AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

The Australian Journal of Agricultural and Resource Economics, 46:4, pp. 559–584

Market power analysis in the retail food industry: a survey of methods*

Larry N. Digal and Fredoun Z. Ahmadi-Esfahani†

The present paper surveys various methods used to analyse market power in the retail food industry. The strengths and weaknesses of these approaches are explored and a review of the issues in using New Empirical Industrial Organization (NEIO) and time-series models is provided. The absence of a theory underlying time-series models is highlighted and a review of some theoretical models in retailing is presented. The impact of imperfect competition in the food processing sector on retailing is also examined. It is argued that a combination of the approaches that minimises the weaknesses and builds on the strengths of single approaches may prove more promising for examining non-competitive behaviour.

1. Introduction

> 'Market power is like the wind. You can feel it but you cannot see it.'
>
> (Kohls and Uhl 2002, p. 270)

A recent article by Griffith (2000) published in this journal critically reviewed previous work on market power in the food marketing chain with an emphasis on the results obtained. It highlighted the importance of conducting research into non-competitive behaviour in the food chain. Such behaviour was estimated to reduce the surplus accruing to Australian consumers by more than A$1 billion per year, and produce a deadweight loss to the economy amounting to A$20 million per year. As a result of the inefficiencies spawned when retail firms exercise market power, non-competitive behaviour of retailers is increasingly becoming a concern not only in Australia (Australian Parliament 1999), but also in

* This article stems from Digal's doctoral dissertation (2001) supervised by Ahmadi-Esfahani and funded by AusAID. The authors gratefully acknowledge the incisive comments and suggestions of Garry Griffith, an anonymous referee and, particularly, the Editors.

† Department of Agricultural and Resource Economics, The University of Sydney.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

the USA, Europe and developing countries.[1] Market power is generally defined as the ability of firms to profitably alter prices away from competitive levels.

There seems to exist a disparity between the extent of concern about market power and the level of analytical refinement used to measure it. A shift of market power from manufacturers to retailers has been a focus of investigation for at least a decade (e.g. Farris and Ailawadi 1992; Ailawadi *et al*. 1995; Messinger and Narasimhan 1995). This research has recently found its way into the agricultural economics literature with the notion advanced by Cotterill (1997) of food convergence. According to this hypothesis, global food market structures are converging into a USA manufacturer-led model where manufacturers dominate the food marketing system, or a UK retailer-led model where retailers dominate, or possibly a hybrid of both.

The purpose of the present article is to critically survey various methods used in analysing market power in the retail food industry. As such, it complements the article by Griffith (2000) which focused on reviewing previous work in the food marketing chain to map out policy and research directions.

New approaches to determining market power have emerged in recent years but there have been limited applications in retailing. Applications of imperfect competition models in the manufacturing sector appeared in the 1930s but those in the retail sector lagged behind and began to emerge only in the middle of the 1940s (Bliss 1988). In the retail food industry, the majority of these studies have been conducted in developed countries, particularly the USA. Very few have been undertaken in developing countries.[2] Accordingly, the scope of this article is limited to the research conducted in developed countries (Table 1).

The present article is organised as follows. Section two reviews general approaches to analysing retail market power. Some key issues in applying models under two of these approaches – the New Empirical Industrial Organization (NEIO) and time-series approaches – are examined in sections three and four. A few alternative retail theories are then discussed in section five, followed by concluding comments in section six.

[1] For analysis of market power in the retail food industry in a developing country setting (Philippines), see Digal (2001) and Digal and Ahmadi-Esfahani (2000).

[2] This is based on literature searches in popular journals in economics, agricultural economics, and *Journal of Retailing*.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

Table 1 Food retailing market power studies[a]

Study	Methodology	Market power present	
		Yes	No
Hall *et al*. (1979)	Concentration-price model	√	
Marion *et al*. (1992)	Concentration-price model	√	
Lamm (1981)	Concentration-price model	√	
Cotterill (1986)	Concentration-price model considering the product-price-service mix of supermarkets	√[b]	
McDonald *et al*. (1989)	OLS linear regression of relative profit rates against time	√[c]	
Newmark (1990)	Concentration-price model		√
Farris and Ailawadi (1992)	Compared profitability measures: gross margin, net return on sales and net return on assets		√[d]
Kaufman and Handy (1989)	Concentration-price model		√
Cotterill and Harper (1995)	Concentration-price model accounting for differences in quality of service among supermarkets	√	
Messinger and Narasimhan (1995)	Formed representative portfolios of stocks in grocery retailing and manufacturing to estimate a market model (capital asset pricing model) to determine accounting and stock measures of profit		√[e]
Ailawadi *et al*. (1995)	Calculated the economic value added by deducting cost of capital from accounting profit; also used market value added to determine potential market power		√
Binkley and Connor (1996)	Concentration-price model	√[f]	
Richards *et al*. (1996)	Conjectural variations model	√	

[a] See Bresnahan 1989 for a list of studies covering other industries and Abbott (1996) for studies in international trade.
[b] Profitability related to market share is due to share-related market power.
[c] Both food manufacturing and retailing sectors in the UK are earning supernormal profits. All other studies in this table were conducted in the USA.
[d] Profitability has decreased and no shift of power to retailers through time.
[e] Profits of both manufacturers and retailers have declined.
[f] Relationship between concentration and price depends on the type of item, whether it is fresh produce or branded dry goods.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

2. Market power analysis

There have basically been four general approaches previously employed to analyse market power: industry case studies; models in the structure-conduct-performance (SCP) paradigm, NEIO models and time-series models.[3]

The SCP approach was pioneered by Bain (1951) as a response to a gap in the application of case studies conceived by Mason in the 1930s. Case studies were found to be too expensive to conduct and limited in terms of their applications in other industries (Scherer and Ross 1990). The SCP approach works on the premise that the organisation and structure of markets determine conduct of firms within an industry, thereby indirectly affecting market performance. The elements of this approach can be incorporated into a convenient framework for analysing industry competition, as in Porter's model (Porter 1980). Within this framework, the testable hypothesis is that average profit in concentrated markets is higher than in less concentrated markets. A popular example of this approach is the retail food industry study of Marion (1979) which has been used in many USA anti-trust cases. To test the concentration-profit hypothesis, profits are regressed against a concentration variable (assumed to be exogenous) and other demand and supply variables, usually using cross-section industry-level data. A positive relationship between profits and concentration is interpreted as evidence of market power (Bresnahan 1989). The advantage of this approach is that it captures important structural parameters across industries, and hence provides insights into sources of market power. However, the concentration variable may be endogenous such that higher profits may not be due to market power, but to lower costs as concentrated markets entail larger, more efficient firms.

The NEIO approach focuses more on aspects of market conduct such as the behaviour and strategic reactions of firms in the industry. It addresses the weak theoretical foundation of the SCP approach by deriving models from microeconomic theory. According to Bresnahan (1989), the NEIO approach 'sees itself as taking the best from the two great empirical industrial organisation traditions: SCP and industry case studies' (p. 1013). Various models have been developed under this general approach which can be broadly classified into those that estimate marginal cost directly, conjectural variations models, and comparative statics models. The latter can be further subdivided into comparative statics in demand, supply, costs and industry structure (Bresnahan 1989).

