The Gains and Losses from Agricultural Concentration

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This paper surveys some potential costs and benefits of increased concentration in agricultural markets in the context of an economic trade-off. The existing industrial organization literature is applied to agricultural markets to provide a more concrete structure for analysis. Although an important part of the debate, market power and the existing empirical literature measuring it are only part of a complete picture and suggestions are made on where this literature could go to increase its impact. Policy frameworks are examined to provide perspective and applications.

The Gains and Losses from Agricultural Concentration

The increase in concentration seen across many agricultural markets in the past few decades has stimulated fears of potential adverse effects from increases in market power. A large debate has arisen questioning wether the potential gains from the increased concentration outweigh the potential loses. Unfortunately, much of this debate remains poorly specified and incomplete. This paper attempts to integrate the agricultural economics and popular debate on agricultural concentration with the existing industrial organization literature and antitrust (competition) policy frameworks in developed countries to make the discussion more concrete.

An important point of this paper is that market power (the measurement of which has been the primary focus of empirical work to date) is only one part of the overall equation. From an economic perspective, an increase in market power is only one potential cost of market concentration, there are other costs to be considered and an entire range of benefits which these costs must be weighed against. From a policy perspective, having market power is not illegal and, by itself, affords little avenue for government intervention regardless of its level. An informed and welfare improving policy intervention must have a legal grounding and must weigh all economically relevant variables (until the marginal benefit of additional measurement falls to the marginal cost of additional measurement).

This paper begins with a brief survey of some potential costs and benefits of concentration. Then a simple trade-off model of market power against (physical) efficiency gains is used to provide a concrete framework for weighing the costs and benefits. A very brief note on empirical estimation is provided in order to relate existing empirical literature to the broader theoretical framework and provide guidance for future empirical work. A final section on antitrust policy reviews the framework for regulatory intervention to relate the points made in previous sections to realistic policy responses.

Gains and Losses from Concentration

Since there is an infinite number of potential gains and losses from any change in market structure, this section will review only a very small subset of them related to concentration[1,2]. This section illustrates that there are more potential costs of concentration than increasing margins and there are many benefits that these costs must be weighed against. Potential costs have been examined in more detail by economists and these will be presented first, including 1) lower costs of collusion; 2) non-cooperative margin expansion; 3) inefficient interfirm rivalry; 4) dominant firms; and 5) decreased innovation rates.

Following Stigler, 1964, the primary concern as concentration increases is that the costs of collusion may decline. A recent survey of this literature is available in the *Handbook of Industrial Organization* chapter by Jacquemin and Slade, 1989. In addition to the potentially high costs of collusion, the recent discoveries of large agricultural cartels[3] and the strong legal position against cartels in most developed countries makes this an important area for policy relevant agricultural economics research, although there has been very little research conducted to date.

A potential cost that has been a very active area of agricultural economics research is non-cooperative margin expansion. This area was initially ploughed with the static models of Cournot (1838) and Bertrand (1883) where firms compete with each other, but do have an individual impact on price (and the behavior of other firms) at take this into account. Recent extensions that allow for repeated interaction between firms have demonstrated the

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[1] The two most common measures of concentration are the four firm concentration ratio (C_4), the sum of the market shares of the four largest firms in the market, and the Herfindahl-Hirschman Index (HHI), the sum of the market shares squared of every firm in the market. The measures can diverge on what constitutes increased concentration and the HHI is preferred (see Stigler, 1968, for a discussion of this). C_4 is less costly to compute and used more frequently.

[2] The relationship between various gains or losses and concentration, i.e. the direction (or lack thereof) of causation, can be important in evaluating them. These finer points will not be addressed in this paper.

[3] The convictions of ADM, Adjinimoto, and Kyowa Hakko Kogyo in a lysine cartel and of ADM, F. Hoffmann-LaRoche, Haarmann & Reimer, and Jungbunzlauer International in a citric acid cartel are examples of recent U.S. legal actions.

theoretical feasibility of tacit collusion, where supramarginal cost pricing is sustained by implicit, rather than explicit, agreement. Friedman (1971) was an early developer of these "supergame" models and Shapiro (1989) reviews the literature in detail. Substantial resources have been invested by agricultural economists in measuring this potential cost but, unfortunately, no widely accepted results have yet been obtained.

There have been many recent advances in the game theoretic modelling of strategic firm interaction to capture rents. Unlike the repeated static model (supergame) used to explain tacit collusion, these dynamic models involve a changing economic environment. An example might be brand name advertising designed solely to capture market share from rivals (i.e. it does not shift the market demand curve out). Each firm must advertise or lose market share, but since each firm is advertising there is no effective change. Resources are being used, but total surplus is not increasing and the advertising investments have a negative return from society's perspective. Other examples include patent races which lead to excessive innovation and, perhaps, some forms of product differentiation[4].

