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Firm-Level Forces Underlying Concentration in Agriculture

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Concentration in agriculture and the accompanying monopoly power impacts have long been of interest to economists. However, while 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 approach to industry concentration is that of the structure-conduct-performance model in which data on the number of firms, prices, and profits are used to measure and draw conclusions on firm concentration (for example, Bain). An alternative approach is applied using the *new* empirical industrial organization (for example, Perry, 1978). However, each of these approaches wants for the specific firm-level decision process that produces its predicted outcome. In the first case, the observed industry structure is implicitly compared with a perfectly competitive market structure, with the classical assumptions relating the number of firms to firm behaviour. In the second case, the specific nature of competitive behaviour between firms is assumed and simulated.

While both of these approaches are pervasive in the literature, they focus on desire to extract monopoly/monopsony rents as motivations for market concentration. Another, perhaps equally important factor resulting in market concentration is the internal motivations for vertical and horizontal integration that exists within firms. That is, the management decisions made by the firm to internalize or outsource operational and marketing activities drive integration which can ultimately result in fewer buyers and

sellers; this is the focus of *new* theories of the firm. From this perspective, market concentration results from more than simply competition for economic rents among firms.

The conventional approach to 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 of integration and concentration.

Received Theories of Integration

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 *et al*) and are typically addressed in an undergraduate economics textbook. 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 purchasing of a firm’s plant and equipment by a rival) and non-physical assets (purchasing a rival firm’s brands, patents, and customer lists). The second significant concept is that lateral integration occurs in industries with high fixed costs and significant scale economies. Thus, by acquiring a rival firm, fixed costs can be better spread across a greater output. For example, integration occurs when two firms merge to reduce common administrative or logistics costs. Alternatively, by merging, rival firms allocate research and development costs over a larger output.

Additional ideas related to integration exist in a vertical context. Helmberger *et al* provide a discussion of vertical motivations for integration. They note that vertical integration can occur due to complementary relationships between successive stages of production. This results from joint products in production or seasonal excess capacity. Joint products naturally direct the firms to enter markets for all of the products produced in the production process; seasonal excess capacity presents an opportunity to combine production of products to obtain capacity utilization economies. Helmberger *et al* also argued that firms integrate vertically as a means to foreclose an adjacent horizontal market. The intuition is that by vertically integrating, the access of competitors to the vertical market is restrained, thus weakening the competitiveness of rivals in the horizontal market. Finally, they suggested 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 institutions and asset ownership in explaining the existence and efficiency of the firm. Coase (1937) made the observation that the distinguishing mark of firms was the “suppression of the price mechanism” of coordination, and inquired as to why some activities were coordinated through market transactions while others were coordinated through the central direction of entrepreneurs in firms. His conclusion that there were costs associated with discovering, documenting, and implementing prices in market transactions established what is now referred to as “transaction costs” approach to the theory 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, given moral hazard and adverse selection. Under this approach, the firm is a nexus of contracts in which the owner-entrepreneur gets the residual stream of earnings in return for organizing and disciplining employees. This is called the “agency” theory of the firm.

A third school of thoughts posits that firms integrate and consolidate to as a means to manage vertical and lateral relationships. Ownership of firm assets is used to control conflicts and motivate employees. This approach combines insights from the transactions cost and agency approaches, and is referred to as the “incomplete contracts” theory of the firm.

These basic ideas provide the fundamental basis for “new” theories of the firm, and they provide an alternative perspective from which to analyze concentration in agriculture. The purpose of this paper is to highlight the relevance of these firm-theoretic concepts on concentration and integration in agriculture. The first section of the paper highlights they key insights of modern transactions costs. 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.

Transactions Costs

Transactions cost economics has developed its own set of jargon terms that deserve precise definition:

- *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).
- *Idiosyncratic* transactions are those in which the identity of parties to the transaction matter 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).
- *Incomplete contracts* are arrangements in which it is impossible to precisely identify all possible contingencies in advance, so breach and renegotiation occur (Besanko, Dranove, and Shanley).
- *Holdup*. A firm holds up its trading partner by attempting to renegotiate the contract terms to appropriate quasi-rents (Besanko, Dranove, and Shanley).