Of the models developed under the spirit of the NEIO paradigm, the conjectural variations model appears to be the 'workhorse' model, as shown by its wide application in various industries including the food sector. With

[3] Bresnahan (1989) and Schmalensee (1989) provide excellent reviews of the NEIO and SCP literature, respectively.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

the emergence of NEIO, there appears to have been a renewed interest in case studies among industrial organisation economists because of a reappraisal of the usefulness of the conjectural variations model (Connor 1998). Disenchantment with the NEIO approach often stems from the fact that one needs to assume a priori the mode of conduct and structure. Therefore, it is difficult to determine whether estimates of market power distortion are reliable – they may simply be the result of the imposed a priori structure, or emanate from measurement or misspecification problems (Azzam and Anderson 1996). NEIO models are typically used to analyse a single market and are difficult to implement empirically because of data requirements and sensitivity to specification errors (Hyde and Perloff 1995). Moreover, NEIO models do not identify sources of market power and, hence, have limited practical contributions in competition policy settings (Bresnahan 1989; Connor 1998).

A fourth approach – the time-series approach – can be identified, at least in the agricultural economics literature, which cannot be classified under either the SCP or NEIO approaches. This approach looks at the movement of prices in vertically-related markets and is widely used in the retail food industry. It does not fall under SCP, as no concentration ratio variable appears in the model. Bresnahan (1989), who reviewed the literature and classified a number of studies, did not include time-series models under NEIO. Examples of this approach are price-asymmetry models which use the Wolffram-Houck procedure to segment variables (e.g. Kinnucan and Forker 1987), cointegration models (Engle and Granger 1987), and price levelling and averaging models (Parish 1967; Griffith *et al.* 1991). These models are relatively easy to implement compared to NEIO models because of fewer data requirements. However, most applications lack theory and cannot distinguish between collusion and perfectly competitive markets. Hence, the corresponding results are only indicative of market power.

Clearly, these four broad approaches to analysing market power all have advantages and disadvantages (Table 2). While the case study approach covers many of the institutional details in a particular industry that are useful in competition policy settings, it is costly and limited in terms of its applications in other industries. On the other hand, the SCP approach to a certain degree helps uncover important structural parameters across industries and, hence, identify sources of market power. However, it lacks a microeconomic foundation. The NEIO approach addresses this weakness, but is difficult to implement empirically (particularly the conjectural variations model). Thus, the choice of approach depends on a number of factors such as the objectives of the study, data availability and budget constraints. Retail market power is expected to vary across products due to the different levels of countervailing power exerted by food processors. With

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

Table 2 Strengths and weaknesses of various approaches in analysing retail market power

Approaches/Models	Strengths	Weaknesses
Industry case studies	Covers institutional details of the industry	Expensive and results are limited only to the industry covered Subjective judgement
Structure-conduct-performance (SCP) paradigm	Cross-section analysis	Not rooted in a microeconomic foundation
New Empirical Industrial Organization (NEIO) Conjectural variations model Comparative statics Demand Supply Industry structure	Rooted in a microeconomic foundation	Limited mainly to single industry analysis Data limitations and sensitivity to specification problems
Movement of prices as indication of Market power Price asymmetry Cointegration Price levelling and averaging	Simple and easy to implement empirically	Most applications lack theory Cannot distinguish between collusion and perfectly competitive markets

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

data limitations and budget constraints, the case study and SCP approaches may not be practical. Moreover, with their lack of microeconomic foundation, they are less preferred to NEIO and time-series models.

3. NEIO studies

There are a number of models stemming from the NEIO approach which have been used extensively to measure market power. Three of the more popular models are considered below.

3.1 Concentration-price model

Early market power studies in the retail food industry employed the SCP approach, particularly the concentration-profit model (e.g. Marion 1979). Another model used to examine market power in the retail food industry is the concentration-price model. This is a comparative statics model of industry structure which examines how concentration variables such as the concentration ratio and other supply and demand variables affect price (Bresnahan 1989).

While Bresnahan (1989) classifies the concentration-price model as an NEIO model, it is actually a 'hybrid' of the SCP and NEIO approaches. It resembles the NEIO approach because, unlike SCP, it examines a single industry (e.g. retail food) without inferring market power from a cross-section of industries and without treating price-cost margins as observables. However, unlike conjectural variations models, it does not consider firm/industry conduct as an unknown parameter to be estimated and, in particular, it is not necessary to make restrictive assumptions about monopolistic seller behaviour. Unfortunately, however, as the concentration-price model has its roots in the SCP paradigm, it inherits some of its problems (Connor 1996), a number of which are highlighted here.

First, the assumption that the concentration or market share variable is exogenous is questionable. Referring to the concentration-profit model, Clarke and Davies (1982) show that margins and concentration are jointly determined by underlying cost and demand conditions. This is essentially the argument advanced by Demsetz (1973) – that margins or profits are high in concentrated markets, not because of market power, but because of lower costs. Cotterill and Harper (1995) suggest that this problem persists in concentration-price studies, but in a different form. Specifically, prices may be higher in concentrated markets, because firms offer higher quality and more expensive differentiated products. Most studies which have used the concentration-price model have assumed homogeneous products except Cotterill (1986), Kaufman and Handy (1989) and Cotterill (1999). An issue arises as to

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

whether the concentration ratio or Herfindahl index is a more appropriate explanatory variable in concentration-price models than market share when products are differentiated. Harris (1988) has shown that, with an homogeneous product, the choice does not matter. However, with differentiated products, a share variable is more appropriate as the effect of concentration on margins is indeterminate a priori. Lamm (1981) and Cotterill (1986) used both measures, assuming homogeneous and differentiated products respectively.[4]

Second, all concentration-price studies assume perfect collusion (the polar extreme to Cournot). Thus, if the underlying game is other than perfect collusion, some bias in the results should be expected (Connor 1996).

Third, the relationship between price and market share may not be linear, but linear in logarithms. However, most studies including those cited above do not estimate the model in log form.

Fourth, while the above studies seek to capture scale effects, cost variables used are in additive form, implying no substitution between inputs. Azzam (1997), however, assuming an homogeneous product, showed that the effect of market power and cost efficiency could be decomposed.

Finally, concentration- price studies focus on determining retail market power in the output market, and assume perfect competition in the input market.

3.2 Conjectural variations models

The concentration-price model focuses on an aggregate sector (e.g. retail food), ignoring the degree of market power across various products within the sector. Applications of conjectural variations models, on the other hand, examine specific products or industries. A firm's belief about rivals' reactions to its output choice is called a conjectural variation (Azzam and Pagoulatos 1990). The majority of these applications have been conducted in the processing sector and very few have been reported in the retail industry.

One of these is the study by Richards *et al.* (1996) which examines retailers' market power in the input and output markets of the lemon industry. Following Schroeter and Azzam (1991), the retail margin is expressed as a function of marketing costs, exogenous variables and output and input market power parameters. The study also examines the effect of marketing order suspensions by using a dummy variable to represent prorate and non-prorate periods, thereby differentiating conjectural elasticities during each of the prorate regimes.[5] The conjectural elasticity is defined as the conjectural

[4] For an interesting debate regarding this issue, see Cotterill (1993b).

[5] Prorates refer to the system of controlled allocations between the fresh and processing markets (Richards *et al.* 1996, p. 263).

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

variation of a firm multiplied by its market share (Azzam and Pagoulatos 1990). To identify the conjectural elasticity values, a multi-stage estimation procedure was applied similar to Azzam and Pagoulatos (1990); Schroeter and Azzam (1991); and Wann and Sexton (1993). The first stage involves estimating time-varying demand and supply elasticities. The second stage involves specifying the marketing input cost function as a dual retailer cost function to account for variations in input price on retail margins.

One limitation of the above model is the assumption of a fixed proportions technology. Heien (1980) argues that this is realistic in a retail setting, where further processing of supplies sourced from farmers, wholesalers or manufacturers is limited. However, studies such as Gardner (1975); Alston and Scobie (1983); Mullen *et al.* (1988); and Wohlgenant (1996) show that a fixed proportions assumption between agricultural inputs and marketing inputs is quite restrictive. With the exception of Wohlgenant (1996), most studies which relax the assumption of fixed proportions are applications in the processing sector and not in the retail sector (e.g. Azzam and Pagoulatos 1990; Azzam 1992; McCorriston *et al.* 1998).

