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Effects of Supermarket Monopsony Pricing on Agriculture

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Abstract

Potential effects of alleged monopsony pricing of farm food products by supermarkets on farm product prices, quantities, incomes and land values are assessed relative to competitive behaviour. A long run comparative static equilibrium model is used. For export and import competing products, the farm food input supply curve facing the supermarkets is close to perfectly elastic and this limits monopsony behaviour. At the margin, the opportunity to reallocate agricultural land between traded and non-traded farm products means a highly elastic supply function for non-traded food inputs facing supermarkets, and very limited monopsony effects.

1. Introduction

The paper assesses concerns about the use of market power by supermarkets in Australia to reduce prices paid for their farm food product inputs and in turn to squeeze the returns to farmers. In addition to articles in the general press, more formal discussions of supermarket behaviour have been undertaken by the Australian Competition and Consumer Commission (ACCC).[1]

In a review of studies of market structure and behaviour in the Australian food marketing chain Griffith (2000) found limited evidence of anti-competitive outcomes. Also, he emphasized caution in transferring the results of the many US and UK studies to Australia because of the greater share of international trade in Australian food markets. Noll (2005) discusses many of the effects of monopsony behaviour in a closed economy context. Round (2006) and Smith

[1]Available at www.accc.gov.au. Of ACCC court cases against unconscionable behaviour by the supermarkets, one against Coles was successful in 2014 and one against Woolworths in 2016 was unsuccessful. Rather than monopsony pricing discussed in this paper, most of the ACCC focus has been on unconscionable conduct, and then primarily of contracts involving delayed payment, added discounts and adverse quality assessments (e.g. ACCC, 2002 and 2016). As a response, several codes of conduct have been established and monitored.

(2006) question the forms of, and the extent of, exercise of market power by the supermarkets. Both authors advocated detailed industry empirical studies to be undertaken. Key contributions of this paper are to formally include international trade as a characteristic of Australian agriculture and the food supply chain, and then to show that international trade limits the ability of supermarkets to exercise monopsony behaviour.

Market outcomes for the extreme cases of the supermarkets acting as a monopsony buyer of farm products for domestic consumption and a perfectly competitive market structure are compared. Comparative static effects of monopsony versus competitive behaviour are assessed on supermarket farm food input costs, farm prices and quantities purchased by supermarkets, and then the implications for farm product returns, incomes and land asset prices. The extent of supermarket buying power in Australia, and its effects on farm prices and returns, lie between the extremes of perfect competition and monopsony.

Initially, the conventional assumption of a closed economy is considered. Then the model is extended for international trade which is a key characteristic of Australian agriculture. Three food input product market contexts are considered: a large share of farm production is exported, for example dairy, beef, sugar and cereals; a large share of supermarket food input purchases is imported, for example pig meats and some processed horticulture products; and, largely a non-traded product, for example for most fresh fruit, vegetables and eggs. For the traded products, the effective highly elastic supply function for the farm product facing the supermarkets means the scope for monopsony pricing is very limited. For non-traded products, the ability to reallocate agricultural land in receipt of economic rent from production of the non-traded products to the traded farm products results in a highly elastic supply curve for the farm input facing the supermarket, which, in turn, limits the magnitude of effects of supermarket monopsony pricing.

The paper is organised as follows. Section 2 provides a simplified outline of the food supply chain and a discussion of the industry structure at the different steps of the chain. The textbook comparison of monopsony pricing and perfect competition pricing is presented in Section 3. Section 4 discusses the implications of, and especially the limitations imposed by, international trade of Australian farm products on monopsony pricing. Some model generalisations are considered in Section 5. A final section concludes.

2. Food Supply Chain

A simplified picture of the food supply chain in Figure 1 provides a background context for assessing the effects of monopsony pricing by supermarkets on the farm sector. The chain from production to consumption includes links for farm inputs, farm production, intermediary value added through the transport, processing and storage of farm products, and wholesale and retail distribution before purchase by consumers.[2] Some firms are involved in several stages of the supply chain, while many are independent operators.

