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United States
Department of
Agriculture

Economic
Research
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Agricultural
Economic
Report
Number 525

The U.S. Turkey Industry

Floyd A. Lasley
William L. Henson
Harold B. Jones, Jr.

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The U.S. Turkey Industry by Floyd A. Lasley, William L. Henson, and Harold B. Jones, Jr. National Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 525.

Abstract

Americans are eating more turkey than ever because of lower real prices and new products. Production and consumption have expanded principally in the off season; both are now year-round activities. Further processed products represent the fastest growing sector of the industry. Turkey processors have expanded; the eight largest firms now process more turkey than the entire industry did in 1960. More turkeys are raised on fewer farms, with 1,608 farms selling 90 percent of all turkeys. About 53 percent are raised on farms selling an annual equivalent of 1,000 tons of live turkey.

KEYWORDS

Turkeys, poultry, prices, consumption, marketing, vertical integration, production

Washington, D.C. 20250

March 1985

Glossary

Brooder house: The brooder house is equipped with brooders (heating units) in which day-old poults (young turkeys) are started and kept for the first 6 weeks at which time they are moved to the growout house.

Confinement rearing: Poults are not permitted to run on range (pasture), but are confined within a house or small fenced apron alongside the house.

Finishing house (barn): The finishing house is used to confine poults from about 13 weeks of age until they are finished and ready to market. The finishing house is not heated and is less insulated, but more ventilated, than the brooder or growout house. Producers in the Midwest and West usually have fenced pens or aprons along both sides of the barn to provide more room for the birds as they grow larger.

Further processing: Turkeys are processed into products beyond the whole body or cutup parts—for example, cooked products, turkey ham, turkey rolls, sausage, or salami.

Gradeout: The percentage of dressed turkeys graded as grade A. Eighty percent is usually considered standard.

Growout house (barn): The growout house is used to confine poults during their intermediate growing stage, from 6-13 weeks old. Many producers keep poults in the growout house until they are ready for market. Growout houses have less insulation than brooder houses, and many are unheated.

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Summary

The U.S. turkey industry has skyrocketed from a modest enterprise with a gross farm value of $270 million in 1950 to a thriving, complex agribusiness with a gross farm value of $1.26 billion in 1983. New technologies have helped lower retail prices and have combined with industry marketing innovations to boost annual per capita consumption to 11.2 pounds in 1983, up from 8.0 pounds in 1970, 6.1 pounds in 1960, and only 1.7 pounds in 1935. Although most turkeys are eaten around the Thanksgiving-Christmas holiday season, turkey is now consumed year round. Less seasonality in production and processing results in a greater annual volume of turkey from a given facility.

Industry innovation in marketing turkey through further processed products, such as turkey rolls, roasts, pot pies, and frozen dinners, has made further processing the fastest growing segment of the industry. Since 1980, further processed items have accounted for almost 40 percent of all turkey sales. Selling prepacked turkey parts in smaller packages has also encouraged consumers to buy more turkey. Most major processors emphasize these value-added products to improve their profits.

Turkey-processing plants have been decreasing in number but growing in volume. The number of plants dropped from 281 in 1962 to 115 in 1982, while the average turkey slaughter per plant rose from 4.9 million to 26.8 million. The 20 largest firms operated 45 plants and slaughtered 87 percent of all turkeys in 1982 compared with 60 plants and 50 percent in 1962. The extent of growth in the industry is witnessed by the fact that the eight largest firms in 1982 processed more turkey than did all firms in 1960.

More turkeys are raised on fewer farms, with 1,608 of the existing 7,498 farms selling 90 percent of all turkeys. About 53 percent are fed on farms selling an annual equivalent of 1,000 tons of live turkey. Gains from efficient production are passed on to consumers, who in turn have responded by buying more turkey, thereby promoting further expansion—for example, construction of new buildings, purchase of new equipment, and development of new technology.

Although inflation has forced actual costs up since the energy crunch in 1973, real unit costs have dropped. The average real price of turkey meat at retail (measured in constant 1967 dollars) fell from 77 cents per pound in 1955 to 32 cents in 1982.

The U.S. Turkey Industry

By Floyd A. Lasley, William L. Henson, Harold B. Jones, Jr.