Second, while not explicitly stated in the study by Richards *et al.* (1996), the model assumes identical firms with equal market shares, equal conjectural variations in equilibrium, and restricted entry. These are standard assumptions in this type of model stemming from the scarcity of firm-level data, and the need to allow for consistent aggregation over firms. The Gorman polar cost function, which assumes that firms have different intercepts or fixed costs, but identical slopes or marginal costs, is usually employed in conjectural variations models (Appelbaum 1982; Cotterill 1993a). However, in reality firms do differ and often vary in size with heterogeneous costs (especially under imperfect competition). As argued by Bresnahan (1989), the marginal costs of firms are likely to vary in equilibrium when market power exists. As such, it is better to interpret the aggregate conjectural variation estimated at the industry level as average industry conduct, and the price-cost margin as average industry mark-up, as in Cowling and Waterson (1976). Thus, the model cannot distinguish between market power and efficiency because intra-industry variation among different sizes of firms is not accounted for in the model (Cotterill 1993a).

Third, there are problems in the empirical estimation of the above model. Hyde and Perloff (1995) found that conjectural variations models were sensitive to choice of functional form. In their simulation, they noted that the use of the translog reduced the probability of correctly determining the true market structure by six times on the average, compared with an estimate based on a correctly-specified functional form. Thus, they concluded that the model would be only powerful and flexible if it were correctly specified. They

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

also found that, using a general structural model, they could not generate reliable results using aggregate data (4-digit SIC) for the food manufacturing industry. This implies that estimating conjectural variations models at the industry level requires extensive experimentation with specification, making tests on the estimates unreliable (Hyde and Perloff 1995). To address this problem, three approaches have been employed. One approach is a full system approach, as in Appelbaum (1982) and Schroeter (1988). The former study includes margin and demand functions for both inputs and output. The latter consists of supply, output demand, margin and input demand equations. A second approach is a partial approach where margins or price and cost-related equations are estimated in a partial equation system, with input supply and output demand elasticities estimated separately or obtained from extraneous sources (e.g. Azzam and Pagoulatos 1990). A third approach is a single-equation variant of the second approach where the margin or price equation is estimated and elasticities are estimated separately or sourced from other studies (e.g. Azzam 1996). Although the full system approach is an ideal approach, as it accounts for the relevant factors simultaneously, the other two approaches may prove more practical, given their sensitivity to misspecification problems and data requirements.

Fourth, in estimating a conjectural variations model, one needs to assume a priori a mode of conduct and structure (i.e. oligopolistic-Cournot or Bertrand; monopolistic/collusion). Accordingly, one is uncertain as to whether the gap between marginal cost and price is due to the assumption, or simply emanates from measurement or misspecification problems (Azzam and Anderson 1996). Azzam (1992) developed a model that addressed this issue by testing whether meat processors set price equal to marginal cost. The model assumes a monopolistic and monopsonistic processor. While this assumption appears to be unrealistic, as there is more than one firm in the meat processing industry, the model tests whether processors set price equal to marginal cost and not whether the demand curve is horizontal. Following Appelbaum (1982), the market power parameter which is the distortion parameter/s in Azzam's model (not a conjectural elasticity) can be interpreted as an average distortion parameter. The advantage of Azzam's model is that its assumptions are consistent when using aggregate data. Holloway and Hertel (1996) show that, at the aggregate level, the only conjecture consistent with equilibrium is the monopolistic conjecture.

Finally, while firms in the above retail conjectural variations model appear to be engaged in dynamic behaviour where they consider the reactions of other rivals in deciding how much to produce, the model is in fact derived in a static framework. Holloway (1991) extended Gardner's (1975) marketing margin model to account for imperfect competition and addressed the issue of entry. However, in the empirical application, he assumed a fixed

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

proportions technology and only addressed market power in the output market, not in the input market.

3.3 Bargaining model

The models discussed thus far assume that retailers source their supplies from competitive markets. However, some suppliers, particularly in the food processing industry, are not price takers, as evidenced in various studies (e.g. Wann and Sexton 1993). Traill and Henson (1994) argued that the retail price of a product was determined by the degree of competition at the manufacturing and retail levels and the bargaining process between these two players in the food chain. Steiner (1993) also argued that an inverse relationship existed between retailing and manufacturing margins, as found in various industries producing homogeneous food products (e.g. Wills and Mueller 1989). The argument is that manufacturers' advertising, which enhances popularity of these products among consumers, causes intense competition among retailers. As manufacturers appear to possess greater bargaining power they can command higher wholesale prices which results in an inverse relationship between manufacturer and retail margins. Studies providing evidence of this inverse relationship include Reekie (1975); Nelson (1978); Albion and Farris (1987); and Steiner (1993). Although this phenomenon is more common in non-food products with high penetration rates, and large advertising budgets (Lal and Narasimhan 1996), a study by Binkley and Connor (1996) on grocery pricing revealed that prices for non-branded unprocessed products, such as fresh red meats and milk, were not affected by cost factors compared to branded products. This may suggest that branded products were priced more competitively than non-branded products, possibly implying an inverse relationship between wholesale and retail margins.

These studies provide insights into dynamics in vertical channels, particularly the interaction between suppliers and retailers. It has been argued that there has been a shift of market power from suppliers to retailers, and this has been the subject of a number of studies, particularly in the field of marketing. This shift of power has been attributed to increasing retailer concentration, access to scanner technology, eroding brand loyalty due to increases in price promotions, and improved quality of private label products (Ailawadi *et al.* 1995; Soucie 1997). In addition, fragmentation of consumer markets, enhanced quality of retail management personnel and a decline in manufacturer advertising also contributed to the shift of power to retailers (Messinger and Narasimhan 1995). The empirical evidence, however, reveals mixed results. Kaufman and Handy (1989); Farris and Ailawadi (1992);

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

Ailawadi *et al.* (1995); and Messinger and Narasimhan (1995) found no evidence of market power in the USA retail food industry. However, as discussed earlier, Marion (1979); Lamm (1981, 1983); and Cotterill (1986) found the opposite. It is inappropriate to compare and draw conclusions from these studies, as they vary in terms of periods or samples covered, methodologies of testing market power and level of data aggregation.

Interestingly, while the marketing field explored the shift of power from manufacturers to retailers, agricultural economists hypothesized that global food market structures were converging into a USA manufacturer-led model, or a UK retailer-led model, or possibly a hybrid of both (Cotterill 1997). One of the many reasons why food manufacturers in the USA dominate retailers is strong brand loyalty produced by effective advertising (Connor 1997). This may explain why some studies found no evidence of market power in the USA retail food industry, as manufacturers dominate the entire food system. On the other hand, retailers in the UK are the dominant players, partly because of their strong private labels (Cotterill 1997).

Although there is some empirical evidence relating to the impact of suppliers' bargaining (or market) power on retailers' margins, there are limited studies providing a balance between theoretical and empirical applications. Based on the concept of Steiner (1978), Lynch (1986) developed a formal model and showed that, with a monopolistically competitive retailing segment, the elasticity of demand facing a brand manufacturer might change inversely with that experienced by the brand's retailers. Similarly, Lal and Narasimhan (1996) used game theory to explain the inverse relationship between manufacturer and retailer marketing margins. While these theoretical studies focused specifically on explaining the inverse relationship hypothesis of Steiner, the bilateral monopoly/countervailing power literature could also be used to understand the interaction between suppliers and retailers.[6]

Bilateral monopoly can be modelled to allow for the dominance of the seller or the buyer, collusion or bargaining. A number of studies have been undertaken in this area since the seminal paper by Bowley (1928). Studies on bilateral oligopoly are limited, even though this model appears to be a realistic one (Azzam 1996). The bilateral oligopoly model developed by Azzam (1996) circumvented the bargaining issue and directly estimated the degree of dominance. It was applied in the beef slaughter and retail industries. The model posits that observed carcass price depends on the relative degree of dominance of packers or retailers. The study provides a framework for modelling interaction between producers and suppliers.

