

Beyond Transaction Costs: Benefit Effects From Contracting and Vertical Integration

While contracts and vertical integration can minimize transaction costs, these arrangements also may facilitate new, more efficient resource allocations (Dietrich; Milgrom and Roberts; Klein, Crawford, and Alchian; Demsetz; Langlois). “Benefit effects” resulting from more efficient resource allocations increase, rather than merely redistribute, gains from exchange. For example, if a firm overcomes supplier quality deficiencies, benefits extend to production, by price and/or productivity changes. In the poultry, egg, and pork industries, benefit effects from resource allocations include improved production efficiency and changing product characteristics that lower costs and increase demand.

Production Efficiency Gains

Lower production and processing costs associated with changes in vertical coordination can be derived from a number of sources. First, contracting or vertical integration can induce firms to make optimal investments in relationship-specific assets. The threat of opportunism in the spot market may discourage parties from investing in highly productive specific assets (for example, genetics, modern in-line egg facilities and equipment). Without contracts or vertical integration to safeguard against opportunism, the producer and processor each may invest in more flexible, less efficient technology that could be used for a wider range of customers.⁴⁰ On the other hand, investments in more specific assets and increased management control may alter the production function to increase pro-

ductivity at higher volumes. Second, contract arrangements and vertical integration also may encourage buyers and sellers to locate closer to each other, thereby lowering transportation costs. Other potential sources of cost savings include improved scheduling of perishable product deliveries and faster responses to changing market conditions.

Important technological innovations in poultry and egg production resulted in significant gains in production efficiency, as measured by feed requirements, length of production period, and output per bird (table 3). Efficiency gains, over periods of extensive changes in vertical coordination, were passed on to consumers in the form of large supplies of lower priced meat and egg supplies (fig. 14). The broiler industry was the last of the poultry and egg industries to develop, as technological innovations helped to fuel rapid growth of the industry (Martinez, 1999). Commercial broiler production was practically nonexistent in 1930, and until 1948, most of the chickens sold were old, tough, egg-type chickens that were primarily by-products of the egg industry. Production of chickens bred for meat rather than egg laying increased from 100 million pounds in 1934, when the numbers were first compiled, to 3 billion pounds in 1953. Another 20-year period, 1960-80, saw broiler production nearly triple, compared with only a 35-percent increase in nonbroiler chicken production. Over the same period, less sizeable, but substantial increases in the turkey industry occurred as production doubled, and despite falling demand for table eggs, egg production rose by 13 percent.

Studies have verified that broiler contracting had lower production costs than independent broiler production and influenced the industry’s growth and efficiency (Roy, 1963, 1972; Marion and Arthur; Tobin and Arthur). Important sources of cost reductions in the broiler industry from 1955 to 1962 included economies of scale at all stages, closer proximity of birds to pro-

⁴⁰According to Masten (1998), the effects of contract protection on the willingness of transactors to make beneficial relationship-specific investments are just beginning to be analyzed.

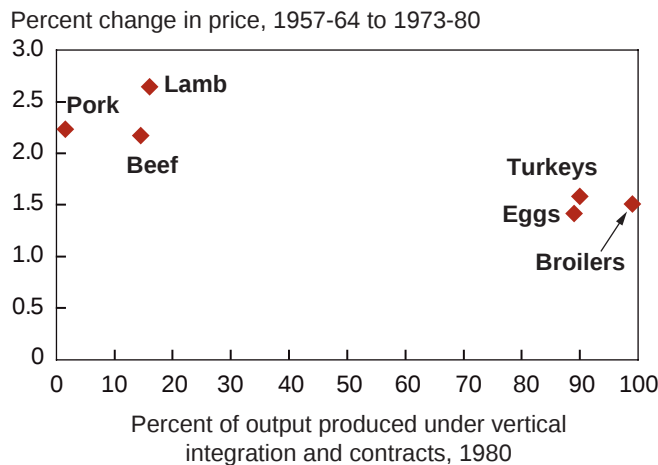
Table 3—Efficiency gains in the poultry and egg sectors

Year	Broilers			Turkeys			Eggs	
	Age to market (wks)	Feed per pound of gain (lbs)	Market weight (lbs)	Age to market (wks)	Feed per pound of gain (lbs)	Market weight (lbs)	Eggs per hen per year	Feed per dozen eggs (lbs)
1925	15.0	4.0	2.8	34	5.5	13.0	112	8.0
1950	12.0	3.3	3.1	24	4.5	18.6	174	5.8
1975	7.5	2.1	3.8	19	3.1	18.4	232	4.2
1990	6.5	1.9	4.5	16	2.6	21.1	250	4.0

Source: University of Arkansas.