Introduction

The turkey industry offers a vivid example of how various agricultural sectors are interrelated and dependent on one another. All segments of the turkey industry—producers, processors, hatcheries, geneticists, nutritionists, veterinarians, suppliers, marketing firms, and consumers—have combined to transform the industry from a minor sideline enterprise into a complex agribusiness.

Further processing and specialty products are the most rapidly growing part of the industry, making it possible for consumers to enjoy turkey in many forms throughout the year. However, many changes were required before this change was achieved. The traditional holiday bird consumption pattern was well suited to (and developed from) the spring hatching season. Processors and wholesalers stored frozen turkeys and most retailers displayed turkey only for the holiday season.

This report identifies some of the efficiency gains made by the turkey industry and describes the factors that caused or accompanied these gains. Circularity is often evident as adjustments made in response to one change sometimes lead to another. The long-term view provides insight into how the industry has developed by assimilating change. The report also stresses the way the efficiency gains in production and marketing have been passed on to the consumer through lower real prices and a variety of new products.

Production

Turkey production is concentrated on large farm units. The 1982 Census of Agriculture reported 7,498 farms selling turkeys. The top 398 farms, each selling over 100,000 head, sold 53 percent of all turkeys. Farms in the South Atlantic region were the largest, averaging nearly 40,000 turkeys per farm, followed by those in the West North Central and Western regions.

Regional production in areas generally located some distance from population centers leads to some regions producing more than they consume while others produce less than they consume. Nearly 800 million pounds of turkey are shipped among regions in the United States. The New England, Mid-Atlantic, and East North Central regions produce less than they consume, whereas the West North Central and South Atlantic regions produce a surplus, which they ship to deficit areas. The South Central, Mountain, and Pacific regions produce about as much turkey as they consume.

Industry Output and Value

Production and marketing of turkeys has become big business. Output grew from 817 million pounds in 1950 to 1.5 billion pounds in 1960, 2.2 billion pounds in 1970, and 3.3 billion pounds in 1983 (table 1). Turkey production, although expanding rapidly, has varied widely year to year, leading to and resulting from marked price changes. The most dramatic annual production variation since 1950 was a 26-percent increase during 1960-61, followed by a 13-percent drop in 1962.

Farm prices increased gradually from the thirties to the late forties, then declined slightly throughout the fifties and sixties until 1973, when higher feed prices boosted costs, and retail turkey prices rose markedly along with worldwide inflation. Gross farm value of turkey production increased from $270 million in 1950 to $1.26 billion in 1983. Gross farm value increased more slowly than did production during the fifties and sixties because of the general decline in prices.

Areas of Production

Most of the Nation's turkeys are produced in relatively small areas of three regions: the North Central, the South, and the West. Production in all areas except New England and the Northwest has trended upward, but quite unevenly and with volatile, short-term fluctuations (table

Table 1—Turkey production, producer prices, and value of production

Year	Production			Average price received by producers	Farm value of production
	Number	Live weight	Pounds produced as percentage of preceding year		
	Million	*Million pounds*	*Percent*	*Cents/pound*	*Million dollars*
1935	20	298	99.5	20.1	59
1936	28	405	136.1	15.6	62
1937	25	376	92.7	18.1	69
1938	27	395	105.1	17.5	68
1939	33	494	125.1	15.7	72
1940	33	502	101.6	15.2	80
1941	32	512	102.0	19.9	101
1942	32	522	101.8	27.5	147
1943	31	509	97.6	32.7	162
1944	35	584	114.7	33.9	199
1945	42	740	126.8	33.7	245
1946	40	714	96.5	36.3	273
1947	34	611	85.5	36.5	236
1948	31	574	94.0	46.8	263
1949	41	769	134.1	35.2	267
1950	44	817	106.3	32.9	270
1951	53	950	116.2	37.5	351
1952	62	1,049	110.5	33.6	356
1953	60	1,008	96.1	33.7	340
1954	68	1,161	115.1	28.8	334
1955	65	1,091	94.0	30.2	329
1956	77	1,274	116.8	27.2	342
1957	81	1,356	106.4	23.4	319
1958	79	1,356	100.0	23.9	322
1959	84	1,433	105.7	23.9	345
1960	84	1,489	103.9	25.4	371
1961	107	1,871	125.7	18.9	356
1962	92	1,626	86.9	21.6	352
1963	94	1,686	103.7	22.3	377
1964	101	1,826	108.3	21.0	383
1965	106	1,915	104.9	22.2	424
1966	116	2,123	110.9	23.1	490
1967	126	2,343	110.4	19.5	458
1968	107	2,015	110.4	20.5	414
1969	107	2,029	100.7	22.4	455
1970	116	2,203	108.6	22.6	499
1971	120	2,264	102.8	22.1	501
1972	129	2,424	107.1	22.2	537
1973	132	2,451	101.1	38.2	936
1974	131	2,426	99.0	28.0	683
1975	124	2,277	93.9	34.8	793
1976	140	2,605	114.4	31.7	825
1977	136	2,562	98.3	35.5	910
1978	139	2,653	103.6	43.6	1,157
1979	157	2,958	111.5	41.4	1,226
1980	165	3,069	103.8	41.3	1,268
1981	171	3,260	106.2	38.2	1,246
1982	165	3,176	97.4	39.5	1,254
1983	170	3,316	105.1	38.0	1,261

