Vertical Integration and Contracting in the U.S. Poultry Sector

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This paper provides an economic explanation of the existing market organization of the poultry industry. The vertical integration and the emergence of contracts with independent farmers is explained by risk sharing, technological progress and innovation dissemination, consumer demand for product reputation and uniform quality, and access to capital. In addition, the sources of growers' discontent with existing contracts are analyzed and the potential need for government regulation is discussed.

The poultry industry in general and particularly the broiler industry is often considered a role model for the industrialization of agriculture. The poultry industry is a vertically integrated production, processing, and distribution system where the physical production of birds is handled almost entirely by contract growers. This industry has dominated the competitive scene in the meat complex over the last 30 years, expanding its market share dramatically as it improved efficiency, maintained lower prices than its competitors, and improved its product offerings and variety. The poultry industry's vertical integration and reliance on production contracts with independent farmers undoubtedly facilitated the industry's efficiency and responsiveness to consumers, making it a more formidable competitor in the global meat market.

Judged by their prevalence, poultry contracts have proven to be very popular among American farmers. They have benefited farmers by providing diversified opportunities to earn income and by alleviating cash flow problems that typically plague small farms. However, contracts also have their critics, largely within the growers' own ranks. Growers complain that the gains from contract arrangements accrue largely to integrators while growers receive small or even negative returns. Federal legislation to provide uniform contract regulations for all growers engaged in agricultural production contracts has recently been contemplated. Several states made attempts to regulate various aspects of poultry contracting within their own jurisdictions.

This paper provides an economic explanation of the existing market organization in the poultry industry. The focus is on production contracts with independent farmers as the critical link in the vertically integrated chain of procurement of inputs, production, processing, marketing, and distribution that characterizes the modern poultry sector in the United States. In addition, the sources of growers' discontent with existing contracts are analyzed and the potential need for government regulation is discussed.

Organization of the Poultry Industry

After World War II the U.S. poultry industry evolved into one of the most integrated agricultural industries. The broiler industry is entirely vertically integrated from breeding flocks and hatcheries to feed mills, transportation divisions, and processing plants. The finishing stage of production is organized almost entirely through contracts with independent growers. The processors became the coordinators of the industry mainly because a large proportion of the value is added in processing and significant economies of scale in processing led to a significant industry concentration. A 1996 survey of broiler companies (Thornton 1997) lists 48 companies that control virtually the entire U.S. broiler output, with the top 15 companies controlling 77 percent of the total industry production. The largest broiler company was Tyson who controlled close to 22 percent of the entire market with estimated annual sales of about 4 billion dollars.

The pattern of vertical integration is less uniform in the turkey industry than in the broiler industry. A turkey company is less likely to own its own hatchery but is more likely to have company-

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owned production farms (Martin et al. 1993). There is also more variation among production contracts in terms of division of risks and profits from growing turkeys than in the broiler industry. The processing plant is the center for control of placement. A processor may contract directly with farmers or contract with a feed supplier who in turn contracts with farmers. In the turkey industry, there are still some independent producers with formal marketing contracts with processors. Such marketing contracts do not always provide any price or margin guarantees to producers. Based on the 1996 survey of leading turkey companies (Heffernan 1997) the comparison of the estimated annual sales between turkey and broiler industries reveals that the leading turkey companies are smaller than their counterparts in the broiler industry. Butterball, the largest turkey company, controlled only about 13 percent of the market, and with its annual sales of $600 million would place be the eighth largest broiler company. From 1979 to 1996 the turkey industry's 15-firm Herfindahl index dropped from 0.0681 to 0.0663 and remained lower than in the broiler, pork, and beef industries, indicating that the turkey industry concentration did not change significantly in the last couple of decades (Gulliver 1997)[1].