[6] This has an interesting history which can be traced back to the concept of countervailing power developed by Galbraith 1952 triggering criticisms due to the lack of rigorous theory of bilateral oligopoly (e.g. Connor 1996).

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

However, no substitution possibilities between labour and material inputs are allowed. Although this may not be restrictive in the beef industry, it does not realistically reflect the possible substitution between retailing inputs evident in more developed retail food industries such as that of the USA.

4. Time-series models

Time-series models are similar to NEIO models, but differ in their capacity to identify market distortion. They include the price-asymmetry, cointegration, and price-levelling and averaging models examined below.

4.1 Price asymmetry

The time-series model most widely used in the agricultural economics literature to examine retail market power is the price-asymmetry model. This model is based on the notion that input price increases are more rapidly and more completely passed on to consumers than input price reductions (von Cramon-Taubadel 1998). It uses the Houck (1977) procedure to segment changes in aggregate costs into decreases and increases in various cost components. This method was based originally on the work by Tweeten and Quance (1969) which was modified later by Wolffram (1971) and Houck (1977). Thus, it has now been dubbed the Wolffram-Houck asymmetry model (von Cramon Taubadel 1998).

The most widely cited application of this model is by Kinnucan and Forker (1987) who used the theoretical model by Heien (1980) as a basis for incorporating dynamics into the Houck procedure. The key question being investigated in this approach is whether decreases and increases in buying prices (farm or wholesale or processor) are reflected in or transmitted to selling or retail prices. In other words, whether lower and higher buying prices are equally transmitted to selling prices. Although not quite explicit in all studies using this approach, the model is derived under the assumption that a profit-maximising firm produces an homogeneous product with a fixed proportions constant returns to scale technology. Early studies such as Heien (1980) and Kinnucan and Forker (1987) made this more explicit. More recent studies such as Fabiosa (1995) and Mohanty *et al.* (1995) focused on the estimation of an empirical model applying the Houck procedure.

Several issues arise in estimating price-asymmetry models. One is the assumption of a fixed proportions technology. While this may not be considered restrictive in the retailing compared to the manufacturing sector retail industries in recent years, particularly in developed countries, have substantially changed due to structural changes in demand. For example, as a result of the increasing demand for convenience food, retailers' ready-to-eat

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

meals categories have expanded, implying substitution between labour and raw material inputs. Moreover, most of the studies employing this approach, while assuming fixed proportions, do not pay much attention to the role of retailing costs (other than the raw material). Kinnucan and Forker (1987), for example, attempted to include cost variables such as labour, packaging materials, and transportation, but resorted to using an index of cost variables due to multicollinearity problems. On the other hand, Pick *et al.* (1991); Fabiosa (1995); and Mohanty *et al.* (1995) did not use any cost variables in their models other than the cost of the raw material.

Another issue in estimating price-asymmetry models with lagged increases and decreases in retail and wholesale prices is the high correlation between the current and lagged segmented prices. One way of addressing this problem is to impose a structure on the coefficients of the segmented variables. The Koyck and Almon polynomial techniques can be used to address this issue. The latter technique, used by Kinnucan and Forker (1987), is more flexible than the Koyck technique which assumes that coefficients decline in a geometric pattern (Gujarati 1995). In addition, it requires fewer data compared to those required in the Koyck technique and does not include lagged dependent variables as explanatory variables. Finally, the number of coefficients to be estimated would be smaller than the original number of coefficients if a low-degree polynomial were fitted (Gujarati 1995).

Aggregation over product types and across regions and cities has important repercussions in modelling. For example, aggregating retail and wholesale prices of particular products, such as all leafy vegetables or all types of chicken, distorts price relationships. The same would be true in aggregating regions and cities. Thus, it is extremely important to use disaggregated data, if feasible.

For more than a decade, the price-asymmetry model using the Wolffram-Houck procedure has been used widely without taking into account the issue of possible non-stationarity of time-series data. Mohanty *et al.* (1995) first addressed this issue in their application of the model to the international wheat trade. They found price series of wheat to be non-stationary, but not cointegrated and hence estimated the model in first differences to avoid spurious regression. von Cramon-Taubadel and Loy (1996) criticised this study for not estimating the model within a cointegration framework as, using the same data set, they found that the price series was cointegrated.[7] Disregarding this observation, von Cramon-Taubadel and Loy (1996) have shown why the Wolffram-Houck procedure is incompatible with a cointegrated system. This is because the model is a vector autoregression (VAR) in

[7] See von Cramon-Taubadel and Loy (1996) for the comment and Mohanty *et al.* (1996) for the response.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

differences, which does not account for the information on the evolution of a cointegrated system that is conveyed in non-stationary levels (Hamilton 1994; von Cramon-Taubadel and Loy 1996). Thus, the model would not capture the long-run relationship between retail and wholesale prices and other cost variables if these variables were non-stationary of order one and cointegrated. von Cramon-Taubadel and Loy (1996) show that it is particularly important to test whether the model variables are cointegrated when the results are asymmetric as in Mohanty *et al.* (1995).

A number of empirical applications of price transmission models conduct causality tests between two vertical nodes, that is, farm and retail or wholesale and retail (e.g. Heien 1980; Ward 1982; Mohanty *et al.* 1995). These studies conduct causality tests as one step in the examination of price-asymmetric responses, often to determine the direction of causality. Based on a theoretical model, farm prices cause retail prices such that retail prices are treated as the dependent variable and farm prices as the independent variable. Thus, if the direction of causality is reversed, the empirical model may be misspecified (Mohanty *et al.* 1995). Heien (1980) found approximately half of the commodities studied conformed with the expected results based on the theoretical model, that is, farm price caused retail price. Other studies, such as those of Kinnucan and Forker (1987) and Pick *et al.* (1991) however, do not recommend causality tests between retail and farm prices and retail and wholesale prices. As indicated by Kinnucan and Forker (1987), this test is controversial and inconsistent with the mark-up model which assumes farm/wholesale prices are exogenous. Conway *et al.* (1984) argue that Sims and Granger's causality tests are fatally flawed for several reasons. One reason is the exclusion of other variables which renders results spurious (Berndt 1991). It is worth noting that, in the profit maximising condition for a firm or retailer behaving non-competitively, there are other variables that affect price-setting behaviour. Under perfect competition, causality testing may be more appropriate, as price is a key factor in a firm's decision-making process, and is in fact exogenous to the model. Under imperfect competition, however, a monopolist considers both demand and supply factors, so price and quantity are determined simultaneously. Moreover, the sampling distributions of various statistics used in causality testing to determine statistical significance are often valid only in large samples (Berndt 1991, p. 383). Finally, Granger's causality test will prove ineffective when data series is non-stationary, although Willett *et al.* (1997) addressed this limitation by including a trend variable and a current period value of the presumed causal factor in the price-asymmetry model.[8]

[8] Time-series analysts do not recommend a trend variable when variables are non-stationary (Gujarati 1995).

