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The Economic Organization of U.S. Broiler Production

James M. MacDonald

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United States
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The Economic Organization of U.S. Broiler Production

James M. MacDonald

Abstract

Broiler production in the United States is coordinated almost entirely through systems of production contracts, in which a grower's compensation is based, in part, on how the grower's performance compares with that of other growers. The industry is undergoing a gradual structural change as production shifts to larger broiler enterprises that provide larger shares of an operator's household income. Larger enterprises require substantially larger investments in broiler housing, and new or retrofitted houses are also an important source of productivity growth in the industry. This report, based on a large and representative survey of broiler operations, describes the industry's organization, housing features, contract design, fees and enterprise cost structures, and farm and household finances.

Keywords: broilers, chickens, production contracts, broiler grower financial performance, chicken housing, chicken litter, poultry

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Summary

U.S. consumption of chicken averaged 86 pounds per person in 2006, more than triple the 1960 level. Chicken became a preferred option as incomes increased and chicken prices remained inexpensive compared with other meats, and as processors created new chicken products that appealed to consumer tastes. Increased consumption required increased production of broilers, which the industry accomplished through a tightly integrated production system that links chicken companies, called integrators, with independent broiler growers through production contracts. The industry's distinctive organization has contributed to its commercial success, but it now faces a series of challenges.

What Is the Issue?

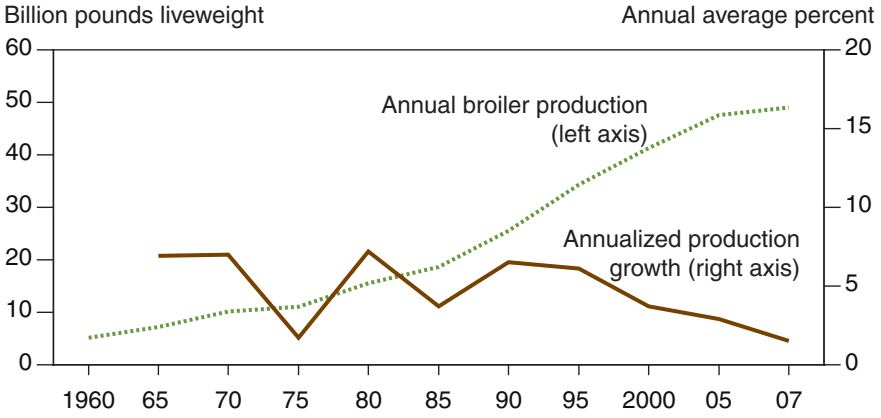
After decades of rapid expansion, growth in both broiler production and productivity began to slow in the mid-1990s. Slowing growth creates challenges for industry decisionmakers, as they consider how to encourage further investments in capacity and new technology, and attempt to manage existing and aging production networks.

The broiler industry has a unique organization. Firms called integrators own processing plants, hatcheries, and feed mills, and contract with independent "grow-out" operations to raise their broilers to market weight. The contractual relationship between farmers and integrators, however, is coming under growing scrutiny from Congress and regulatory agencies, and the industry relies heavily on a particular kind of production contract that has attracted considerable attention.

The broiler industry plays an important role in several public policy issues:

- Large animal feeding operations, including those raising broilers, are under increasingly strict environmental regulation by all levels of government; and
- The broiler industry has dealt with poultry diseases and associated biosecurity issues for many years, while growing public awareness

Broiler production and production growth, 1960-2007



Sources: USDA, National Agricultural Statistics Service

of such threats plays an increasingly important role in industry and public policy planning.

What Did the Study Find?

Other industries use production contracts, but the broiler industry is distinguished by the dominance of such contracts and the methods by which growers are paid. Almost all broiler growers' contracts base the compensation on how each grower's performance compares with that of others.

Beyond that feature, however, contracts are far from uniform. Contracts can include other terms that tie base payments to actions that affect grower costs or that assign some expense or revenue categories to either the grower or the integrator. Contracts also cover a wide range of specified durations, from just over a month to 15 years. Variations in contract design likely follow from differences in grower location, size, and type of broiler housing, but the wide variation in terms and payments makes it difficult for growers to evaluate contracts.

The industry's organization has contributed to its commercial success. High rates of productivity growth, along with new product innovation, led to high growth rates for chicken production, domestic consumption, and exports. Growth in production slowed noticeably, however, after the mid-1990s. With slower production growth, investment in new housing also slowed. New housing embodies new technology, so slowing investment can hinder future productivity growth, unless older houses can be effectively retrofitted with newer equipment. Integrators are requiring such retrofitting for some operations as a condition of extending their contract. For newer and larger operations, integrators are offering contracts of longer duration to induce them to continue to invest in new technology.

Broiler production is gradually shifting to larger operations, a trend common to most agricultural commodities. For operators of small broiler enterprises, off-farm income is the primary source of the household's income, and the broiler enterprise provides a modest amount of additional income. For larger operations, the broiler enterprise typically is the primary source of the household's income. As a result, operators of larger enterprises may be more sensitive to the income risks arising from energy price fluctuations and contract settlements. Contract features may need to be redesigned to adjust for differing risk exposures faced by growers.

Larger operations may realize scale economies in production, but they also concentrate poultry litter in localized areas. Litter is bedding material, such as wood shavings, sawdust, or straw, that is spread on the floors of broiler houses. When it is removed, it consists mostly of poultry manure, along with the original bedding, feathers, and spilled feed. In 2006, about 40 percent of used litter was spread on the farm's fields, while the rest was removed from broiler operations for field application elsewhere or for processing. There was enough of a market for litter in 2006 to allow growers to sell about a third of the litter removed from farms, but farmers had to give away the rest or pay to have it removed. Litter disposal remains a major issue confronting the industry.

How Was the Study Conducted?

The analysis relies on data drawn from a large-scale representative survey of producers, conducted as part of the annual Agricultural Resource Management Survey (ARMS), which is the U.S. Department of Agriculture's primary source of information on the financial condition of farm businesses and households and farm production practices.

Two ARMS versions collect financial and production information for all types of farms, but other versions target specific commodities and collect additional information on production practices, financial performance, and contractual relationships for those commodity enterprises. ARMS included a broiler version for the first time in the survey conducted early in 2007, with a focus on performance during 2006. The survey's target population consisted of all operations that produced broilers for meat and had at least 1,000 broilers onsite at any time during 2006, in the 17 States that accounted for 94 percent of U.S. broiler production. Analyses in this report are based on responses received from 1,568 operations, out of 2,100 originally selected for the survey.

Introduction

This report describes the organization and economics of broiler production in 2006. Broilers, young chickens bred for meat, account for nearly all chicken meat and most poultry meat produced in the United States.[1] The broiler industry's processes are tightly controlled by firms called integrators, who operate processing plants, feed mills, and hatcheries, and who contract with farmers to grow broiler chicks to market weight. This report focuses on farms in the production or grow-out stage and their commercial relationship with integrators.[2]

Broiler production grew rapidly for many years, fueled by powerful shifts in consumption patterns. In 1960, Americans consumed about 28 pounds of chicken per person, compared to nearly 60 pounds of pork and 65 pounds of beef (fig. 1). Chicken consumption rose steadily in the ensuing decades, reaching 87 pounds per person in 2006, while per capita beef consumption remained virtually unchanged from its 1960 value and pork consumption declined. Increasing chicken consumption reflected changes in consumer preferences, the introduction of many new chicken-based retail products, and declining relative prices for chicken.

Between 1960 and 2006, poultry prices rose by 2.7 percent per year while prices for all food rose by 4.2 percent per year, according to the Consumer Price Index (CPI). As a result, retail poultry became cheaper compared with other foods, encouraging a shift to poultry. Other price data indicate that rapid productivity growth was at the heart of poultry's superior price performance. Prices for prepared feeds, the major input used by poultry producers, rose by 2.5 percent per year during the same period, but wholesale broiler prices rose by just 1.3 percent per year as the industry found ways to increase feed efficiency.[3]

Per capita consumption increases of 2-4 percent per year, when combined with U.S. population growth of about 1 percent per year, provided the industry with substantial increases in demand over a long period. International markets provided a third source of demand growth, with increased chicken exports accounting for about a third of the total growth in production during the 1990s. Table 1 divides the growth in production into three parts—expanded exports, population, and consumption—and shows how changes in each affected the industry's production growth.

Overall production growth slowed sharply after 2000. While per capita consumption continued to grow at 1.9 percent per year, the contribution of population growth fell in comparison to earlier years and export growth fell sharply (table 1). Changes in exchange rates can affect the competitiveness of U.S. exports, and growth in foreign incomes can be an important force. In the near future, a declining dollar, combined with income growth in Asia, may boost export growth again.