Two related areas involve the presence of a dominant firm in a market. Landes and Posner (1981) explain the problem of a dominant firm pricing above marginal cost and creating an umbrella for a small competitive fringe. Another dominant firm problem, related more to the strategic interaction models from above, is predation. Milgrom and Roberts (1982) introduced the modern game theoretic treatment of predation (entry deterrence) and a large literature has followed. Ordover and Saloner (1989) review this literature.

Finally, concentration may result in less vigorous competition which leads to less technological advancement. Williamson (1965) found a negative relationship between concentration and innovations. The *Handbook of Industrial Organization* chapters by

[4] The importance of non-cooperative strategic interaction (and predatory pricing which is examined next) is still being fiercely debated in the industrial organization literature. The "Chicago" view tends to be sceptical of the recent game theoretic explosion that is largely untested empirically.

Reinganum (theoretical) and Cohen and Levin (empirical) review the literature on this potential cost.

Potential benefits deriving from or resulting in concentration have been much less examined by economists and are thus, as will be seen, more vague and poorly understood. This section will examine 1) lower production costs; 2) management gains; 3) increased levels of competition or "competitive rivalry"; 4) increased rates of innovation; and 5) more efficient quality signalling.

Economies of scale, leading to lower average (across firm) per unit production costs in markets with fewer, larger firms, has perhaps been the most cited source of gain from concentration (see McGee, 1971). Demsetz (1973), Peltzman (1977), and others have demonstrated additional ways that a negative correlation between concentration and production costs can arise (e.g. one firm develops a lower cost method of production and expands output increasing its market share and concentration and simultaneously lowering average costs across firms).

Manne (1965) argued that corporate control should be thought of as a distinct market and that horizontal merger is one type of transaction in this market. When a firm is poorly managed, another firm with better managers may recognize this and take the firm over to realize the gain available from bringing the firm up to its production frontier. Stillman (1983) pointed out that firms in the same industry as the poorly managed firm may be more likely to recognize the poor management and concentration may thus result from the efficient reallocation of capital (firm ownership) from bad managers to good managers. In this case concentration is a by-product of an unrelated efficiency improving change. See also the theoretical literature on the efficient allocation of capital among mangers (Lucas, 1978, and Rosen, 1982).

Although the perfect competition model of passive, price taking behavior currently dominates economics, historically competition was defined as a process of competitive rivalry. Demsetz (1995) argues that the level of competitive rivalry may be maximized in oligopoly. In other words, the level of competition between firms may not be monotonic in the number of firms, but instead might follow an inverted U-shape where an oligopoly market structure is more competitive than both a large number of firms and only one firm. Unfortunately, these ideas are underdeveloped and not effectively operational for applied research.

Although potential costs of concentration included too rapid and too slow rates of innovation, in a theory related to Demsetz's argument above it is also possible that concentration will lead to a more efficient rate of innovation. Schumpeter (1942) was an early proponent of the idea that dynamic efficiency was promoted by concentration at the expense of the static efficiency achieved in diffuse markets. The citations above to the *Handbook of Industrial Organization* chapters on innovation rates examine this possibility.

Another area related to Demsetz that has received little attention is reducing transaction costs related to quality measurement and signalling. If measuring quality during a transaction is excessively costly, markets may substitute into alternative methods like branding to signal a particular quality and the costs of these alternatives may be lower with fewer firms (that have larger market shares). In other words, with a large number of agricultural firms producing a generic product there will be free riding on all aspects of the transaction not specifically contracted to and firms are paid according to their average contribution to quality, not their marginal contribution (in a market that realizes an average price over quality). If the costs of developing a reputation (brand) is a positive function of the number of competing firms, then concentration may result in greater market efficiency (and competition) over costly to measure transaction attributes. This potential gain seems

particularly relevant to recent agricultural concentration, but has received little formal analysis.

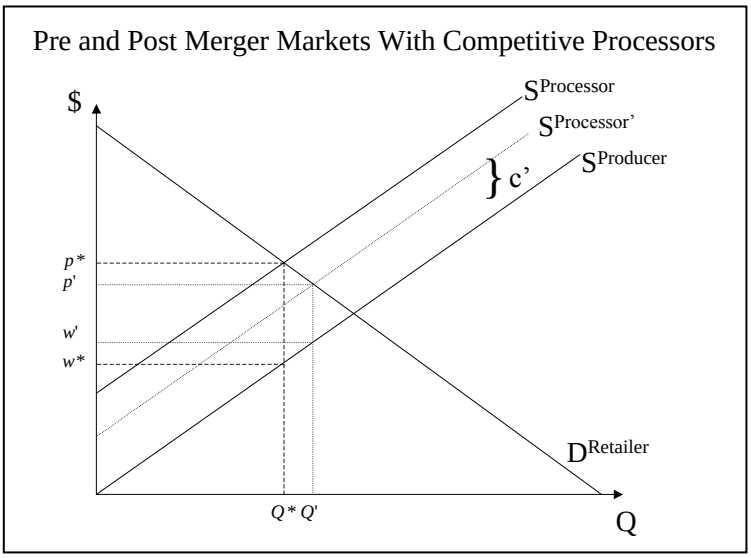
Trading Off Market Power Losses and (Physical) Efficiency Gains