International trade is important at various stages of the supply chain.[3] Imports of machinery, chemicals and other farm inputs are important at the farm level. For sales of farm food products and early processed food products, exports dominate sales for ultimate domestic consumption for many products, including grains, oil seeds, pulses, beef, sheep meats, dairy and sugar. Food imports by wholesalers and retailers are important for beverages, pig meats and some horticulture products, with over 80 per cent described as "substantially and elaborately transformed foods" rather than farm outputs (ABARES, 2017). Only a few products fall into the non-traded category, including eggs and in-season fresh horticulture products. Even then, for many of the horticulture products, there are both imports and exports reflecting product heterogeneity and consumer preferences for variety.

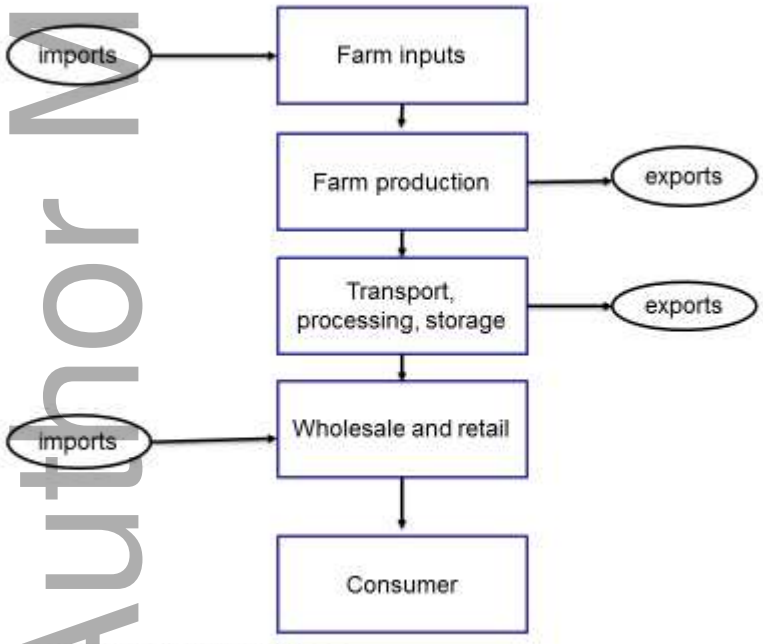

Figure 1 Food Supply Chain

[2] More details for specific products are provided in studies by ABARES, including, for example, beef (Goesch et al., 2015). While these studies provide invaluable data and descriptions of industry structure, they provide no formal non-competitive models to explain market conduct and outcomes. Smith (2006) discusses a range of decision options and strategies available to firms along the supply chain.

[3] This paragraph draws on the extensive data on production and international trade in ABARES (2017), and earlier related publications.

There is a high level of market concentration at the retail stage of the food supply chain. About 70 per cent of domestic retail food sales are made by the two large supermarket chains, Woolworths and Coles (ACCC, 2016). With the exceptions of limited access to desirable shop sites in many areas and the importance of economies of scale, barriers to entry are relatively low as indicated, for example, by the growth of market share by Aldi in recent years.[4] Purchases of food at supermarkets account for just over 60 per cent of domestic food consumption with the rest purchased at smaller independent retailers, restaurants, takeaways and others (Australian Government, 2012). Supermarkets provide a bundle of different foods and other household products, and they provide many other services, such as convenience, quality assurance, information and promotion, and access to financial and other services. At best, the food retail sector is an oligopoly/oligopsony, both on the retail demand side and on the food input purchase side, rather than a monopoly/monopsony.[5] Although market structure varies across the different stages of the food supply chain, at each link of the supply chain market forces, rather than government policy interventions, determine quantities produced and consumed, prices received and paid, and incomes.

The assumption of monopsony conduct by the supermarkets provides an extreme position, rather than a realistic assumption. Most oligopoly models generate price and quantity decisions between perfect competition and monopoly outcomes. The objective of this paper in taking a monopsony assumption is to assess the extreme outcome as a benchmark.