[1]Other chickens include capons and stewing hens, but broilers accounted for almost 99 percent of ready-to-cook chicken production in 2006, and chicken in turn accounted for 86 percent of all poultry production, with turkey taking up most of the remainder.

[2]The report does not cover breeder broiler or pullet operations that produce eggs for hatcheries.

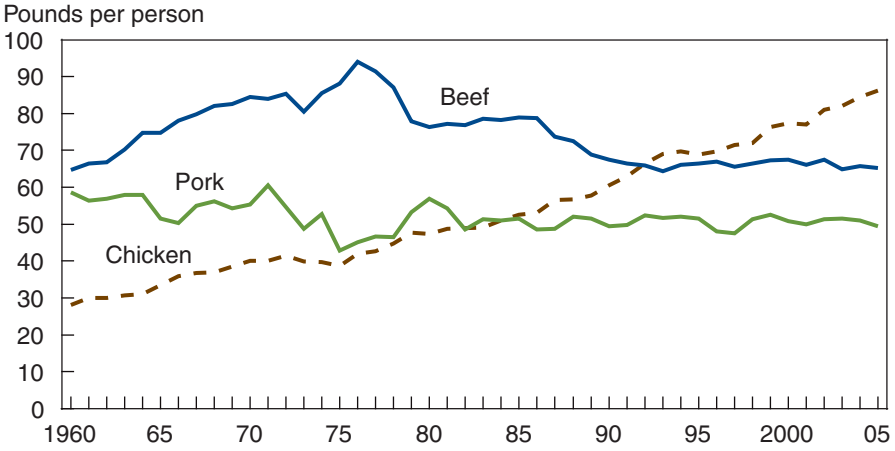
[3]Using Producer Price Index (PPI) data.

Increases in total liveweight production have been realized from a rapid expansion of the total number of broilers produced and also from increasing the size of birds (fig. 2). Annual slaughter volumes rose from 1.53 billion birds in 1960 to 8.84 billion in 2006, while average weight rose from 3.4 to 5.5 pounds. In turn, increased production meant spreading to new locations, attracting new growers in existing locations, and increasing the size of production facilities. Slowing production growth is also apparent in figure 2. Before 1995, annual slaughter volumes of birds grew at a 4.6 percent annual rate, but at 1.7 percent afterward, even as average weight continued to increase.

Broiler production is organized in a distinctive manner. Most farms are linked to an integrator through a production contract, under which the integrator provides chicks, feed, veterinary services, and other inputs to the farmer, who grows the birds to market weight. Besides providing their own labor, farmers invest in specialized poultry housing (along with associated equipment), pay for any hired labor, and bear some or all of the cost of utilities. Because broiler housing is specialized and long-lived, the decision to produce broilers is a long-term commitment, and most producers have worked with their integrator for at least 10 years.

Figure 1

Trends in per capita consumption, 1960-2005



Source: ERS Food Availability (Per Capita) Data System, at www.ers.usda.gov/Data/FoodConsumption.

Table 1

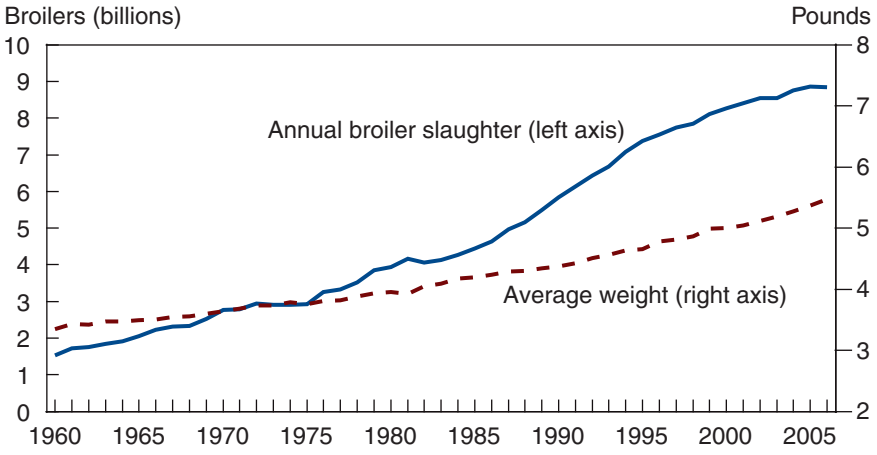
Growth in chicken production, 1960-2005

Item	1960-70	1970-80	1980-90	1990-2000	2000-05
	Average annual percentage growth in pounds produced (liveweight)				
Production	5.0	3.4	4.9	4.3	2.9
Contributions from growth in:					
Exports	-0.1	0.5	0.4	1.4	0.1
Population	1.3	1.2	1.2	1.1	0.9
Per capita consumption	3.8	1.7	3.3	1.9	1.9

Source: ERS Food Availability (Per Capita) Data System, at www.ers.usda.gov/Data/FoodConsumption.

Figure 2

Growth in broiler production, 1960-2006



Source: USDA, National Agricultural Statistics Service.

Integrators usually own hatcheries, feed mills, slaughter plants, and further processing plants—that is, they may be vertically integrated into all stages except for broiler production, where they rely on networks of growers assembled through production contracts. Integrators also contract with, or own, primary breeder companies that develop poultry breeding stock, and they contract with other farm operations to produce broiler eggs for hatcheries.

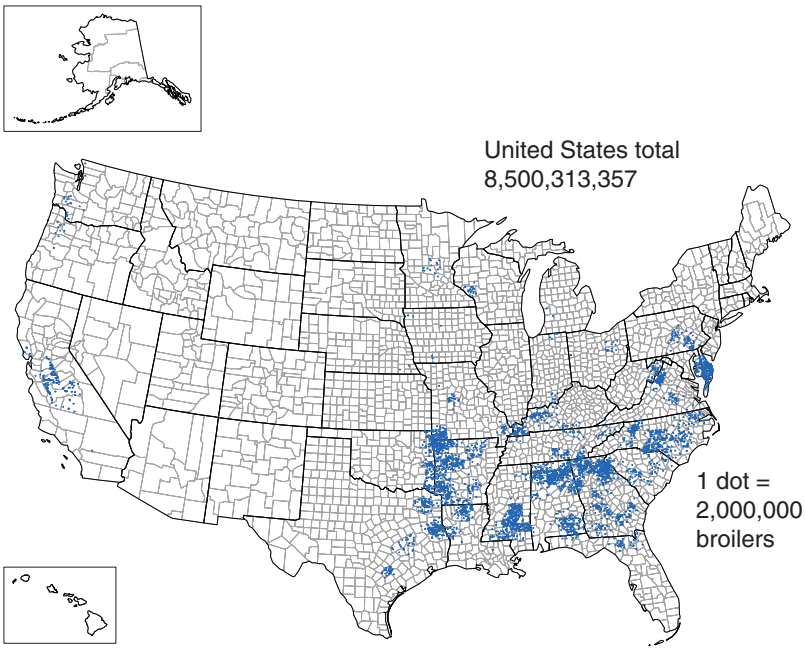
Production contracts are used in turkey and egg production and have been adopted widely in recent years throughout the hog industry. They can also be found in some areas of crop and horticultural production. But production contracts cover almost all broiler production, while other commodities also use a mix of other arrangements.

Production contracts in all commodities pay farmers for their growing services, not for the commodity. But the broiler industry uses a distinctive compensation arrangement. Farmers are most often paid on the basis of their relative performance, compared with other producers who deliver broilers to the integrator within a specified time period, usually a week. Under a relative performance standard, all producers receive a base fee, but those who deliver more poultry meat for the number of chicks placed receive higher payments; differences in relative performance, therefore, are driven by differences in chick mortality and feed efficiency. In turn, this type of contract shields producers from the common risks due to weather or input price fluctuations that affect producers as a group, since payment depends on relative performance and not on the average performance of the group (Knoeber, 1989).

Broiler production is geographically concentrated. Figure 3, drawn from the 2002 Census of Agriculture, shows where broilers are produced. The map clearly shows the concentration of production in Southeastern States and also shows how production is concentrated into dense networks within those States. Geographic concentration is driven by economies of scale in broiler production and slaughter, which encourage the growth of large facilities, and from the reductions in transportation costs for chicks, feed, and birds that can be achieved by locating processing plants, hatcheries, feed mills, and

Figure 3

Number of broilers and other meat-type chickens sold, 2002



Source: USDA, National Agricultural Statistics Service.

grow-out farms near one another. Pressures for geographic concentration are counter-balanced by the associated concentration of poultry litter, which can, in high concentration, create pollution risks to water and air resources, and by the risks from the contagious spread of poultry diseases within a network.