The two most discussed potential impacts of increased concentration in agriculture are increased levels of market power and (physical) efficiency gains. This section develops a simple trade-off model between them using the framework from Williamson (1968). Azzam and Schroeter (1995) brought this framework into the agricultural economics literature with their application to beef processing. The purpose of this section is to introduce the economic analysis of concentration, the framework that should guide academic debate and (with substantial political and legal modification, of course) forms the basis of antitrust policy in most developed countries.

For concreteness, examine a wave of horizontal mergers[5] in a food processing market[6] that results in both (physical) efficiency gains and an increase in market power. The processors purchase an agricultural input from competitive producers with an upward sloping supply (perhaps due to rising input prices) in a farm gate market and sell to competitive retailers with a downward sloping demand (consumer demand vertically translated by marginal retailing costs) in a wholesale market. The processors have constant marginal processing costs of c and the wave of mergers lowers this cost to $c' < c$. With a perfectly competitive processing sector, this model is the straightforward food sector model used in undergraduate agricultural marketing courses and the pre and post merger equilibriums are illustrated below.

[5] While the analysis applies equally well to internal horizontal expansion leading to the same tradeoff, the analysis of this section focuses on concentration by merger for two reasons. First, this provides a concrete institutional framework to work within that is directly tied to much of the policy debate. Second, while the legal framework for intervention in horizontal merger is well established in developed countries and is widely accepted by economists and policy makers, there is generally little opportunity within standard antitrust policy frameworks for structured intervention in internal expansion by firms.

[6] From Food Institute data on U.S. agricultural mergers from 1992 to 1997, 712 of the 3,276 mergers (22%) were food, meat, or poultry processors, making this the largest category by a wide margin.



The supply in the wholesale market is simply the farm gate supply curve translated vertically by the marginal processing costs, which equals the processor margin in perfect competition[7]. The pre merger wholesale price is p^*, farm gate price is w^*, and quantity is Q^*. After the merger, wholesale price falls to p', farm gate price rises to w', and quantity increases to Q'. If the (physical) efficiency gain were the only impact of the mergers, the market structure change would be unambiguously welfare improving and there would be no need to continue the analysis.

The problem arises when market power gains result from the merger as well. Let there be n pre merger firms and examine the i^{th} firm's profit function:

$$\pi_i = p(Q)q_i - cq_i - w(Q)q_i,$$

where q_i is the i^{th} firm's output, $Q = q_1 + q_2 + \ldots + q_n$, and market power is incorporated by allowing firms to farm gate and wholesale prices through their impact on aggregate output. If the firms are symmetric and compete Cournot, each firm's first order condition is:

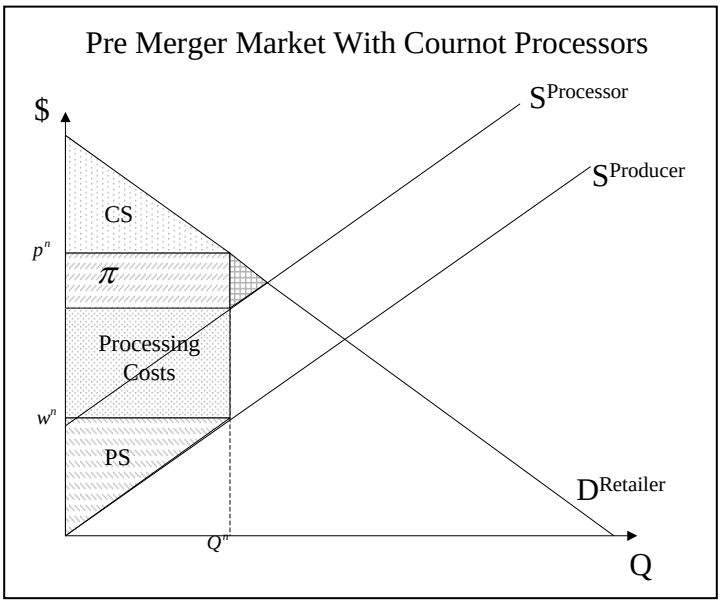
$$p\left(1 + \frac{1}{n\varepsilon^D}\right) = c + w\left(1 + \frac{1}{n\varepsilon^S}\right),$$