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

4.2 Cointegration

The cointegration approach has also been used to examine movements of prices to infer the conduct of marketing firms. However, unlike the above models, most studies that utilise cointegration such as Goodwin and Schroeder (1991), examine prices not between two market levels such as farm and retail, but between traders or retailers in two locations. The concept is that, if the market is perfectly competitive, then prices move together in the long run and hence are cointegrated. This implies that markets are integrated if prices are cointegrated. However, Faminow and Benson (1990) argued that such market integration results could either be interpreted as efficient arbitrage or perfect collusion. They showed theoretically that interpretation of the results of market integration analysis, assuming a standard point-space trading model, differed from a model assuming spatial competition. The former interprets short-run market integration as competitive FOB pricing and efficient Marshallian arbitrage, while the latter implies basing point pricing which results from an organised oligopoly setting, as in price leadership or collusion (Greenhut 1971; Scherer and Ross 1990).[9] To illustrate this they applied the Ravallion (1986) market integration model to examine hog prices in Canada. They found incomplete basing-point pricing using a weak form of the short-run integration test.[10]

Results using cointegration models will be unreliable if simultaneity bias exists between two prices. Purcell (1999) employed a vector error correction model to examine price asymmetry between producer and retail prices. He argued that asymmetric-price transmission provided an indication of market power as producer and retail prices were slow to adjust due to the lack of competitive pressure. He found a slow adjustment between retail and producer prices which was interpreted as an indication of 'vertical' market power, but found horizontal competition to be sufficient. It should be noted, however, that as in the price- asymmetry and price levelling/averaging models, the cointegration approach is a 'weak test' of imperfect competition. The absence of cointegration may be due to a number of factors aside from market power, such as government intervention and poor infrastructure, as well as its lack of power to distinguish between collusion and a competitive outcome (Baulch 1997).

While cointegration analysis provides only an indication of market power, it is a necessary step in estimating price-asymmetry models, at least when a

[9] Basing point pricing refers to a system in which one production point is accepted as the basing point, and all prices are quoted at that point plus freight to destination (Scherer and Ross 1990, p. 504).

[10] Short-run integration implies long-run integration in Ravallion's model (Ravallion 1986).

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

sufficiently long time-series is available. It is needed to address the problem of non-stationarity of time-series variables which results in inferential inconsistencies and biases, as in Mohanty *et al.* (1995); von Cramon-Taubadel and Loy (1996); and von Cramon-Taubadel (1998). While useful in testing market integration to provide an indication of market power, cointegration is also helpful in providing an indication of whether or not products or markets should be aggregated, which is important in the empirical analysis of market power. Monke and Petzel (1984) argue that if markets are not integrated or independent, they should be modelled in a disaggregated manner. Hick's composite commodity theorem suggests that commodities can be aggregated when the relative prices of these products remain constant. Hence, aggregating commodities when prices are not integrated runs into some conceptual problems. Similarly, Gardner and Brooks (1994) noted that the markets might be viewed as a single market when they were integrated, since arbitrage eliminated price differences in the two markets. Imperfect competition such as collusion, or preferential access to scarce resources such as transport and credit, leads to higher price differences than transaction costs, thus affecting market integration (Sexton *et al.* 1991). In their study of the West Bengal food economy, Palaskas and White (1993) found that factors such as polarisation of assets, institutional control of information and price formation, and various other barriers to entry, affected market integration aside from underdeveloped infrastructure facilities. These factors perpetuate market power and distort price signals and market integration (Faminow and Benson 1990; Goodwin and Schroeder 1991).

4.3 Price levelling and averaging

Transmission of prices between farm and retail has also been examined, using price levelling and averaging models, ostensibly to infer the conduct of retailers. The degree of price variability often varies between retail and wholesale/farm levels with the latter being found to be more variable. Parish (1967) attributed this phenomenon to retailers' levelling and averaging of prices. Aside from repricing costs, instability of supply and other demand conditions, Parish argued that retailers levelled or averaged prices because of market power. He noted that if one were willing to assume that the demand curve facing a retailer was not only more elastic at high prices than at low prices, but also possessed a kink (oligopoly demand) at the normal price, one could explain both the rigidity of retail prices and the variations in margins among various products similar to those resulting from price levelling and averaging.

Like the price-asymmetry and cointegration models, an indication of price levelling and averaging does not necessarily mean the presence of market

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

power. There are other factors which may give rise to the same result. However, price levelling and averaging may potentially provide an indication of market power with a model derived from a profit-maximising retailer, assuming imperfect competition in the retail output market.

Assuming that the level of output is exogenous and demand is constant over the period covered, a positive relationship between output and retail price implies market power. In Parish's model, this result is taken as evidence of price levelling. On the other hand, if a linear demand curve facing the retailer is assumed, with the price of a substitute taken as a demand shifter, a negative and significant relationship between retail price and the price of a substitute implies imperfect competition. A negative significant relationship between these two variables implies price averaging. This shows how the empirical model of price levelling and averaging can be used to test for market power, a useful result which has not been emphasised in the literature. However, price levelling and averaging are typically short-run phenomena and, hence, the length of run or period covered in the analysis may also affect the conclusion, as found by Chang and Griffith (1998). Although a number of issues arise in estimating the model, such as stationarity of time-series data, frequency of time-series intervals (i.e. weekly or daily), data aggregation and possible endogeneity of farm and wholesale prices, the main criticism is the all-too-common lack of theory underpinning time-series models.

5. Some alternative retail theories

A number of theories of retail firms have been developed outside the agricultural economics literature. While providing a framework for analysing the behaviour of a retail firm the theoretical models by Ehrlich and Fisher (1982); Betancourt and Gautschi (1988); and Bliss (1988), among others, address the important issue of search costs. Bliss (1988) considers transport costs incurred by the consumer shopping around. Ehrlich and Fisher (1982) elaborate using the concept of full price, which includes factors affecting search costs such as the information provided by the retailer through advertising, its stock of knowledge about the retailers in the area, amount of goods purchased and other selling services. Betancourt and Gautschi (1988), on the other hand, provide more detail encompassing other non-search costs incurred by the consumer such as psychic costs. This is perhaps due to the fact that, unlike the concept developed by Ehrlich and Fisher (1982), this theory was specifically developed for retailing, and therefore the terms used resemble those used by people in the retail business, such as depth and breadth of the goods carried by retailers. Table 3 summarises the types of search costs incurred by consumers in purchasing goods from retailers, and the corresponding services or outputs provided by retail firms to ameliorate these costs.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

Table 3 Consumers' search costs versus retailers' outputs

Consumers' search costs	Distribution services/Outputs of retail firms*
Direct time costs or the opportunity cost of travel time, including the waiting time inside and outside the retail establishment	Accessibility of location
Direct transportation costs or the monetary costs of going to and from the retail establishment	Accessibility of location
Adjustment costs incurred in purchasing or consumption activities, as a result of the unavailability of products or services at the desired time of consumption and purchase	Degree of assurance of immediate product delivery in the desired form, place and time
Psychic costs or costs inflicted on the consumer in using the retail system by undesirable characteristics of the retail environment, such as inconvenience caused due to poor customer service or inadequate air-conditioning	Ambience which determines the 'psychic' costs imposed on the consumer by the nature of the retail environment
Storage costs	Level of production assortment which can be classified further into: breadth (different product lines) and depth (different varieties within the product line)
Information costs	The amount of information provided by retailers with respect to the price, availability and other characteristics of the goods and services via advertising, promotion, and provision of sales assistants

* Includes the provision of goods and services termed as 'explicit products'.
Source of basic data: Betancourt and Gautschi (1988).

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

The customer theory of Okun (1981), used by Lye and Sibly (1994), where retailers and customers benefit by maintaining stable prices, can also be explained using the concept of search costs. Customers minimise costs, including search costs, once they have identified the best retail outlet to source their needs. This outlet provides the best services demanded by the customer considering the prices of the goods purchased, including search costs. Therefore, it is beneficial for the retailer to minimise variability in prices as he/she will incur costs of attracting or informing customers. However, Azzam (1999) shows that asymmetry may be due to the non-linearity of demand which, in turn, may be due to the assumption of spatial competition, implying the presence of search costs.