Modern poultry production contracts are agreements between an integrator company and farmers (growers) that bind farmers to tend a company's animals until they reach market weight in exchange for monetary compensation[2]. Poultry contracts have two main components: the division of responsibility for providing inputs and the method used to determine grower compensation. Growers provide land and housing facilities, utilities (electricity and water), and labor. Operating expenses such as repairs and maintenance, clean-up cost, and manure and mortality disposal are also the responsibility of the grower. Integrators provide animals to be grown to processing weight, feed, medication, and the services of field personnel and makes decision about the frequency of flock rotations on any given farm. The costs for items such as fuel or litter can be the responsibility of either party or they can be shared. Most integrators require houses to be built and equipped according to strict specifications. New houses are typically well-insulated units with highly automated feeders, drinkers, and heating and cooling devices.

An interesting feature of the existing contractual arrangements is the simultaneous presence of distinct remuneration schemes in these two similarly organized industries. The broiler industry almost completely adopted a *two-part piece-rate tournament* whereas some turkey companies use tournaments and others use some form of a *fixed performance standard.* In a two-part piece-rate tournament scheme the grower receives a bonus if his performance is better than the group average and a penalty if his performance is below the group average. In a fixed-performance-standard scheme the performance of a grower is compared to a predetermined technological standard. Tsoulouhas and Vukina (1999) refer to the limited liability of the integrator, which can hinder the use of tournaments, to explain the use of different payment mechanisms by different poultry industries. The theoretical results were supported by empirical evidence on the output price volatility and the firm size. Given the prevalence of smaller companies in the turkey industry, larger price volatility generates a significant bankruptcy risk for some companies rendering the use of tournaments infeasible. By contrast, with large companies dominating the broiler industry, smaller price volatility facilitates the use of tournaments.

Design of Poultry Contracts

The evolution of the design of poultry contracts has been followed chronologically by Martin (1994). The industry started with *open account contracts* where growers were given loans by banks, production credit associations, or feed mills in return for interest payments. To reduce risks of losses to growers some integrators started offering *open account—no loss contracts* which carried a clause ensuring that any deficit incurred by the grower after

[1] Generally, if the Herfindahl index is below 0.18 the industry is considered to operate under perfect competition.

[2] The specific information on poultry contracts design is representative of the contracts offered to growers in North Carolina. The information gathered is considered to be representative of the entire industry. North Carolina ranks first in turkey production and fourth in broiler production nationally. We focus our discussion on the so-called finishing contracts where a certain age group of animals — *e.g.* one day old chicks — is brought to the farm and then grown to market weight. Other types of production contracts include breeder and hatching-egg contracts in the broiler industry and brooding contracts in the turkey industry.

broilers had been marketed was absorbed by the contractor. This arrangement resulted from competition among integrators for growers and the threat by growers to discontinue broiler production. The next stage was *guaranteed-price contracts*, which contained an additional clause guaranteeing the grower a certain price per bird delivered. Guaranteed price contracts were popular in the broiler industry in the 1950s and 1960s, but their use in the turkey industry was limited. The holiday consumption pattern and the long grow-out period for turkeys made output price unpredictable at the beginning of the cycle.

The next generation of contracts were *flat-fee contracts* under which growers were compensated for their husbandry and inputs by payment per pound, per bird, or per week. The integrator retained ownership of birds; provided feed, medicine and chicks; and coordinated production and marketing decisions. Due to low incentive compatibility, flat-fee contracts encouraged growers to shirk. To mitigate agency problems, both broiler and turkey companies started including feed-conversion bonuses in their flat-fee contracts and introduced profit sharing. *Share contracts* stipulated proportions according to which profits were shared between the integrator and the grower with the responsibilities of the two parties remaining as in the flat-fee contract. A *basic feed-conversion contract* compensated growers according to a specified schedule of feed conversion (pounds of feed per pound of live weight). Such contracts were often used with a flat-fee payment, which made those contracts very similar to the contracts we observe today.