Note: Italicized numbers in parentheses refer to items in the reference section at the end of this report.

Sources: *(73, 75)*.

2 and fig. 1). Led by North Carolina, the South Atlantic region has expanded most in recent years. After losing ground during the late fifties and early sixties, the South expanded output and now produces over 40 percent of our turkey supply.

Production continues to increase in the West North Central region, but has remained fairly level in the East North Central region since 1960 *(11, 19)*.[1] The two North Central regions provided over half the Nation's turkeys in 1960, but now produce less than 40 percent. Although output has increased in the Mountain and Pacific areas, the West's share of total production dropped from 30 percent in 1950 to less than 18 percent in 1982.

Changes in costs and relative profitability led to interregional shifts in turkey production. Low-cost feed ingredients gave the Midwest an early lead in turkey production, but many Midwestern producers have recently found it more profitable to devote their resources to other enterprises. Certain areas of the South Atlantic and South Central regions, with less productive soil and limited alternative employment opportunities, have found turkeys an attractive enterprise. These newer production areas use direct ownership and contract growers whereas independent growers, coordinated through marketing contracts, are more prevalent in the Midwest. In

[1]Italicized numbers in parentheses in the text and tables refer to items in the reference section at the end of this report.

Table 2—Regional production of turkeys and percentage change from preceding year, selected years

Region	1959		1961		1965		1970	
	Number raised	Percentage change from previous year	Number raised	Percentage change from previous year	Number raised	Percentage change from previous year	Number raised	Percentage change from previous year
	Thousand	*Percent*	*Thousand*	*Percent*	*Thousand*	*Percent*	*Thousand*	*Percent*
North Atlantic	3,531	-3.1	3,601	8.1	3,265	5.2	3,102	8.8
East North Central	13,136	15.2	16,695	32.4	15,427	-1.2	14,573	17.2
West North Central	28,679	19.9	38,726	29.5	35,321	5.1	35,554	6.9
South Atlantic	12,069	.4	11,320	24.5	15,420	8.4	20,185	6.4
South Central	7,777	-6.1	11,085	33.1	13,487	13.6	17,421	21.2
West	19,301	-4.9	26,322	24.2	22,764	1.0	25,180	9.2
Other States[1]	NA	NA	NA	NA	NA	NA	386	NA
United States	84,493	6.2	107,749	27.6	105,684	4.8	116,401	9.1

Region	1975		1980		1982		1983	
	Number raised	Percentage change from previous year	Number raised	Percentage change from previous year	Number raised	Percentage change from previous year	Number raised	Percentage change from previous year
	Thousand	*Percent*	*Thousand*	*Percent*	*Thousand*	*Percent*	*Thousand*	*Percent*
North Atlantic	3,231	-6.8	6,012	14.6	5,834	-6.2	7,434	27.4
East North Central	14,009	-12.4	15,481	.8	17,929	4.8	18,033	.6
West North Central	39,549	-2.4	47,685	6.2	48,147	-.3	49,907	3.7
South Atlantic	25,742	-2.3	42,279	4.3	44,827	.3	46,716	4.2
South Central	17,315	-4.1	24,465	5.3	20,255	-15.5	19,850	-2.0
West	23,862	-8.5	28,495	5.8	27,519	-9.4	27,788	1.0
Other States[1]	547	-14.9	326	5.2	NA	NA	NA	NA
United States	124,255	-6.2	164,743	5.2	164,511	-3.7	169,728	3.2

