in more pig meat being produced from the national herd.

Improvements in productivity have been substantial. The industry has been able to increase efficiency in other ways as well. One of the more important of these has been to decrease the herd feed conversion ratio, the units of feed consumed per unit of meat marketed. In this respect, Hope reports that one large Australian piggery had improved its feed conversion ratio by 22 per cent between 1970 and 1988. These improvements have permitted the real price of pigs to fall. For example there was a 32 per cent drop in the real price of bacon pigs between 1970 and 1988. Yet, despite this, pig production has remained profitable. Such improvements in productivity have occurred while the total number of pig producers has declined. In the

period 1980 to 1993, producer numbers fell from 19,279 to 4,794 and the trend appears to be continuing (Ransley and Cleary).

A substantial fraction of total Australian production comes from units which are very large, even by world standards. The first big piggeries were established in the early 1960s at Penguin in Tasmania (900 sows) and at Hartley in Victoria (initially 2,000 sows) (Cardner and Dunkin). Subsequently, a number of other large units have been built in the range of 2,000-25,000 sows, so that today about 40 such producers control about 30 per cent of Australian production (Ransley and Cleary). Many of these units are integrated with feed millers and meat processors. Several have been set up as breeding companies to supply smaller producers with performance tested stock.

As a result of demand from health-conscious consumers the industry has embarked upon a campaign to improve pig meat quality by reducing the amount of carcass fat. The implementation of a national system of carcass classification in the mid to late 1970s together with payment to producers on the basis of objective measurements has resulted in a steady reduction in the amount of fat on pig carcasses. In Queensland the average fat thickness decreased from 22.8mm in 1976 to 14.4mm in 1989 (Gardner, Dunkin and Lloyd). Pig producers are also making improvements in carcass leanness through improved nutrition as well as by genetics.

In 1994/95 Australia exported less than 1 per cent of its total production (7,852 tonnes). The majority of exports consist of frozen and chilled meat. In addition, imports of 2,966 tonnes took place.

5.2 Costs of Production

Many input costs in the pig production process vary considerably from period to period. The prices received for product at market, although influenced by the quality of the product, are largely affected by external market forces and beyond the control of the producer. This is why it is essential that producers understand the parameters governing the efficiency of their operations, as they can significantly improve the competitiveness of their product vis-a-vis other producers.

Table 2 shows estimated costs of production and revenues of bacon for the financial year 1992/93. This is an average of sales prices and costs for 25 producers

surveyed in a study for the Australian Pork Corporation (Ransley and Cleary). Clearly, the inputs which significantly effect costs are feed and labour. Wages and feed prices are very important parameters in determining the profitability of pig production and the potential for export.

Table 2: Estimated Costs of Pig Production 1992/93, Australia

	\$ per kilogram live weight (rounded)
Bacon Sales	1.56
Feed Costs	0.77
Herd Costs	0.09
Shed Costs	0.09
Labour	0.24
Fixed Overheads	0.09
Vehicle Overheads	0.12
Total Costs	1.41
Profit Margin	0.15

Source: Ransley and Cleary (1994)

The competitiveness of Australian pig meat in the Singapore market is not just determined by domestic costs of production, but also freight and other marketing costs. The authors derived estimates from various sources of the costs per kilogram of shipping pig meat from Western Australia to Singapore. These estimates are presented in Table 3.

The total cost of landing the carcasses from Australia is estimated to be below the wholesale price of lean pork, but is higher than the ex-farm prices per kilogram of pigs in Singapore (Table 1). The product exported from Australia would have to undergo further processing such as the boning of the carcass into its component cuts, in order to be sold by the wholesale market. The cost of this process is 80 to 90 cents per kilogram (KMP Foods, Singapore). Thus, the export of whole carcasses to Singapore is not competitive at current prices of around 370 cents per kilogram compared to the current wholesale price of 324 cents per kilogram. It is evident that at the present cost levels, the Australian product is currently 10 per cent over priced and in this form is uncompetitive.