Challenges Facing the Industry

The industry's distinctive organization has been an important contributing factor to its productivity and output growth (Rogers, 1979; Lasley, Henson, and Jones, 1983; Knoeber, 1989). But the industry now faces several challenges. The post-1995 slowdown in production growth is matched by a similar slowdown in productivity growth, resulting in retail price changes for chicken that now look much more like price changes for all food items.[4] Slowing productivity growth will press profits and lead to searches for different organizational designs.

While the industry's geographic concentration enables integrators to realize scale economies in production and processing, it also creates several risks and public policy challenges. For example, the worldwide spread of contagious poultry diseases is a growing concern and an important driver of industry biosecurity safeguards. But government agencies will also be involved in planning for and reacting to any serious outbreaks, and they need a deeper understanding of the industry's organization in order to carry out their responsibilities.

Because production occurs in localized networks, growers in most areas have very few integrators from which to choose. Many growers have only a single integrator in their area and most have no more than three. The lack of alterna-

[4]Broiler prices rose by much less than feed prices between 1960 and 1995, as steady improvements in feed conversion offset the effects of feed price increases on costs. But broiler price changes have closely matched feed price changes since 1995, as improvements in feed conversion began to lag. In turn, retail poultry prices have risen at nearly the same rate as all food prices since 1995, after rising much less rapidly during 1960-95.

tives has led to controversy over production contracts and to legislative and regulatory proposals to regulate them.

Finally, high geographic concentrations of broiler litter can create increased risks of water and air pollution from excessive applications of the nitrogen and phosphorous in litter. Concerns over those risks have led to expanded regulatory intervention, expanded funding under USDA conservation programs, and public and private sector searches for solutions.

This report is designed to provide an overview of the industry's organization and economics, so as to provide objective and reliable background information. Our data are drawn from a large-scale representative survey of producers conducted early in 2007. The survey is part of the Agricultural Resource Management Survey (ARMS), an annual survey of U.S. farms that serves as the U.S. Department of Agriculture's primary source of information on the financial conditions and production practices of farm businesses and the well-being of farm households. ARMS has several versions. Two—a short version distributed by mail and a personally enumerated longer version—focus on all types of farms. Broiler operations do appear in those versions and some prior Economic Research Service (ERS) studies have used that data (Perry, Banker, and Green, 1999; MacDonald and Korb, 2008).

Other survey versions (up to three each year), which are also personally enumerated, focus on producers of selected commodities and include detailed questions on commodity production practices, as well as contractual and marketing relationships. A broiler version was included, for the first time, in an ARMS conducted in early 2007; the questions focused on performance during 2006.

Conducting a Broiler Version of the ARMS

The survey focused on commercial producers of broilers grown for meat. Therefore, a sample was drawn from a target population consisting of all operations that produced broilers for meat and had at least 1,000 broilers onsite at any time during 2006. The sample definition excluded operations that raise broilers for show or private consumption, as well as egg-laying, hatchery, and broiler breeder operations. To conduct the survey efficiently, standard practice for commodity-specific ARMS versions is to limit the sample to major production States—in this case, 17 States that account for 94 percent of U.S. broiler production.[5]

ARMS samples are randomly selected from a list of operations compiled from the Census of Agriculture, commercial databases, and USDA program databases. In June 2006, sample farms were screened for continued operation during ARMS survey Phase I. The questionnaire was finalized in November 2006, and survey enumerators conducted their interviews in February and March 2007. Of 2,100 operations targeted for interviews for the broiler version, 1,602 usable survey responses were received. Some respondents were still in farming, but did not produce broilers for meat during 2006, leaving 1,568 broiler producers for analysis (a 75-percent response rate). Most of this report focuses on the 1,546 operations that reported having a production contract for broilers (22 were independents, processor-owned, or did not respond to the question).

[5]We used the 2002 Census of Agriculture to identify the States: Alabama, Arkansas, California, Delaware, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, and Virginia. A focus on commercial producers of broilers raised for meat provides a large sample of similar operations for analysis.

To obtain more reliable estimates, some farms have a higher probability of sample selection. For example, larger operations are more likely to be selected for interviews than smaller, and selection probabilities also vary across geographic areas. Each sample farm represents a number of other farms from a similar geographic location and size class. These weights (the number of farms that each sample point represents) range from 3 to 40 farms. When sample observations are weighted to reflect their varying selection probabilities, population estimates for production and other industry characteristics can be generated.

How Production Is Organized

There were an estimated 17,440 commercial broiler farms in the 17 surveyed States in 2006, with production of 8.44 billion broilers (table 2). Since total nationwide slaughter amounted to 8.84 billion broilers in 2006 (fig. 2), the data from this 17-State sample represent 95 percent of total production.

Production contracts dominate the industry, accounting for almost all farms and broilers (table 2). The survey did identify a few independent operations (0.4 percent of birds produced) and some operations that were owned by processors (about 1 percent of farms). Respondents were also asked whether they produced certified organic broilers or free-range broilers ("free range" is operator-defined and not necessarily organic). About 1.7 percent of operations were certified organic (1.4 percent of broilers), while a smaller fraction (0.44 percent of operations) reported that they produced free-range broilers.

Farms specialize according to the size of the bird produced; smaller broilers are used in the food service and restaurant trade, while the largest are cut into parts in processing plants.[6] The survey sorted production into four size classes according to weight at removal (fig. 4). The most common, birds between 4.26 and 6.25 pounds, captured just over 40 percent of total production, measured by birds or by weight. The smallest class (4.25 lb. or less) accounted for 32 percent of all birds and 23 percent of all liveweight pounds produced in 2006, while the largest class accounted for 9 percent of birds and 14 percent of liveweight production. Over time, production has shifted to larger birds, reflecting the growth of de-boned and further processed products. Large birds are grown in larger houses equipped with more modern climate controls. They also spend more time on the farm, and hence consume more labor, feed, utilities, and housing services, so producers of larger birds receive higher compensation per bird. [7]

[6]Some farms did produce birds in more than one size class during 2006 (3.2 percent of operations), but most of those were switching from one size class to another.

[7]Birds in the smallest size class (4.25 lb. or less) spend 39 days, on average, on the farm. The larger classes—4.26-6.25, 6.26-7.75, and 7.76 or more pounds—spend an average of 49, 56, and 63 days, respectively, on the farm.

Housing

Broiler houses are a major investment for growers. A single large house of nearly 30,000 square feet can cost $300,000, and most growers have multiple houses. Housing also plays an important role in the industry's productivity growth, as improvements in housing design and climate control systems can lead to improved feed efficiency, lower bird mortality, and reduced costs of feeding, litter management, and bird removal.

Table 2
Broiler production in 2006, by type of operation

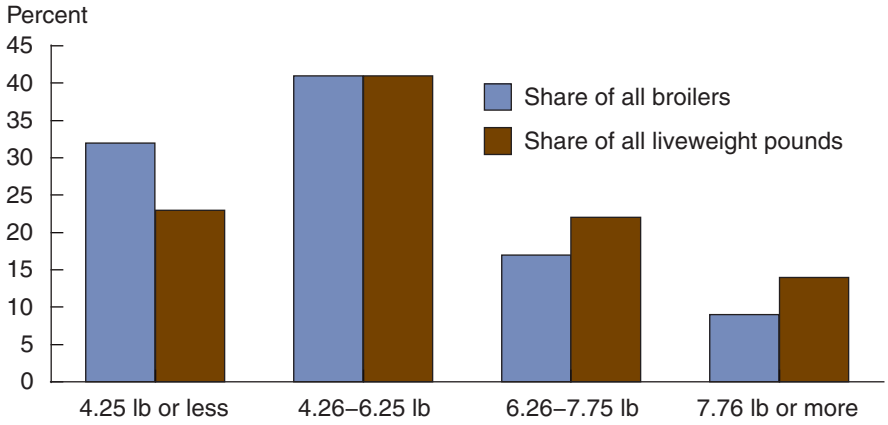
	All farms		Farms reporting broiler removals		
Type of operation	Obs.	Farms	Obs.	Farms	Removals
Production contract	1,546	17,200	1,543	17,183	8,310,308,738
Processor-owned	12	163	12	163	84,166,446
Independent	6	52	6	52	31,411,423
More than one type	2	14	2	14	8,219,932
Refusal/don't know	2	11	2	11	5,265,540
All operations	1,568	17,440	1,565	17,423	8,439,372,079

Notes: "Obs." refers to sample observations. Three sample farms with production contracts failed to report any birds removed, leaving 1,543 respondents in the removals column.

Source: 2006 Agricultural Resource Management Survey, version 4.

Figure 4

Broiler production in 2006, by size of bird



Source: 2006 Agricultural Resource Management Survey, version 4.

There were over 70,000 broiler houses in use for meat production in 2006. Their age structure follows a hump-shaped profile (fig. 5), with nearly two-thirds of capacity built in a 15-year period from 1986 through 2000. Investment dropped sharply after 2000, as considerably less capacity was built in the 6-year period from 2001 through 2006 than in any of the three preceding 5-year periods (1986-1990, 1991-95, and 1996-2000).