Broiler Contracts

As mentioned earlier, virtually all modern broiler contracts are settled using a two-part cardinal-tournament scheme consisting of a fixed base payment per pound of live meat produced and the variable bonus payment based on the grower's relative performance (sometimes called the prime-cost rating). The bonus payment is determined as a percentage (bonus factor) of the difference between group-average settlement costs and producer's individual settlement costs. The calculation of the group-average performance includes growers whose flocks were harvested at approximately the same time (typically within the same week). Settlement costs are obtained by adding chick, feed, medication, and other customary flock costs divided by total pounds of live poultry produced. The grower receives a bonus for below-average settlement costs (above-average performance), and a penalty for above-average settlement costs. The bonus factor ranges from 50 to 100 percent. The total revenue to the grower is the sum of the base and bonus payments multiplied by the live pounds of poultry moved from the grower's farm.

In addition to a performance-based payment most broiler contracts also have two auxiliary payment mechanisms: the minimum guaranteed payment and the disaster payment. If the producer's revenue based on the performance payment is smaller than some minimum guaranteed revenue, the minimum-payment formula will be applied. In the event of a disaster such as fire, flood, or hail involving a loss of part or all of a flock the grower will be compensated based on the disaster-payment formula. With the majority of integrators, neither the minimum guaranteed payment schedule nor the disaster payment applies in cases of gross negligence. Minimum-guaranteed-payment and disaster-payment schemes differ substantially among integrators. Both are designed to secure sufficient payments to prevent a grower from defaulting on the chicken-house mortgage.

A recent development in broiler contracts has been the introduction of the market-price clause. This payment mechanism was added to the performance payment scheme (*i.e.*, base plus bonus) with the idea to tie growers' payments to the fluctuations of the market. The market-price clause is defined as a percentage (*e.g.*, 2 percent) of the difference between the market price for broilers and the integrator's average variable cost of producing them. The market price is typically defined as a 3-week average of the composite whole bird price delivered to one of the major markets (e.g., New York City). The average variable cost is the sum of the average settlement costs, some other expenses such as vaccination and sanitation (sometimes called nonchargeable expenses), and processing costs.

Turkey Contracts

During the last two decades turkey production was organized mainly through contract production

with a standard technological production unit consisting of one brooder house and two finishing houses covered by one contract. In recent years, mainly as a result of the outbreak of the disease *Poult Enteritis Mortality Syndrome* (PEMS)—popularly known as *spiking mortality*—and other bio-security reasons, the production technology is gradually changing towards separate (off-site) brooding and finishing operations. The rationale for the change is to avoid the presence of multiple generations of turkeys on the same farm at any given time. With the new management practice the farmer specializes in either brooding or finishing of turkeys, and the two stages of the production process are covered by separate contracts. The old production technology (joint brooding and finishing) is still very much in existence. Turkey contracts use some combination of a flat fee and a feed-conversion bonus paid per pound of live meat produced to determine growers' compensation. At least three different remuneration schemes are observed.

The first type is a fixed-performance-standard (benchmark) scheme where growers are paid a floor payment (*e.g.*, 3.75 cents/lb.) augmented by the feed-conversion bonus, if achieved. The feed-conversion bonus is calculated by comparing a grower's feed conversion to a predetermined benchmark (*e.g.*, 3.00, *i.e.*, three pounds of feed per one pound of meat). If an individual grower's feed conversion is lower than the benchmark, each point difference will be converted into money and added to the floor payment. The critical difference between a tournament and a fixed standard is in the computation of the benchmark against which the performance of an individual grower is compared. Whereas in the first case the benchmark is determined by the contest among growers, in the second case it represents a predetermined technological constant. Most of the contracts are designed to have an upper and a lower bound on the payment per pound, expressed as a minimum- or a maximum-allowable feed conversion. In this case the floor payment simultaneously serves as a minimum guaranteed payment, i.e., there is no punishment for the feed conversion higher than the pre-established benchmark.

The second category can be labeled a performance-brackets-payment scheme. The essence of the scheme is the existence of predetermined feed-conversion ranges (brackets) for different weight groups of harvested birds. Each feed-conversion bracket is associated with a different payment per pound of approved meat delivered. Lower feed-conversion brackets yield higher payment per pound.

The third type of payment used in the joint brooding and finishing operations is virtually identical to the broiler tournament with some minor modifications related to the treatment of the consumption of LP gas. Gas is used extensively for heating in the brooding stage and is a significant component of the growers operating expenses, so it is typically shared between the integrator and growers.