[7] This model assumes an approximately fixed proportion technology (e.g. constant dressing percent in livestock processing). This assumption is straightforward to relax, but will be maintained throughout for simplicity.

where ε^D is the elasticity of retailer demand and ε^S is the elasticity of producer supply. The first order condition can be rearranged to examine the processor margin explicitly:

$$p - c - w = -\frac{p}{n\varepsilon^D} + \frac{w}{n\varepsilon^S},$$

i.e. the market power expansion of the margin is due to the mark up of retail price determined by the demand elasticity and the mark down of the farm gate price determined by the supply elasticity. The pre merger market power equilibrium is illustrated below.

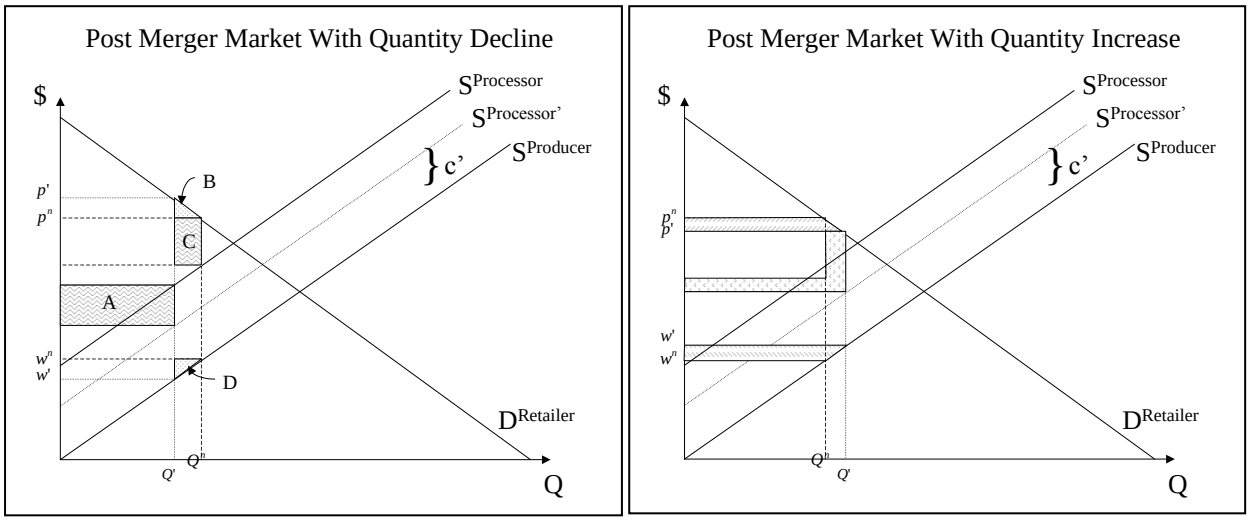


It is straightforward to identify the consumers' surplus (CS)[8], producers' surplus (PS), total processor profits (π), processing costs, and dead weight loss (denoted with the grid fill). The processors' profits come from capturing some portion of competitive CS and PS, as apportioned by the first order condition from above.

The relevant question from an economic and public policy perspective is what happens when a wave of mergers occurs that both increases market power and provides a (physical) efficiency gain (c falls to c'). There are three relevant possibilities. If the market power gain outweighs the (physical) efficiency gain, total surplus ($TS = CS + \pi + PS$) will

[8] If the competitive retailers had constant marginal cost, the CS triangle illustrated above would be the consumers' surplus.

fall. If the market power gain is dominated by the (physical) efficiency gain, total surplus increases (even though quantity may decline), and thirdly if the domination is very large, quantity (and CS and PS) increases as well. In the diagram below, the left hand panel illustrates the first two possibilities and the right hand panel illustrates the third possibility.



The change in total surplus from the wave of mergers is the sum of the change in profit, the change in consumer surplus, and the change in producer surplus. When the merger results in a reduction in quantity, the change in consumer and producer surplus is unambiguously negative and the portion of this change not captured by the processors in extra profit is dead weight loss (region B from consumers and region D from producers). The change in profit (netting out the portion that is redistributed surplus) is region A minus region C. For the change in total surplus to be positive, the profit gain must outweigh the consumer and producer surplus loss, $(A-C)-B-D>0$. The right hand panel illustrates the extreme case of (physical) efficiency gains dominating the market power gain, the case where quantity, consumer surplus, and producer surplus actually increase even though the level of market power increases. The increase in consumer surplus is given by the right leaning fill, the increase in producer surplus is given by the left leaning fill, and the increase in profit is approximated by the dotted fill.