For the links in the food supply chain of Figure 1 for the processing, storage and transport of farm products for delivery to the wholesale and retail chain, or for export markets, oligopoly or monopolistic competition best fits the market structure. Economies of scale, and often also economies of scope, favour larger business firms, including private companies, grower owned cooperatives, and for some transport activities government owned businesses. Other than the importance of economies of scale, other market and regulatory barriers to entry are low in most cases. For simplicity, the paper assumes this intermediary sector of the food chain sets output prices as a constant mark-up on variable input costs, and variable costs dominate total costs. Input costs include purchases of farm products.

[4] Beginning with one store in 2001, Aldi reports 470 stores today and plans for more in the future (Aldi, 2017).
[5] The potential bargaining power effects of monopoly pricing to exploit consumers are not considered. A recent study of competition among UK supermarkets by Thomassen et al. (2017) finds limited use of monopoly pricing using a model that captures the multiple product characteristic of supermarket selling and with some buyer decisions to switch all purchases from one seller to another if a single product price in the basket of products purchased becomes too expensive.

Across all stages of the food supply chain, firms are treated as price taking buyers in large national markets for their inputs of labour, capital and other materials. Then, changes in supermarket food input purchase prices are passed back to the farm link of the supply chain in Figure 1 as an approximate dollar for dollar change in the domestic farm product derived demand function.

The farm production link in the food supply chain of Figure 1 is the classic perfect competition sector. There are many producers of homogenous products, and free entry and exit. Individual farms are price takers for both inputs and outputs. The supply function for different products is given by the marginal cost function. Geographical differences in the characteristics of soils, climate, access to transport and so forth as they affect productivity and costs result in a rising product supply function for farm products.[6]

At the farm level, economic rents, or producer surplus, is a residual return for the favoured fixed in supply natural resources. In turn, land asset prices approximate the expected value of the sum of the discounted stream of future rents.[7] Formally, the land asset price, A, is given by

$$A = \sum(1+d)^t R_t = R/d \qquad (1)$$

where, d is the discount rate and R_t is rent income or producer surplus. The right hand simplification assumes a constant expected d and R each period into the future. Then, lower farm prices resulting from monopsony pricing by supermarkets become smaller economic rents and lower land prices.

Specific units of land with location-specific soil, climate and other characteristics affecting food production productivity and costs are close to fixed in supply.[8] Also, at the margin, agricultural land can be reallocated from one agricultural product to another for only a small reduction in economic rent. In this marginal context, land allocated to a particular product can be considered a variable in supply input with an opportunity cost equal to the rent return if reallocated to produce an alternative farm product.

3. Text Book Monopsony Versus Perfect Competition

[6] Arguably, differences in managerial skills, which again have a low supply elasticity, contribute to a rising supply curve and earn some of the measured economic rent.

[7] While other factors such as proximity to urban centres and expectations of capital gains may affect the land asset price, these other explanatory variables are held constant. The focus of this paper is on the changes in farm product prices and land rent through to land asset price, ceteris paribus.

[8] In some areas at the margin agricultural land competes with alternative uses for urban use and for the environment.

This section provides the text book comparison of the long run equilibrium effects of a supermarket monopsony compared with a perfect competition model outcomes for farm price, quantity, income, and land value.[9] The model implicitly assumes no international trade. This assumption is relaxed in Section 4.