Coase (1937, 1960) established the idea that firms structure themselves to minimize the sum of production and transactions costs. According to Coase (1937), the primary motivations for internal coordination are economies of scale and transactions costs. Another motivation for coordination through the firm rather than the market is 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 was obtained.

Klein, Crawford and Alchian (1978) connected the coordinational function of the firm with opportunism problems. Their focus was on the incentives for opportunism of firms in contractual trading relations with specialized investments. Specialized investments create appropriable quasi rents. 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 vertical integration.

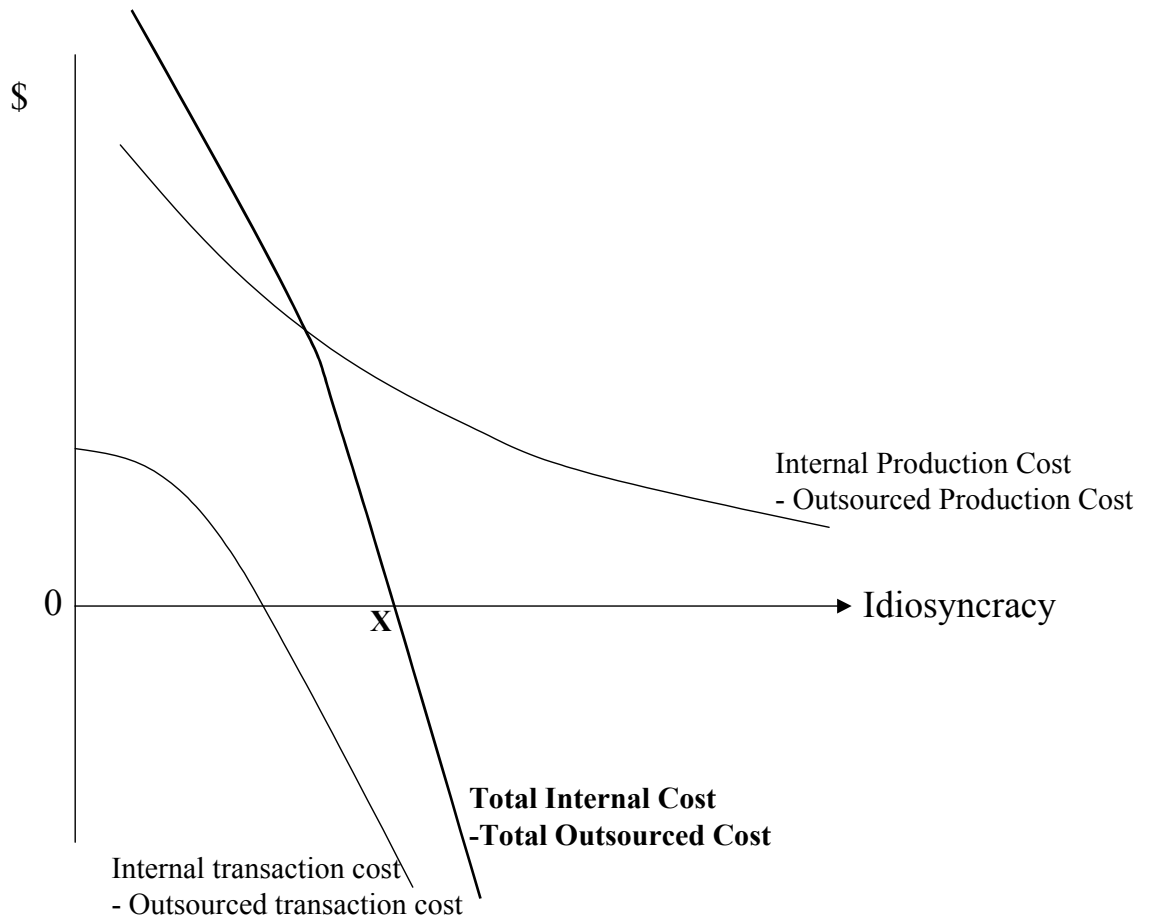
Williamson (1979, 1985) viewed the crucial distinction in firm structure as idiosyncrasy (level of specialization) in transactions. Completely unspecialized goods (commodities) can readily be traded through markets; idiosyncratic goods are not as readily traded through markets. There may initially be 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/consuming 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. Williamson argued that

