Staff Paper

An Institutional Analysis of Vertical Coordination Verses Vertical Integration: The Case of the US Broiler Industry

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Abstract:

This paper analyzes the situation, structure and performance of broiler production. The inherent interdependence in broiler production is high transactions costs. Two types of transactions costs, asset specificity with uncertainty and high information costs, are identified and explored. The performances of the alternative structures, vertical integration and vertical coordination, are outlined. In broiler production, vertical coordination is preferred by both firms and growers because it minimizes transactions costs. These conclusions are extended to other agricultural commodities, using pork and rice as examples. 13 pages.

I. INTRODUCTION

The predominance of contract production in the broiler industry offers an excellent example for analyzing organizational structure. This paper will begin with a statement of the primary hypothesis which will be tested with theory and empirical data. Then a brief overview of the broiler industry will outline the assets and activities provided by each party. Finally, the interdependencies of the broiler industry will be presented and analyzed using the Situation, Structure, and Performance (SSP) Paradigm (Schmid 1987).

SSP is a paradigm for relating institutional alternatives to performance. The paradigm provides a connection between alternative institutions, property rights, or rules of the game and the performance resulting from these different alternatives. The key components of the paradigm are situation, structure, and performance (SSP). The situation classification uses the attributes of the good to identify interdependencies. The structure is alternative institutions. Simply stated, the performance is who gets what. Measurements of performance vary depending on the good. One example is income distribution. The key to SSP analysis is given a good with certain characteristics, alternative institutions will result in different performances.

> *Hypothesis: Where transactions costs are high in agricultural production, both farmers and processing firms prefer vertical coordination over vertical integration in the production of agricultural goods.*

This paper will show that in agricultural markets, vertical coordination is the structure that is chosen to deal with interdependencies due to high transactions costs. The broiler industry is used as an example because it is the most deeply coordinated industry and historic data is

available on contracts and other relevant variables. However, the trend toward vertical coordination is apparent in other commodities, such as hogs and grains.

The terms vertical integration and vertical coordination are often used interchangeably. However, the two structures differ significantly. Vertical integration is defined as the ownership of the production of a previously purchased input used in the manufacturing of an output or the ownership of a production unit that previously had purchased the output from a particular firm (Kilmer 1986). The key to vertical integration is asset ownership. However, vertical integration is only one of many possible types of vertical structures. Vertical coordination is a more comprehensive structure and includes all means of vertically harmonizing production, processing, and distribution activities. In this paper, the vertical integration structure refers to firm ownership of all aspects of broiler production. The vertical coordination structure refers to the use of production contracts in broiler production.

II. OVERVIEW OF BROILER INDUSTRY

Integration and production contracts in the broiler industry began in the 1930's in the south and evolved to their current form by the mid 1950's. By the mid 1950's, contracting grew to dominate the industry, eliminating the short lived success of the poultry auctions, which emerged in the 1950's. Thus, the integrated structure seen today was in place by the 1960's (Sawyer 1971).

In broiler contract production, the processing firm provides the young chicks, feed, poultry science and other technical support, and delivery and pick up of the chickens. Firms use field supervisors to oversee production units. Typically, the supervisor visits each unit once a week. The grower provides the physical structure in which the chickens are housed, the waste

disposal facility, and the labor for the feeding, cleaning of the structure, and other day to day care of the chickens. The grower is paid per pound of live broiler produced and the contracting period is usually three years. The contracts also have an incentive program, paying a bonus for above average relative performance and penalizing for below average relative performance.

Contracting accounts for approximately 92 percent of broilers produced. The remaining 8 percent are raised on firm-owned farms (USDA 1988). The remainder of the paper will focus on the differences between vertical integration and vertical coordination. The analysis will address the question why is contracting the dominate choice in broiler production?

III. SSP ANALYSIS OF THE BROILER INDUSTRY

A. SITUATION

In terms of the SSP paradigm, the good in this case is the broiler grown for processing. The prevailing situational interdependence in the broiler production is high transactions costs. Transaction costs are high for both growers and the firm. The transactions costs can be categorized into two areas: 1.) Asset specificity and 2.) Information cost. This paper will focus on two alternative structures, vertical integration and vertical coordination, and their performances. The following sections present a hypothesis related to each type of transaction costs and discuss how they affect the grower and the firm.

1. Asset Specificity with Uncertainty

Hypothesis: In the production of agricultural products, farmers and firms will choose vertical coordination via production contracts over vertical integration as an institution to deal with the problem of highly specific assets under uncertainty.