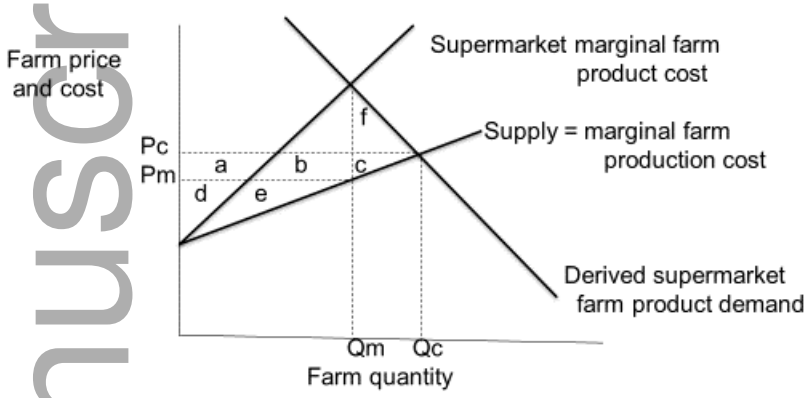

Figure 2 Farm Market Outcomes

Figure 2 captures the competitive market outcomes drawing on the background of Section 2. The derived demand for the farm product input by supermarkets represents the final consumer demand less the marketing margins to provide the intermediary services of processing, transport, storage and distribution, including by the supermarkets. The supply curve for the farm food product input is represented by the farm production marginal cost curve. It has a positive slope to reflect different endowment characteristics of the different geographic parcels of land, and perhaps also managerial expertise.

Competitive market equilibrium is given by farm price Pc and quantity Qc. Gross farm receipts of PcQc cover the opportunity cost of the variable in supply inputs used by farmers given by the area under the marginal cost or supply curve. A producer surplus or economic rent, R of (1), is given by the area above the supply curve and below the price line, area a+b+c+d+e. In turn, the economic rent, R, is capitalised into the price of the land asset, A, using (1). The more favourably

[9] See for example, Perloff (2012, chapter 15), which builds on Robinson (1933) and others.

endowed the land, the larger the rent and land asset price, with marginal land generating a zero rent.

If the supermarkets adopt a monopsony strategy they recognise the rising farm product supply curve and that purchasing more farm product raises the average price paid on all farm food input purchased, both infra-marginal and marginal. To maximise profits, they calculate the marginal farm product cost for the farm food input, MFC, given by

$$MFC = d(MC\ Q) / d\ Q = MC\ (1 + 1/Es) \quad (2)$$

where, (MC Q) is total expenditure by the supermarket on the farm food input, MC is marginal cost or average price given by the competitive supply curve, Q is quantity purchased, and Es is the elasticity of the supply curve for the farm product input (see Appendix). For the non-farm inputs of labour, machinery and other materials, the supermarket is a price-taker. Supermarket profit is maximised by equating MFC of (2) with the price from the derived demand curve.

In Figure 2, relative to the perfect competition decision, the monopsony supermarket chooses a smaller quantity $Qm < Qc$ and pays farmers a lower price $Pm < Pc$. Detailed derivation of formula to quantify the magnitudes of effects of a shift from perfect competition to monopsony by the supermarket in purchasing the farm food input is given in the Appendix. Proportionate reductions in the quantity of farm food product purchased by the supermarkets, $\Delta Q/Qc$, and of the price received by farmers, $\Delta P/Pc$, can be expressed in terms of (absolute values of) the elasticities of derived demand and supply of farm food to supermarkets, Ed and Es, respectively, as

$$\Delta Q/Qc = Ed/(2Ed+Es) \quad (3)$$

$$\Delta P/Pc = Ed/(Es(2Ed+Es)) \quad (4)$$

Table 1 applies (3) and (4) to illustrate the magnitudes of farm quantity and price reductions for a shift from competition to monopsony behaviour by supermarkets in their purchases of farm product inputs for a range of values of the elasticities of demand and supply. A range of arbitrary supply elasticities are chosen. The demand elasticities reflect the range of retail food demand elasticities reported by Ulubasoglu et al. (2016). The more elastic supply, the smaller both the price and quantity reductions and the smaller the one-off fall in the land asset value with a shift from perfect competition to monopsony pricing. As the supply curve approaches an infinite supply elasticity reflecting constant returns to scale technology and no fixed in supply farm inputs, the monopsony outcomes approach the competitive market outcomes. The less elastic is

the derived demand for the farm product, the smaller the supermarket monopsony pricing effects on lower farm price and quantity.