transactions of idiosyncratic goods traded on a recurring basis should be made using long-term contracts specified only at a general level with conditions placed on suitable adaptations, or conducted internally by integrating.

Thus, integration occurs as firms adjust to minimize the sum of production and transactions costs. The basic intuition behind transactions costs and business integration is presented in Figure 1¹. In performing an activity, there are production costs and transaction costs. For products with low levels of idiosyncrasy (commodities), specialist firms can obtain scale economies in production, so it is lower cost to outsource. However, as the product becomes more specialized (idiosyncratic), it is more difficult for outsourced specialists to obtain scale economies, and it is relatively less expensive to produce internally. The transaction costs of outsourcing are low for commodity grade products; the more idiosyncratic the product, the greater the transaction cost of outsourcing. The total costs are the sum of production and transaction costs. In the figure, the total cost using internal organization is greater than the outsourced costs for levels of idiosyncrasy in the product less than X, and internal costs are lower for levels of idiosyncrasy greater than X. Thus, for levels of idiosyncrasy greater than X, production is organized internally; for lower levels than X, it is outsourced. Note that changes in relative transaction costs *or* relative production costs affect the location of X. For example, if internet-based communication lowers the transaction costs of outsourcing, the relative transaction cost curve and the relative total cost curves shift to the right, and it allows more idiosyncratic production to be outsourced. Also, as newer, more flexible

¹Adapted from Besanko, Dranove, and Shanley

Figure 1 Transactions Costs and Integration



production technology that is developed² that effectively makes products less idiosyncratic, the relative production cost curve and the relative total cost curve shift to the right, which allows greater outsourcing.

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 Alchian and Demsetz (1972). They 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 in the relationship between the seller-customer and employee-employer 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 team members because the output of the team is observable, but the contribution of individual team members 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 policing agency problems where there are advantages of team production.

²For examples, see Milgrom and Roberts

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 on behalf of 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 benefit 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 and the cost of contract enforcement.

The agency theory approach to concentration and integration has spawned a diverse literature in economics. This approach has also been applied extensively in agricultural economics; for example 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 U.S. and Canada by Allen and Lueck (1998). Their generic model of the farm includes multiple stages of production with uncertainty, seasonality of task-effort, and credit constraints for family farms, partnerships, and corporate farms. There are no moral hazard problems on family farms because the farmer is the residual claimant on earnings, but farms remain small because of limited labor and high debt cost. Partnerships have a lower debt cost but face moral hazard in the choice of effort by the partners, and corporate farms have the lowest debt cost but face costs of monitoring the effort of hired labor. The authors use their model to anticipate a number of events in North American agricultural history, including the failure of the

Bonanza farms in the Red River Valley and the recent integration of livestock agriculture, and test it using 1992 data from British Columbia and Louisiana. The study concludes that only as high levels of seasonality in task-effort and variance in production are mitigated do corporate farms become favored over family farms and partnerships.

Incomplete Contracts Theory

One of the crucial distinctions among theories of integration and concentration is the implicit assumption that is made about risk in business relationships. Transactions cost theory assumes that risks cannot be entirely characterized in a contract, so contract breaches can occur. In contrast, agency theory assumes that all sources of risk can be characterized and addressed in a contract, or at least that a specific source of risk due to moral hazard can be treated in isolation from others. The consequence is that in agency theory, contracts are conditioned to uncertainty in such a way that breach never occurs. However, in reality contract breaches occur and agreements must be renegotiated, so rather than being all encompassing (complete), contracts tend to be incomplete.