The slowdown in new house construction mirrors the slowdown in the industry's growth (fig. 6). Annual production of broilers grew by nearly 6 percent per year in the late 1980s and early 1990s, when measured by liveweight pounds at slaughter plants. Growth rates fell after the mid-1990s, to 2-3 percent per year in 2001-2006. As a result, far fewer new houses were needed to meet additions to production.[8]

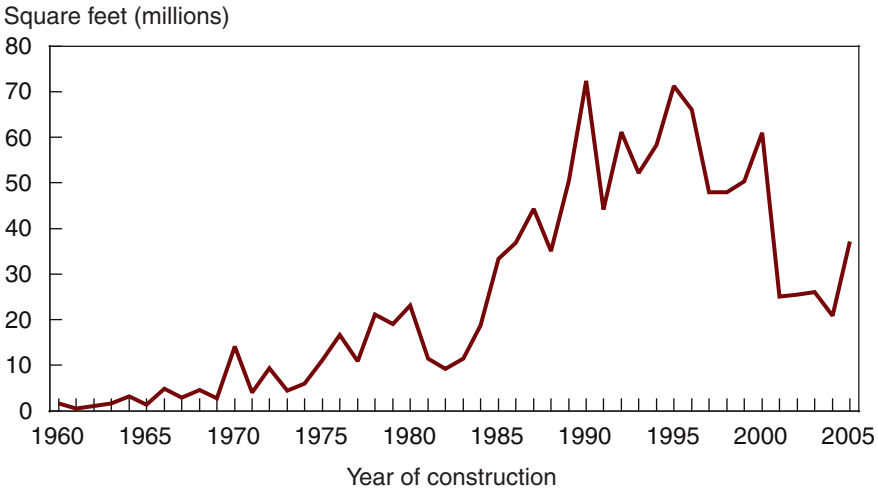
The diffusion of technologies in the industry can be traced by sorting houses according to vintage—that is, the year in which they were built (table 3). Houses have become steadily larger over time. Whereas the typical house built in the 1960s was about 12,750 square feet, recently built houses average over 20,000 square feet, and large houses built in 2005 and 2006 are much larger—up to 36,000 square feet. Most houses built before 2000 have side curtains—fabric that can be raised or lowered to help control the climate in a house with natural ventilation. While many recently built houses also have side curtains, they are more likely to have solid walls with equipment added for climate control.

Two important types of climate control equipment are tunnel ventilation and evaporative cooling cells. Tunnel ventilation systems consist of large fans at one end of a broiler house and air inlets at the other end. The fans pull air through the house, removing heat from the building and creating a wind chill that provides further cooling. Evaporative cooling systems can be activated when tunnel ventilation alone fails to provide sufficient cooling. The systems are located on the outside of the house near air inlets. Perforated pads in the systems are moistened, either through the use of fogging nozzles that spray water or through pipes that seep water through the pads. The

[8]Newer houses can produce more birds from a given capacity than older houses because they have better temperature controls. Houses built between 2000 and 2005 produced about 8 percent more than the industry-wide average of 36.8 liveweight pounds per square foot, but the growth of new capacity still fell sharply after 2000, even when one accounts for this effect.

Figure 5

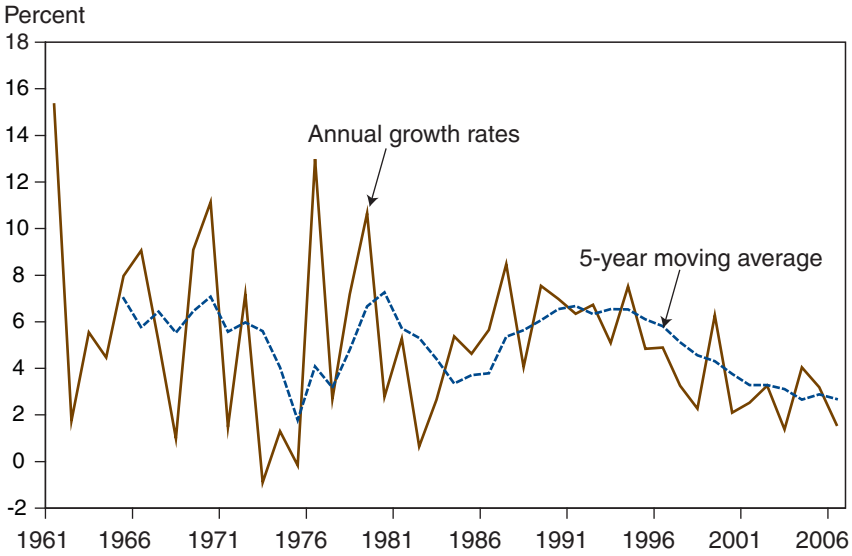
Broiler housing capacity, by year of construction



Source: 2006 Agricultural Resource Management Survey, version 4.

Figure 6

Annual growth in broiler slaughter (liveweight), 1961-2006



Source: USDA National Agricultural Statistics Service.

cooling pads then lower the temperature of the air as it is pulled through the pads and the house. Additional control equipment can be used to automatically monitor a house's temperature and humidity, adjusting the climate accordingly.

About 75 percent of broiler houses had cooling cells and tunnel ventilation in 2006, and newer houses are much more likely to have them (table 3). Over 90 percent of houses built after 2000 had those features, compared with 70 percent of houses from the late 1980s and 50 percent from the 1970s. Older houses that have cooling cells and tunnel ventilation have probably been retrofitted, with the equipment installed after the houses were originally constructed.

Table 3
Broiler housing, by vintage

Vintage (year built)	Houses: Number	Houses: Share of total (%)[1]	Mean size (Sq. ft.)	Percent of houses with: Side curtains	Cooling cells	Tunnel vent.
No year	1,013	1.4	14,466	66	29	57
pre-1960	345	0.5	12,340	70	50	36
1961-1965	619	0.9	12,751	80	28	11
1966-1970	1,292	1.8	12,754	87	44	40
1971-1975	2,883	4.1	13,110	82	49	53
1976-1980	5,362	7.6	14,694	72	55	53
1981-1985	4,486	6.4	16,449	68	64	64
1986-1990	12,291	17.4	16,259	75	71	70
1991-1995	16,303	23.1	17,678	74	78	79
1996-2000	15,142	21.5	18,765	75	85	88
2001-2006	10,861	15.4	20,180	48	92	94
All houses	70,597	100.0	17,352	70	75	76

[1]Column sums may not add to 100 due to rounding.

Source: 2006 Agricultural Resource Management Survey, version 4. Only includes houses for farms that have production contracts.

Entry and Experience in Broiler Production

Slowing industry growth means fewer recent entrants to broiler production. The survey asked respondents for the number of years that the operation had been producing broilers. Only 4.5 percent of farms, with 6.6 percent of production, produced broilers for 5 years or less (table 4). In contrast operations that, by 2006, had been in operation for 6-10 years accounted for 20 percent of farms and 23 percent of production. At the other end of the spectrum, about a third of all operations had been in business for at least 20 years.

An operation's age has a strong connection to its housing and finances. Older operations are smaller with much older housing and technology. Many older operations have no debt, while those with debt carry much less, per square foot of capacity, than newer operations.

New operations, in business for 5 years or less, have houses that are 11 years old on average, indicating that many recent entrants bought out existing operations with older facilities. Just under half of the new operations in table 4 also had new houses. Those operations carried higher debt loads—$6.52 per square foot, on average, compared to $3.03 for new operations with older houses—and 99 percent of their houses had evaporative cooling and tunnel ventilation.

How Large Are Broiler Operations?

Among farms with production contracts, average production in 2006 was 483,600 birds and 2.65 million pounds removed (table 5). But because averages are influenced by a few very large operations, two other measures can also provide useful information on farm sizes.[9]

The typical operation, as measured by the median (half of operations produced more and half less), produced 402,500 birds and 2.2 million pounds. While the typical contract broiler farm produced 402,500 birds in 2006, the typical broiler came from an operation that produced about 605,000

[9]Broiler production resembles many other economic activities in this regard: most operations are relatively small, but a significant amount of production occurs on a few large operations.