Table 1 Effects on Farm Quantity and Price of Monopsony Behaviour Relative to Perfect Competition for Different Elasticities of Supply and Demand

Elasticities for farm product facing supermarket monopsony		Percentage changes in farm market outcomes for monopsony relative to competition	
Supply	Demand	Quantity	Price
1.0	0.5	-25	-25
	1.0	-33	-33
2.0	0.5	-16.7	-8.3
	1.0	-25	-12.5
5.0	0.5	-8.3	-1.7
	1.0	-14.3	-2.9
10.0	0.5	-4.5	-0.45
	1.0	-8.3	-0.83
∞	0.5 or 1.0	0	0

Note that even with supermarket monopsony pricing the farm sector receives enough receipts to cover the outlays on variable inputs, and so the farm sector would be willing to supply the quantity sought by the monopsony supermarket. But, producer surplus or economic rent received for the land and other fixed inputs is reduced to R' = area d+e, which is less than R under competition. The lower rent income in turn drives a one-off windfall loss in the land asset price via (1). So long as the monopsony induced reduced rent generated by farm food production exceeds rent generated from the next best land use option, such as environment amenity, the land will continue in food production.

A reviewer raised the possibility for additional effects of a shift from perfect competition to monopsony for farmers holding debt, and more so if farmer heterogeneity is important. The above analysis implicitly assumes 100 per cent equity and that all land is owned by the farmer. Then, a shift from perfect competition to monopsony pricing by the supermarket causes a fall in producer surplus or land rent and a one-off windfall capital loss on the farmer owned land asset. The farmer loses equity, but continues to produce.

Suppose instead a farmer is heavy in debt with security against the land asset. A shift to monopsony pricing by the supermarket, and the resulting fall in the land asset value, also raises the debt to equity ratio. The higher debt to equity ratio may force some farmers into bankruptcy and others to sell their land. The property sale at a lower price becomes a lower cost entry for a new farmer or a lower cost opportunity for an existing farmer to expand. If the new owner produces similar products with similar production methods, the aggregate story for farm production, prices and land values will be similar to the 100 per cent equity scenario.

However, farmer heterogeneity between the old and new owners may result in changes in product mix and/or production methods, and then to realised land prices. In addition, the forced sales by some high debt to equity farmers may support requests for government funding to assist the industry to restructure. The additional transaction costs of the forced property sales and government subsidies to the industry represent additional social costs of a shift from perfect competition to monopsony pricing by supermarkets.

The smaller quantity of farm food input purchased by the monopsony supermarkets relative to under competition also means a higher consumer product price. From a society efficiency perspective, the monopsony decision involves an efficiency loss shown in Figure 2 as area f+c. The efficiency loss involves distortions to the mix of the farm input and other inputs in producing the consumer products along the food supply chain, and distortions to the mix of food and other products purchased by consumers.

4. International Trade

International trade is an important component of the market for most Australian farm produced products. For the products where exports dominate, supermarkets have to compete against overseas buyers for the Australian product, or, farmers have the option of an export sale rather than a domestic sale. While export demand for some Australian farm products may not be perfectly elastic, computer general equilibrium models drawing on a range of econometric studies assume highly elastic export demand elasticities of between -5 and -10.[10] Where Australia is a net importer, supermarkets are close to price takers in a much larger global product market. For the few cases of non-traded products, Australian farm product prices are bounded between an export parity price and an import parity price, with the difference reflecting costs of transport, storage and inventory management. International trade for farm production restricts the capacity for supermarkets in their purchases of food products for domestic consumption to exercise monopsony pricing. Formally, in terms of the marginal factor

[10] See, for example, Dixon and Rimmer (2002) for the MONASH model and Hertel (1997) for the GTAP model.

cost function of (2), international trade results in a large elasticity of supply for the farm food input, Es, facing a supermarket monopsony.