This hypothesis is consistent with variations of Williamson's basic rule of asset specificity (Williamson 1989), which states that vertical integration will occur with highly specific assets. While total vertical integration does not dominate the broiler industry, it is dominated by vertical coordination with over 90 percent of production occurring under production contracts.

Both growers and firms face high transactions costs due to asset specificity and uncertainty. Assets the growers use in production, the land, broiler housing structure, and waste disposal facility, are highly specific, immobile assets with little or no alternative uses. Also, the individual grower's cognitive ability is limited and thus, he is unable to process the vast amount of information needed for production. Large amounts of information are needed to evaluate and make decisions in an environment with price volatility, changing consumer tastes and preferences, and new technologies.

The firm faces the problem of asset specificity in its processing machinery, which has no other alternative use. Also, the firm faces uncertainty in broiler supply and the quality and size of the broilers. A steady and consistent supply of broilers is necessary for the firm to maintain plant efficiency and meet consumer demand. Branding and consumer preferences dictate the need for high quality, while the mechanized processing facility requires a certain size bird.

Changing consumer tastes and preferences are another type of uncertainty for the firm. According to Hirschman (Hirschman 1970), specific assets will not be recovered by other firms if the firm is dissolved. Therefore, as consumers change, the firm must "recuperate" itself to meet

these changing needs. The broiler industry is a good example of firms reinventing their product line to meet consumer demands. The industry has gone from the New York dressed fryer, with feathers off but entrails in and head on, to the "pan ready," precut fryers (Sawyer 1971) to the further processed boneless, skinless breasts that are so popular today. Even the name of the industry has changed with the environment: from chicken farming to agribusiness to commercial broiler industry.

2. Information Costs

Hypothesis: Where there are high costs of monitoring production practices, firms will choose contracting over firm-owned farms as a means of agricultural production.

Firms must cope with high transactions costs due to the high cost of monitoring production processes. Contracts with either independent growers or employees are used to deal with the problem of monitoring. Firms must also deal with this issue in the processing plant, however, since the good in question is broilers for processing, the issue of workers in the plant is not addressed in this paper.

B. STRUCTURE AND PERFORMANCE

This section will analyze the two alternative structures[1], vertical integration and vertical coordination, and the performance from each. Then empirical studies, which support the primary and secondary[2] hypotheses, will be presented. See Exhibit 1 for an abbreviated presentation of the analysis.

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[1]Other structures, such as a farmer (grower) owned cooperative processing plant, are possible. However, the analysis of the paper is limited to the two structures, vertical integration and vertical coordination, that dominate the broiler industry.

[2]Secondary hypotheses are those presented in part A under sections one and two.

1. Vertical Integration

Under the vertical integration structure, the firm owns the processing facility and all of the assets of production, which includes the land, broiler housing structure and waste disposal facility. Thus, the transactions costs are reduced by internalizing the production and processing specific assets. The uncertainty of supply is eliminated. Quality and size uncertainty is greatly reduced, but not totally eliminated due to the high cost of information.

Information costs are high due to the high cost of monitoring employees in the production facility. Since the workers do not own a stake in the product, shirking could be a problem. Employee contracting is necessarily incomplete because the firm can not feasibly spell out in the contract the details of every activity the employee needs to perform. Thus, the firm has the power to interpret the contract as it wishes. An alternative institution to address the issue of shirking is to build worker identity with the firm (Simon 1991). This results in workers exerting more than a minimal effort. However, worker identification with the firm is difficult to create, especially in low level, physically intensive positions.

2. Vertical Coordination

Under the vertical coordination structure, the firm enters into production contracts with independent growers. The firm's transactions costs due to asset specificity are reduced because while the processing specific assets are internalized in the firm, the risk of ownership of production specific assets is shifted to the grower. Thus, a case of hostages (Williamson 1989) is created between the firm and grower. They are hostages because they depend on each other to eliminate uncertainty and provide a return on investments in large specific assets. However, they are not mutual hostages because the processing firm holds more power due to the large number of

growers relative to processors. The firm's supply, quality and size uncertainty is greatly reduced through the production contract. If the grower does not deliver the specified characteristics, his contract will not be renewed.

The grower's uncertainty about prices, consumer tastes, and technology are reduced through the contract. The grower is assured a certain price per pound and thus, a predictable, stable income. The firm will evaluate, analyze, and disseminate information on changing consumer tastes and provide education on new technology. Because each grower has a limited cognitive ability to collect and analyze information on changes in the market, i.e. consumer tastes, technology, etc., the contract reduces risks associated with a changing operating environment by providing information unavailable to him otherwise. However, the contract does not totally isolate the grower from risks associated with a changing environment.