Efficiency Gains from Contract Production

The transaction cost framework provides a useful perspective for examining the choice among spot markets, contracts, and vertical integration. The importance of relation-specific assets provided by grower (chicken houses) and integrator (feed mill and processing plant) makes spot markets uneconomical for organizing broiler production. The choice between contracts and vertical integration depends largely on the anticipated need to adapt to a changing or uncertain future. Anticipation of a volatile and uncertain future, which characterizes broiler production, should lead to vertically integrated production, yet contracting with individual farmers is nearly universal. As pointed out by Knoeber (1989), the resolution to this puzzle has two parts. First, compensation by tournaments eliminates the bias toward vertical integration by reducing the cost of contracting. Tournaments provide an effective adaptation to technological change without contract renegotiations and enables the shifting of common production risk to the integrator without requiring complex contingent contracts. Second, the requirement that growers provide capital in the form of chicken houses creates a bond that assures growers' performance, makes the contracting relation long-term, and induces self-selection of high-ability growers.

The emergence of vertical integration via contracts with independent farmers in the poultry industry can be explained by the formation of economic circumstances that required adequate mechanisms to facilitate risk sharing or provision of insurance, technological progress and innovation dis-

semination, response to consumer demand for product reputation and uniform quality, and access to capital. The same four categories can be used to summarize the most important benefits that the widespread adoption of production contracts generated during the past 40 years.

Risk Sharing

The first important reason for contracting is the provision of insurance by risk-neutral (or less-risk-averse) integrators to risk-averse growers. However, insurance provision can be hindered by the integrator's inability to fully monitor growers' actions and by growers' opportunistic behavior. In poultry production contracts, however, the provision of relationship-specific capital by growers virtually eliminates the opportunism problem. The integrator's inability to observe the growers' efforts remains a problem, however. Therefore the integrator can never provide full insurance to the growers, so payment schemes cannot be independent of realized outcomes. With payment schemes that depend on observed outcomes, contracts provide sufficient incentives for growers to exert a desired level of unobservable effort. Yet in the presence of production uncertainties common to all growers, the integrator may be able to offer some insurance if growers' results convey information about common uncertainties. Examples of common production uncertainties include the effects of weather, untried feed mixes, and newly introduced genetic stock. In the presence of such uncertainties relative performance evaluation via tournaments provides a mechanism to partially insure the growers by filtering away common production uncertainty.

The magnitude of risk shifting from growers to integrators has been investigated by Knoeber and Thurman (1995). They decomposed the total risk in the broiler industry into price, common production, and idiosyncratic production risks and found that price risk accounted for 84 percent of total risk, common and idiosyncratic production risks each accounted for three percent, and the remainder was attributed to the joint contributions of the three components. The form of contracting used in broiler industry shifts nearly all risk to the integrator except for the 3 percent of the idiosyncratic risk. The likely explanation for the weak relation between price risk and broiler supply found elsewhere in the literature (Aradhyula and Holt 1989) is not the small price risk but the fact that all risk is shifted to large, sometimes publicly owned, integrator companies who have relatively small risk-bearing costs.

Technological Change

The expedient adoption and implementation of technological innovations is another important cause of the emergence of contracts as well as one of the major benefits created by contracting in the poultry industry. The rapid technological change generated tremendous productivity gains which resulted in a significant reduction in the cost of production, which to a large extent ended up being passed to consumers via reduction in the consumer prices of poultry meat.

To isolate the impact of contracting on productivity one can compare the broiler industry to other livestock industries where contracting did not occur, such as the pork and beef industries. Contract production of broilers began just after Word War II and quickly came to dominate the entire industry. From 1950 to 1980 the broiler industry was the only industry using production contracts. Contract production in the pork industry did not start until the late 1970s, and the elaborate production contracts used for poultry and hogs are still virtually absent from the beef industry. Over the 25-year period of experimenting with contracts, the feed-conversion ratio in the broiler industry dropped nearly 30 percent from 2.85 in 1955 to 2.08 in 1980. The number of days to grow a broiler to market weight fell from 73 to 52 while the average market weight actually increased from 3.1 to 4 pounds (Lasley 1983). This increased productivity came about through disease control, development of genetically superior breeding stock and innovations in animal nutrition.