Figure 3 illustrates the role of international trade for the limiting case where Australia is a price-taker in world markets. Australian supply of the farm product is given by the marginal cost curve, S. Consider first an export product, such as grains, beef, sugar and dairy. The export demand reflects the export parity price, Pe. For the farm food input demand curve of supermarkets, DD(e), Qd(e) goes to domestic consumption and Q(e) – Qd(e) to export. The farm food input supply curve facing the supermarket monopsony effectively is infinitely elastic at the export parity price, Pe. Should supermarkets set price below the export parity price, Pe, competitive farm product marketers will arbitrage and reallocate production to the export market until the domestic price rises to match the export parity price.

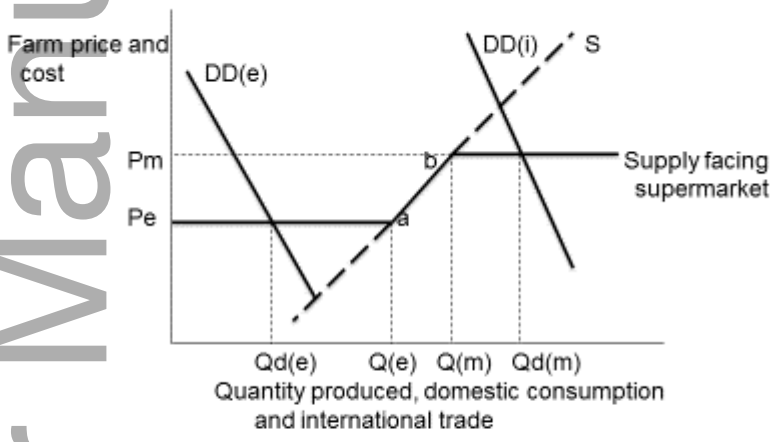

Figure 3 Farm Outcomes with International Trade

Consider an import competing product, for example pigmeat and some processed horticulture products. Here, domestic demand DD(i) exceeds domestic supply at the import parity price, Pm. At the import parity price, domestic supply is Q(m), quantity demanded is Qd(m), and Qd(m) – Q(m) is imported. The effective supply curve for the farm food input facing the monopsony supermarket is infinitely elastic at the import parity price. There is no opportunity for monopsony pricing by the supermarket because it has no market power in the international

market. Importers facing close to zero market entry costs will purchase domestic product for sale to the supermarket if the price offered by the supermarkets falls below import parity.

A non-traded agricultural product, such as most fresh horticulture and eggs, would have a domestic demand curve crossing the farm supply curve at a price above export parity and below import parity, namely along ab of the supply curve in Figure 3. In principle, for non-traded products where the food input supply curve facing the supermarket is less than perfectly elastic, a supermarket monopsony has an opportunity to increase its profit by setting a price below the competitive price as told in Figure 2.

However, there are two important restrictions on how low that price could be set. First, the export parity price, Pe, sets a lower bound.

Second, even though land available for all agricultural products is close to fixed in supply, the allocation of that aggregate farm input between the different export, import competing and the non-traded agricultural products is not restricted. If land is homogeneous and transaction costs are small, the land input allocated to the non-traded products becomes a variable input and one which is close to perfectly elastic in supply to the non-traded product. The market price of the variable land input for non-traded product production, expressed either as R or A in (1), is determined in a much larger aggregate land market dominated by the production of traded food products.

Non-homogeneity of land would contribute to a less than perfect elasticity of non-traded farm food supply. Given that the land required by some non-traded farm products is a very small share of agricultural land, for example poultry, and that many producers of non-traded products also produce traded products, for example vegetables, [11] suggests the contribution of heterogenous land to a loss of elasticity of supply for non-traded products should be small.

Another potential contributor to a less than infinite elasticity of supply of the non-traded farm food input is industry specific management. Management skills may take some time to adjust to switching products. On the other hand, rather than changes of ownership, much of the changes in the mix of quantities produced of different farm products in response to changes in market circumstances is achieved by changes in the scales of operation by existing farms using current management.

[11] For example, land with specific requirements for poultry farms is very small, and most vegetable farmers are also producers of internationally traded livestock and grain products and they vary the vegetable hectares from year to year (Valle, et al., 2014).