Table 4
Experience and broiler production

Item	Years operation has produced broilers			
	Under 6	6-10	11-20	Over 20
Farms	770	3,354	7,073	5,802
Share of broiler farms (%)	4.5	19.5	41.2	33.8
Share of broiler removals (%)	6.6	22.9	41.3	28.4
Mean operator age (years)	48	49	54	60
Financial characteristics				
Debt per sq ft of housing ($)	4.55	4.81	2.42	1.69
Share with no debt (%)	14	13	25	43
Housing characteristics				
Average age (years)	11	12	16	24
Tunnel ventilation (%)	88	85	76	55
Evaporative cooling (%)	91	80	72	57
Side curtains (%)	43	72	72	73
Contract duration				
Five years or more (%)	40	22	15	6
One year or less (%)	46	58	62	73

Notes: Shares of farms and pounds sum to 100 when refusals are added (1.0 percent of farms and 0.8 percent of pounds). Debt, per square foot of housing, is reported for all farms, not just those with debt.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Table 5
Production and the number of houses on broiler operations

	Birds removed	Pounds removed	Capacity utilization
		Means	
Operations with:			
Two houses	227,971	1,163,653	35.5
Three houses	340,298	1,775,921	36.1
Four houses	472,302	2,584,358	36.8
Six houses	722,530	4,079,423	38.7
Eight houses	896,440	5,229,069	36.9
All operations			
Mean	483,600	2,615,251	36.8
Median	402,500	2,211,600	36.5

Notes: Capacity utilization equals pounds removed per square foot of housing capacity. The table lists the five most common classes, according to the number of houses.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

birds (half of broiler production came from farms that produced more than 605,000 birds, and half came from farms with less). Using this last measure, production is shifting to larger operations over time. Hoppe et al. (2007) use Census of Agriculture data to show that this midpoint farm—where half of broiler production came from larger farms and half from smaller—was 520,000 broilers in 2002 and 300,000 in 1987, just about half the size of the midpoint broiler enterprise in 2006.

We can also look at size according to the number of houses on an operation. Most are small: 70 percent had between 1 and 4 houses, and together they accounted for just under half of broiler production, while operations with 5 to 6 houses and operations with 7 or more houses each accounted for just over a quarter of production. The largest operations responding to the survey had 18 houses, although enterprises of that size are not common (table 6).

Although production is shifting to large operations, family farms still dominate. Integrators directly own farms that account for 1 percent of production. Among farms with production contracts, 88 percent are sole proprietorships (table 7). While corporations account for just over 10 percent of production, most are family corporations in which more than half of the stock is owned by people related by blood or marriage. Large family farms often seek to incorporate, and that pattern holds among broiler operations—35 percent of those with 13-18 houses are incorporated, compared with only 6 percent of those with 3-4 houses (table 8).

Table 6
Size distribution of broiler operations

Number of houses	Farms	Broilers removed	Pounds removed	Capacity (sq. ft.)
		Percent of total		
nr	0.5	0.2	0.2	0
1-2	27.3	11.6	10.7	11.0
3-4	43.1	38.0	37.4	38.0
5-6	18.7	25.4	26.0	25.0
7-8	6.1	10.9	11.3	11.8
9-10	1.7	4.2	4.2	4.2
11-12	1.2	3.4	3.6	3.5
13-18	1.6	6.4	6.7	6.6
All farms	100.0	100.0	100.0	100.0
		Million		
Totals	17,183	8,310	44,815	1,221

Notes: Columns may not add to 100 because of rounding. Some operations did not report the number of houses, or had none, and they are designated with an "nr."

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Table 7
Legal organization of contract broiler operations

Type of organization	Farms	Broilers
	Percent	
Individual (sole/family proprietorship)	87.9	83.6
Legal partnership	4.6	5.8
Family corporation[1]	5.2	7.2
Nonfamily corporation	2.2	3.2
Other[2]	0.1	0.2
Total	100.0	100.0

[1]Family corporations are those in which more than half of the voting stock is held by people related to one another by blood or marriage. [2]Other includes estates, trusts, and cooperatives.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Table 8
Farm organization, by size of broiler operation

Number of houses	Percent of farms that are incorporated	Share of gross cash income from broiler contract fees
1-2	4	68
3-4	6	88
5-6	8	87
7-8	15	87
9-10	10	88
11-12	28	79
13-18	35	75
All farms	7	85

Note: Gross cash farm income includes fees from production contracts, revenues from cash sales and marketing contracts, government payments, land rents received, and revenues from other farm activities, such as grazing, custom work, and machine hire.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Production Contracts

Broiler production is a long-term commitment—houses are expensive, built to last for many years, and have few alternative uses. Because of that, producers tend to have long-term relationships with their integrator. On average, survey respondents reported holding contracts for 13 years with their current integrator.

Actual contracts often specify very short durations (fig. 7). Forty-five percent of respondents reported that their contracts were flock-to-flock, explicitly covering only the birds currently in their houses (5-10 weeks).[10] But durations also range widely. Eight percent of production contracts specified a term of at least 7 years, while the longest run 15 years.

[10]Contracts are, therefore, renewed frequently.

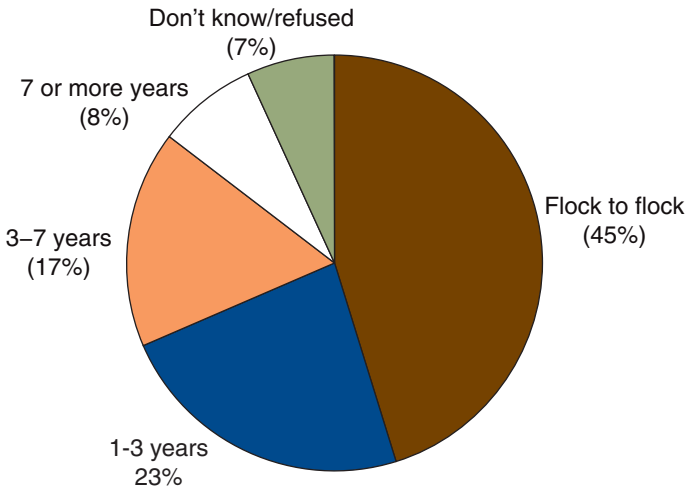
Long durations tend to be offered to newer and larger operations (table 4). Forty percent of recent entrants had long-term contracts (a specified duration of at least 5 years) compared with only 6 percent of operations in business for at least 20 years. Among recent entrants, those with long-term contracts averaged half again as much production as those with shorter contracts.

Contracts and Competing Integrators

Because production is so localized, most producers have few integrators to choose from. Nearly a quarter (24.7 percent) reported that only a single integrator served their area, while another 28.7 percent reported two and 21.7 percent reported three. Those findings may overstate the number of integrators farmers can choose among if some integrators are not actively seeking new growers. In the 2004 ARMS (version 1), we asked 545 respondents with broiler production contracts whether they had alternatives, in the form of other contractors, cash markets, or both, to their current contractor. Most (59 percent) responded that they had none—far more than the 2006 fraction reporting a single integrator in the area. The responses would be consistent

Figure 7

Contract duration among broiler operations



Source: 2006 Agricultural Resource Management Survey, version 4.

with one another if some integrators, particularly those in areas with 2 or 3, were not recruiting growers.

Integrators will not necessarily be able to exercise market power, even if there are only one or two in an area, because the competition for growers depends on more than just the number of integrators in a market. Integrators must recruit growers away from other activities, such as producing other commodities on the farm or working off the farm. Those outside options for growers set limits on the degree to which integrators can impose low fees on growers. There is little empirical evidence, however, of the effects of integrator concentration on grower returns.

Once a contract has expired, growers may have to retrofit their houses with new capital equipment in order to gain a contract extension. These expenditures can be substantial. Between 2004 and 2006, farms spent a total of $650 million on capital improvements to their broiler enterprises, an average of $38,000 per farm. That average is skewed by a few large expenditures, but one operation in six spent at least $50,000 and another one in eight spent between $25,000 and $50,000. Retrofitting is related to the age of the operation's facilities, and those with the oldest houses were much less likely to make significant investments in new equipment (fig. 8).

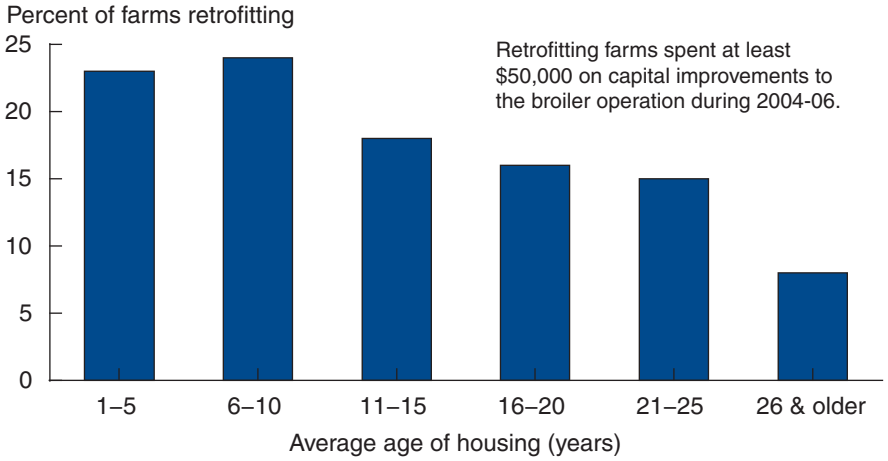
Fees Paid in Production Contracts

Broiler farms are quite specialized and depend heavily on fees from broiler production contracts, which account for 85 percent of their gross cash farm income, on average (table 8).[11] In the hog industry, where production contracts are also used widely, contract fees average about 27 percent of gross cash income on farms with production contracts for market hogs.[12]

Broiler contracts specify compensation arrangements, which usually depend on the grower's performance in raising chicks to market weight, with performance measured in comparison to other growers (table 9). Growers who deliver more meat, for the amount of feed and chicks provided, get rewarded

Figure 8

Farms with older houses are less likely to retrofit



Source: 2006 Agricultural Resource Management Survey, version 4.

