WATER-RAIL RATE COMPETITION AND THE COMPETITIVE POSITION OF THE NORTHEASTERN POULTRY INDUSTRY

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ABSTRACT

Differential grain transportation rates between the Northeast and South have been identified as a possible source of comparative disadvantage for Northeastern broiler producers. Low cost barge transportation into the South provides competition for railroads resulting in generally low transportation rates in the South. Barge transportation is low cost in part because the Federal improvements of waterways have resulted in a toll-free waterway system. Solutions for a transportation model were found with and without the subsidy. The results indicate that subsidy removal is unlikely to affect interregional broiler production and consumption.

The last twenty-five years have seen major geographical shifts in the location of the broiler chicken industry. In 1950 Delaware led the nation in broiler production with 12.49 percent of the total, but by 1957 Georgia led in production with 17.60 percent, a substantial lead over Arkansas which followed with 6.39 percent. In 1964 Georgia produced 16.91 percent with Arkansas following with 12.55 percent. As of 1974 Arkansas took the production lead with 16.12 percent to Georgia's 14.65 percent (USDA, 1975). More generally, the Northeastern broiler production areas have consistently lost market shares to Southeastern and Southcentral production areas.

An obvious question is why this has occurred. Roy suggested that the move to the South was due to a lack of better farming opportunities within the region, a large pool of underemployed farm producers, development of contract farming and lower grain freight costs into the region (Roy). The importance of freight costs to the competitive position of the Northeastern broiler industry was discussed more recently by Seaver who pointed out that differential freight rates can affect agricultural production on a regional basis. The Seaver argument provides a particularly interesting focus upon rail-water competition and its impact on the broiler industry's location. In broad overview, the argument is that ICC regulatory policy has allowed railroad pricing policies which are based upon minimum traffic diversion to competing modes.[1] As such, in those areas where effective water competition exists, substantial evidence can be found of low rail rates set to avoid traffic diversion. Where no such competition exists, rail rates remain relatively high. A review of the geographic dispersion of U.S. waterways and traffic flows on the waterways of corn and soybeans clearly indicates that the Southeastern and Southcentral U.S. has regional advantages. By extension, one would expect to find, and indeed does find, low rail rates into the Southeast for grain and soybeans when compared to the Northeast. The importance of this result for interregional competition in the broiler industry is noted by Seaver:

> [In the Northeast] The entire livestock industry, especially poultry, has suffered for years from severe interregional competition. This largely stems from the extremely high freight rate from Midwest origins to Northeast destinations. The deterioration in the competitive position of the Northeast poultry industry traces, in large part, to the reduction in rates instituted by the Southern Railway in order to meet barge and truck competition [Seaver, p. 238].

Barge rates are low for basically two reasons. First, there are inherent economies in barge operations that make them the low cost mode in terms of hauling low-value bulk commodities such as feed. Secondly, barge operators pay no fee for the use of the nation's waterways. Since the waterways were built and are maintained and operated by the Federal government, users of waterway transportation are in effect receiving a subsidy, i.e., they are moving goods for less than it would cost if they were to pay for the maintenance of their thoroughfares much like a railroad must maintain its trackbed. In the South, railroads have been forced to reduce rates to meet this subsidized competition and the Interstate Commerce Commission has allowed these reductions to take place. In the Northeast however, railroads do not face intermodal competition for movement of bulk commodities and have therefore maintained higher rates.

The Seaver argument stems directly from standard interregional competition theory and a careful review of rate relationships within the Northeast and Southeast regions. If valid, a reasonable question to ask is whether increased barge rates resulting from a user charge would provide the opportunity for rail rate increases to Southern points, with a resulting reduction in the regional cost advantage and a relocation of U.S. broiler production. This focus is timely in that recent legislation has been introduced in Congress that would force barge operators to bear the costs of maintaining and improving the waterways they use.[2]

It can be hypothesized that if this subsidy is removed, the advantage the South maintains will be reduced. Broiler producers in other areas, particularly the Northeast, should therefore gain advantage in market shares which should be reflected in the region's production and distribution of broilers.

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[1]This has been a common argument about ICC regulatory policy (Harbeson). This specific impact of barge competition on rail rates as discussed by Seaver is often cited as a benefit of barge transportation by its proponents (National Waterways Conference, Inc.).

[2]During the most recent session of Congress both the House and Senate passed bills requiring a navigation user charge. In addition, such a charge has the full support of the President. During the next session of Congress the level of the charge will have to be determined since the House and Senate versions of the bill differed.