With all inputs used in farm production of non-traded products regarded as variable inputs close to perfectly elastic in supply, the farm level supply of non-traded farm input products facing supermarkets also will be close to perfectly elastic. Then, as argued above, the large supply elasticity means the opportunity for supermarkets to exercise monopsony power is negligible.

5. Some Generalisations and Qualifications

The previous section considered the exercise of supermarket bargaining power over farmers in a long run equilibrium. In defence of the long run equilibrium analysis, supermarkets are in business for the long run. Further, with projected increases in population and incomes, the demand for the farm food input by supermarkets mean a future time profile of outward shifts of the demand curves for food. Then, the relevant part of the supply curve facing supermarkets is drawing extra resources to produce extra output. If supermarkets set farm prices below the opportunity costs of variable inputs required for additional farm production, farmers will withdraw production and the supermarkets will lose a vital input.

Suppose supermarket bargaining power takes a short-term view. The short run farm product supply curve will lie below the long run curve represented in Section 4 above. Some key inputs variable in the long run would be considered as sunk costs over the short run, including fruit trees and specialised equipment, and some producers would require time to acquire the skills and confidence to shift employment in and out of different agricultural product mixes. These short-term fixed in supply inputs, in addition to land of the long-term model, provide opportunities for supermarkets to use their monopsony power to achieve lower prices in the short term than that obtainable with a long run supply curve focus. Also, relaxing the simplifying assumptions of homogeneous agriculture land at the margin and minimal transaction costs in shifting land from one product to another adds stickiness to inter-product supply changes and hence an element of individual product supply inelasticity. However, the benefits to the supermarkets of exploiting greater opportunities to squeeze farmers in the short run need to be balanced against the longer term costs of higher prices to acquire a larger future supply for an expanding population and in reaping the benefits of security of supply to satisfy customers. Large supermarkets plan for the longer term.

A simplifying assumption so far was that the monopsony supermarkets set a single price for all farmers and then allow farmers to choose the quantity offered. More sophisticated and larger economic rent transfer options for the supermarkets include: effective price discrimination across farmers at different points on the farm product supply curve; and, a “take-it or leave-it” price and quantity package. These purchase strategies would increase the transfer of producer

surplus or economic rent from the farm sector to the supermarkets leading to further reductions of land asset values, but still providing enough revenue for farmers to cover variable input costs and a normal return on their own labour and expertise.

In theory, and at the extreme, with discriminatory monopsony pricing, all economic rent could be transferred from farmers to the supermarket, and the competitive quantity would be traded. None the less, the arguments supporting a close to perfectly elastic farm input supply curve facing the supermarkets for export, net import and non-traded products made for the single price strategy of the previous section continue to apply to limit these more sophisticated monopsony price discrimination and "take-it or leave-it" strategies.

The unambiguous single farm price formulation of the models used in Sections 3 and 4 above readily can be generalised to include a range of specific charges on farmers for labelling, promotion and so forth in addition to the market price. The ACCC discussions with suppliers to supermarkets note such pricing complexity often is used, and that much of its intervention in these markets has been designed to add to clarity and certainty of contracts between farmers and supermarkets, for example the codes of conduct (ACCC, 2016). Converting these multi-characteristic pricing packages into a net price return to farmers and cost for supermarkets does not change the general finding of Section 4 that the importance of international trade to Australian agriculture works to greatly reduce, if not eliminate, the opportunity for monopsony price behaviour by supermarkets.

Reality is that the food market supply chain is a dynamic and evolving market and there are other competitive dimensions besides price. Changes in incomes, tastes, international markets, exchange rates, climate and technology are just some of the factors which shift demand functions and cost functions at all stages of the food production chain. These changes in turn induce decision changes leading to changes in market prices, quantities and incomes at all stages along the supply chain.

Competition involves other dimensions as well as price setting. These include developments in product characteristics, dimensions other than price in the supermarket purchasing experience, and the development and application of technology and better management practices. Supermarkets and many others along the food supply chain are multiproduct suppliers. The allocation of joint costs of management, marketing, floor space and so forth across the many different food and other products sold by supermarkets challenge quantitative studies of market conduct and market outcomes at the individual farm product level.