One direct way to quantify the discussion is to measure the (physical) efficiency gain required to offset the market power losses. Begin with the cases where quantity decreases. The profit gain is given by $-\Delta cQ'$ and the profit loss is given by $-\left(p^n - c - w^n\right)\Delta Q$. The dead weight losses can be approximated by $-\frac{1}{2}\Delta p\Delta Q$ and $\frac{1}{2}\Delta w\Delta Q$. Thus, the requirement for total surplus to increase is:

$$-\Delta cQ'+\left(p^n - c - w^n\right)\Delta Q + \frac{1}{2}\Delta p\Delta Q - \frac{1}{2}\Delta w\Delta Q > 0,$$

or:

$$-\frac{\Delta c}{c} > \frac{1}{2}\frac{\Delta Q}{Q'}\left(\frac{\Delta w - \Delta p}{c}\right) - \frac{\left(p^n - c - w^n\right)}{c}\frac{\Delta Q}{Q'}.$$

The following table provides estimates of the percentage reduction in marginal processing costs required to make a wave of mergers increase total surplus when the wholesale market is competitive (oligopsony only)[9]. The simulations were conducted by beginning the market in perfect competition ($n = \infty$) and then engaging it in a wave of mergers than leaves a small number of firms remaining. The number of post merger firms forms the vertical structure of the table. The elasticity of supply varies across the table horizontally. To complete the simulations, the Cournot competition assumption was imposed (on the farm gate market), the change in quantity was estimated with $\Delta Q/Q' = \varepsilon^S \Delta w/w'$, and the pre merger marginal processing costs were assumed to be 20% of the pre merger farm gate price[10].

[9] Restrictions were necessary to identify the system of equations. The general perception in most empirical work to date is that the lower transportation costs and higher degree of substitutability with other products in wholesale markets generally leaves less opportunities for market power than exists in farm gate markets.
[10] This was the average processor margin from 1970 to 1979 in U.S. beef processing. This period was at the beginning of the merger wave and represents a period when the level of concentration was still relatively low.

Necessary Cost Savings with Perfectly Elastic Demand			
Number of Post Merger Firms	Supply Elasticity		
	2.0	1.0	0.5
2	17.8	30.4	47.0
3	9.3	16.4	26.8
4	5.7	10.4	17.5
6	2.8	5.2	9.2
8	1.7	3.2	5.7
10	1.1	2.1	3.9

Thus, with unitary farm gate supply elasticity and perfectly elastic retailer demand, a wave of mergers in the processing sector that moved the market from perfect competition to four firms ($C_4 = 100$) competing Cournot would require a reduction in marginal processing costs of 10.4% for total surplus to increase. As can be seen, the required cost savings are generally small except at extreme levels of concentration and inelasticity. In fact, the estimates in the table generally overstate the cost savings necessary because the Cournot assumption provides a high level of market power in concentrated structures, i.e. the markups it implies are large. For example, a five firm outcome (which is not illustrated in the table but matches the current U.S. steer and heifer slaughter concentration ratio of $C_4 = 80$) with $\varepsilon^S = 1.0$ implies a 15.5% suppression of the farm gate price (and requires a 7.1% cost savings to compensate). The most dramatic estimates of price suppression currently available for the slaughter cattle market are not much more than half that amount (see Azzam and Anderson, 1996). The duopoly outcome with $\varepsilon^S = 1.0$ (and required cost savings of 30.4%) entails a price suppression of about 30%. When Azzam and Schroeter calibrated this model to the U.S. slaughter cattle market, they found that a 2.4% cost savings would be sufficient to offset the losses associated with a 50% increase in concentration.

The more extreme case where the cost savings are sufficiently large that the processor margin actually decreases can also be examined. The general requirement is $(p' - w') - (p^n - w^n) < 0$. With the assumptions used above, the required cost savings are

large. Again, however, these assumptions give the post merger firms a higher level of market power than has generally been found in the existing empirical literature and many studies have found that real margins have decreased after controlling for supply and demand conditions as concentration has increased (see, e.g. Azzam, 1997).

This section examined one explicit potential cost of concentration (noncooperative margin inflation) and one specific potential benefit (physical efficiency gains) and provided a trade-off analysis. This trade-off analysis, extended to include other costs and benefits, forms the basis of the economic analysis of mergers and provides the general framework for antitrust policy in most developed countries. From a normative perspective, if there are no additional costs and benefits, then mergers that lower total surplus should be contested and mergers that raise total surplus should be permitted. If there are additional factors, then these should be added in and the decision based on the impact on total surplus[11]. Estimates of market power are an essential component of the analysis, but there are many other equally important components necessary to complete the analysis.