Other evidence of the exceptional pace of technological change in broiler production is found by comparing the changes in real broiler meat prices with those of beef and veal and pork prices during the same period. The results are presented in Table 1. The numbers suggest a rapid technological change in broiler production and little or no change in beef and pork production. The decline in broiler prices is continuous except during the 1970–1975 period, which was largely due to the dramatic in-

Table 1: The Dynamics of Real Meat Prices: 1955–1980.

	Percentage Change in Price		
Time Period	Broilers	Beef and Veal	Pork
1955–60	-29	+17	-7
1960–65	-11	-4	+10
1965–70	-13	+3	-1
1970–75	+8	+3	+23
1975–80	-23	+4	-31
1955–1980	-54	+18	-14

Source: Lasley (1983), reproduced from Knoeber (1989) p. 273

crease in grain prices in 1973. The 54-percent drop in the real price of broilers during the 25-year period was much larger than the drop in pork prices, and real beef prices actually increased. The price reduction is even more important if one keeps in mind that the per capita consumption of broiler meat increased from 13.8 pounds in 1955 to 46.7 pounds in 1980 (Lasley et al. 1988).

The expansion of broiler production and the decline in real broiler prices continued into the 1990s. Additional evidence of the magnitude of the broiler industry's production and marketing efficiency gains can be illustrated by the results obtained by Martinez (1999). He simulated the retail price of whole broilers by holding technology and input-output relationships constant and varying broiler production and marketing costs according to changes in input prices. The simulated retail price was then compared to the actual price to measure the productivity gains passed to consumers. The results showed that if higher input prices had been passed to consumers, average retail broiler prices for the 1992–1996 period would have been $1.58 per pound instead of the actual average of $0.91 per pound.

Response to Changes in Consumer Preferences

An important characteristic of the poultry industry that differentiates it from other livestock industries is the ability to rapidly respond to changes in consumer preferences. Per-capita broiler consumption nearly doubled from 1976 to 1997, compared to a 5-percent increase in pork consumption and a 30-percent reduction in beef consumption. In 1986 per-capita consumption of broiler meat exceeded the consumption of pork and in 1993 it surpassed the consumption of beef. Increasing per-capita consumption and more-or-less constant prices suggest the possibility of a demand shift caused by changing consumer preferences.

The poultry industry measures significant improvements in product form differentiation. During 1980s the combined sales of cut-up and further processed chicken exceeded sales of whole birds. By 1995, 63 percent of broiler volume was sold as parts and 11 percent as further-processed products. The poultry industry is the leading prepackaged consumer-ready meat-products industry. According to its 1996 listings one major supermarket chain offered consumers 70 prepackaged consumer-ready poultry products, 58 pork products, and less than 10 each of veal, lamb, and beef products (Martinez 1999).

Contracting and vertical integration have also given the poultry industry greater control over both the volume and quality of its products, which turned out to be especially important in meeting the needs of large food-away-from-home establishments and supermarket chains. In the 1980s approximately 25,000 fast-food outlets added chicken items to their menus (Lasley et al. 1988). Poultry producers are increasingly pursuing the creation of brand names that consumers associate with uniformly high-quality product. According to Bugos (1992) brand names accounted for half of all supermarket sales of chickens, and shoppers were willing to pay 14-percent more for brand-name broilers than for supermarket brands.

Access to Capital

Yet another benefit of contracting comes from sharing the cost of capital expansion between inte-

grators and growers. One of the reasons for the rapid expansion of the broiler industry was a relatively easy and inexpensive access to capital through Federally insured loans the construction of housing facilities. Grower provision of capital investments provides an efficient way for the integrators to finance expansion, with a positive employment feedback on growers. Productive growers typically enjoy a long-term relationship with an integrator. Grower provision of capital is the fee for entering a long-term relationship with an integrator and an important device for screening out low-ability growers. Relationship-specific investments have the added benefit of enhancing an integrator's ability to provide insurance to risk-averse growers by reducing grower opportunism.