Closely related issues include the forward integration of processors venturing into retailing, often analysed using the concepts of organisational theory or transaction cost analysis (Williamson 1985) and forward integration by suppliers under monopolistic competition (Perry and Groff 1985). Theories such as the 'evolutionary economics of markets' and the 'resource-based theory of business strategy' (e.g. Penrose 1959; Nightingale 1996) help explain the ability of firms to exercise market power. For a retail firm to extract rents in an industry, it needs to have an advantage over other firms in areas such as product quality or differentiation, knowledge, information and depth and breadth of products sold.

While the above models provide a more realistic alternative framework for modelling a retail firm, empirical applications appear limited due to data unavailability. The study by Betancourt and Gautschi (1993), for example, encountered difficulties in producing an empirical equivalence for the theoretical model. However, these retail models do provide a theoretical basis for incorporating retail services into the demand for 'explicit products'.

6. Conclusion

A number of conclusions emerge from this survey. First, more studies on market power appear to have been conducted in food manufacturing than in food retailing in developed countries.

Second, there are advantages and disadvantages to the four approaches to analysing market power reviewed in the present paper, that is, the case study, SCP, NEIO and time-series models. While the case study approach provides institutional details of an industry, it is expensive to conduct. The SCP approach typically covers a cross-section of industries, but it lacks a microeconomic foundation. On the other hand, while rooted in microeconomic theory, NEIO is usually limited to a specific industry and difficult to estimate empirically, as it requires a large amount of data and is sensitive to

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

misspecification problems. Time-series models are easier to implement, but they too generally lack a microeconomic foundation.

NEIO models, such as concentration-price and conjectural variations models, can be used to test explicitly for market power. However, they also have a number of drawbacks. Although the concentration-price model is able to provide insights into the sources of market power by including variables such as firm-level characteristics, most studies using such a model do not distinguish market power across products and may encounter endogeneity problems if using a concentration variable. However, these problems can often be addressed by using better data. Even though the conjectural variations model tests for market power in a specific industry, it does not provide insights into the sources of market power.

Various studies using time-series models, such as the Wolffram-Houck price-symmetry model, cointegration and price averaging and levelling models, have found price asymmetry and rigidity. They also reveal that results vary across types of products and commodities. Most authors attribute their findings to the exercise of market power among retailers. However, applications of these models lack a solid theoretical basis, and only provide an indication of market power, as there are other factors that may yield the same conclusion.

Third, a key question that needs to be addressed is whether retailers exercise market power in input and output markets. A model that tests for market power for the whole retail sector, such as a concentration-price model or a conjectural variations model (provided the weaknesses of these models are dealt with), is needed. However, a number of studies show that market power may also be present in the processing sector, where large firms operate in highly concentrated markets. Thus, the possibility of bargaining power in this sector cannot be discounted. Moreover, while analysis by product should be done at a highly disaggregated level, data availability is a limiting factor in analysing market power. Ideally, firm-level data should be used, as firms have different cost structures which affect the degree of market power.

Finally, given the strengths and weaknesses of these approaches and other considerations such as data and budget constraints, it appears that an approach which minimises the weaknesses and builds on the strengths of individual approaches may be worth pursuing. One way to achieve this is to combine several approaches, particularly NEIO and times-series models, which may be implemented in several stages. Price-asymmetry and cointegration models may be employed in the first stage to provide an indication of price rigidity and asymmetry in a number of industries covering both unprocessed and processed food products. Because the time-series models only provide an indication of market power, a conjectural variations model may be estimated in a second stage to explicitly test for retail market power in

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

the input and output markets. The possibility of countervailing power may be explored in a third stage. By employing a multi-stage approach using a number of models, various ways of characterising market power can be validated. Indeed, there are many options open to researchers to examine market power in the retail food industry. While the choice depends on several constraints, the significance of a solid theoretical foundation for the approach employed cannot be ignored.

References

Abbott, P.C. 1996, 'Industrial organisation and trade in food industries: Introduction', in I.M. Sheldon and P.C. Abbott (eds) *Industrial organisation and trade in the food industries*, Collective volume articles. Harper Collins, Westview Press, Boulder and Oxford.

Ailawadi, K.L., Borin, N. and Farris, P.W. 1995, 'Market power and performance: A cross-industry analysis of manufacturers and retailers'. *Journal of Retailing*, vol. 71, pp. 211–248.

Albion, M.S. and Farris, P.W. 1987, *The advertising controversy: Evidence on the economic effects of advertising*. Auburn House, Boston.

Alston, J.M. and Scobie, G.M. 1983, 'Distribution of research gains in multistage production systems: Comment'. *American Journal of Agricultural Economics*, vol. 65, pp. 353–356.

Appelbaum, E. 1982, 'The estimation of the degree of oligopoly power'. *Journal of Econometrics*, vol. 9, pp. 287–299.

Australian Parliament 1999, *Report to the joint select committee on the retailing sector*, Senate Printing Unit, Parliament House, Canberra.

Azzam, A. 1992, 'Testing the competitiveness of food price spreads'. *Journal of Agricultural Economics*, vol. 42, pp. 248–256.

Azzam, A.M. 1996, 'Estimating the degree of dominance in a bilateraloligopoly'. *Applied Economics Letters*, vol. 3, pp. 209–211.

Azzam, A.M. 1997, 'Measuring market power and cost-efficiency effects of industrial concentration'. *Journal of Industrial Economics*, vol. 45, pp. 377–386.

Azzam, A. 1999, 'Asymmetry and rigidity in retail-price transmission: A theoretical analysis'. *American Journal of Agricultural Economics*, vol. 81, pp. 525–533.

Azzam, A. and Anderson, G. 1996, *Assessing competition in meat packing: Economic history, theory and evidence*, Grain Inspection, Packers and Stockyards Administration, United States Department of Agriculture, Washington, DC.

Azzam, A.M. and Pagoulatos, E. 1990, 'Testing oligopolistic and oligopsonistic behavior: An application to the US meat-packing industry'. *Journal of Agricultural Economics*, vol. 41, pp. 362–390.

Bain, J.S. 1951, 'Relation of profit rate to industry concentration: American manufacturing, 1936–40'. *Quarterly Journal of Economics*, vol. 65, pp. 293–324.

Baulch, B. 1997, 'Transfer costs, spatial arbitrage and testing for food market integration'. *American Journal of Agricultural Economics*, vol. 79, pp. 477–487.

Berndt, E.R. 1991, *The practice of econometrics: Classic and contemporary*, Addison-Wesley Publications Co, Reading, Massachussets.

Betancourt, R. and Gautschi, D. 1988, 'The economics of retail firms'. *Managerial and Decision Economics*, vol. 9, pp. 133–144.

Betancourt, R. and Gautschi, D. 1993, 'The outputs of retail activities: Concepts, measurement and evidence from US census data'. *Review of Economics and Statistics*, vol. 75, pp. 294–301.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

Binkley, J.K. and Connor, J.M. 1996, *Market concentration and metropolitan-area grocery prices*, Department of Agricultural Economics, Purdue University, West Lafayette.

Bliss, C. 1988, 'A theory of retail pricing'. *Journal of Industrial Economics*, vol. 36, pp. 375–391.

Bowley, A.L. 1928, 'Bilateral monopoly'. *Economic Journal*, vol. 14, pp. 651–659.

Bresnahan, T.F. 1989, 'Empirical studies of industries with market power', in R. Schmalensee and R.D. Willig (eds) *Handbook of industrial organisation*, vol. 2, Elsevier Science Publishers, Amsterdam.

