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Firm-level Forces Underlying Concentration in Agriculture

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The Issue

Although industry concentration in agriculture has a long history, the analysis of concentration and normative recommendations on it are a source of ongoing controversy in agricultural economics. The received approaches to the study of industry concentration are based on the structure-conduct-performance model or on the "new" empirical industrial-organization literature which explicitly models competitive behaviour. However, each of these approaches wants for analysis of the specific firm-level decision processes that produce its predicted outcome. An alternative approach is to analyze the internal motivations for vertical and horizontal integration that exist within firms and that ultimately result in market concentration. From this perspective, market concentration results from more than simply competition among firms for economic rents.

Implications and Conclusions

The internal factors that affect firms' decisions toward integration provide diverse insights. From the transaction-cost perspective, more diverse and unique consumer wants suggest greater moves toward firm integration; at the same time, improved communication technology argues for less integration. Because of the increase in demand

for safe and specialty foods, the benefits from integrating food supply chains and brands have increased; this integration has been enabled by better technology to monitor moral hazard. Greater specialization in food products presents the potential for greater vertical and lateral conflicts, which can be controlled through ownership and integration. In contrast, the need to motivate skilled employees suggests less concentration in ownership.

Introduction

The conventional approach to analysis of integration and concentration in an industry is to assess its impact on monopoly power. The purpose of this paper is to present a survey of alternative approaches that focus on the internal management motivations for integration and concentration. An understanding of these "new" theories of the firm brings additional analytical insights to the established study of industrial organization, and questions the traditional normative judgements made with regard to integration and concentration.

There are two primary received notions related to lateral integration in a market, both of which have been the subject of many reviews (for example, Helmberger, Campbell and Dobson, 1981) and are typically addressed in undergraduate economics textbooks. The first relates to the capture and exercise of monopoly power. Firms integrate laterally to reduce the number of competitors, thus allowing greater monopoly rents to be captured. This concept is applied both to physical assets (the purchase of a rival firm's plant and equipment) and non-physical assets (the purchase of a rival firm's brands, patents, and customer lists). The second received notion is that lateral integration occurs in industries with high fixed costs and significant scale economies. Thus, by acquiring a rival firm, fixed costs (such as human resources, logistics, research and development, etc.) can be better spread across a greater output.

Additional ideas related to integration exist in a vertical context. Helmberger, Campbell and Dobson provided a discussion of vertical motivations for integration. They noted that vertical integration can result from joint products in production or from seasonal excess capacity. They also argued that firms integrate vertically as a means to foreclose an adjacent horizontal market. The intuition is that by vertically integrating they restrain competitors' access to the vertical market, thus weakening the competitiveness of rivals in the horizontal market. Finally, they suggest that firms vertically integrate in an attempt to reduce the price risk in exchanges between vertical stages of a supply chain.

However, relatively recent ideas related to concentration and integration are introduced by richer, "new" theories of the firm. The first surrounds the role of transaction costs in explaining the structure of the firm. Another school of thought approaches the firm as a collection of activities conducted by a team of employees, and inquires what structures and mechanisms are developed by the firm to monitor, renegotiate, deploy, and discipline employees. A third approach posits that firms integrate and consolidate as a means to manage vertical and lateral relationships. These basic ideas provide an

alternative perspective from which to analyze integration and concentration in agriculture. The first section of the paper highlights the key insights of modern transaction-cost theory. The second section provides a discussion of agency theory and its impact on concentration and integration decisions. The third section presents a discussion of incomplete-contracts theory and its insights. The final section of the paper interprets these insights in the context of observed changes in agricultural markets.

Transaction Costs

Modern transaction-cost economics has developed its own set of jargon terms that deserve precise definition prior to a discussion of transaction-cost theories.

Asset specificity refers to an investment that is made to support a specific transaction; the investment cannot be redeployed to another transaction without a sacrifice in the productivity of the asset or an adaptation cost (Besanko, Dranove, and Shanley, 2000).

Idiosyncratic transactions are those in which the identity of parties to the transaction matters in determining the price at which a good is exchanged; the more specialized a good is to a particular trading relationship the more idiosyncratic it is (Williamson, 1979).