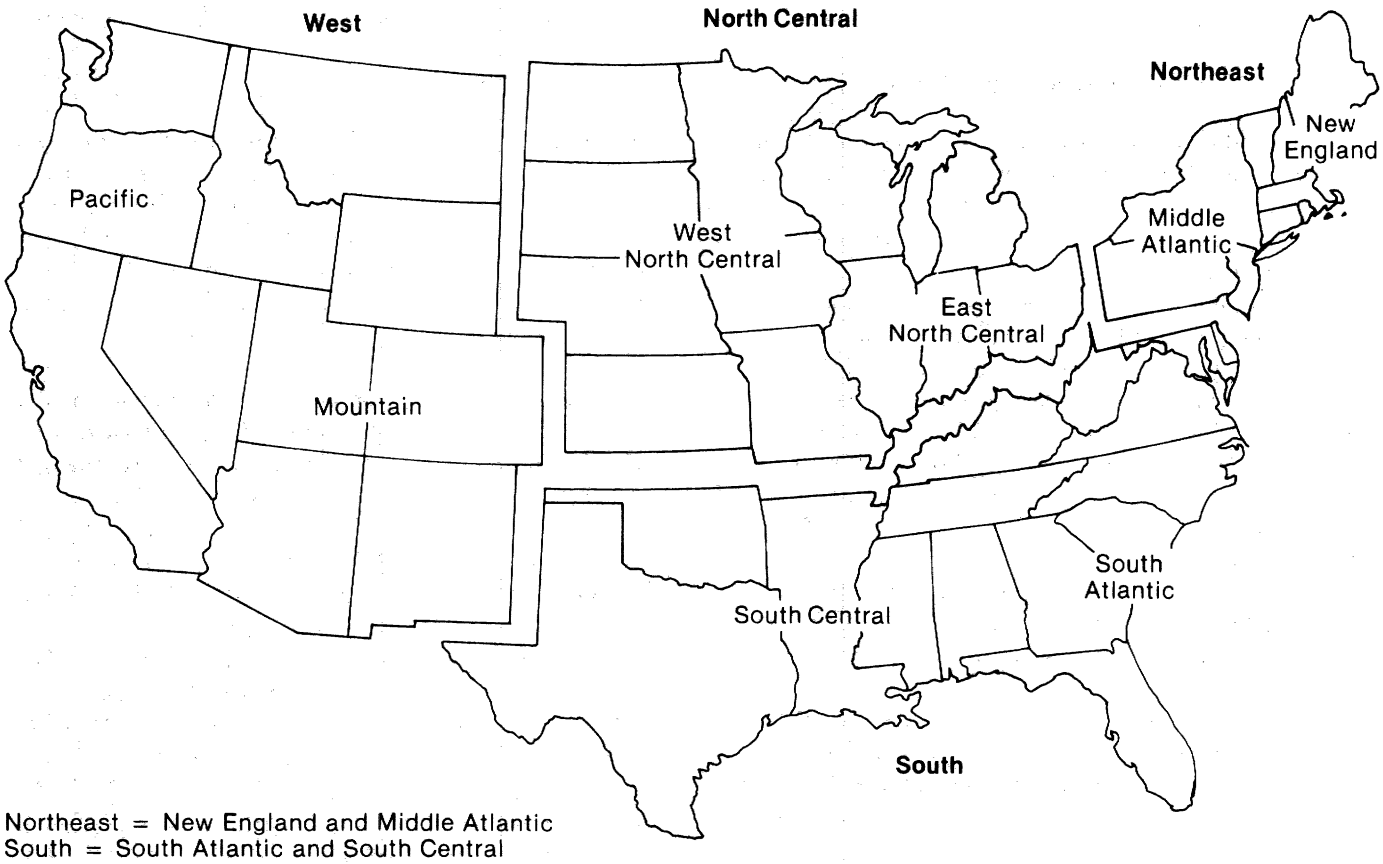
NA = Not available.

[1]Florida, Montana, Idaho, Wyoming, New Mexico, and Arizona are combined to avoid disclosing individual operations.

Source: *(73)*.