Chang, H-S. and Griffith, G.R. 1998, 'Examining long run relationships between Australian beef prices'. *Australian Journal of Agricultural and Resource Economics*, vol. 42, pp. 369–387.

Clarke, R. and Davies, S.W. 1982, 'Market structure and price-cost margins'. *Economica*, vol. 49, pp. 277–287.

Connor, J.M. 1996, 'Did the competitive regime switch in the 1980s?' *American Journal of Agricultural Economics*, vol. 78, pp. 1192–1197.

Connor, J.M. 1997, 'Economic overview and research issues'. *Agribusiness*, vol. 13, pp. 253–259.

Connor, J.M. 1998, *What can we learn from ADM global price conspiracies?* Department of Agricultural Economics, Purdue University, West Lafayette.

Conway, R.K., Swamy, P.A.V.B. and Yanagida, J.F. 1984, 'The impossibility of causality testing'. *Agricultural Economics Research*, vol. 36, pp. 1–19.

Cotterill, R.W. 1986, 'Market power in the retail food industry: Evidence from Vermont'. *The Review of Economics and Statistics*, vol. 86, pp. 379–386.

Cotterill, R. 1993a, 'Introduction and methodological overview', in R. Cotterill (ed.) *Competitive strategy analysis in the food system*, Westview Press, Boulder.

Cotterill, R. 1993b, 'A response to the Federal Trade Commission/Anderson critique of structure-performance studies in grocery retailing', in R. Cotterill (ed.) *Competitive strategy analysis in the food system*, Westview Press, Boulder.

Cotterill, R.W. 1997, 'The food distribution system of the future: Convergence towards the US or UK model?' *Agribusiness*, vol. 13, pp. 123–135.

Cotterill, R.W. 1999, 'Market power and the Demsetz quality critique: An evaluation for food retailing'. *Agribusiness*, vol. 15, pp. 101–118.

Cotterill, R.W. and Harper, C.D. 1995, *Market power and the Demsetz critique: An evaluation for food retailing*, Food Marketing Policy Center, University of Connecticut, Storrs.

Cowling, K. and Waterson, M. 1976, 'Price-cost margins and market structure'. *Economica*, vol. 43, pp. 267–274.

von Cramon-Taubadel, S. 1998, 'Estimating asymmetric price transmission with the error correction representation: An application to the German pork market'. *European Review of Agricultural Economics*, vol. 25, pp. 1–18.

von Cramon-Taubadel, S. and Loy, J.P. 1996, 'Price asymmetry in the international wheat market: Comment'. *Canadian Journal of Agricultural Economics*, vol. 44, pp. 311–317.

Demsetz, H. 1973, 'Industry structure, market rivalry, and public policy'. *Journal of Law and Economics*, vol. 16, pp. 1–10.

Digal, L.N. 2001, 'Market power in the Philippine retail food industry', Unpublished PhD Dissertation, The University of Sydney, Sydney.

Digal, L.N. and Ahmadi-Esfahani, F. 2000, 'Market power in the Philippine retail food industry', Contributed paper presented at the 44th Annual Conference of the Australian Agricultural Resource Economics Society, University of Sydney, 23–25 January, 2000.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

Ehrlich, I. and Fisher, L. 1982, 'The derived demand for advertising: A theoretical and empirical investigation'. *American Economic Review*, vol. 72, pp. 366–388.
Engle, R.F. and Granger, C.W.J. 1987, 'Cointegration and error correction: Representation, estimation and testing', *Econometrica*, vol. 55, pp. 251–276.
Fabiosa, J.F. 1995, 'Price asymmetry in the rice marketing channel: Is there evidence of market power?' *Journal of Agricultural Economics and Development*, vol. 30, pp. 66–85.
Faminow, M.D. and Benson, B.L. 1990, 'Integration of spatial markets'. *American Journal of Agricultural Economics*, vol. 72, pp. 49–62.
Farris, P.W. and Ailawadi, K.L. 1992, 'Retail power: Monster or mouse?' *Journal of Retailing*, vol. 68, pp. 351–369.
Galbraith, J.K. 1952, *American capitalism: The concept of countervailing power*, Houghton-Mifflin, Boston.
Gardner, B. 1975, 'The farm-retail price spread in a competitive food industry'. *American Journal of Agricultural Economics*, vol. 57, pp. 399–409.
Gardner, B.L. and Brooks, K.M. 1994, 'Food prices and market integration in Russia: 1992–93'. *American Journal of Agricultural Economics*, vol. 76, pp. 641–646.
Goodwin, B.K. and Schroeder, T.C. 1991, 'Cointegration tests and spatial price linkages in regional cattle markets'. *American Journal of Agricultural Economics*, vol. 73, pp. 452–464.
Greenhut, M.L. 1971, *A theory of the firm in economic space*, Lone Star Publishers, Austin TX.
Griffith, G.R. 2000, 'Competition in the food marketing chain'. *Australian Journal of Agricultural and Resource Economics*, vol. 44, pp. 333–367.
Griffith, G.R., Green, W. and Duff, G.L. 1991, 'Another look at price levelling and price averaging in the Sydney meat market'. *Review of Marketing and Agricultural Economics*, vol. 59, pp. 180–201.
Gujarati, D.N. 1995, *Basic Econometrics*, McGraw-Hill Inc, New York.
Hall, L., Schmitz, A. and Cothern, J. 1979, 'Beef wholesale-retail marketing margins and concentration'. *Economica*, vol. 46, pp. 295–300.
Hamilton, J.D. 1994, *Time series analysis*, Princeton University Press, Princeton, New Jersey.
Harris, H. 1988, 'Testable competing hypotheses from structure-performance theory: Efficient structure versus market power'. *Journal of Industrial Economics*, vol. 36, pp. 267–280.
Heien, D.M. 1980, 'Mark-up pricing in a dynamic model of the food industry'. *American Journal of Agricultural Economics*, vol. 62, pp. 10–18.
Holloway, G. 1991, 'The farm-retail price spread in an imperfectly competitive food industry'. *American Journal of Agricultural Economics*, vol. 73, pp. 979–989.
Holloway, G.J. and Hertel, T.W. 1996, 'Explaining the causal relationship between farm and retail prices', D. Martimort (ed.) *Agricultural markets: Mechanisms, failures, regulations*, North Holland Publishing Co., Amsterdam.
Houck, J.P. 1977, 'An approach to specifying and estimating nonreversible functions'. *American Journal of Agricultural Economics*, vol. 59, pp. 570–572.
Hyde, C.E. and Perloff, J.M. 1995, 'Can market power be estimated?' *Review of Industrial Organisation*, vol. 10, pp. 465–485.
Kaufman, P.R. and Handy, C.R. 1989, *Supermarket prices and price differences: City, firm, and store-level determinants*, US Department of Agriculture, Washington DC.
Kinnucan, H.W. and Forker, O.D. 1987, 'Asymmetry in farm-retail price transmission for major dairy products'. *American Journal of Agricultural Economics*, vol. 69, pp. 285–292.
Kohls, R.L. and Uhl, J.N. 2002, *Marketing of agricultural products*, 9th edn. Prentice Hall, Upper Saddle River.
Lal, R. and Narasimhan, C. 1996, 'The inverse relationship between manufacturer and retail margins: A theory'. *Marketing Science*, vol. 15, pp. 132–151.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