Appropriable quasi-rents result from the excess in value of a specialized asset in its intended use over alternative uses (Klein, Crawford, and Alchian, 1978).

Incomplete contracts are arrangements in which it is impossible to precisely identify all possible contingencies in advance, so breach and renegotiation can occur (Besanko, Dranove, and Shanley, 2000).

Holdup. A firm holds up its trading partner by attempting to renegotiate the contract terms to appropriate quasi-rents (Besanko, Dranove, and Shanley, 2000).

The most basic concept of concentration is the integration of activities within a firm, rather than the co-ordination of activities by private agents in a market. Coase (1937, 1960) established the idea that firms structure themselves to minimize the sum of production and transaction costs. According to Coase (1937), the primary motivations for internal coordination are economies of scale and transaction costs. Another motivation for coordination through the firm rather than the market results from the problem posed by long-term contracts, in which the obligations of parties to an exchange can only be expressed in general terms, with the precise details (including what type of good is to be traded) left to a later date. Coase argued that when the ultimate direction of resources becomes dependent on the buyer in this way, the "firm" relationship is obtained.

Klein, Crawford and Alchian (1978) connected the co-ordinational function of the firm with problems created by opportunism. Firms are observed to behave opportunistically in attempting to appropriate the quasi-rent after contracts have been established, particularly as a bargaining device for future transactions. Using a number of case studies, Klein, Crawford and Alchian found that the greater the size of the quasi-rent,

the greater the prevalence of legalistic over implicit long-term contracts and the greater the prevalence of integration.

Williamson (1979, 1985) viewed the crucial distinction in firm structure as idiosyncracy in transactions. There may initially be many buyers and sellers capable of adapting themselves to producing and consuming an idiosyncratic good, but once a buyer and seller have made an agreement to transact, the relationship becomes a bilateral monopoly (Williamson, 1985, p. 61). As adaptations occur in the bilateral relationship that were not initially anticipated, there are incentives for opportunism and holdup. For example, one party, observing that the other has sunk costs in producing the idiosyncratic good, opportunistically insists on a change to the initial terms of trade. If this occurred under market transaction of a commodity good, the relationship would dissolve and both parties would simply trade elsewhere. However, since the good is idiosyncratic there are incentives for both parties to renegotiate. The time and effort spent in renegotiation and associated delays result in holdup. Firms structure themselves by balancing the scale economies obtained from specialization and outsourcing with the costs of transacting and the threat of holdup.

In performing an activity, there are production costs and transaction costs. For products with low levels of idiosyncracy (commodities), specialist firms can obtain scale economies in production, so the cost to outsource is lower. However, as the product becomes more specialized (idiosyncratic), it is more difficult for outsourced specialists to obtain scale economies, so it is relatively less expensive to produce internally. The transaction costs of outsourcing are low for commodities because they have established grades; the more idiosyncratic the product, the greater the number of unique qualities that must be specified, and the greater the transaction cost of outsourcing. The total costs are the sum of production and transaction costs.

The basic intuition behind transaction costs and business integration is illustrated in figure 1. Figure 1 plots relative production costs, relative transaction costs, and total relative costs (the vertical sum of relative production and relative transaction costs) as a function of product idiosyncracy. In each case, total costs are interpreted as the cost of internal co-ordination relative to external co-ordination; positive values measured on the vertical axis indicate that internal costs exceed external costs. The figure shows that, for products with very low levels of idiosyncracy (commodities), the total cost of using internal organization is greater than the outsourced cost. This is because the transaction costs are relatively low (there are established grades and standards, etc.) and specialist firms can obtain scale economies producing the product, since a wide market can be served. In contrast, for products that are more idiosyncratic, the transaction costs associated with establishing prices, quality standards, breach remedies, etc. are relatively high, and since the product is highly specialized (and the market more narrow), it is more difficult for specialist firms to obtain scale economies. Figure 1 shows that outsourcing