Examining the Trade-off Empirically

Since forced retroactive divestiture is generally not lawful (in the case of internal expansion) or seldom practiced (in the case of horizontal merger), the primary empirical focus of antitrust regulators is on projecting impacts before a merger takes place. This section, however, reviews some methods for examining changes during or after the fact since this is the area most academic empirical work addresses. This type of work is important in evaluating past policy decisions (which may aid in future decision making) and because agricultural regulators often have additional leeway for retroactive intervention than traditional competition regulators (see comments on this below, however).

[11] Other criteria than total surplus maximization can, of course, be used.

This section briefly reviews two empirical methods, the New Empirical Industrial Organization (NEIO) and the market valuation event study approach. The NEIO method is examined because it currently dominates the IO literature, represents a sizable fraction of the recent empirical work in the agricultural economics literature, and can be directly applied to the trade-off model from the last section. A comprehensive review of the NEIO approach can be found in the *Handbook of Industrial Organization* chapter by Breshnahan, 1989. Azzam and Anderson (1996) provide a particularly good review with an emphasis on livestock markets (their work also includes an exhaustive review of empirical applications to U.S. livestock markets). The market valuation event study approach is examined because it explicitly attempts to measure the trade-off of potential gains and losses in a more general way than the NEIO method. It has not been used in agricultural economics research to date.

The most direct method for measuring costs and benefits is to model them and attempt to directly estimate them with price and quantity data. This is what a fully specified NEIO regression does and the following treatment examines supra-marginal cost pricing and (physical) efficiency gains. Recall firm i's profit function from above, $\pi_i = p(Q)q_i - c_i q_i - w(Q)q_i$. Relaxing the Cournot and symmetry assumptions yields a first order condition:

$$p\left(1+\frac{\theta_i}{\varepsilon^D}\right) = c_i + w\left(1+\frac{\gamma_i}{\varepsilon^S}\right),$$

where θ_i is an index of firm i's market power in the wholesale market, γ_i is a similar measure in the farm gate market[12], and marginal processing costs have been indexed by i to allow them to vary across firms. In most empirical work, firm level data are not available

[12] The terms can also be considered conjectural elasticities because they take the form of the percentage change in total quantity for a given percentage change in firm i's quantity, i.e. $(\partial Q/\partial q_i)(q_i/Q)$. In a Cournot model, $(\partial Q/\partial q_i)=1$ and symmetry implies $(q_i/Q)=1/n$, thus yielding the FOC of the previous section.

and the individual first order conditions are summed across firms (usually weighted by market share) to give an average first order condition (markup equation) for the market:

$$p\left(1+\frac{\bar{\theta}}{\varepsilon^{D}}\right)=\bar{c}+w\left(1+\frac{\bar{\gamma}}{\varepsilon^{S}}\right).$$

This equation is estimated with time series data in a simultaneous equations setting with demand and supply systems also specified. Rearranging, the regression equation is to explain the margin by cost and market power effects:

$$p-w=\bar{c}-p\frac{\bar{\theta}}{\varepsilon^{D}}+w\frac{\bar{\gamma}}{\varepsilon^{S}}.$$

With a stable market, i.e. little change in market structure during the period of the study, the estimation would be carried out for a constant $\bar{\theta}$ and $\bar{\gamma}$ and a $\bar{c}$ which varied according to processor input prices. An estimate of zero for $\bar{\theta}$ or $\bar{\gamma}$ implies no market power in the respective markets, a value of $1/n$ (or, more generally, the HHI) would be compatible with Cournot competition, and a value of one would imply monopoly or monopsony. The focus in agricultural research is on the dynamics of agricultural markets, however, and the relevant question is whether the values of $\bar{\theta}$ or $\bar{\gamma}$ increased over the past few decades and whether $\bar{c}$ has declined. The simple extension employed is to make them a function of concentration.

Virtually all of the empirical work in agricultural markets to date has only included examining the behaviour of $\bar{\theta}$ and/or $\bar{\gamma}$ through time. A large fraction of these works have found no evidence of market power, leaving the analysis largely complete if the estimates are correct and there are no other serious costs to be considered. The work that has found evidence of price effects, however, has largely stopped at that point, leaving the policy relevant variables unestimated. Fortunately, some recent works have attempted to complete

the analysis. Azzam (1997) estimates the trade-off in U.S. slaughter cattle markets finding beef processor concentration resulted in narrower processor margins.

When any other costs or benefits are relevant to the study, they also must be modelled and added into the regression equation. Leaving them out is equivalent to estimating only one subset of (mis-specified) equations out of a larger simultaneous equations model and the results are not reliable estimates of the desired parameters (particularly, market conduct)[13].