Figure 14

Relationship between retail prices and share of U.S. output under closely coordinated production



Source: Compiled by ERS/USDA from Lasley; Marion.

cessing plants, and closer forms of vertical coordination. Increases in broiler contracting in the South provided the impetus for the region's expanding production, while other regions had lower levels of contracting and lagged in production volume. Low production costs made it feasible for processors to ship broilers to all parts of the United States and overseas as well.

The turkey industry also benefited from cost reductions (Roy, 1963, 1972; Gallimore and Irvin). A highly coordinated turkey production and marketing system in the South, along with mild weather and low transportation rates, helped enable the region to overcome disadvantages in feed costs. In the 1960s and 1970s, vertically integrated firms usually had better management control and lower costs.

In the 1960s, close proximity of large table egg flocks to egg-packing plants lowered procurement costs and increased the optimal size of the packing plants, resulted in sizable scale economies (Rogers, Conlogue, and Irvin). Without the industry's arrangements to protect against opportunism, however, eggs obtained from small and dispersed flocks would limit plant size. That is, it would be infeasible for processors to expand the procurement area to support a larger specialized plant. At a particular distance, procurement costs would exceed gains from scale economies. The cost of eggs from vertically integrated table egg firms is significantly lower and less variable than the cost of eggs from spatially separate production units associated

with spot-markets and contract operations (George Morris Centre Food Industry Research Center; Roy, 1963; Michael Foods, Form 10-K, filed with Securities and Exchange Commission March 31, 1999).

More recently, contracting in the pork industry has been associated with continuing gains in production efficiency. Larger litter size, more litters per sow, and heavier market weights have resulted in 30 percent more pork per breeding animal in 1999 than in 1990. In 1999, a 4-percent smaller breeding herd than in 1998 produced 7 percent more pork. Larger hog operations that produce hogs under contractual arrangements tend to have higher production efficiency and lower costs (Kliebenstein and Lawrence; USDA, Animal and Plant Health Inspection Service). In areas of expanding production, productivity gains of hog production have helped to offset feed cost advantages enjoyed by the Midwest.

Quality and Uniformity

The broiler industry has successfully adapted breeds and processed products to meet consumer preferences. Consumer preferences are shaped by a number of factors, including demographics (for example, workforce composition, household size, ethnic diversity) and information linking diet and health.⁴¹ Consequently, consumers increasingly demand a wide variety of branded products that can be prepared quickly or consumed away from home (Kinsey). The TV dinner was the first major prepared poultry product to win consumer acceptance and provided considerable benefits to working mothers of the 1950s and 1960s (Strausberg). As broiler integrators became increasingly dissatisfied with low, highly variable prices for "commodity" chickens, they focused on the development of value-added chicken products (Strausberg).⁴² In the 1980s, branded fresh chicken and further-processed products became increasingly popular with consumers. For example, Tyson Foods introduced a rolled tortilla with a chicken-based filling for the Nation's rapidly growing Hispanic market. By 1990, the company expanded its product line to include pre-cooked fried chicken.

⁴¹According to marketing specialists, value influences market share, where value is defined as perceived benefits from consumption divided by price (Ritchie et al.).

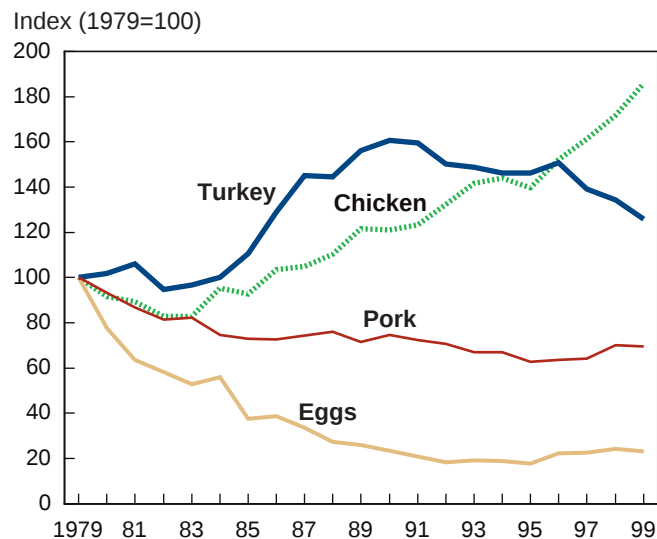
⁴²The deflated price of chicken paid by retailers fell 25 percent from 1974 to 1980.