APPROACH

A basic transportation model that incorporated the most important aspects of the broiler industry was developed to analyze this problem. The model is realistic in the sense that (1) consumption of broilers is determined in market areas that represent the entire population of the continental United States; (2) broiler production is accounted for by using the eight major production areas of the U.S. and accounting for all other production by adjusting local consumption figures downward by the amount of local production; and, (3) costs of broiler production and distribution are taken from survey data from within the producing areas. Then, given initial production costs in the producing areas, and production and consumption data by area, ready-to-cook (RTC) broilers are allocated from the eight production regions to the consuming areas in such a manner that total costs of production and distribution are minimized. The result is termed the base solution. Production costs are then increased in response to a user charge policy and the model is re-solved to see if regional production levels change in response to the cost changes.[3]

BROILER PRODUCTION

Production of broilers takes place in many areas of the country. To simplify the problem, eight major production areas were chosen on the basis of size and location.[4] The Southern production areas are located near major waterways and can therefore be assumed to benefit from low transport rates on feed transported into the area. The Northern areas do not have access to waterways and therefore receive feed through higher cost railroads. Table 1 shows production of broilers by production areas.

TABLE 1.
Broiler Production By Production Areas, 1974

Production Area	Production (RTC)	% of Total U.S. Production
	–lbs.–	
Harrisburg, Pennsylvania (Includes Virginia)	429,481,000	5.10
Salisbury, Maryland (Includes Delaware)	1,057,870,000	12.54
Gainesville, Georgia	1,240,756,000	14.71
Fayetteville, Arkansas (Includes Texas)	1,882,482,000	22.32
Belfast, Maine	255,458,000	3.03
Lexington, North Carolina	900,466,000	10.68
Gadsden, Alabama	1,126,441,000	13.36
Jackson, Mississippi	660,443,000	7.83
Other	879,258,000	10.43
Total	8,432,655,000	100.00

Source: *Agricultural Statistics,* 1976, p. 406.

[3]This approach assumes no impediments to adjustment in the industry and no brand loyalty tied to regional production in the consuming areas. As such, the model will have a tendency to overestimate user charge impacts.

[4]These eight areas represented approximately 90 percent of total U.S. broiler production in 1974.

BROILER CONSUMPTION

Consumption of broilers was assumed to take place in 49 marketing areas as delineated in the *Rand McNally Marketing Atlas.* Population in each area was found by taking the 1970 Rand McNally estimates and extrapolating to 1974. Estimates of per capita broiler consumption for 1974 were provided by Rauniker.[5] Consumption of broilers by marketing area was then found by multiplying population by estimated per capita consumption.

In order that the model can be considered national it was necessary to account for the production not represented by the eight major production areas. Production occurring in other areas was subtracted from consumption of broilers in the marketing areas nearest this production. For example, since some broiler production does occur in Michigan, this production was subtracted from the consumption figures for the Detroit marketing area. Table 2 shows consumption of broilers by marketing area after this adjustment.

ESTIMATION OF PRODUCTION AND PROCESSING COSTS

Production and processing costs by production area were estimated in a survey by Pennsylvania State University and the University of Georgia and published by USDA (1976). Some of the costs reported were on a liveweight basis and have been adjusted such that all costs are on a ready-to-cook (RTC) basis.[6] Table 3 shows production, processing and assembly costs by production area. Due to overlaps in the survey, budgets for some production areas are the same.

ESTIMATION OF TRANSPORTATION COSTS

Transportation costs of moving RTC broilers from each production area to each marketing area were estimated. Since broilers move by unregulated trucks, data on costs are not readily available. A telephone survey of four major trucking firms who specialize in transporting broilers was conducted. It was found on average to cost .00127 cents per pound mile to move refrigerated RTC broilers.[7] Assuming a strictly linear function, road mileage between each production and marketing area multiplied by .00127 yielded the transportation cost for delivering a pound of RTC broiler.

NET EFFECT OF WATERWAY SUBSIDY

Previous studies have determined that if waterway users were to bear the full cost of maintaining and operating the waterways, the maximum effect on a producer who receives feed would be four cents a bushel, if the full cost is passed on to the users of broiler feed.[8] Since it has been suggested

[5]Per capita consumption figures were provided by Dr. Robert Raunikar of the University of Georgia from unpublished data.

[6]Liveweight costs are adjusted to a RTC cost basis by multiplying them by 1.34. The factor 1.34 is found by dividing 1 by an assumed dressing percentage of .745.