Lamm, R.M. 1981, 'Prices and concentration in the food retailing industry'. *Journal of Industrial Economics*, vol. 30, pp. 67–77.
Lamm, R.M.J. 1983, 'Agribusiness management and food marketing: Discussion'. *American Journal of Agricultural Economics*, vol. 65, pp. 1075–1077.
Lye, J.N. and Sibly, H. 1994, 'Testing for pricing asymmetries in customer markets'. *Australian Economic Papers*, vol. 33, pp. 239–252.
Lynch, M. 1986, 'The 'Steiner Effect': A prediction from a monopolistically competitive model inconsistent with any combination of pure monopoly or competition', Federal Trade Commission, Bureau of Economics, Washington DC.
Marion, B.W. 1979, 'The price and profit performance of leading food chains'. *American Journal of Agricultural Economics*, vol. 61, 420–433.
Marion, B.W., Heimforth, K. and Bailey, W. 1992, 'Strategic groups, competition and retail food prices', in R. Cotterill (ed.) *Competitive strategy analysis in the food system*, Westview, Boulder.
McCorriston, S., Morgan, C.W. and Rayner, A.J. 1998, 'Processing technology, market power, and price transmission'. *Journal of Agricultural Economics*, vol. 49, pp. 185–201.
McDonald, J.R.S., Rayner, A.J. and Bates, J.M. 1989, 'Market power in the food industry'. *Journal of Agricultural Economics*, vol. 40, pp. 104–108.
Messinger, P.R. and Narasimhan, C. 1995, 'Has power shifted in the grocery channel?' *Marketing Science*, vol. 14, pp. 189–223.
Mohanty, S. and Peterson, W.E.F. 1996, 'Price asymmetry in international wheat market: Reply'. *Canadian Journal of Agricultural Economics*, vol. 44, pp. 319–321.
Mohanty, S.E., Peterson, W.F. and Kruse, N.C. 1995, 'Price asymmetry in the international wheat market'. *Canadian Journal of Agricultural Economics*, vol. 43, pp. 355–366.
Monke, E. and Petzel, T. 1984, 'Market integration: An application to international trade in cotton'. *American Journal of Agricultural Economics*, vol. 66, pp. 481–487.
Mullen, J.D., Wohlgenant, M.K. and Farris, D.E. 1988, 'Input substitution and the distribution of surplus gains from lower US beef processing costs'. *American Journal of Agricultural Economics*, vol. 70, pp. 245–254.
Nelson, P. 1978, 'Advertising as information once more', in D.G. Tuerck (ed.) *Issues in advertising: The economics of persuation*, New York University Press, New York, pp. 131–161.
Newmark, C.M. 1990, 'A new test of the price-concentration relationship in grocery retailing'. *Economic Letters*, vol. 33 p. 369.
Nightingale, J.J. 1996, 'Evolutionary processes and revolutionary change', in P.E. Earl (ed.) *Management, marketing and competitive process*. Edward Elgar, Cheltenham.
Okun, A.M. 1981, *Prices and Quantities*, Brookings Institution, Washington DC.
Palaskas, T.B. and White, B.H. 1993, 'Testing market integration: New approaches with case material from the West Bengal food economy'. *Journal of Development Studies*, vol. 30, pp. 1–57.
Parish, R.M. 1967, 'Price levelling and averaging'. *Farm Economist*, vol. 11, pp. 187–198.
Penrose, E.T. 1959, *Theory of the Growth of the Firm*, Basil Blackwell, Oxford.
Perry, M. and Groff, R. 1985, 'Resale price maintenance and forward integration into a monopolistically competitive industry'. *Quarterly Journal of Economics*, vol. 100, pp. 293–311.
Pick, D.H., Karrenbrock, J. and Carman, H.F. 1991, 'Price asymmetry and marketing margin behavior: An example for California-Arizona citrus'. *Agribusiness*, vol. 6, pp. 75–84.
Porter, M.E. 1980, *Competitive strategy: Techniques for analyzing industries and competition*, Free Press, New York.
Purcell, T. 1999, 'Forecasting marketing margins in the Australian pig industry', Contributed paper presented at the 43rd Annual Conference of the Australian

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002

Agricultural and Resource Economics Society, Christchurch, New Zealand, 20–22 January, 1999.
Ravallion, M. 1986, 'Testing market integration'. *American Journal of Agricultural Economics*, vol. 68, pp. 102–109.
Reekie, W.D. 1975, 'Advertising and market structure: Another approach'. *Economic Journal*, vol. 85, pp. 143–158.
Richards, T.J., Kagan, A. and Adu-Asamoah, R. 1996, 'Marketing order suspensions and fresh lemon retail FOB margins'. *Journal of Agricultural and Applied Economics*, vol. 28, pp. 263–277.
Scherer, F.M. and Ross, D. 1990, *Industrial market structure and economic performance*, Rand McNally College Publishing Co, Chicago.
Schmalensee, R.D. 1989, 'Inter-industry studies of structure and performance', in R.D. Schamalensee and R.D. Willig (eds) *Handbook of industrial organisation*, Elsevier Science Publishers, New York, pp. 952–1009.
Schroeter, J.R. 1988, 'Estimating the degree of market power in the beef packing industry'. *Review of Economics and Statistics*, vol. 70, pp. 158–162.
Schroeter, J. and Azzam, A. 1991, 'Marketing margins, market power, and price uncertainty'. *American Journal of Agricultural Economics*, vol. 73, pp. 990–999.
Sexton, R.J., Kling, C.L. and Carman, H.F. 1991, 'Market integration, efficiency of arbitrage, and imperfect competition: Methodology and application to US celery'. *American Journal of Agricultural Economics*, vol. 73, pp. 568–580.
Soucie, W.G. 1997, 'Efficient consumer response meets the industrialisation of agriculture'. *Agribusiness*, vol. 13, pp. 349–355.
Steiner, R.L. 1978, 'A dual stage approach to the effects of brand advertising on competition and price', in J.F. Cady (ed.) *Marketing and the public interest*, Marketing Science Institute, Cambridge.
Steiner, R.L. 1993, 'The inverse association between the margins of manufacturers and retailers'. *Review of Industrial Organisation*, vol. 8, pp. 741–746.
Traill, W.B. and Henson, S. 1994, 'Price transmission in the United Kingdom yellow fats market in the presence of imperfect competition'. *Journal of Agricultural Economics*, vol. 45, pp. 123–131.
Tweeten, L.G. and Quance, L.C. 1969, 'Positive measures of aggregate supply elasticities: Some new approaches'. *American Journal of Agricultural Economics*, vol. 51, pp. 342–352.
Wann, J. and Sexton, R. 1993, 'Imperfect competition in the multiproduct industries with application to pear processing', in R. Cotterill (ed.) *Competitive strategy analysis in the food, system*. Westview Press, Boulder, pp. 71–90.
Ward, R.W. 1982, 'Asymmetry in retail, wholesale, and shipping point pricing for fresh vegetables'. *American Journal of Agricultural Economics*, vol. 64, pp. 205–212.
Willett, L.S., Hansmire, M.R. and Bernard, J.C. 1997, 'Asymmetric price response behavior of red delicious apples'. *Agribusiness*, vol. 13, pp. 649–658.
Williamson, O. 1985, *The economic institutions of capitalism*, Free Press, New York.
Wills, R.L. and Mueller, W.F. 1989, 'Brand pricing and advertising'. *Southern Economic Journal*, vol. 56, pp. 383–395.
Wohlgenant, M.K. 1996, 'Retail to farm price linkages in a complete system of demand functions: Extension to disaggregated marketing costs and tests for market power', Economic Research Service, United States Department of Agriculture, Washington DC.
Wolffram, R. 1971, 'Positivistic measures of aggregate supply elasticities: Some new approaches – some critical notes'. *American Journal of Agricultural Economics*, vol. 53, pp. 356–359.

© Australian Agricultural and Resource Economics Society Inc. and Blackwell Publishers Ltd 2002