There are many other approaches to measuring gains and losses from concentration. Stillman (1983) and Eckbo (1983) develop a method of measuring the net effect (gains versus losses) using equity market valuations. When two firms merge, if there is upward pressure on margins the competitors to the merging firms benefit from the merger and the value of owning them increases. If there is downward pressure on margins competitors lose from the merger and the value of owning them declines. An obvious way to distinguish these scenarios is to examine stock prices of competitors before and after mergers (announcement dates, approval dates from regulators, implementation dates, etc.)[14]. The industrial organization literature has made use of this method, a recent and thorough application being Banerjee and Eckard (1998). To date, this method has seen little use in agricultural economics. In addition to the standard problems of implementing the event study methodology, agricultural markets generally have a higher level of privately held firms without publicly available share prices which may limit the feasibility of such studies. Agricultural markets may offer an added benefit to this approach, however, with futures

[13] For example, assume that with a large number of processors producing a generic product, there is a free riding problem that limits value adding and quality improvement (processors are paid for the average quality in the market, not their marginal impact on quality). If concentration facilitates brand name development and higher levels of product improvement, then $p - w$ will increase as concentration increases. This is not from market power, but because the quality equation has been omitted from the SEM model and coefficient estimates will be biased and inconsistent. Examples in meat processing might include closely trimming fat, chilling and aging, and additional value added processing. Grain marketers dry, condition, or clean the grain and may combine different grades, protein levels, and other characteristics to create a particular blend.

[14] Stated another way, the basic intuition is that a merger which increases the value of competitors is probably anti-competitive while a merger that decreases the value of competitors is probably pro-competitive. Of course, this methodology is also far from perfect.

markets. If the market expected a merger between two beef processors to expand margins, then the boxed-beef futures price less the slaughter cattle futures price should increase.

Antitrust Policy

Although the abstract considerations of welfare trade-offs are an important part of the overall debate on agricultural concentration, another important part is the antitrust (or competition) policy framework that must be worked within to address potential losses. This section briefly outlines some aspects of antitrust regulation with an emphasis on what the opportunities for and limitations on intervention are with respect to agricultural concentration. Many countries have additional competition policies specifically for agriculture and a brief mention of these is made at the end.

The first, and most important, point is that the possession and use of market power, by itself, is generally not illegal and affords little avenue for intervention (it is not even illegal to be a monopolist). As was mentioned in the first section, the bulk of the empirical work (and the discussion) to date has been on the possibility of price being above marginal cost, but this is not, in the first order, relevant from an intervention standpoint. Violations of antitrust law in most developed countries can roughly be placed into three categories horizontal restraints of trade (e.g. price fixing cartels), abuse of a dominant position, and anticompetitive horizontal mergers[15]. Empirical evidence (like that reviewed in the last section) of an economic impact does not form the basis of prosecution or conviction for any of these violations[16].

The strongest stand taken in the law is against horizontal combinations in restraint of trade. The most least defensible practices on efficiency ground (price fixing, bid rigging, market divisions, etc.) are *per se* illegal in most developed countries and evidence of

[15] There is actually a fourth category, vertical restraints of trade, but this is beyond the scope of the current paper.

[16] Empirical evidence of economic effects can become important if a firm is found guilty of anticompetitive behavior and damage awards are to be made.

conspiracy forms the basis for conviction. There can, of course, be efficiency enhancing horizontal combinations and trade-off analysis is conducted on these under the *rule of reason*. As was mentioned in the first section, the potential costs of cartels, the strong legal standing for intervention, and the successful prosecution of large agricultural cartels recently makes this a highly relevant area for agricultural economics research. Research on conditions in agricultural markets which may facilitate cartel formation and sustainment would have direct policy implications[17].

Being a dominant firm and pricing above marginal cost is not illegal, but abusing a dominant position to develop or maintain a monopoly generally is a violation of antitrust law. The most notorious example is predatory pricing. Although long thought to be too costly to implement, recent game theoretical arguments have added new life to the predation debate. There have been claims of abuse in the agricultural concentration debate (e.g. quality measurement in the U.S. slaughter cattle market being used to price discriminate[18]), but the evidence remains mixed and there have been few legal interventions.

The contesting of anticompetitive horizontal mergers provides the only significant venue for proactive intervention. Unless predation or some other abuse is involved, an increase in concentration by internal expansion has little legal recourse whereas concentration by merger can be derailed if it is demonstrated that the costs outweigh the benefits. In addition to contesting a merger, antitrust regulators also can attempt targeted interventions (these can be used in other types of cases as well) [19]. This provides additional leeway for

[17] The most obvious horizontal restraints on trade in agriculture are the government administered ones. The U.S. has acreage reduction programs and other devices for inducing quantity restrictions. Australia and Canada have single desk selling authorities which would be illegal cartels if they weren't government protected. One key to cartel sustainment often is the ability to monitor prices and most government agriculture departments in developed countries have (voluntary or mandatory) price reporting services (some even in almost real time).