[7]This cost coefficient compares favorably with P. P. Boles recent study. His cost coefficient for a 41,500 pound truckload is .001296.

[8]The asumption that the full cost of the user charge would be shifted to broiler producers is extreme. Most likely it would be allocated between the factors of production in barge transport, feed growers, and broiler producers in proportion to the relevant demand and supply elasticities.

TABLE 2.
Adjusted Broiler Consumption By Marketing Area

Marketing Area	Per Capita Consumption	Consumption
	–lbs.–	–lbs.–
1. Boston	39.85	343,626,000
2. New York	46.31	1,195,489,000
3. Buffalo	40.47	119,075,000
4. Pittsburgh	39.13	189,859,000
5. Philadelphia	43.89	387,391,000
6. Washington	50.17	309,674,000
7. Richmond	46.87	160,502,000
8. Charlotte	46.32	280,740,000
9. Charleston	39.94	12,191,000
10. Knoxville	38.86	24,311,000
11. Louisville	40.44	105,519,000
12. Nashville	44.64	19,554,000
13. Memphis	46.05	114,891,000
14. Birmingham	45.45	129,255,000
15. Atlanta	46.89	244,250,000
16. New Orleans	45.96	107,259,000
17. Mobile	44.58	42,618,000
18. Jacksonville	47.72	69,184,000
19. Tampa	46.39	33,904,000
20. Miami	47.77	91,959,000
21. Little Rock	46.05	34,219,000
22. Tulsa	43.98	11,490,000
23. Oklahoma City	45.06	46,532,000
24. Dallas	45.26	256,465,000
25. Shreveport	47.88	36,504,000
26. Houston	45.96	128,837,000
27. San Antonio	41.63	89,013,000
28. Milwaukee	35.95	106,867,000
29. Chicago	39.60	524,189,000
30. Detroit	39.82	375,183,000
31. Cleveland	38.50	170,222,000
32. Columbus	35.96	56,118,000
33. Indianapolis	36.38	62,687,000
34. Cincinnati	39.47	118,268,000
35. St. Louis	37.40	163,857,000
36. Minneapolis	34.47	158,358,000
37. Des Moines	35.02	73,231,000
38. Omaha	34.80	53,544,000
39. Kansas City	37.51	52,181,000
40. Wichita	35.96	26,624,000
41. Denver	36.78	129,980,000
42. El Paso	36.21	23,663,000
43. Phoenix	36.32	72,542,000
44. Salt Lake City	33.79	60,312,000
45. Spokane	36.27	36,362,000
46. Los Angeles	39.47	369,667,000
47. San Francisco	41.04	205,386,000
48. Portland	37.12	48,051,000
49. Seattle	38.00	81,833,000

that rail and barge rates move together, the effect of this subsidy is to lower the cost of broiler producers by approximately four cents a bushel.[9] To determine whether removal of this subsidy will have an effect on regional production and distribution of broilers, a broiler ration must be developed.

Since the subsidy has its impact on delivered feed, the ingredients in the broiler ration must be isolated. A typical broiler ration reported by Kenyon and Shapiro was used for this purpose. Producers in all producion areas are assumed to use the same ingredients. In the ration there are 1,138 pounds or 20.32 bushels of corn and 498 pounds of soybean meal. Soybean meal was converted to soybean equivalents by using a factor of 1.27 pounds yielding 10.54 bushels of soybeans in the ration. A total of 30.86 bushels of feed would therefore need to be delivered to mix a ton of poultry meal. Since the maximum size of the subsidy was four cents a bushel, the effect of subsidy removal would be to raise the cost of a ton of broiler feed 123.44 cents to Southern producers.

Since each production area faces different prices for feed and different converion ratios, the net effect of removal of the subsidy will vary by production area. The procedure to calculate the net effect of subsidy removal on each production area involves first adding the costs of subsidy removal (123.44¢) to each Southern production area. The new cost of feed multiplied by the area's conversion ratio yields the new cost of feed to produce a pound to liveweight broiler. After conversion to a RTC basis and added to the appropriate cost budget (Table 3) yields a new cost of producing a pound of RTC broiler. When compared to the budgets shown in Table 3, the difference indicates the effects of subsidy removal on the total costs of broiler production in the affected production area. Table 4 shows these results.

TABLE 4.
Net Effects of Subsidy Removal on Costs

Production Area	Change in Costs
	(cents/lb. RTC)
Georgia	+.18
Arkansas	+.17
Alabama	+.17
Mississippi	+.18

RESULTS

The model was evaluated to determine the production and distribution of broilers before and after removal of the subsidy. Several specifications of the model were examined including one in which production equaled consumption and others when production in each production area was allowed to increase.