Growers Discontent and Potential Need for Regulation

Whereas most of the poultry growers seem to be satisfied with their contracts, some complain about various aspects of contracting. Most of the complaints are about the tournament schemes. Growers are opposed to the system where one grower's payment depends on the performance of others. They seem to be more favorable to the fixed performance standards used by many turkey companies. The crux of the growers' complaints about tournaments is the issue of the group-composition risk. Under a tournament system, consecutive flocks grown by the same grower and with similar production costs could receive substantially different payments because of the results of other growers in the settlement group. The essence of the contract settlement through tournaments is the elimination of the common production risk from the responsibility of the grower. Tournaments require that the calculation of the group average performance includes growers whose flocks were harvested at approximately the same time, so that they are all exposed to the same influence of common stochastic factors including weather, disease, feed quality, genetic strains, etc. Therefore the group composition changes on a flock-by-flock basis because of the unequal rotation lengths of flocks grown on different farms and logistical considerations related to the transportation of feed and chicks. Hence a grower's payment can vary from one flock to the next even if all else is constant. Growers have expressed exasperation over this form of remuneration since they have no way of accurately forecasting their revenues.

In addition to complaining about the settlement process, growers have also raised complaints about the quality of chicks, the way live birds and feed are weighed, and the length of time between flock placements. They also complain about contract nonrenewal, contract terminations, requirements that facilities be modified or upgraded (excessively), their limited choice of integrators or their inability to change integrators, and alleged integrator reprisals for joining grower associations and for seeking redress of grievances.

The magnitude of the mistrust can best be illustrated by the results of a survey conducted in 1993 by Tyson, the largest broiler processor company in the U.S., of its own growers. The survey revealed that more than 50 percent of growers do not trust the company scale weights, 44 percent do not trust feed weights, 62 percent are unhappy with the quality of chicks provided by the company, and 40 percent do not fully understand how their payments are determined (Bjerklie 1994). In a 1998 study of Delmarva Peninsula poultry growers by Ilvento and Watson (1988) contract growers expressed relatively high satisfaction with their poultry business, their contractors, and their flock supervisors. Nearly half felt communication was inadequate and feared retaliation if they raised concerns. Most felt that income was adequate or that they were getting a fair return on their investment. Earlier Alabama grower surveys (Kennedy 1994; AP&EA 1998) found substantial differences in overall grower perceptions of the fairness of the contractual arrangements, with satisfaction ranging between 20 and 73 percent. The 1998 survey results were generally more positive toward integrators' performance, with 50 to 90 percent generally favorable, but some still complaining about various aspects of contracts.

Out of concern for such grower discontent, a number of states have considered legislation to protect growers. In Southern states such legislative proposals generally failed as integrators voiced strong opposition. For example, in 1993 the North Carolina Legislature introduced a bill that would have restricted the types of contracts that growers and integrators could sign. The bill specifically prohibited payments to a grower based on his performance

relative to other growers (Vukina 1997). Legislation with provisions that protected the rights of growers to organize and create associations were also defeated in Alabama and Louisiana. However, various forms of legislation aimed at regulating contracts without explicitly targeting tournaments were passed in Minnesota, Wisconsin, and Kansas in the early 1990s (Lewin 1998).

On the Federal level, in 1997 a regulatory initiative came from the Grain Inspection, Packers, and Stockyards Administration of the U.S. Department of Agriculture. In an advanced notice of proposed rulemaking, the agency announced that it is considering "the need for issuing substantive regulations to address concerns in the poultry industry with respect to contract payment provisions tied to the performance of other growers" (GIPSA 1997, p. 5935). Furthermore, in 1998 the National Commission on Small Farms recommended that the Secretary of Agriculture evaluate the need for Federal legislation to provide uniform contract regulations for all growers engaged in agricultural production contracts. In reference to poultry contracts the recommendation specifically focused on the factors used in ranking growers and determining performance payments. No concrete regulatory actions have been taken so far but the pressure from the growers' circles to regulate the industry continues.