Together, the complications of the multiple product decision context, the many non-price dimensions of relationships between buyers and sellers along the food supply chain, and multiple exogenous shocks altering the opportunities available to all the players along the food supply chain, create many challenges for quantitative studies to estimate the magnitudes of effects of market behaviour, including supermarket monopsony, relative to other forces affecting observed market outcomes. Empirical evaluation of the conceptual models will require extensive data on prices, costs and profits along the supply chain. As noted by Nga et al. (2016), the required information is very limited for Australia, and especially for the non-traded farm products.

6. Conclusions

The paper has used conceptual models to assess the effects of the exercise of monopsony pricing by Australian supermarkets on prices, quantities, incomes and land asset values of Australian farmers.

Even if monopsony pricing was invoked, it is not in the long term interest of the supermarkets to set a farm price below the opportunity cost of variable in supply farm production inputs consistent with a competitive market. At most, monopsony pricing can transfer some of the economic rent, or producer surplus, earned on favourably endowed fixed in supply agricultural land from farmers to the supermarkets, and then a one-off fall in land asset values.

The importance of international trade for Australian farm products, both exports and imports, means the supermarkets face a highly elastic supply function for the domestic farm food inputs they require. As a result, the opportunity for monopsony pricing is minimal.

Further, these results hold with greater force as we move from the extreme market power position of monopsony to the more realistic Australian supermarket world of oligopsony.

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Appendix

Functions for the supermarket farm product demand and for the farm level product supply equal to marginal cost are

$$P = a - bQ \quad (1)$$

$$P = MC = c + dQ \quad (2)$$

For a perfect competition market equilibrium, equate demand of (1) and supply of (2) for quantity, Q_c,

$$Q_c = (a - c) / (b + d) \quad (3)$$

For monopsony, from supermarket total expenditure $E = PQ = cQ + dQ^2$, derive the marginal farm product cost function, MFC

$$MFC = dE / dQ = c + 2dQ \quad (4)$$

Equate demand of (1) with MFC of (4) to determine monopsony quantity, Q_m

$$Q_m = (a - c) / (b + 2d) \quad (5)$$

From (3) and (5), the reduction of quantity in moving from competition to monopsony is

$$\Delta Q = Q_c - Q_m = (d / (b + 2d))\, Q_c \quad (6)$$

Then, substituting for b and d using the demand and supply elasticities, Ed and Es, with $b = (1/Ed)(P/Q)$ and $d = (1/Es)(P/Q)$, change in quantity due to monopsony, $\Delta Q/Q$,

$$\Delta Q/Q = -Ed / (Es + 2Ed) \quad (7)$$

Drivers of the magnitudes of effects of a shift from perfect competition to monopsony on farm input quantity can be obtained by taking partial derivatives of (7) with respect to the supply and demand elasticities; for a given $0 < Ed < \infty$, the more elastic supply the smaller $\Delta Q/Q$, and in the limit of a perfectly elastic supply $\Delta Q/Q$ approaches zero; for a given $0 < Es < \infty$, the more elastic demand the larger $\Delta Q/Q$.

For change in farm level price, ΔP, use farm supply (2) and change in quantity (6)

$$\Delta P = d\, \Delta Q = -(d^2 / (b + 2d))\, Q_c \quad (8)$$

In (8), substituting for b and d with the elasticities of demand and supply, change in farm price due to monopsony, ΔP/P

$$\Delta P/P = - Ed / (Es (Es + 2Ed)) \quad (9)$$

Drivers of the magnitudes of effects of a shift from perfect competition to monopsony on farm product price can be obtained from the partial derivatives of (9) with respect to the supply and demand elasticities; for a given $0 < Ed < \infty$, the more elastic supply the smaller the price fall, and in the limit of an infinite supply elasticity the price change is zero; for a given $0 < Es < \infty$, the more elastic demand the larger the farm price fall.