[18] Since predation is not accused, it is doubtful that this price discrimination would be pursued by antitrust regulators even if true. Actions that have been taken by the USDA under the more generous Packers and Stockyard Act have failed as well.

[19] For example, a merger between two Danish pork processors (Danish Crown and Vestjyske Slagterier) in 1998 was investigated by the European Commission. Prior to the merger, a national hog price quotation system was operated by an association of the four major processors (which included the merging firms and had a pre merger

reducing anticompetitive effects without jeopardizing potential efficiency gains. An interesting empirical fact is that, although agricultural concentration has been the topic of so much debate, agricultural firms and markets remain sufficiently diffuse that they represent a small fraction of most antitrust regulators' merger case portfolios[20].

There are several general areas where agricultural economics research can have direct relevance in antitrust enforcement (and improve the overall debate on gains and losses from concentration). The first issue that arises when regulators begin an investigation of a merger (and in most other cases as well) is the delineation of the market. The definition is usually divided into product and geographic markets. An existing empirical literature on market definition can potentially increase the quality of the regulators' market definitions. Stigler and Sherwin (1985) provide a discussion of market definition and Hayenga, Koontz, and Schroeder (1996) conduct three detailed empirical studies of U.S. cattle procurement markets[21].

Fundamentally related to market definition are the issues of barriers to entry and potential entry into the market should prices rise. Although the importance of potential entry has long been recognized, the contestability literature brought it to the forefront in the industrial organization literature (see Baumol, Panzar, and Willig 1982). Dunne, Roberts, and Samuelson (1988) provide an empirical study of entry and exit in U.S. manufacturing industries. Understanding these issues (market delineation, entry and exit, and the large number of related issues) in agricultural markets is an important foundational step to

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concentration level in nation wide hog slaughter of $C_4 = 94\%$). There was concern that the quotation system might facilitate collusion and the firms were required to abolish the system to gain approval of the merger out of concern that the system could facility collusion.

[20] Although food and fibre system consumes a sizable portion of most economies, in fiscal 1999 in the U.S. only 232 (5.3%) of the 4,340 permerger filings were agricultural. Of these, only eight (7%) out of 113 total progressed to second request investigations. Broken down by two digit SIC code the mergers were: Ag production, crops (01) – 2 filings, Ag production, livestock (02) – 1 filing, Ag services (07) – 1 filing, Food and kindred products (20) – 141 filings (4 progressed), Tobacco products (21) – 21 filings, Food stores (54) – 34 filings (4 progressed), and Eating and drinking places (58) – 32 filings.

[21] See the Department of Justice filings in the Cargill acquisition of Continental Grains commodity marketing operations for an application and an illustration of where prior research could be used.

understanding the impacts of concentration in agricultural markets that has largely not yet been taken.

In addition to the above discussion of antitrust policy, agriculture occupies a special position in most developed countries and extra competition laws are often in place dealing exclusively with agricultural markets. In the U.S. these extra policies are contained in the Packers and Stockyards Act (PSA), 1921, administered by the Grain Inspection, Packers and Stockyard Administration (GIPSA), which provides the U.S. Department of Agriculture with broad latitude for intervening in livestock markets. In addition to extra competition laws for agriculture, most countries have special exemptions from competition laws for agriculture, e.g. statutory monopolies to market agricultural products like the single desks of Australia.

In part, these agriculture specific policies address an issue that has been at the heart of antitrust policy since its inception: is the purpose of antitrust the improvement of efficiency (maximization of total surplus or some related criteria) or to protect specific groups (small business, the lifestyle of family farmers, etc.)? These social and political issues have been an active part of the agricultural concentration debate as well. The bulk of antitrust policy (and the industrial organization field) has moved away from these social and political goals do, in part, to the argument that market structure regulation is a poor venue for this type of government engineering. This argument applies the current agricultural debate equally well and it is recommended that the focus of agricultural economists be on the standard antitrust venues[22].

Conclusion

The recent increases in concentration in many agricultural markets have stimulated great concern about potential adverse impacts and a lively debate among agricultural economists has ensued. This paper has attempted to draw on the existing industrial

[22] There may be exceptions to this. In the U.S., the Federal Trade Commission Act precludes issues covered by the Packers and Stockyard Act from the Federal Trade Commission's jurisdiction (the DOJ is not restricted).

organization literature and regulatory frameworks to add structure to the debate. Important results are that market power constitutes only one part of the overall equation, market power is generally not, by itself, illegal and thus not an avenue for intervention, and that some of the existing empirical literature may have misspecification problems that must be considered when evaluating past work and designing new studies. Both theoretical and empirical work are needed on many of these areas.

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