The literature on the economic impact of integrator practices and procedures on poultry growers and consequently the need for government regulation of contracts is quite small. In somewhat related papers, Vukina and Foster (1998) assessed how optimal input decisions by growers change with the adoption of alternative contract designs and Goodhue (2000) showed how integrators reduce the information rents paid to growers by controlling inputs. The closely related literature on franchising has generally been very critical of government regulation on the grounds that any regulation will interfere with the ability of economic parties to negotiate efficient agreements (Beales and Muris 1995; Brickley, Dark, and Weisbach 1991).

Addressing the theoretical rationale for government regulation of poultry contracts, Lewin (1998) argued that by requiring growers to make large specific investments in chicken houses integrators can increase grower incentives without increasing grower compensation since the risk of losing the investment will increase a grower's fear of low performance. She concludes that because asset specificity has such an effect on distribution, integrators have an incentive to insist on investments that are unnecessarily specific. Lewin is in favor of regulation to allow the unionization of growers that would increase their bargaining status; she also favors the regulation of contract duration.

Analyzing the welfare effects of the regulatory proposal to ban tournaments and replace them with fixed performance standards, Tsoulouhas and Vukina (2001) investigated if such regulation would increase grower welfare and the social surplus (the sum of integrator's and growers' welfare). They showed that the mandatory replacement of tournaments with fixed performance standards absent any other rules can decrease grower income insurance (i.e., increase income volatility) without raising welfare. However, income insurance and welfare can simultaneously be increased provided the slope of the bonus-payment scheme, the so-called "piece rate," is also regulated. The enforcement of fixed performance standards absent any rules concerning the magnitude of the piece rate will result in an unambiguous reduction in social surplus. Regulation accompanied by a rule determining the magnitude of the piece rate may or may not reduce social surplus, depending on the technology and preferences, because integrator welfare is reduced but grower welfare is increased.

There are many other important facets of poultry contracts that were not addressed in the literature. In addition to the issue of regulating the payment schemes, the need for government intervention in private contracts may or may not be justified on some other grounds. One of the more interesting issues is the effect of regional competition on the market for growers, and the related problem of a potential "hold-up." It is certainly conceivable that by making growers incur large specific investments integrators can increase grower incentives without increasing grower compensation, since the risk of losing his investment will increase a grower's fear of low performance. Because asset specificity has such an effect on distribution, integrators have an incentive to insist on investments that are unnecessarily specific. Thus, especially in geographical regions where the integrator enjoys market power, grower complaints about excessive investments may be theoretically justified.

Conclusions

The poultry industry is a significant competitor in the global meat market, rapidly gaining market share over the last 30 years. The broiler industry is entirely vertically coordinated through ownership or contract. Breeding flocks, hatcheries, feed mills, transportation divisions, and processing plants all have a single owner. The integrator has production contracts with growers to feed the chicks to market weight. The significant economies of scale in poultry processing and the large proportion of the value added in processing are two main reasons why processors became the industry coordinators. Turkey production is mainly organized through contract production with individual farmers. Recently, farmers have tended to specialize in either brooding or finishing of turkeys under different contracts. Some independent producers who have formal marketing contracts with turkey processors still exist.

There are possible advantages and disadvantages to contract production in the poultry industry. The extensive use of contracts with independent farmers in the poultry industry has resulted in lower financial risk for farmers, rapid technology adoption, quicker response to changing consumer demand, and improved industry access to capital. The broiler industry has dramatically improved its competitive position in the last 30 years, improving efficiency, developing innovative products, keeping consumer prices low, and greatly increasing its market share.

While a large number of contract broiler growers surveyed recently expressed satisfaction with their contract arrangements, including their income and the rate of return on invested capital, many growers expressed dissatisfaction with bonus determination, communication, and a number of other operational issues with their contractor. Despite the fact that there may be some theoretical grounds for the regulation of broiler contracts, the complexity of welfare-improving regulatory solutions should serve as a strong deterrent for more aggressive government involvement.

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