How do contracts and vertical integration facilitate response to changing consumer demands? As value-added food processing increases and specifications for the raw materials become more stringent, material inspection must become more rigorous as well. In the spot market, prohibitive testing costs and sampling and measuring errors can cause underinvestments in farm-level quality control (Hennessy). The situation is especially relevant when processors place a significant premium on quality and consistency of inputs (see box on marinating and breeding of chicken products) or when quality is difficult to identify in the raw product, as with food safety. Under these circumstances, there are incentives for processors to substitute costly measuring with vertical integration or production contracts. Hence, contracts and vertical integration could facilitate resource allocations that improve the quality and uniformity of chicken supplies by removing the need to test for quality (Hennessy). At the same time, transaction costs associated with measuring product attributes are reduced.

The benefits of further-processed, branded products are suggested by increases in broiler demand, as measured by the broiler demand index, corresponding to expanded value-added products in the 1980s (fig. 15). Demand indices represent percentage changes in

Figure 15

Poultry, egg, and pork demand relative to 1979



Source: Compiled by ERS/USDA.

demand relative to 1979. Each index is calculated by comparing actual changes in per capita broiler consumption to changes that result from variations in the retail chicken price (app. D). A broiler index approximating 200 in 1999 suggests that broiler demand nearly doubled since 1979.

Marinating and Breeding of Chicken Products

Automation enables poultry processors to quickly and efficiently meet the high-volume demands of foodservice outlets and supermarkets for further-processed, branded products. As demonstrated by the processes in which chicken is marinated and breaded, those demands place a premium on uniform size and shape of poultry. Most marinated products, which are the fastest growing and highest volume value-added products, are injected with marinade on the processing line. A tray loader automatically accumulates and deposits cut-up chickens on a conveyor belt. While workers are required to spread and turn the cut-up chicken for injecting with marinade, no manual sorting is required.

In the early 1980s, most processors began to manufacture breaded products (most of which are first marinated) in response to the popularity of breaded chicken in the fast food industry. The development of in-line bread and batter machines enabled the production of breaded chicken on a commercial scale. A conveyor belt pulls cut-up chicken parts through a bed of breading to cover the underside of the chicken parts. Breading is also sifted from above to cover the tops of the chicken parts. Modifications to the machines include rollers, flips (to turn the product over), and blowers (to remove excess breading). The amount of breading material applied to the parts depends on a number of factors, including size and shape of the raw products.

Fast food companies, such as Kentucky Fried Chicken, prefer broilers that are small and uniform for portion and cost control purposes. Breaded chicken parts of uniform weight and size facilitate even frying.

Sources: Benton; Smith (October 1999); Marion and Arthur; Horowitz and Miller.

Because the demand index provides no information on the cause of the demand shift (price of competing meats, income, tastes, and preferences), a regression equation is used to explain per capita chicken consumption. A simple linear demand equation is estimated using data from 1970 to 1982:

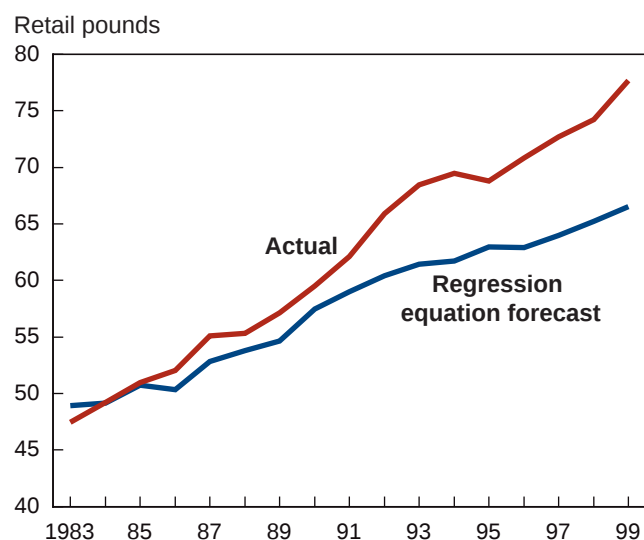
$$\text{PCC} = 32.8 - .18 \times \text{CHICKEN} + .05 \times \text{BEEF} + 1.5 \times \text{INCOME}, R^2 = .96,$$

where PCC is per capita consumption, CHICKEN is the retail price of chicken, BEEF is the retail price of beef (chicken substitute), and INCOME is per capita disposable income. Forecasts of per capita chicken consumption are obtained by substituting actual values of the independent variables, from 1983 to 1999, into the regression equation. These forecasts are consistently below actual per capita consumption, which suggests that factors other than prices and income have accounted for persistent increases in per capita consumption after 1982 (fig. 16). The industry's response to changing consumer tastes and preferences, along with consumer perceptions regarding the healthfulness of chicken versus red meat, has apparently influenced the growth in broiler demand.