Formal models of incomplete contracts were 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. This 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. Firms wish to own assets because contracts are costly. Contracts are costly because, in the period in which investments are made, it is difficult to anticipate all future contingencies, and when unanticipated states occur it may not be evident what actions are appropriate until after they have occurred. In addition, the use of assets is non-contractible; it is expensive or

impossible to specify all possible uses of an asset in all possible states of the world. In particular, “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.

The incomplete contracts approach assumes that transactions are idiosyncratic, and that there are gaps in the contract because it is impossible or prohibitively expensive to plan all possible contingencies in advance. As adaptations occur, there is scope for opportunism. When holdup problems occur, the parties are faced with the option of remaining in the bilateral relationship or trading on the spot market, but trading on the spot market rather than with each other is costly because of the idiosyncrasy in the product. However, both parties must consider the possibility the other will hold it up as adaptation and renegotiation occurs.

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 the contract is silent, because he retains the right to remove his assets from the manager’s control. A manager that does not own the assets he controls can only threaten to remove his own labor from the relationship. The former threat is less 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,

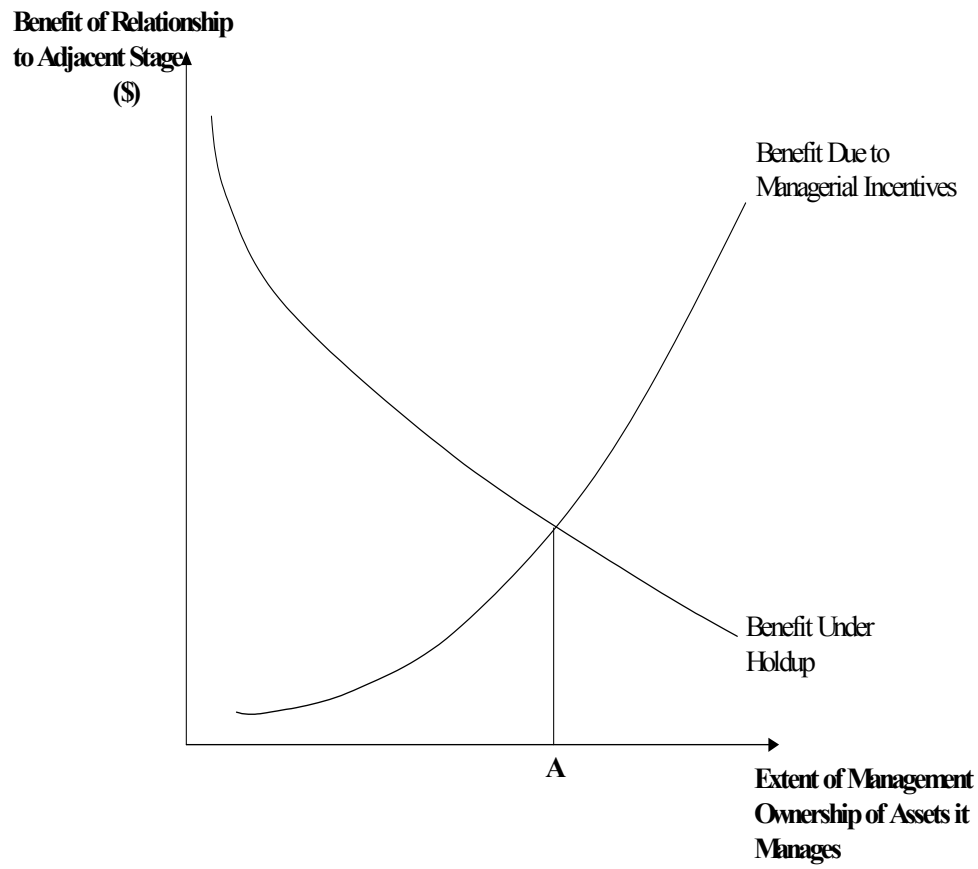
“the benefit of integration is that the acquiring firm’s incentive to make relationship-specific investments increases since, given that it has more residual control rights, it will receive a greater portion of the *ex post* surplus created by such investments... the cost of integration is that the acquired 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.