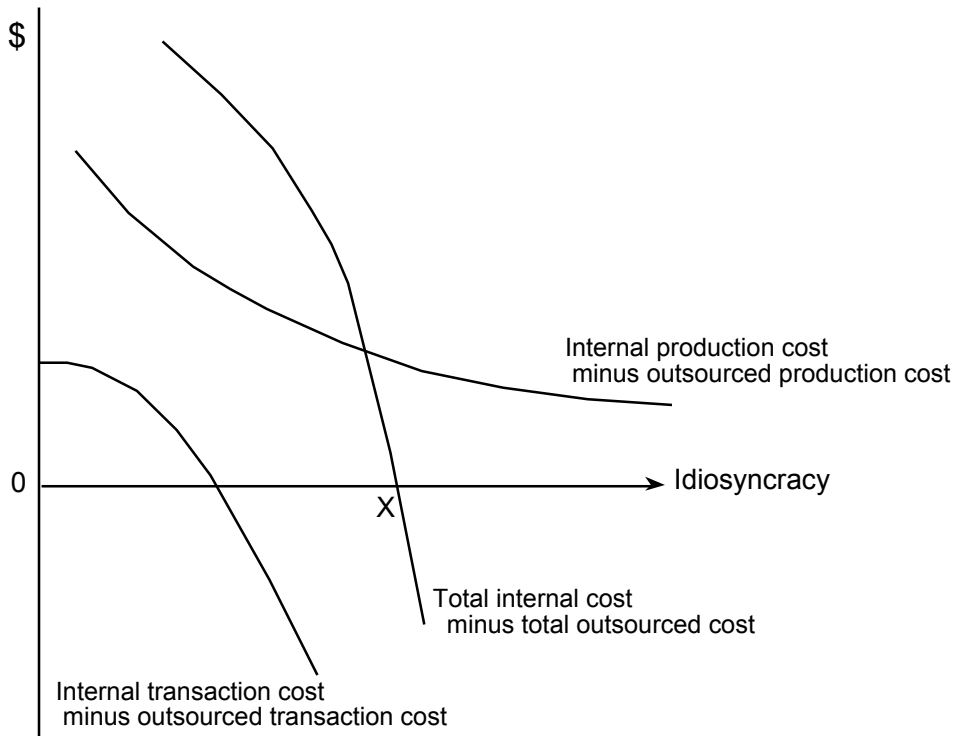

Figure 1 Transaction costs, production costs and integration decisions as related to product idiosyncracy.

Adapted from Besanko, Dranove and Shanley (2000)

costs are lower for levels of idiosyncracy in the product less than X, and internal costs are lower for levels of idiosyncracy greater than X. Thus, for levels of idiosyncracy greater than X, production is organized internally (integrated); for lower levels than X, it is outsourced.

Agency Theory

The agency-theory literature has developed through the use of "principal-agent" models and the tools of mechanism-design theory. The problem addressed by these models is to structure incentive contracts to balance moral hazard and the enforcement costs. The seminal contribution in this literature is a paper by Alchian and Demsetz (1972), which focused on the employee-employer relationship in a firm. They argued that long-term contracts between employer and employee were not the essence of the firm; rather contracts between employer and employee were constantly being renegotiated. The real difference between the seller-customer relationship and the employee-employer relationship lies in *team production*. Team production is used if it yields an output sufficiently greater than the sum of separable individual efforts (due to the joint use of inputs,

economies of scale, etc.) to cover the costs of organizing individual team members. There are costs to organizing a team because the output of the team is observable, but the contribution of individual team members generally is not; this gives rise to moral hazard (shirking) on behalf of some team members. The role of the entrepreneur-manager in a classical firm is to monitor, renegotiate, deploy and discipline team members in return for the residual income stream from the team's effort. The firm is thus a device that polices agency problems where there are advantages of team production.

The basic logic of agency-theoretic models is the following. In return for the residual income stream, the manager of the firm monitors, renegotiates, and enforces contracts with employees. The more significant the benefits of team production, the greater the incentive for the manager to organize activities internally and manage relationships with employees. However, as the costs of monitoring and enforcing arrangements with employees increase relative to the benefits of team production, the manager has an incentive to sever the employee relationship and outsource the activity; the agency problem then shifts to that of structuring relationships with private contractors. Thus, the equilibrium firm relationship posited by agency theory balances the benefit of team production against the cost of contract enforcement.