The assertion that vertical coordination reduces transactions costs is supported by Frank and Henderson (1991). They use a vertical coordination index incorporating industry nonmarket relationships and input-output relationships. This vertical coordination index is used in an econometric analysis to examine the effects of transactions costs on food industry vertical linkages. The types of transactions costs incorporated into the index are asset specificity, uncertainty, input supplier concentration, and internalization costs. The empirical analysis supports that vertical coordination via nonmarket contracts is motivated by transactions costs.

Information and monitoring costs are addressed in the production contract. The production contract pays a fixed price per pound produced and is thus, result oriented. They establish motivation through a system of rewards, both positive and negative, for the grower. The contracts specify the reward structure, general production practices, pricing agreement,

adjustment mechanisms for adverse weather, and many other factors. Thus, farmers who produce above average will be rewarded both monetarily and through recognition; while farmers who perform poorly will be penalized monetarily. Consistently poor performers will not be awarded additional contracts.

Knoeber and Thurman (1995) found that production contracts shift risk from the grower to the processing firm. They classify risk into three categories: price risk, common production risk, and idiosyncratic production risk. Common production risk is risk that is common to all growers, such as weather. Idiosyncratic production risk is risk that is specific to one grower, such as a glitch in an automatic feeding system.

Production and payment data from 75 growers under contract to one firm were obtained. Four years of data, 1981 through 1985, were broken into four different periods because of changes in the contract. Also, feed and broiler price data were obtained from USDA sources.

Two model simulations were produced and compared to the actual income variability of the growers in the sample. The first model simulated income variability of grower with nontournament contracts. In tournament contracts, the actual contracts, the grower is paid based on relative ranking among other growers rather than absolute ranking among other growers, which is used in nontournament contracts. The second model simulated income variability of independent growers.

The authors produced two significant measurements from the analysis. First, they found that price risk is the major component of overall risk. The pure contribution of price risk is 84 percent of all risk measured by payment variance. The pure contributions of production and idiosyncratic risk are 3 percent each. The remaining 10 percent of risk is a function of

interactions between the three categories. Second, in this sample, 97 percent of risk was shifted from the grower to the firm, since changes in price did not affect the payment to the grower.

However, the use of contracts creates other types of risk for the grower. Two contracting risks are important to farmers: 1.) The risk of contract nonrenewal and 2.) The risk of contractors not keeping chicks in housing units on a regular basis. Most of the risk of nonrenewal can be avoided by fulfilling the specifics of the contract. However, the growers do face some risk of nonrenewal which they can not reduce by following the exact production practices of the contract. These include distance from the processing plant, a change in firm ownership, a change in environmental regulations, or other factors out of the control of growers.

Demand fluctuations are the primary cause of the risk of contractors not filling the houses regularly (USDA 1988). The firm controls the timing and placement of chicks to meet their market needs. Placement can occur either quickly or slowly depending on the firm's needs. These delays can be costly for growers, especially those with mortgage payments on their housing structures.

The contracting risks faced by the growers are a tradeoff for shifting price risk to the firm. Clearly, the firm holds greater power in the contracting relationship than the grower. This is a function of there being many growers who are looking to contract with only a few firms. Growers will continue to contract as long as the risk of contracting is perceived to be less than the price risk.

IV. CONCLUSION

The situational interdependence in broiler production is high transactions costs. Asset specificity with uncertainty and high information costs are the two types of transactions costs that affect the industry the most. Two alternative structures dominate the industry, vertical integration and vertical coordination.

Over 90 percent of broiler production occurs under contracts, with the remaining production occurring on firm-owned farms. By the 1960's, the integrated system of contract production had evolved and is perpetuated by specific assets with uncertainty coupled with a high cost of monitoring production practices. Firms choose contracting because it minimizes their transactions costs. Growers choose contracting because it minimizes their transactions costs while allowing them to maintain ownership of a farm and some independence.

This paper used the broiler industry to examine vertical integration and vertical coordination. However, the conclusions can be generalized to other agricultural commodities, such as pork and rice. Hog contracting and grain contracting are interesting examples of vertical coordination because they offer two different examples of contracting. Hog contracting follows the traditional model of contracting similar to the broiler industry. However, in the case of grains, the contracts often specify production practices in exchange for price premiums.