The essential idea behind incomplete contracts is that there is uncertainty in trading relationships, and that not all of this uncertainty is accounted for in a contract, so contracts are inherently incomplete. As conditions change, the parties to a contract must adapt and renegotiate obligations, perhaps in ways that were not anticipated by the initial terms of the agreement. As contract renegotiation occurs, there can be disagreement between parties as to the new terms, resulting in holdup. In the limit, the partners may be unable to come to an agreement and the relationship dissolves with any specific assets redeployed into other, second-best uses. However, in the contract renegotiation process, ownership of assets conveys bargaining power. 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). Thus, as Oliver Hart (1995) states it, “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... the 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 fraction of the incremental *ex post* surplus created by its own investments" (page 33). 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.

This is illustrated in Figure 2. The figure illustrates a vertical trading relationship between two adjacent stages in a supply chain in which contracts are inherently incomplete. Assume that initially the manager of the adjacent stage owns all the assets (integration). As the manager of the current production stage is granted ownership over more of the productive assets he controls, his bargaining position in contract renegotiation improves because he now has the discretion to redeploy the assets if holdup occurs. This improves his incentives for investment and the efficiency of 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 greater portion of the gains from the bilateral relationship.

Figure 2



This diminishes the incentives of the manager-owner of the adjacent stage to make beneficial investment decisions, thus reducing the gains generated by the bilateral relationship. Thus, the adjacent stage's "benefit under holdup" is decreasing as the asset ownership of the current stage increases. The two parties attempt to structure ownership in the bilateral relationship to tradeoff 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 is upward sloping and shifted to the right), the manager should own more of the assets he 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, eg. due to narrower scope technology) the manager should not own the asset he operates. The reasoning is that, if the manager has little discretion, there is little scope to respond to the incentives granted through ownership; he makes the same choices whether he owns the assets or not. If the manager's decisions are critical, his choices will be influenced by the fact that he has less bargaining power when renegotiation occurs and the manager will respond to the incentives given by ownership of assets. Conversely, the more 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 implication of the foregoing on industry concentration and integration in agriculture is based on the following stylized facts:

- There is an increased demand for unique 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, agri-food is becoming more of a knowledge-based sector.
- Improvements in communications and technology make possible detection and monitoring of food quality attributes that were not previously possible.

Transaction costs models represent the boundaries of the firm (the extent of integration) as determined by the costs of conducting external exchanges relative to 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 less specialized products. 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 idiosyncrasy, 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.

However, the level of idiosyncrasy has not remained at constant. Food and agriculture has moved to serve a greater diversity of consumer preferences, and this leads to higher levels of idiosyncrasy. Initially at least, this has increased transaction costs. 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; It amounts to a de-commoditization of agricultural products. This shifts the relative transaction cost curve to the left in Figure 1, which makes it 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 occurs.

From an agency perspective, integration is limited by managers' ability to monitor, motivate, and discipline employees. As agri-food evolves toward a more knowledge-based industry, it will be increasingly important to effectively compensate and motivate more highly skilled employees that deliver specialty attributes in foods. Technology is improving monitoring of employee performance, and thus managers' ability to reward employees proportional to actual performance. 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. Each of 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, thus reducing concentration. In agri-food, the former consideration seems more significant than the latter, leading to an expectation of greater integration on the basis of agency considerations.

The implication of incomplete contracts relates to the relative significance of ownership in creating beneficial incentives for managers relative to the greater scope for holdup. The ambitious pace of growth in some sectors of agri-food 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% 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 obtains an existing management and control structure that has proven successful, so the negative "management incentive" effect 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 above, as the demand for unique and guaranteed-safe food intensifies, 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 idiosyncrasy 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 the niche 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, 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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