The agency-theory approach to concentration and integration has spawned a diverse literature in economics and a number of applications in agricultural economics, for example, work by Chu et al. (reduced-nitrate seed corn) and Hueth and Ligon (tomatoes). A notable contribution in the agricultural economics literature is the analysis of farm structure in the United States and Canada by Allen and Lueck (1998). They showed that only as high levels of seasonality in task-effort and variance in production are mitigated (so the true effort of employees is observable) do corporate farms become favoured over family farms and partnerships.

Incomplete-contracts Theory

Incomplete-contracts theory was first established by Grossman and Hart (1986), Moore and Hart (1988), and Hart and Moore (1990) as an attempt to describe precisely what changes when firms merge. The ensuing literature is now referred to as the "property rights" or incomplete-contracts approach to firm organization. Under this approach, a firm is defined on the basis of the assets it owns. In any given period during which decisions are made it is difficult to anticipate all future contingencies, and this difficulty means that contracts regarding the use of assets are incomplete; thus firms will wish to own assets. The use of assets is non-contractible and goods are idiosyncratic, so it is expensive or impossible to specify all possible uses of an asset under all possible conditions. Thus, "when it is too costly for one party to specify a long list of the particular rights it desires over another party's assets, it may be optimal for that party to purchase all the rights except for those specifically mentioned in the contract" (Grossman and Hart, 1986). In

other words, ownership conveys residual rights to assets in lieu of specifying particular rights to asset use.

Because the specific uses of assets are non-contractible, asset ownership can be used to police the holdup problem. In the renegotiation process, the holder of residual control rights (owner) can impose decisions on the holder of specific rights (manager) where a contract is silent, because he retains the right to remove his assets from the manager's control. A manager who does not own the assets he controls can only threaten to remove his own labour from the relationship. The former threat is generally more credible than the latter, which allows the holder of residual control rights a greater share of the *ex post* surplus generated by the bilateral relationship. However, the holder of specific rights may be less motivated because he receives a smaller share of the *ex post* surplus. Thus, "the benefit of integration is that the acquiring firm's incentive to make relationship-specific investments increases since, given that it has more residual control rights, it will receive a greater portion of the *ex post* surplus created by such investments... . [T]he cost of integration is that the acquired firm's incentive to make relationship-specific investments decreases since, given that it has fewer residual control rights, it will receive a smaller portion of the *ex post* surplus" (Hart, 1995).

An asset owner always has recourse to assets where the contract is silent (since only *operational* control is delegated to a manager). In particular, the owner retains the discretion to fire the manager if he refuses to agree to the owner's terms in renegotiation. On the other hand, as the manager obtains a greater ownership stake in the assets he manages, his incentives to make efficient operational and investment decisions improve. This is because, since ownership conveys bargaining power in contract renegotiation, a manager with greater levels of asset ownership can guarantee himself a greater share of the eventual gains from the bilateral trade relationship (regardless of holdup). The problem of business organization in this context is to distribute the property rights to assets in such a way that decision makers (managers) will make the optimal (or most nearly optimal) investment choices, given the potential for holdup.

This is illustrated in figure 2. Consider a trading relationship between two adjacent stages in a supply chain in which contracts are inherently incomplete. Assume that initially the manager of an *adjacent* stage owns all the assets (full integration). As the manager of the current production stage is granted ownership over more of the productive assets she controls, her bargaining position in contract renegotiation improves because she now has more discretion to redeploy the assets if holdup occurs. This improves her incentives for investment and decision making in the operation, so the managerial incentives-based benefits are given by an upward sloping curve. However, from the standpoint of the manager-owner of the adjacent stage, as the manager of the current stage obtains greater ownership, the probability and severity of holdup increases because the manager of the current stage is obtaining greater bargaining power, and can thus retain a