In the turkey industry, increased production of cut-up and further-processed turkeys led to tighter control over input specifications to provide more uniform

Figure 16

Actual versus forecasted per capita broiler consumption



Source: Compiled by ERS/USDA.

birds of specific weight (Rogers, 1979).⁴³ Demand for the turkey roll (one of the first processed items) and other processed products developed slowly, as consumers were slow to change their eating habits. However, 90 percent of turkeys are now processed beyond the ready-to-cook form, compared with 17 percent in 1963 and 33 percent in 1970 (Gallimore and Irvin; Gardner and Hyatt). Consequently, the availability of value-added products has extended turkey consumption from Thanksgiving and Christmas to other times of the year (fig. 17).⁴⁴

Growth in table egg contracting and vertical integration was influenced by mass merchandisers' demand for egg quality and uniformity. A growing demand for higher quality eggs by egg-breaking plants reflected efforts by food manufacturers to improve the quality of their products (Roy, 1963). Modern, vertically integrated facilities produce a high percentage of grade A eggs, which sell at higher prices (Cal-Maine Foods, Form 10-K, filed with Securities and Exchange Commission August 21, 2000).⁴⁵

In the pork industry, contracts and vertical integration can facilitate production of case-ready products by reducing measuring costs and protecting against opportunistic behavior associated with specialized investments in genetics. Case-ready pork is packaged, priced, and labeled by the processor for store display. Uniformity in size and weight of hogs is required for size control in the production of standardized case-ready products.

⁴³ In the early 1960s, some smaller firms had well-known brand names and indicated a preference for expanding through buying or leasing farms, instead of contracting, because integration could help maintain quality associated with these brand names (Gallimore).

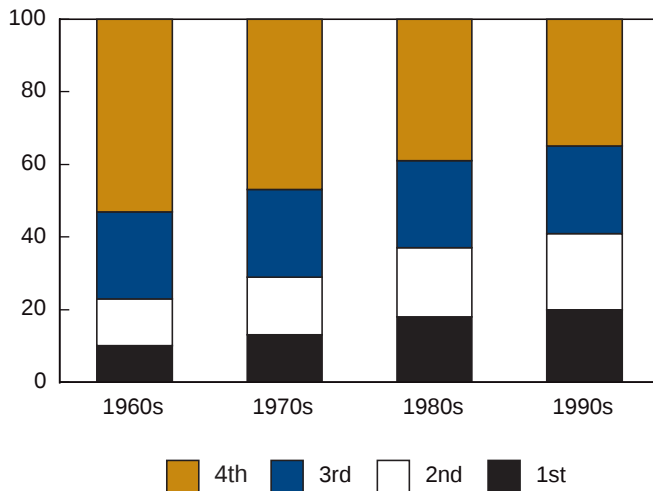
⁴⁴ Evidence suggests that an increase in turkey demand in the mid-1980s (fig. 15) was likely due to new product development and consumer preferences for white meat (Cheney et al.).

⁴⁵ While egg demand has fallen since the 1950s because of convenience and health-related factors (Brown and Schrader), more recent developments have apparently stabilized the decline in egg demand (fig. 15). In the 1990s, per capita egg consumption increased 9 percent, compared with a 13-percent decline in the 1980s, as the percentage sold in egg-product form continued to increase. For example, more liquid egg products are now sold at grocery stores as a cholesterol-free and safer alternative to shell eggs. In addition, recent research indicates that the correlation between egg consumption and cholesterol levels is not as strong as once thought.

Figure 17

Per capita turkey consumption by quarter

Percent of total consumption



Source: ERS, USDA.

Allocating resources to the production of case-ready meat offers several benefits. Case-ready meat promotes the development and expansion of branded products (M. Miller) and reduces retailer labor costs related to meat handling and cutting. Case-ready pork also facilitates reductions in the frequency of “out-of-stocks,” which refers to products that are sought by consumers but are not on the display shelves (Messenger). Pork out-of-stocks are particularly problematic because retail meat cases typically have fewer pork cuts on display than beef cuts or chicken parts. A National Pork Producers Council study in 1998 showed that pork averaged 29.0 percent out-of-stocks during peak shopping hours, compared with 16.0 percent for beef and 7.5 percent for chicken (Messenger). The low rate for chicken is attributed to the higher number of case-ready products. Ready-to-stock meats reduce the frequency of out-of-stocks that are due to labor shortages and inexperienced workers in the meat department.