[11]Gross cash farm income includes fees from production contracts, revenues from commodity sales through spot markets or marketing contracts, government payments, and income from other farm activities such as grazing, custom work or machine hire, and land rentals.

[12]According to data from the 2004 ARMS hog version. Hog operations tend to have large crop enterprises.

Table 9
Contract features related to compensation

Contract includes:	Percent of contracts with feature
Performance-based payment incentives	92.7
Pay for performance, compared with other growers	86.9
Adjustments for market price of broilers	13.2
Provisions for catastrophic payments	17.9
Seasonal adjustments for energy prices	55.7
Prices for energy purchased from specified dealer	5.6
Facility financing from the contractor	6.0

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

under the relative performance design of contract compensation. In turn, that depends on feed efficiency and mortality. Other factors may influence contract payments. Some contracts adjust compensation for energy prices, market prices of broilers, or local catastrophes. Furthermore, pricing schedules may vary across locations, depending on the amount of competition that an integrator faces in attracting growers. But relative performance has a powerful effect on compensation, and the strongest performers can be paid 50 percent more per pound than the weakest.

Fees received under production contracts vary with the size of the bird produced (table 10). Operations that produce larger birds receive more per bird—37 cents, on average in the largest size class, compared with 20 cents in the smallest. But larger birds also cost growers more, because they have longer production cycles, thus using more energy, labor, and housing services. For that reason, fees are better analyzed on a per pound basis, where they average about 5 cents (liveweight), with average fees falling slightly as bird sizes increase. Because fees can vary widely with relative performance, the 10th and 90th percentile values for fees are also reported in table 10. This "interdecile range" captures the variation in fees around the average (10 percent of growers receive fees that are at or below the 10th percentile value, and 10 percent receive fees that are at or above the 90th percentile value). While average fees cluster around 5 cents per pound, fees at the 10th percentile can fall to 3 and 4 cents per pound (varying with bird size), while fees at the 90th percentile cluster around 6 cents per pound. Some of the variation may reflect differences in relative performance among producers, but the variation can reflect other elements of contracting as well. For example, integrators in some areas bear at least part of utility or litter expenses, and fees will be lower in those areas.

Contracts may require growers to carry out certain production practices, and some of those requirements may affect grower costs and fees. The survey asked about several practices that related to testing of flocks for avian influenza, salmonella, and other pathogens (table 11). Few respondents (11.6 to 14.3 percent) asserted that such testing was not required, but many reported that they did not know (25.8 to 36.3 percent). Because some tests may be conducted by the integrator, the "don't know" response is reasonable and informative. Over 40 percent of operations reported that growth-promoting antibiotics were not used in their feed; in this case as well, it is not surprising to see a high fraction of "don't knows" (29.4 percent), since feed is provided by the integrator.

Table 10
Payments received under production contracts

Broiler size class	Mean fee per bird	Fees per pound		
		Mean	10th percentile	90th percentile
		Cents		
4.25 lb or less	20.4	5.3	4.1	6.6
4.26-6.25 lb	26.6	5.0	3.9	5.9
6.26-7.75 lb	34.3	5.0	3.6	6.1
7.76 lb or more	37.3	4.6	3.1	5.7
All birds	27.7	5.0	3.8	6.2

Note: Ten percent of fees in any size class are at or below the 10th percentile value, and 10 percent are at or above the 90th percentile value.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only..

Table 11
Production practices specified in contracts

The contractor requires:	Percent responding:		
	Yes	No	Don't know
Testing flocks for pathogens:			
Avian influenza	62.6	11.6	25.8
Salmonella	52.3	14.6	33.1
Other pathogens	49.4	14.3	36.3
Specified production practices:			
Flocks must be all-in, all-out	84.8	5.9	9.3
Houses must be cleaned out after each flock	31.1	59.7	9.2
Operation must have HAACP plan[1]	54.3	16.0	29.7
Specified animal welfare practices[2]	71.2	10.1	18.7
No antibiotics in feed or water[3]	42.4	27.2	29.4

[1]HACCP refers to Hazard Analysis and Critical Control Point, a systematic set of principles for improving food safety.
[2]The question specified, as examples, standards for minimum space per bird and Humane Farm Animal Care (HFAC) certification.
[3]The question contained the qualifier "unless the birds are ill."

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Eight-five percent of growers said that production was carried out on an all-in all-out basis—that is, all birds were removed at the same time and all chicks were placed at the same time. All-in-all-out production limits the spread of disease and also allows operations to tailor feed mixes to birds of a specific age. Over 70 percent reported that their contractor required them to follow specific animal welfare practices, such as space standards per bird, while only 10 percent reported that they were not required to follow such practices.

Two other practices were tied to food and poultry safety concerns. As of 2006, just over half of all operations were required to have a HACCP (Hazard Analysis and Critical Control Point) plan in place for food safety. And about a third of contracts required houses to be fully cleaned out, washed, sanitized, and dried after removal of each flock, while more than half did not.[13] The alternative, removing some or no litter after a flock is removed, with full clean-out occurring only after several flock removals, is less costly for the grower. Each approach seems to be widely used; about a quarter of respondents did not fully clean out any houses in 2006.

[13]We also asked respondents whether they stored litter in their houses and, if so, whether they cleaned out their houses fully during 2006. About a quarter of respondents did not clean out any of their houses, although most of those crusted out their houses (removed some litter).

Expenses on Broiler Operations

The size of the operation affects the form of broiler enterprise expenses. For example, large and small operations provide labor in different ways (table 12). In the smallest enterprises (1-2 houses), the primary operator reports providing the broiler enterprise with 25 hours per week, on average. For those with 1-2 houses, a broiler enterprise provides additional income, but it is unlikely to be the primary source of employment. Operator hours rise steadily with enterprise size to 35 hours per week (3-4 houses) and to 45 hours (9 or more houses) with some additional hours provided by spouses and other operators.

Smaller operations use virtually no hired labor (table 12). In contrast, larger enterprises rely on considerable amounts of hired labor, which allows for greatly expanded production for a given time commitment by the operators. Among large enterprises, hired labor compensation amounts to 0.45 to 0.60 cents per pound or about 10 percent of average production contract fees.

Utility expenses are the major cash operating expense faced by most growers, and amount to 1.1-1.2 cents per pound, a significant cost when production contract fees average about 5 cent per pound (table 13). Electricity expenses vary from 0.36 to 0.41 cents per pound of meat produced, with no apparent advantage to larger sizes. Most growers spend more on fuels with expenses ranging from 0.6 to 0.8 cent per pound, although the largest operations realized noticeably lower expenses in 2006.

Fuel expense can also be an important feature in contracts—three-quarters of the smallest producers received some fuel assistance from integrators in 2006, compared with 40 percent of the largest, with the incidence of assistance falling steadily as enterprise size increased. Assistance took two primary forms: reimbursement for fuel expenses or adjustment of compensation to reflect seasonal changes in fuel prices. If energy prices continue to exhibit the wide variation seen in recent years, we can expect to see more such assistance, as well as efforts to redesign houses for greater energy efficiency.

Table 12
Labor commitments in contract broiler production

Number of houses	Weekly hours: Primary operator	Weekly hours: All operators	Labor inputs to production: Unpaid hours	Labor inputs to production: Paid labor compensation ($)
			Per 1,000 pounds produced	
1-2	25	30	1.72	0.00
2-4	35	40	0.97	0.09
5-6	40	49	0.67	1.01
7-8	40	50	0.53	2.44
9-10	45	45	0.41	2.65
11-12	45	50	0.35	4.42
13-18	45	45	0.27	5.97
All farms	32	40	0.96	0.15

Note: Estimates are median values in each size class (half of farms in a class have greater values and half have smaller).