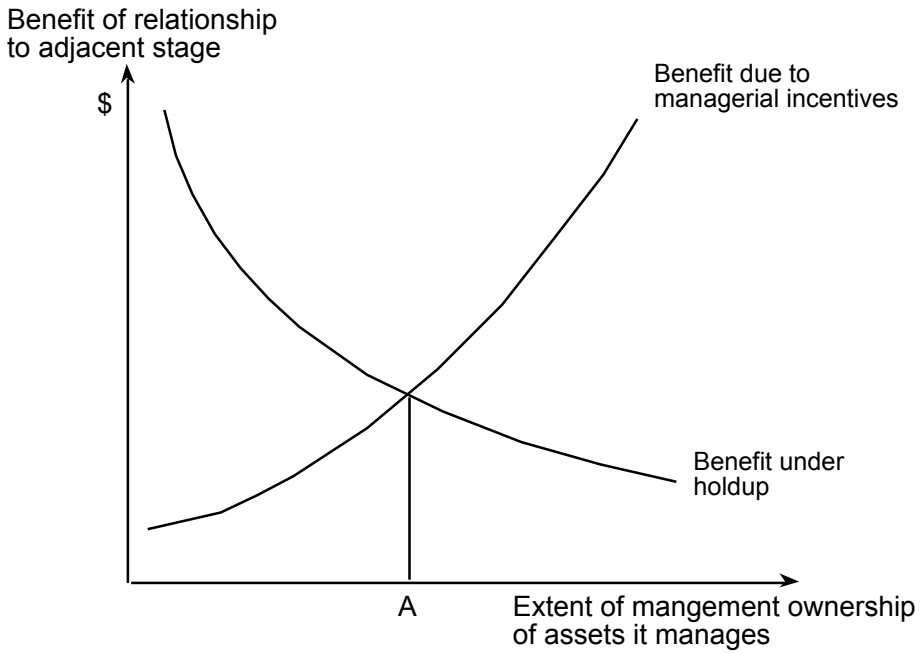

Figure 2 Asset ownership and incentives in relation to holdup.

greater portion of the quasi-rent from the bilateral relationship. This diminishes the incentives of the manager-owner of the adjacent stage to make beneficial investment decisions, and reduces the gains generated by the bilateral relationship. Thus, the adjacent stage's "benefit under holdup" is decreasing with its ownership stake. The two parties attempt to structure ownership in the bilateral relationship to trade off these conflicting effects. In the figure, the optimal ownership structure is for the manager of the adjacent stage to grant the manager of the current stage ownership of assets up to point A. In the incomplete-contracts framework, the parties in a bilateral trade relationship attempt to allocate property rights in correspondence to A.

The intuition underlying incomplete-contracts ideas follows from figure 2. If the decisions made by the manager conducting the activity become more crucial to the success of a bilateral trade relationship (the "managerial incentives" curve shifts to the right), the manager should own more of the assets she operates. Conversely, if the manager's discretion in operating the activity is small (so that the managerial incentives curve is flat and shifted to the left, for example, due to narrower-scope technology) the manager should not own the asset she operates. The reasoning is that, if the manager has little discretion, there is little scope to respond to the incentives granted through ownership; she makes the same choices regardless of whether she owns the assets or not. If the manager's decisions are critical, her choices will be influenced by the fact that she

has less bargaining power when renegotiation occurs and the manager will respond to the incentives given by ownership of assets. Conversely, the more potentially damaging the impact of holdup ("benefit under holdup" curve shifts to the left), the more ownership rights should be retained by the adjacent stage. When the potential for holdup is relatively insignificant to the manager of the adjacent stage, (benefit under holdup curve shifts to the right) the efficient ownership structure is for the manager of the current stage to own more of the current-stage assets.

Interpreting Concentration and Integration in Agriculture

The implications of the foregoing on industry concentration and integration in agriculture relate to the following trends:

- There is an increased demand for differentiated and niche attributes in food products.
- There is an increased demand for assurance and certification that food is safe.
- Because it must serve the above demands, the agri-food sector is becoming more knowledge based.
- Improvements in communications and technology make possible detection and monitoring of food quality attributes to a degree that previously was not possible.

Transaction-cost Perspective

Transaction-cost models represent the boundaries of the firm (the extent of integration) as determined by the costs of conducting external exchanges relative to the costs of conducting internal transfers. Transaction costs provide a dichotomous view of concentration. On one hand, the rapid and continuing improvements in information technology have dramatically lowered transaction costs for products with a given level of idiosyncracy. The costs of finding others to trade with and the costs of negotiating have decreased significantly. In the context of the model in figure 1, decreasing transaction costs shift the relative transaction cost curve to the right, so that for a *given* level of idiosyncracy, it is relatively more profitable to outsource activities. This supports the notion of greater levels of specialization and outsourcing (less concentration), which is occurring in many aspects of agri-food production.