Large supplies of uniform, precooked, further-processed products also are required to meet the needs of the foodservice sector. According to the National Pork Producers Council, pork use by the foodservice sector, including bacon-topped sandwiches, rib dinners, and ham, grew 17 percent from 1996 to 1999 (Smith, February 18, 2000). This increase was more than double the growth in volume experienced by the foodservice sector as a whole. Since 1995, the number of new pork items on menus has more than doubled

(National Pork Producers Council, February 2000). Currently, pork receives more menu mentions than any other meat, except for chicken.⁴⁶

Potential for Further Research on Incorporating Benefit Effects

According to Williamson (1999), most, but not all, predictions from TCE have been found to hold when production costs (which are affected by resource allocations) also are considered. However, Williamson acknowledges that transaction and production costs should be considered together. One implication of considering benefit effects is that transaction costs may not change with different methods of vertical coordination, or may increase to exploit potential benefits. The shift from farrow-to-finish hog production operations to highly specialized, large-scale operations illustrates this point. Production stages in traditional farrow-to-finish operations are vertically integrated. A single producer located at a single site conducts all stages of production, from farrowing to finishing. Producers that specialize in distinct phases of production at separate locations are “disintegrating.”⁴⁷ The larger producers tend to own the farrowing operations because labor is more specialized and investment decisions are more critical (Martin, 1999). Grower-owned facilities under production contracts with the larger producers are then used to finish or nurse the pigs. While coordinating through production contracts (for example, drafting and monitoring agreements) carries costs, these costs are apparently outweighed by benefits from vertical disintegration. Benefits are derived from scale economies, specialization of capital resources, disease control, specialized labor and management, and manure dispersion. Large producers that specialize in certain phases of production can spread capital over more production units, hogs, and management services and still maintain significant control over production. Employees specialize in specific functions, focusing on breeding, feeding, health maintenance, and other areas.

⁴⁶An apparent decline in the demand for pork since the 1970s appears to have stabilized in more recent years (Martinez, 1999). Based on the pork demand index (fig. 15), demand for pork has increased 11 percent since 1995. In 1999, per capita pork consumption reached its highest level since 1981.

⁴⁷According to Langlois, firm disintegration due to costs of vertical integration has received relatively little attention.

To account for “neoclassical” production costs (productivity) in the TCE framework, Williamson (1979; 1985) establishes a framework whereby firms choose open market production or vertical integration to minimize the sum of transaction costs and production costs. According to Dietrich, however, transaction costs and production costs cannot be summed in such an ad hoc fashion. Transaction costs depend on humans’ limited cognitive abilities (bounded rationality), while neoclassical production costs do not.

Dietrich asserts that TCE is an inherently static approach. If attributes of a transaction do not remain invariant when contracts replace open-market production, then the transaction costs involved (for example, monitoring activity) cannot be defined. In other words, when comparing the effects of alternative methods of vertical coordination on transaction costs, the underlying characteristics of the transaction must not change. This condition is equivalent to assuming that benefits from resource allocations must not change (for example, productivity improvements, ability to control economic processes). These benefits are based on how resources are used rather than simply efficient allocations with given technology and product characteristics. To avoid considering benefit effects, one must assume a general organizational equilibrium (that is, equality of conditions before and after a contract agreement or other change in vertical coordination), so that there is no incentive to adjust coordinating arrangements. Such an assumption requires an ex ante understanding of relevant issues or conditions or an

understanding that does not require changing based on actual events.

Because methods of vertical coordination may be influenced by benefit effects, Dietrich further suggests placing transaction cost economics in a “dynamic” setting, where change unfolds rather than being specified ex ante (Dietrich).⁴⁸ In this case, the general organizational equilibrium loses its significance, and vertical coordination need not rely solely on reducing transaction costs.

To introduce a dynamic element into the analysis of vertical coordination, concepts from resource-based theory (RBT), pioneered by Penrose, may be useful (Mahoney and Pandian). RBT views the firm as a unique pool of productive resources and attempts to model the sources of sustainable competitive advantage. A reallocation of resources, which include physical capital, human capital, and organizational capital, creates benefits that may be viewed as a way for a firm to achieve a sustained competitive advantage.⁴⁹ Translating TCE into the RBT framework would view the firm as both a pool of productive resources and an administrative organization (Mahoney and Pandian).

⁴⁸In his 1999 article, Oliver Williamson, a pioneer in the area of transaction cost economics, concurs that transaction cost economics could benefit from a more dynamic approach. However, he also suggests that such an endeavor will not be easy and will require working “through the mechanisms of economic organization in a slow, molecular, definitive way” (p. 1101).

⁴⁹Organizational capital includes decisionmaking processes, coordinating systems, training, and routines (Westgren).