An initial solution was reached under conditions where consumption of broilers (Table 2) equaled production of broilers (Table 1). An optimal solution was reached with a least cost distribution of broilers. The model was then reevaluated with the subsidies removed. The new solution indicated that there was no change in the distribution of broilers.

[9]The estimate of four cents per bushel on corn and soybean prices is taken from Congressional Budget Office.

TABLE 3.
Production and Processing Costs for RTC Broilers, 1974

	Pennsylvania, Maine	Maryland	Georgia North Carolina, Alabama	Arkansas, Mississippi
		—¢ per pound (RTC basis)—		
Production costs:				
Grower costs				
Fuel	.067	.188	.482	.375
Electricity	.094	.174	.107	.080
Litter	.000	.054	.174	.134
Hired Labor	.255	.255	.281	.255
Miscellaneous	.027	.027	.281	.255
Depreciation	.576	.590	.549	.603
Interest	.348	.241	.389	.469
Ins., Taxes	.281	.188	.188	.214
Maintenance	.201	.201	.054	.094
Contractor costs				
Feed (average)	25.620	25.770	24.160	23.825
Chicks	3.966	3.457	3.631	3.873
Grower payment	3.136	3.765	3.176	3.417
Medication	.415	.456	.362	.268
Fuel, other	.978	.549	.442	.429
Total Production	35.964	35.915	34.276	34.291
Processing costs:				
Plant labor	4.170	3.900	3.200	3.310
Packaging	1.400	1.450	1.020	1.170
Utilities	.520	.580	.410	.260
Management	.880	.340	.570	.470
Miscellaneous	.330	.280	.170	.250
Depreciation	.230	.320	.440	.220
Maintenance	.180	.210	.400	.300
Taxes	.320	.310	.300	.380
Total Processing	8.030	7.390	6.510	6.360
Assembly costs	.650	1.080	1.070	1.000
TOTAL COSTS	44.644	44.385	41.856	41.651

Source: U.S. Department of Agriculture.

To allow for a production response in the event of changing relative costs after subsidy removal, the model was analyzed with each production area being able to produce one, three and five percent more broilers than its 1974 actual production. For each of these new production levels an optimal solution was reached. In each solution, Maine produces progressively fewer broilers. With 1 percent excess capacity the state does not produce any broilers. Similarly, Pennsylvania with a 5 percent excess capacity produces only 75.74 percent of its 1974 output. The reason for this is that each area can produce more broilers and since Maine and Pennsylvania are relatively high cost producers, the consumption requirement in the model is met by the other seven production areas.

The question of importance is whether Maine can gain back its lost market (Boston) when subsidization is removed from the Southern producers. The models were resolved and the optimal distributions were compared to the distributions before the subsidy was removed. The results indicated that no redistribution of broilers occurred in any of the excess capacity models.

Given the nature of the transportation algorithm, if relative costs do change and there is excess production avaiable, at some cost level there will be production and distribution changes. The three excess capacity models were therefore resolved when costs to Southern producers were parametrically increased by .10 cent increments. In all three

models Maine was found to make entry into the Boston market at a simultaneous cost increase to Southern producers of .60 cents. This would convert to a subsidy of approximately 15 cents on a bushel of feed or nearly four times the current proposed level.

CONCLUSIONS

This study attempted to determine the effect that water-rail competition in the South was having on the competitive position of the Northeastern poultry industry. Articles cited in this paper indicate that differential transportation rates between the two regions are in part responsible for the rise of the Southern poultry industry and the decline of poultry in the Northeast.

The study was conducted under three key assumptions. First, rail rates were raised to match barge rates, second, local corn and soybean prices were raised to the level of imported feeds, and third, all cost increases were passed on to the broiler producer.

The results of the study indicate that removal of subsidies will not have interregional effects in terms of poultry production and distribution. This is because the net effect of subsidy removal will only raise the cost of producing a pound of RTC broiler .18 cents. Further examination of the model indicates that if the costs of feed in Southern production areas were raised to approximately 15 cents a bushel, changes would begin to occur in distribution as well as production of broilers. This finding supports Seaver who notes that in 1964 rate reductions on a bushel of corn were approximately 12 cents greater in the South than Northeast [p. 239]. At a 12 cent level it is quite possible that interregional changes in the broiler industry will occur. Thus, should the size of this Federal subsidy increase, there is the distinct possibility of changes in the interregional production and distribution of broilers.

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