Contracting similar to the broiler industry is increasing in the pork industry[3]. The driving force behind this is asset specificity with uncertainty. Pork processors want to increase

[3]Much of the contract production is in the south, especially North Carolina. However, growth is slowing in North Carolina due to increased environmental regulations. A significant amount of production has emerged in Oklahoma where the environmental regulations are not as strict. This is an example of the risk of nonrenewal discussed in the previous section.

mechanization, but in order to do so, they must have a standard sized product. Also, pork producers must adjust to changing consumer preferences toward leaner pork. Contracting is one method to deal with these uncertainties. However, whether or not contracting will dominate the pork industry is questionable because growers have the option of a well established pork commodity market as a risk management tool. Also, some processors are using price premiums to signal the product characteristics they want, i.e. leaner hogs.

A different type of contracting has emerged in rice. Riceland Foods, a farmer owned rice mill, contracts with Gerber to produce rice for baby food (Greenwalt, Schweikhardt, and Fairly 1995). Gerber's business is built on the reputation of high quality, safe products. Therefore, it must know the production practices used in growing rice for its baby food. Riceland provides a guarantee of production practices and quality in exchange for a price premium. However, the farmers purchase all inputs, in accordance with the contract, rather than Gerber providing them.

Vertical coordination is chosen over vertical integration because of its flexibility. It allows firms to obtain inputs with specific characteristics without getting into another business (farming) where large investments in specific assets are required. Vertical coordination reduces uncertainty for the farmer and provides a more stable income while allowing him to maintain ownership of his business. Future research in this area should focus on different performances of different types/degrees of vertical coordination.

References

Frank, Stuart D. and Dennis R. Henderson. "Transactions Costs as Determinants of Vertical Coordination in the U.S. Food Industries." *Amer. J. Agri. Econ. 74(November 1992): 941-950.*

Greenwalt, Bert, David B. Schweikhardt, and Mary Helen Fairley. "Quality and Coordination in the Food System: The Case of Riceland Foods." Case study, 1995.

Hirschman, Albert O. *Exit, Voice, and Loyalty*. Cambridge, Massachusetts: Harvard University Press, 1970.

Kilmer, Richard L. "Vertical Integration in Agricultural and Food Marketing." *Amer. J. Agri. Econ.* 68(December 1986): 1155-1160.

Knoeber, Charles R. and Walter N. Thurman. "Don't Count Your Chickens. . . : Risk and Risk Shifting in the Broiler Industry." *Amer. J. Agri. Econ.* 77(August 1995): 486-496.

Sawyer, Gordon. *The Agribusiness Poultry Industry*. New York: Exposition Press, 1971.

Schmid, A. Allan. *Property, Power and Public Choice*. New York: Praeger, 1987.

Simon, Herbert A. "Organizations and Markets." *J. Econ. Persp.* 5(Spring 1991): 25-44.

United States Department of Agriculture, Economic Research Service. *The U.S. Broiler Industry*. Agricultural Economic Report Number 591, November 1988.

Williamson, O.E. "Transaction Cost Economics." *Handbook of Industrial Organization*, 1989.

Exhibit 1

SSP OUTLINE FOR THE BROILER INDUSTRY		
SITUATION: sources of interdependence	**STRUCTURE:** alternative property rights, rules of the game, institutions	**PERFORMANCE:** who gets what
TRANSACTION COSTS *Asset Specificity with Uncertainty* A. Grower/production ➤Land ➤Structure ➤Waste disposal ➤Price ➤Changing consumer tastes and preferences ➤Technology B. Firm/processor ➤Machinery built for a certain size chickens ➤Stable supply ➤Quality ➤Size	1. *Administrative hierarchy* - vertical integration - firm owned production 2. *Market bargaining* - vertical coordination - production contracting	1. TC due to asset specificity with uncertainty are reduced: production and processing specific assets are internalized in the firm. Loss of independent farmer. 2. TC due to asset specificity with uncertainty are reduced: processing specific assets are internalized in the firm, while the risk of ownership of production specific assets are shifted to the farmer. Farmers could by left with capital losses.
TRANSACTION COSTS *Information Cost* A. Firm/processor - *High cost of monitoring production practices* ➤Contractual power - many growers, few firms	1. *Administrative hierarchy* - vertical integration - firm owned production a. Employee contracting b. Build worker identity with the firm 2. *Market bargaining* - vertical coordination - production contracting	1a. Possible workers will “shirk”. Workers do not own a stake in the product. ➤Incomplete contracts - firm holds power to interpret 1b. Workers exert more than minimal effort. 2. Issues of motivation are dealt with in contract, i.e., positive and negative incentive structure. Workers are owner of part of the production process. ➤Result oriented contracts - firm holds contractual power