Table 3: Estimated Costs of Exporting Australian Pig Meat to Singapore, 1994

Purchase (Backfat 14mm) Hot Weight		Cents per kg
Contract Schedule July 6- Sept 4, 1994		202.00
Plus 3 per cent by abattoir for loss in cold weight		6.06
Slaughter plus Meat Inspection (\$15 per head)		21.46
Levies	Per Head	
Promotional	\$1.65	
R & D	\$0.75	
	\$2.40	3.69
Freight		
Abattoir to container terminal (\$122 per 20' container)		1.63
Wharfage (\$77.20 per 20' Container)		1.03
Export Documents (@ 1 cent per carcass)		0.01
Freight to Singapore (\$3,700 per 20' Cont.)		49.33
Total Cost		285.21
<p>Note: Direct costs of exporting pig meat from Australia to Singapore in September 1994 is based on export from Western Australia; 62 - 65kg carcasses in 20 ft containers, 7.5 tonnes per container, temperature control -18.5 Degrees celsius.</p>		
<p>Sources: WA Department of Agriculture, Clover Meats Pty Ltd, W.A Stateships and WAPPEX, Australian Pork Corporation</p>		

6. Conclusions

It is apparent for the continued growth of the Australian pork industry, export markets need to be developed. To this end producers have organised bodies to investigate such opportunities. Export opportunities can only be developed if producers understand the parameters governing the efficiency of pig production and the importance nutrition plays in altering growth rates and therefore the total costs of production.

Quite clearly the greatest obstacle to competitive pricing is freight cost. Up until 1995 the State government in Western Australia had used enormous leverage for the public owned monopoly stateships to carry South East Asian Trade. Stateships has now been closed down by the state government and opens up the possibility for a foreign flag to take over the carriage of parts to Singapore at a lower cost.

In order to reduce freight costs consideration should also be given to changing the current Trade Practices Act which provides special arrangements allowing for shipping cartels.

Another area where cost savings could be made is in licensing and inspection fees which account for 5 per cent of the total export costs of pork from Australia. Currently the Australian Quarantine Inspection Service completes this task at an annual rate of \$67 000 per inspector per year. The costs are higher if the inspectors are required on a less frequent basis. These costs are prohibitive to the establishment of export markets as the additional cost of inspection contributes to pricing the Australian product out of the Singaporean market. This is especially so as the pork market internationally is extremely competitive. Thus, there is no shortage of alternative suppliers of the product, including Canada, The United States and Denmark.

Some would argue that the additional cost of the inspection charges is an advantage to Australian producers as it ensures the quality of the Australian product and has helped earn Australia an international reputation for the delivery of quality produce. However, Australian produce, in this case pork, has to meet domestic health requirements in order to be sold in this country. It could be argued that if the standards for

Australian consumers are met then they are of a high enough standard to be supplied to export markets.

Further, the importance of exporting to all Australian industries, particularly agricultural industries, has become more apparent over the last decade. Therefore, producers are aware that their survival and indeed the reputations of their industry rely on quality, price and meeting the specifications of the particular international market in question. Thus, the survival of industries such as the pork industry should be determined by their ability to deliver a quality product at a competitive price and the free market will determine that the quality of the product is maintained. This is especially so when an agricultural industry is in its infancy in terms of developing an export market.

A relaxation of export inspection would require the relevant government bodies in Singapore to be notified and have them agree to such a policy. Although this may sound a difficult task, Singapore currently accepts pork from Indonesia and Malaysia, both of whom cannot gain entrance to the Japanese pork market. However, Australia has been able to penetrate this market, due to the perceived superior quality and standards of the Australian product in international markets.

In summary, there is a great deal that policy makers can do to make exports of pork to Singapore, and other overseas countries, very competitive. If the right moves are put in place Australian pork producers can look forward to a profitable export future. In this paper it was only possible to briefly discuss the issues relevant to improving Australia's competitiveness in the Singapore pork market. Clearly, further research would include a detailed analysis of Australia's major competitors, potential for improvements in productiv-

ity and the implications for Australia's competitiveness. Competitiveness of Australian produced pork should be looked at on a time series basis and market shares of competitors analysed and understood.

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