However, the level of idiosyncracy typical in the sector has not remained constant. The food and agriculture industry serves increasingly diverse consumer preferences, and this leads to higher levels of idiosyncracy. Initially at least, transaction costs have increased. Consider the new demands placed on the agri-food system due to GMO segregation, identity preservation, and the growth of organic foods. Additional checks and balances are required relative to previous periods in which commodity product was

moved through the supply chain; the increase in idiosyncracy amounts to a de-commoditization of agricultural products. This shifts the relative transaction cost curve in figure 1 to the left, a situation where it is more profitable to conduct activities internally (integrate). As information technology improves, the curve will shift back to the right; however, if the demand for more diverse food products continues to increase as well, the offsetting effect will occur.

Agency Perspective

From an agency perspective, integration is limited by managers' abilities to monitor, motivate, and discipline employees. As agri-food production evolves toward a more knowledge-based industry, it will be increasingly important to effectively compensate and motivate more highly skilled employees who deliver specialty attributes in foods. Advances in technology have improved the ability to monitor employee performance, and thus managers' ability to reward employees proportional to actual performance has improved. At the same time, it appears there are increasing benefits associated with extended control of supply chains and marketing systems to maintain food safety and quality of supply. These factors argue for increasing levels of integration. The counterargument is that as technology becomes more flexible and capital becomes increasingly scarce, the benefits to team production are actually falling – we see this in firms seeking to decrease exposure to overhead costs. Where there are decreasing returns to team production, the ability to better monitor contractees (as opposed to employees) will reduce integration and concentration. In agri-food, the former considerations seem more significant than the latter, leading to an expectation of greater integration on the basis of agency considerations.

Incomplete-contracts Perspective

The implications of the incomplete-contracts model relate to the significance of ownership in creating incentives for managers relative to the greater scope for holdup. The ambitious pace of growth in some agri-food sectors suggests that safeguards against holdup are critical and that integration will be used to protect against it. Consider Smithfield's acquisition of Murphy Farms as an example. Smithfield can now boast that about 70 percent of its slaughter hogs are transferred internally. This has value to Smithfield because the cost of holdup (in the form of low or insufficient volumes for slaughter, price haggling or variable quality hogs) could be very damaging. In the Murphy acquisition, Smithfield obtained an existing management and control structure that had proven successful, so the negative "management incentive" effect resulting from restraining ownership from Murphy managers may be small. However, if agri-food is to be a knowledge-based industry, mechanisms to motivate and reward skilled employees are needed; ownership can be used as an employee motivation incentive in contexts where employee discretion is important. In meeting more diverse consumer wants, it appears that

motivating employees to use foresight and intuition will be increasingly important. In the context of figure 2, as the demands for unique and guaranteed-safe foods intensify, the managerial incentives curve is likely to shift to the right, arguing for greater ownership of assets by employees and less integration.

As the level of idiosyncracy in food products increases, incomplete-contracts motivations tend to push business structures toward less integration – incentives dominate the holdup threat. To the extent that growth is occurring primarily in differentiated and "certified-safe" foods, this is particularly the case because the focus is on growing and exploiting new market niches rather than bargaining over static shares in mature markets. In traditional foods with slower growth, there is more of a tendency for industry players to argue over benefit shares because the whole market benefit is mature or very slow growing.

Conclusion

This paper provides a perspective on integration and concentration in agriculture that is frequently ignored. More commonly, analysis of industry concentration is approached from the perspective of rival firms competing for monopoly rents. Here, we highlight the internal management motivations for integration, and review alternative analytical approaches. Conventional analysis assumes that firms integrate and consolidate in the hopes of obtaining monopoly power, and makes normative judgements on integration and concentration on that basis. This analysis serves to point out that such normative judgements limited solely to conventional analysis of industry concentration ignore established aspects of firm management. This may lead to erroneous conclusions related to concentration and integration.

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