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Table 13
Utility expenses in contract broiler production

Houses	Fuels & oils	Electricity
	Cents per pound produced	
1-2	0.760	0.395
3-4	0.753	0.395
5-6	0.684	0.396
7-8	0.679	0.378
9-10	0.802	0.363
11-12	0.760	0.367
13-18	0.572	0.405
All farms	0.735	0.394

Note: Estimates are median values among operations in each size class.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Litter Management Practices

Poultry litter is bedding material, such as wood shavings, sawdust, or straw, spread on broiler house floors. After being used, litter consists mostly of poultry manure, along with the original bedding, feathers, and spilled feed. The manure contains nutrients, including nitrogen, phosphorous, potassium, and calcium that can be used to fertilize cropland. Excessive applications of nutrients, however, can create environmental risks to water and air resources. Litter management, therefore, becomes an important issue.

Farms may apply used litter to cropland or they can remove it to other farms or other uses. Most farms (about 71 percent) removed at least some litter from the farm in 2006, and a little over half of those removed all of it (table 14). In the aggregate, 61 percent of all broiler manure produced on farms in 2006 was removed and used off the farm.

Thirty-six percent of the litter removed from farms was sold. Revenue from litter sales, about 0.2 cent per pound of liveweight production, therefore added about 4 percent to the operation's gross income for growers who could find litter buyers.

About 60 percent of operations applied litter to their own fields (table 14), and about half of those were able to field-apply all of their litter. Thirty-nine percent of all litter stayed on the farm and was applied to fields on the operation. For those that did so, survey responses indicated that about 1 acre of cropland was fertilized with litter for every 4,000 broilers produced (for average size birds). For an operation that removed 400,000 birds in a year, and aimed to field-apply all litter, 100 acres would therefore be required, on average.[14]

[14]The estimate of 4,000 birds per acre was derived from survey questions on the number of birds removed in 2006, the average weight of the birds, the share of litter applied to fields on the operation, and the number of acres receiving litter.

Table 14
Methods of managing litter

Methods of litter mangement	Percent of farms	Percent of litter
Methods of litter disposal:		
Applied to fields on the operation	60.2	39.0
Removed from the operation	70.8	60.7
Other	2.5	0.3
		100.0
Method by which litter was removed:		
Sold by the operation	33.4	36.3
Hauled off operation for a fee	4.5	4.2
Exchanged for clean-out and hauling	33.9	33.8
Exchanged for other services	5.8	5.2
Given away free of charge	21.9	20.5
		100.0

Note: Some farms have more than one method of litter disposal or litter removal, so the "percent of farms" column will not add to 100.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Farm Operators and Their Households

Farm operators make day-to-day management decisions for the farm. Until a few years ago, USDA surveys gathered information on only one operator (the primary operator) for a farm. But many farms have more than one operator, and ARMS now asks for the number of operators on a farm and a limited amount of personal information for up to three operators. The survey also gathers demographic and financial information on the primary operator's household, because important farm business and household financial decisions may be linked.

We summarize operator characteristics for family owned and operated broiler farms in table 15 and compare them to operators of all family farms with at least $50,000 in gross cash farm income. Many farms, as defined in USDA statistics, are extremely small, with very little farming activity or income derived from farming. Almost all commercial broiler operations meet the $50,000 sales cutoff, so this cutoff was chosen as a useful comparison.

The typical operator was a white male in his 50s whose formal education ended after completing high school (table 15)—much like other farm operators. Operators of broiler farms differed from other operators in two important dimensions: more of them were women and fewer of them had graduated from college.

Eight percent of broiler primary operators were women, compared with just over 4 percent of all commercial farms, but this only captures part of the story. Most spouse-operators were women, and respondents usually report the male as the primary operator when a husband and wife each operate the farm. When we survey all operators of the farm, 54 percent of broiler farms reported having at least one female operator, compared with 36 percent of all commercial farms.

Survey respondents were asked for the highest level of formal education that they completed and given four response categories—less than high school, completed high school, completed some college, and a college degree. More than 50 percent of commercial farm operators had completed at least some college education and less than 10 percent did not complete high school. Over 60 percent of broiler farm operators had no more than a high school diploma and 12 percent completed college, compared with 28 percent of all commercial farm operators.

Table 15

Operator characteristics, contract broiler farms vs. all commercial farms

Item	Broiler farms		All farms, gcfi>$49,999	
	Primary operator	Operator-spouses	Primary operators	Operator-spouses
Number of farms	17,005	8,280	488,716	188,386
Operator age				
Average age (years)	55	53	55	54
Percent under age 40	8.5	10.4	11.2	10.1
Percent 65 or older	20.6	13.9	21.9	16.4
Gender and Ethnicity			*Percent*	
Female	8.0	92.2	4.4	93.0
Hispanic	0.7	0.5	1.8	1.8
African American	1.1	0.3	0.2	0.1
American Indian	1.2	0.1	0.9	0.03
Asian	1.1	1.7	0.4	0.3
Education			*Percent*	
Less than high school	13.5	9.9	7.3	8.0
High school only	49.6	52.5	38.9	35.9
Some college	24.9	24.5	25.3	29.1
College	12.0	13.0	28.4	26.8

Notes: Nonfamily farms are excluded. Table compares broiler operations with production contracts to all family farms with gross cash farm income (gcfi) of at least $50,000.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Farm Business Finances

ARMS collects information on farm businesses and the households of principal operators, thereby allowing users to see the links between business and household finances—indeed this is a primary and unique advantage of the survey. In table 16, farm-level financial data, including revenues, expense, and returns are presented for four size classes of broiler enterprises.

Organizing the Information

The data are organized into three panels. The top panel provides information on broiler enterprise characteristics for the farms in each size class. The middle panel identifies the operation's sources of gross income and then derives net farm income from gross income and operating expenses. The bottom panel shows how net income from the farm business flows to the principal operator's household.

"Small" operations include broiler enterprises with less than 1.33 million liveweight pounds removed in 2006—the smallest 25 percent of operations. Most of those farms had 1-3 broiler houses and average production was 846,838 pounds. The "medium" class includes enterprises with between 1.33 and 3.30 million pounds removed (50 percent of all operations). Most of them had 2-5 houses. The largest 25 percent of broiler operations were divided into two equal-size classes because that group covered a wide range of enterprise sizes. The "large" class had between 3.30 and 4.49 million pounds of liveweight production, usually in 4-8 houses, while the "very large" had more than 4.49 million pounds of liveweight production. Some of the very largest operations had 18 houses, but the interdecile range (10th to 90th percentile) was 6-14.

The four classes show distinct age patterns—small enterprises have older houses (24 years, on average) and older operators (60 years), while very large operations tend to have the newest houses and the youngest operators (table 16).

Some farms, including a sixth of the very large operations, have multiple households sharing the net income from the farm, either because of partnerships or because some of the farm's equity holders are not part of the primary operator's household. We excluded those farms from the financial analyses in order to simplify the analysis of farm business finances and the linkage to households. Exclusion has no substantive effect on the findings presented in table 17, but it had some impact on the estimates in table 16.[15]

[15]Mean values of two measures (farm business income to the household and farm income to the household) would be lower if we included operations with multiple households in the calculations.

Net Farm Income

The middle panel of table 16 summarizes gross and net income for the farms. Gross cash farm income is the sum of fees from production contracts, revenues from cash sales and marketing contracts, government payments, and other farm income. Fees from production contracts account for most of gross cash farm income—70 percent in the small class, where some farms are diversified into significant production of other commodities and 80 percent or more in the other classes.

Table 16

Income statement, contract broiler farms, by size of broiler enterprise

Item	Broiler enterprise size class[1]			
	Small	Medium	Large	Very large
	Farm characteristics			
Average production (lb)	846,838	2,253,019	3,845,109	6,449,921
Broiler houses (no.)[2]	1-3	2-5	4-8	6-14
Average house age (years)	24	17	14	13
Average primary operator age	60	54	52	51
	Gross and net farm income			
Fees from production contracts	44,476	112,693	191,688	322,027
plus Crop & livestock cash income	15,828	20,225	23,290	65,448
plus Government payments	1,639	2,793	2,504	5,950
plus Other farm income[3]	1,587	4,189	2,764	9,152
equals Gross cash farm income	63,530	139,900	220,246	402,577
plus Net change in inventories[4]	3,319	17,520	27,251	18,036
plus Other noncash income[5]	8,350	8,841	7,663	9,215
equals Gross farm income	75,199	166,261	255,160	429,828
minus Noncash operating expenses[6]	13,796	28,765	44,022	73,496
minus Cash operating expenses	42,681	95,236	140,276	247,884
equals Net farm income	18,722	42,260	70,862	108,448
	From farm to household income			
Gross cash farm income	63,530	139,900	220,246	402,577
minus Cash operating expenses	42,681	95,236	140,276	247,884
equals Net cash farm income	20,849	44,664	79,970	154,693
minus Depreciation expense	13,756	28,549	43,688	72,494
minus Wages paid to the operator	8	394	1,432	1,093
minus Income from land rents	135	294	339	484
equals Farm business income	6,950	15,427	34,511	80,622
times Operator HH share[7]	1.00	1.00	1.00	1.00
equals Farm business income to HH	6,950	15,427	34,511	80,622
plus HH Income from land rents	897	1,004	670	781
plus Income from another farm business	1,927	1,971	2,869	2,119
plus Farm wages paid to HH	238	1,339	2,658	2,821
equals Farm income to HH	10,012	19,741	40,708	86,343

[1]Size classes are based on liveweight pounds removed. The small class (less than 1.33 million) included the smallest 25 percent of farms, the medium class (1.33 to 3.30 million) included the next largest 50 percent of farms, and the two largest classes (3.30 to 4.486, and over 4.486 million) each had an eighth of all farms.

[2]The row labeled "Broiler houses" reports the interdecile range; for example, in the very large column, 10 percent of farms had 6 houses or less and 10 percent had 14 houses or more.

[3]Includes income from land rentals, custom work, machine hire, grazing, etc.

[4]Also includes changes in accounts receivable.

[5]Includes the value of farm production consumed on the farm and the imputed rental value of the operator's on-farm dwelling.

[6]Includes depreciation expense charged to farm assets and noncash benefits for farm employees.

[7]The operator HH share is always 1.00 because nonfamily farms and farms with multiple households sharing in farm business income are excluded (8 percent of family farms have multiple households sharing farm business income).

Note: HH refers to primary operator household.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Gross farm income combines gross cash farm income with noncash income. In turn, noncash income includes the net change in inventories and accounts receivable, as well as the imputed rental value of the operator's home if it is part of the farming operation. On average, farms in each class reported substantial increases (equivalent to 5-10 percent of gross cash farm income) in inventories and accounts receivable in 2006. Industry production continues to grow, and we would expect growing industries to exhibit growing accounts receivable. Farms with crop operations could also have kept some production in storage at the end of 2006, leading to increased inventories in anticipation of rising crop prices.

Net farm income subtracts cash and noncash operating expenses from gross farm income, and net cash farm income subtracts cash operating expenses from gross cash farm income. Cash operating expenses typically amount to 60-67 percent of gross cash farm income and average depreciation expenses, which account for almost all noncash operating expenses, amount to 30-32 percent of cash operating expenses. Net farm income is the difference between gross farm income and operating expenses, and it amounts to 25-27 percent of gross farm income in each size class.

Net farm income, however, varies widely among broiler operations, where a quarter of farms experience losses—negative net farm income. Poor productive performance may be one source of negative net income since, on average, operations with negative net farm income receive fees of 4.8 cents per pound, compared with 5.1 cent per pound for those with positive net income. Depreciation is a more important factor explaining differences in net income. On farms with negative net farm income, depreciation expenses account for 39 percent of gross income, on average, compared with 13 percent for other operations. Farms with recent major capital expenditures will usually record substantial depreciation expenses, often large enough to generate negative net farm incomes. Correspondingly, older operations with fully depreciated assets rarely report negative net incomes.

Tracking How Net Income Flows to Operator Households

The lower panel of table 16 shows how the flow of net income from the farm to the household is derived from the farm business's financial statement. In this case, the calculation starts with gross and net cash income (noncash income—changes in accounts receivable and inventory and the imputed rental value of operator housing—is not included). Depreciation expenses are deducted from net cash income when calculating farm income to the household.[16] Finally, note that farm income to the household also includes income from other farming activities, such as wages from working on other farms or income from another farm business. Most farm operator households do not have these sources of income, but some do.

The last row of the table reports farm income to the household. Note that it is considerably different from net cash farm income, primarily because of depreciation expenses. It also differs considerably from net farm income due to the exclusion of noncash income from farm income to the household.

[16]This step is consistent with the practice followed in nationwide household income surveys, such as the Current Population Survey, and allows for comparisons of household incomes between farm and nonfarm households.

Farm Household Income

The last line of table 16 provides the farm component of household income for the primary operator's household. Note that it combines income from the farm business, the household's income from rentals of farm land, farm wages paid to household members, and income flowing to household members from ownership interests in other farm business.

But farming is not the only source of household income, which also includes off-farm income whether earned (wages and salaries) or unearned (such as pensions or returns on financial assets). Household income is reported in table 17 for all farm households and the four size classes used earlier.

Several striking patterns stand out. Off-farm income is important in all size classes. On average, households earned $43,717 in off-farm income, which was substantial even among very large operations ($44,476, on average). Off-farm income accounts for nearly 80 percent of total household income, on average, for small broiler farms, but still accounts for 34 percent of the total among very large farms. We know, from table 16, that very large operations are substantial farming businesses. Gross farm income—think of it as 2006 contract fees, plus other farm revenues and increases in accounts receivable and inventories—was over $400,000, on average, at very large farms and over $250,000 among large farms. Yet, in each class, off-farm income provided a substantial fraction of total household income. Off-farm employment also frequently provides farm operator households with access to benefits, such as health insurance, in addition to wages and salaries.

Total household income and household income from farming rise sharply as farm size increases. While the household's income from farming averages $27,643 across all farms, it ranges from $10,012 in the small class to $86,343 among very large operations. Very large operations average nearly eight times as much production as small operations, and their nonbroiler enterprises (crop and livestock cash income in table 16) are four times larger.

Average household income for operators of broiler enterprises compares favorably to nationwide averages. Mean household income in the United States was $66,570 in 2006, compared with $72,453 for broiler farm households (table 17). Median income—half of households earn less and half earn more—was $48,201 for all U.S. households in 2006 and $56,248 among operators of broiler farms.

Table 17
Average household income, primary operator households, 2006

	Broiler enterprise size class				
	Small	Medium	Large	Very large	All farms
Number of farms	4,251	8,503	2,125	2,126	17,005
Average household income					
Total	$52,717	$64,974	$77,183	$130,819	$71,360
Off-farm	$42,705	$45,233	$36,475	$44,476	$43,717
Farm	$10,012	$19,741	$40,708	$86,343	$27,643

Notes: Nonfamily farms and farms with more than one household sharing in farm business income are excluded. For size class definitions, see footnote 1, table 16.

Source: 2006 Agricultural Resource Management Survey, version 4, production contracts only.

Conclusions

The broiler industry is organized in a unique manner. Almost all broiler production is carried out on contract grow-out operations that are linked to integrators through production contracts. Most grow-out operations are paid through a relative-performance compensation scheme in which contract fees depend, in part, on the grower's production performance relative to other growers. This organization model may be one reason for the industry's commercial success, as evidenced by high growth rates of poultry production, rapid productivity growth, and falling relative prices.

Although most contracts include a relative performance design, they are far from uniform. Contracts can include other terms that tie base payments to actions that affect grower costs or that assign some expense or revenue categories to either the grower or the integrator. Contracts also cover a wide range of specified durations from just over a month to 15 years. Variations in contract design likely follow from differences in grower location, size, and housing, but substantial variation in terms and payments make it difficult for growers to evaluate contracts.

While the survey captures a single year of data, the bottom panel of table 16 provides a signal of changes in the industry. The smallest size class of farms have significantly older houses, on average, and older operators as well. The industry is shifting away from a reliance on smaller operations and toward larger operations whose household income is more closely tied to the broiler enterprise.

The size shift is not as pronounced as the changes occurring in hog or dairy production, where very rapid shifts to much larger operations have occurred in recent years (Hoppe et al., 2007). Most broiler production still occurs on relatively small farms, as measured by gross income, and the shifts that have occurred have been more gradual.

Because newer operations are larger, they typically have a more substantial investment in housing and associated equipment. In turn, the households that own and run those operations are more reliant on the income from the broiler enterprise, and hence more sensitive to the income risks arising from energy price fluctuations and contract settlements in the broiler enterprise. New large operations typically receive longer term contracts from integrators, along with the greater assurance that longer contracts may bring, but contract compensation and reimbursement features may also need to be redesigned to handle the differing risk exposures that those larger farms face.

During the 1990s, U.S. broiler production grew at rates of about 6 percent per year, but since 2000 growth rates have decreased by half to about 3 percent per year. With slower growth, fewer new houses have been constructed and relatively few new operations have entered into production. The industry's rapid productivity growth has been driven, in large part, by improved poultry genetics, but also by steady improvements in structures, equipment, and production practices. These improvements, taken together, have led to greater feed efficiency, lower mortality, and more intensive use of capital and labor services—essentially, raising the output of broiler meat that can be achieved for given inputs of feed, fuel, capital, and labor inputs. Slowing investment in new housing could reduce the industry's productivity growth and, in turn, limit any price advantages over other meats.

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