Structural Change in U.S. Chicken and Turkey Slaughter

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1. Introduction

The emergence of the integrator-grower production system in the late 1950's and early 1960's, along with sharp growth in U.S. poultry consumption and exports, has dramatically changed poultry industry structure over the past three decades. A typical chicken plant in 1992 produced about five times more output than a plant in 1967 and, rather than producing mainly whole birds, had a product mix consisting of traypacks, cut-up and deboned poultry in bulk containers, and nuggets and other further-processed products.

A shift to larger average plant size can cause the number of plants to drop and the production share of the largest firms (concentration ratio) to rise because each plant then accounts for a larger share of industry production. However, the number of poultry slaughter and processing plants in 1992 was about the same as in 1967, and the four-firm industry concentration ratio rose only for chicken slaughter, not turkey slaughter, and, only for chicken over the 1977-87 period to about 45, a level not particularly high compared with other manufacturing industries. By contrast, similar increases in plant size for cattle and hog slaughter coincided with a much larger increase in the four-firm concentration ratio in cattle and a 75-percent reduction in the number of hog and cattle slaughter plants. Economists generally believe that when the four-firm concentration ratio exceeds 80, large firms can raise prices with less fear of competitors' taking away market share by selling a similar product at a lower price. Increased prices are possible because there are fewer competitors to try to underprice the product.

A primary goal of this report is to estimate the extent to which larger poultry plants can produce products at a lower cost than smaller ones (scale economies). Scale economies combined with other production-related changes, such as changes in product mix, affect production workers through changed opportunities, retailers and wholesalers through changes in product mix, and consumers through changes in poultry prices and product variety. A better understanding of scale economies and, more generally, structural change allows one to make inferences about the future of the poultry industries. A clear understanding of scale economies is particularly important for assessing market competition. For example, substantial scale economies can explain why small producers have been forced to exit an industry. Alternatively, the absence of scale economies in an industry with only a few large producers may prompt one to be more concerned about anticompetitive behavior.

Increases in scale economies have other public policy implications. The need to continuously reduce production costs to capture the cost savings of large plants raises worker safety and compensation concerns for farmers who raise chickens and turkeys and for slaughter plant workers. Additionally, large slaughter plants require a vast number of live birds, which generate an enormous amount of animal waste. Historically, chicken and turkey farmers and slaughter plants have spread poultry waste on nearby farms as fertilizer. Since bird farmers typically locate within 20 miles of slaughter plants, they have been disposing of a growing volume of animal waste within a confined area. In some parts of the country, the animal wastes pose no environmen-

tal threat, but in other, more environmentally sensitive areas, the high concentration of animal wastes has resulted in nitrogen and phosphates leaching into ground water or washing into streams, causing water quality problems and environmental degradation.

The policy issues described above concern the effects of the modern integrated poultry production plant. This report aims to assess the causes of structural changes by using a unique dataset to describe and to explain the process of consolidation. In particular, this report examines several innovations that may have created scale economies and changed product mix and affected slaughter costs and consolidation among slaughter firms.

Chapter 2 briefly summarizes the relevant developments in U.S. poultry consumption and production. Chapter 3 provides the key statistics summarizing structural changes. It also defines market concentration and presents changes from 1963 through 1992. We show that large plants account for growing shares of chicken and turkey slaughter over this period and that the rate of plants leaving the industry (exits) is less rapid than for cattle slaughter. As industry structure changed, so did plant operations. Chapter 4 discusses changes in grower-integrator contractual relationships, seasonality of production, plant output mix, poultry meat input mix, location, and labor force. Chapter 5 describes how confounding effects, changes in product mix or live bird prices, are controlled in cost function analysis. Chapters 6 (chicken) and 7 (turkey) contain the results of statistical analyses, and chapter 8 provides concluding comments.

Scale economies are found to exist over a range of large plant sizes. Controlling for plant product mix proves to be critically important. Plants that do more fabrication and processing of whole birds have higher costs, but also receive higher prices for output. The omission of product mix in an econometric analysis may lead to inaccurate productivity estimates if different product mixes require different levels of inputs.

The report relies on a unique data source, the Longitudinal Research Database (LRD) from the Bureau of the Census. The LRD details the records of individual establishments reported in the Census of Manufactures (Census). The LRD data used for this manuscript includes all plants reporting to the Census in each of the 5-year censuses: 1972-92 for chicken and 1967-92 for turkey (data from the 1997 Census will be processed for the LRD too late for this report). Census data prior to 1967 were excluded because there are no data on further-processed products and State-inspected poultry plants were not required to meet the more rigorous Federal food safety standards.[1] After 1963, Congress mandated that State plants meet Federal standards, perhaps causing many plants to leave the industry. Data from the 1967 Census were also excluded from chicken slaughter cost estimates because chicken traypack data, an important component in production costs, were not collected in that survey year.

LRD data provide detailed information on the physical quantities and dollar amounts of many different products shipped by slaughter plants, physical quantities and prices paid for materials, and employment and average wages for each establishment. The file also notes ownership and location information. Because the LRD contains data on individual plants over several Censuses, researchers can make comparisons for different plants during the same year, and can also trace changes in product and input mixes, costs, and concentration over time.

Researchers can use LRD data only for research purposes, and may not divulge information on any individual plant or firm, and may publish only aggregated information. This report therefore identifies aggregated statistical data and the coefficients from regression analyses covering hundreds of establishment records. Any references to specific company or plant names are based on publicly available information, and not on any Census source.

[1] Under current Federal food safety standards, red meat and poultry plants must be inspected by either Federal or State Food Safety Inspectors prior to the sale of finished products. A s of 1999, only federally inspected plants can ship products across State lines. Inspection standards are made uniform by legislation requiring State food safety inspection programs to be certified by the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA).