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THE CONTRIBUTION OF THE BROILER INDUSTRY TO NORTH CAROLINA'S ECONOMY: EVALUATING THE ECONOMIC IMPACTS OF INDIVIDUAL PROJECTS

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In late 2014 and early 2015 a version of the avian flu with a high mortality rate was detected in a number of farms in Minnesota, Iowa, and other states. The direct losses of poultry production resulting from that avian flu outbreak have been estimated at \$113.6 million in Minnesota alone. Because it is thought the virus is transmitted via migratory birds, the possibility of an outbreak in other states with large a poultry population such as North Carolina is possible. This recent episode rekindled the interest in economic policy circles for an assessment of the economic contribution of the poultry industry to the state's economy, with an objective of measuring the extent of potential losses from such an event.

The methodology for estimating economic losses is the same as one used for evaluating economic benefits of a new investment project or policy proposal. In this issue of the *NC State Economist* we evaluate the expected economic benefits of the Sanderson Farm new broiler production and processing division soon to open in the eastern part of the State. To set the stage for the analysis, we begin by describing the

poultry industry's structure, dynamics and its interconnectedness with the rest of the economy.

National Trends

The overall economic position of the U.S. broiler industry and its underlying structure has changed considerably in the post 2008 recession period. The newest available data and research results appear to be pointing to three novel trends (Vukina and Zheng 2015). First, in the last decade, the increase in the national broiler industry output came almost exclusively from an increase in slaughter weights. In the period from 2002 to 2014, the number of chickens slaughtered remained almost unchanged. However, the amount of ready-to-cook (RTC) chicken meat produced increased from 32.2 billion pounds to 38.6 billion pounds—an increase of 19.6%. The average RTC processed weight grew from 3.77 pounds per bird in 2002 to 4.52 pounds per bird in 2014, a 19.9% increase.

Second, since 2002 when the Census of Agriculture first started collecting data on contract poultry production, the number of contract growers involved in broiler

production continuously decreased. The total number of poultry farms with contracts (broilers, pullets, and eggs) decreased from 25,808 in 2002 to 20,358 in 2012, an astonishing 21% decline. Even more pronounced is the decline recorded separately for the contract broiler finishing farms. The number of such farms dropped by nearly one-third, from 20,778 in 2002 to 15,830 farms in 2012. Essentially, the same number of much larger birds were grown by a substantially smaller contract grower force. Obviously, on average, contract grow-out facilities must have become significantly larger (in square footage of the floor space) during the last decade as well.

Finally, the geographical distribution of production appears to be changing as production is gradually shifting from the periphery to the core production regions. During the 12-year period, the composition of the group of top 15 broiler producing states has not changed, but their share of total contract broiler production has increased from 90.5% in 2002 to 92.9% in 2012. Especially stable has been the ranking of the top five states which include Georgia, Alabama, Arkansas, North Carolina, and Mississippi. The core states are gaining shares both in terms of production volumes and in number of contract farms. Nationally, North Carolina's broiler production ranked 5th in 2007 and 2002 and 4th in 2012.

Economic Impact of the North Carolina Poultry Industry

In evaluating the economic impact of the broiler industry, the industry definition itself becomes a problem. To the best of our knowledge, all statistics that cover the

poultry and egg industry treat hatching eggs production for broilers together with table eggs production. Within the Census of Agriculture data on contract production, it is impossible to disentangle eggs (layers) and pullets contracts into those related to table egg production and those related to broiler production. Both the eggs and the pullets contracts are a conglomeration of table eggs, hatching eggs for meat type, and hatching eggs for table egg type contracts. This statistical coverage problem lends itself to two possible solutions. One solution is to define the broiler industry solely as the production and processing of chickens; this ignores the hatching eggs component of the industry (pullets and layers) and thus under-estimates the total economic impacts. Alternatively, one could define the broiler industry by combining chicken production and processing with egg production and processing; this over-estimates the economic impacts due to the (erroneous) inclusion of table eggs. As table eggs production constitutes the smaller part of the total egg production in North Carolina, for the purpose of this analysis we rely on the broader definition of the broiler industry (including eggs) as the better alternative.

The size of the broiler industry in North Carolina can be surmised from Table 1. Farm cash receipts of North Carolina broiler growers grew substantially from \$2.84 billion in 2012 to \$3.85 billion in 2014, an increase of over 35%. For comparison purposes, in the same two-year period the production expressed in weight (pounds) has increased by only 6.5%, whereas the number of birds produced actually dropped slightly. When using broader definition of

Table 1. Commercial Broilers: Production and Value (Cash Receipts) in NC

	Number ('000')	Pounds ('000)	Value (\$'000)
2012	799,600	5,677,200	2,838,600
2013	786,600	5,889,500	3,580,997
2014	795,200	6,043,500	3,849,710

Source: NC Agricultural Statistics

the industry, the sum of broilers and eggs cash receipts for 2014 gives the total industry size of \$4.35 billion. The numbers appear to reveal a major improvement in broiler revenues within the last several years. However, this result could be misleading because for contract production,

receipts cannot be considered farmers' revenue as they do not represent contractual payments that growers receive. Instead, they are based on market prices for live broilers which are only relevant for poultry integrators who own the birds. Grower payments, on the other hand, are fixed contractual rates unrelated to actual market prices.

Table 2 shows estimated 2014 aggregate economic measures for the North Carolina broiler industry reported by IMPLAN—a well-known, North Carolina-based firm that supplies data and software for economic impact assessment. Based on the IMPLAN data, output at a farm level was valued at \$5.1 billion (somewhat higher than reported by the NC Agricultural Statistics). There

Table 2. Estimates of Direct Size and Impact of the NC Poultry Industry

	Farm Level	Processing Level
Output value ^a	\$5.1 billion	\$7.7 billion
Employment ^a	5,044	15,853
Wage income ^a	\$49 million	\$586 million
Value-added ^b	\$1.6 billion	\$1.3 billion
Output multiplier ^b	1.80 × \$ output change	2.30 × \$ output change
Value-added multiplier ^b	0.65 × \$ output change	0.69 × \$ output change
Labor income multiplier ^b	0.36 × \$ output change	0.46 × \$ output change
Employment multiplier ^b	6.4 × \$ mil. output change	10.1 × \$ mil. output change

Sources: (a) John Dunham and Associates, *2014 Economic Impact Study of the Poultry Industry*.

(b) IMPLAN, LLC, Huntersville, NC, *IMPLAN for North Carolina, 2013*.

were over 5,000 jobs in poultry farm operations. Value-added, a measure of the additional market value created by an economic sector after subtracting the value of non-labor inputs, was estimated at \$1.6 billion in 2014. Economists consider value-added to be the best measure of the monetary contribution of an economic sector to the state economy because it avoids double-counting of inputs that were counted for other economic sectors in the state. Value-added also avoids counting the value of inputs purchased from outside the state. Value-added is comparable to gross domestic product (GDP). The sum of the value-added numbers for all economic sectors in the economy forms the total GDP of a geographic area, such as a nation or a state.

Beyond broiler production, there is also a large broiler processing industry in the state estimated to have generated \$7.7 billion of output, \$586 million of wage income, \$1.3 billion of value-added, and employed almost 16,000 workers in 2014. Importantly, the value-added number does not include the costs to the processors of the purchased broilers. Since most of these broilers would have been grown in North Carolina, the value-added measure eliminates double-counting the value of the broilers at both the farm level and the processing level.

Table 2 also shows “multipliers” that allow total economy-wide changes to be estimated from a marginal change in the poultry industry. An industry’s output is termed its “direct impact.” When an industry’s output changes, purchases from input suppliers will also change. This is

termed an “indirect impact.” Also, consumer purchases will change as a result of changes in incomes to both the industry’s workers and the workers of the industry’s suppliers. This is called an “induced impact.”

For example, Table 2 indicates that a \$1 million change (either increase or decrease) in broiler sector output at the farm level would cause a total economy-wide change in spending in North Carolina of \$1.8 million ($\$1 \text{ million} \times 1.8$); a \$0.65 million change in economy-wide value-added ($\$1 \text{ million} \times 0.65$); a \$360,000 change in economy-wide wage income ($\$1 \text{ million} \times 0.36$); and an economy-wide employment change of 6.4 workers (1×6.4). The table also shows that a \$1 million change (either increase or decrease) in output of the poultry processing industry results in an economy-wide change in total spending in North Carolina of \$2.3 million ($\$1 \text{ million} \times 2.3$); a \$0.69 million change in economy-wide value-added ($\$1 \text{ million} \times 0.69$); a \$0.46 million change in economy-wide wage income ($\$1 \text{ million} \times 0.46$); and an economy-wide employment change of 10.1 workers (1×10.1). It is important to realize that, for the processing industry, these economy-wide changes include associated changes at the farm level.

The multipliers shown in Table 2 are sometimes applied to the direct values to provide a total economic impact of the industry, including direct, indirect, and induced effects. For example, the output multiplier of 1.8 for the farm level would be applied to the \$5.1 billion aggregate farm level output value to give a \$9.2 billion total economic impact of the industry. Or, the 2.3

output multiplier for the processing level would be applied to the \$7.7 billion aggregate processing value to imply a \$17.7 billion total economic impact of the processing industry.

There are two issues with this use of multipliers. One is the multipliers assume a readily available supply of inputs at constant prices. For large changes—as would be represented by the entire industry—this assumption is unlikely to hold. Second, as already noted, the output value for the processing sector includes the outputs at the farm level if, as is usually the case in North Carolina, broilers produced at the farm level are shipped to North Carolina processors. Thus, adding the results for the farm level and processing level again double counts the farm level output. Consequently, it is best to apply the multipliers to relatively small changes (either an increase or decrease) in industry output.

Example: The Sanderson Farms Project

To show how multiplier analysis is used, we consider the Sanderson Farms expansion project in the St. Pauls community of Robeson County scheduled to begin operation in January 2017. The project comprises a state-of-the-art poultry complex with the capacity to process 1.25 million big birds for deboning per week (approximately 500 million pounds of dressed poultry meat per year). At full capacity, the complex will employ approximately 1,100 people and will require 100 contract growers. The total annual contract grower payments are estimated at \$39 million and the total annual employee

payroll at \$26.5 million. Sanderson Farms expects to invest approximately \$155 million in the complex and associated contract growers will need to invest an additional \$168 million in housing facilities.

At the farm level, the expansion anticipates the production of 65 million birds per year. Given the fact that the entire state produced 795.2 million broilers in 2014 (Table 1) and that farm level output that year was valued at \$5.1 billion (Table 2), we can estimate the value of farm output at about \$6.4 per live bird produced. Multiplying this value by the incremental production of 65 million birds yields \$416 million in additional farm level direct effects created by the project. Using the multipliers in Table 2 for the farm level, this direct production effect is estimated to result in total new economy-wide spending in North Carolina of \$752 million ($\$416 \text{ million} \times 1.8$), new economy-wide value-added of \$270 million ($\$416 \text{ million} \times 0.65$), new economy-wide labor income of \$150 million ($\416×0.36), and new economy-wide employment of 2662 jobs (416×6.4).

Since all live broilers produced will also be processed in North Carolina, then the total impacts (farm level plus processing level) are larger. When fully operational, the new broiler complex will sell approximately 500 million pounds of dressed poultry annually. Taking the current (April 2016) Georgia free on board dock price for broilers and fryers of \$1.115 per pound, this amounts to \$558 million in annual sales. Using the multipliers for the processing level from Table 2, the resulting new economy-wide spending in North Carolina would be \$1.3 billion ($\$558 \text{ million} \times 2.3$), new economy-wide value-added would be \$385 million ($\$558 \text{ million} \times$

0.69), new economy-wide labor income would be \$257 million ($\$558 \text{ million} \times 0.46$), and new economy-wide employment would be 5636 jobs (558×10.1). In addition to these effects, there may also be one-time construction economic impacts that are not analyzed here.

In summary, the presented analysis indicates the significant economic impact of the broiler industry in North Carolina, and consequently projects large effects that the industry's expansion (or a possible contraction) will have on the state economy. Among the reasons for choosing North Carolina as a site for a new poultry

complex, Sanderson Farms cites the proximity to large poultry markets in the northeastern corridor, a strong tradition of animal agriculture and contracting in the region, and the presence of a qualified labor force. Considering these factors, we can reasonably anticipate future growth of the poultry industry in North Carolina with corresponding large positive effects on the state-wide economy.

References

Vukina, T. and X. Zheng. "The Broiler Industry: Competition and Policy Challenges." *Choices*, (2015) 30(2): 1-6.