Figure 1

Poultry Production-Marketing Regions



Northeast = New England and Middle Atlantic
South = South Atlantic and South Central
North Central = East North Central and West North Central
West = Mountain and Pacific (excluding Hawaii and Alaska)

these established areas, the close coordination of production and marketing within specialized complexes, complete with a well-developed infrastructure of local support services, now provides a competitive advantage.

North Carolina leads the turkey-producing States, followed by Minnesota, California, Missouri, and Arkansas (table 3 and fig. 2). These five States produced 57 percent of the total in 1983.

Production in North Carolina is centered in two areas, with some output being sent to Virginia's Shenandoah Valley area for slaughter. Minnesota's production is heavily concentrated in the central part of the State. Production in Arkansas is highly concentrated in the northwest corner of the State.

Production changes in these areas since the 1978 Agricultural Census further emphasize the pressures toward greater geographic concentration. Production tends to decline on the periphery of established production areas and increase in the heart of concentrated production areas. Production expanded very little outside established producing areas.

The leading counties further illustrate the degree of concentration of turkey production (table 4). Duplin County, N.C., continues to lead all counties after moving from 19th to first between the 1964 and 1969 Agricultural Censuses. Second place is held by neighboring Union County, which also moved up rapidly from 26th place in 1969. Fresno County, Calif. (third), and Rockingham County, Va. (fourth), were more consistent than

most counties in expansion. Stanislaus County, Calif., dropped from second in 1969 to 21st in 1978. McLennan County, Tex., had the most volatile ranking: in 1959, it was not in the top 40, rose to sixth in 1969, then dropped to 35th in 1978.

Number of Farms and Output per Farm

Turkey production has evolved from a secondary farm enterprise to a highly specialized industry over the past three decades. The number of farms producing turkeys, as listed in the Agricultural Census, dropped from 162,244 in 1949 to 88,399 in 1959 and to only 26,638 in 1978. Most of these farms produced just for home use, and by 1982 only 7,498 farms sold turkeys (table 5), with the average in this group selling more than $200,000 worth of turkeys per year. During the past quarter century, most turkeys were produced on a relatively small number of farms. By 1982, one-third of the farms selling turkeys (2,436 farms selling more than 16,000 turkeys each) sold 96 percent of all turkeys. More than 50 percent of the turkeys were sold by the 398 farms selling more than 100,000 head (equivalent to 1,000 tons) illustrating how these farms developed into very large and specialized production units *(11)*.

Agricultural Census data for all regions show that the number of farms producing turkeys fell, but the average size of the operation rose. Output per farm in 1978 was greatest in the South Atlantic, West North Central, and Western regions (table 6). Average production per farm was lowest in the North Atlantic and East North Central regions, probably the result of a higher than average proportion of farms selling birds directly to consumers.

Costs of Production

Several factors influence the costs of producing turkeys; these may be grouped under efficiency factors or prices of inputs. Both factors have contributed to changes in costs of production over the past three decades *(1)*. Tremendous gains were made in efficiency, but these improvements were sometimes overshadowed by price increases for feed and other production factors.

Four important cost components in production are poults, feed, labor, and physical facilities. Because feed represents about 60 percent of total production cost, changes in feed efficiency or price will substantially affect costs.

Feed conversion has improved through better rations, improved selecting and breeding to produce birds with greater ability to convert feed to meat, improved housing and management, and reduced mortality and morbidity. These improvements are evident by the reduction in feed per pound of gain from 4.87 pounds during 1955-59 to 3.01 during 1981-82 (table 7). In other words, 1 ton of feed produced 671 pounds of live turkey in 1982, or

Table 3—Leading States in U.S. turkey production

State	Rank in turkey production							
	1983	1982	1981	1980	1975	1970	1960	1955
				Number				
North Carolina	1	1	1	2	2	3	12	16
Minnesota	2	2	2	1	1	1	2	2
California	3	3	3	3	3	2	1	1
Missouri	4	5	5	5	5	5	5	8
Arkansas	5	4	4	4	4	6	11	13
Virginia	6	6	6	6	6	9	4	3
Iowa	7	7	8	8	8	7	3	4
Wisconsin	8	9	10	11	9	12	6	10
Pennsylvania	9	10	11	10	11	15	13	9
Indiana	10	8	9	9	10	8	9	11
Texas	11	11	7	7	7	4	7	5
Colorado	12	12	12	12	12	12	14	21

Source: (*73*).

60 percent more than the 420 pounds of turkey produced in 1965.

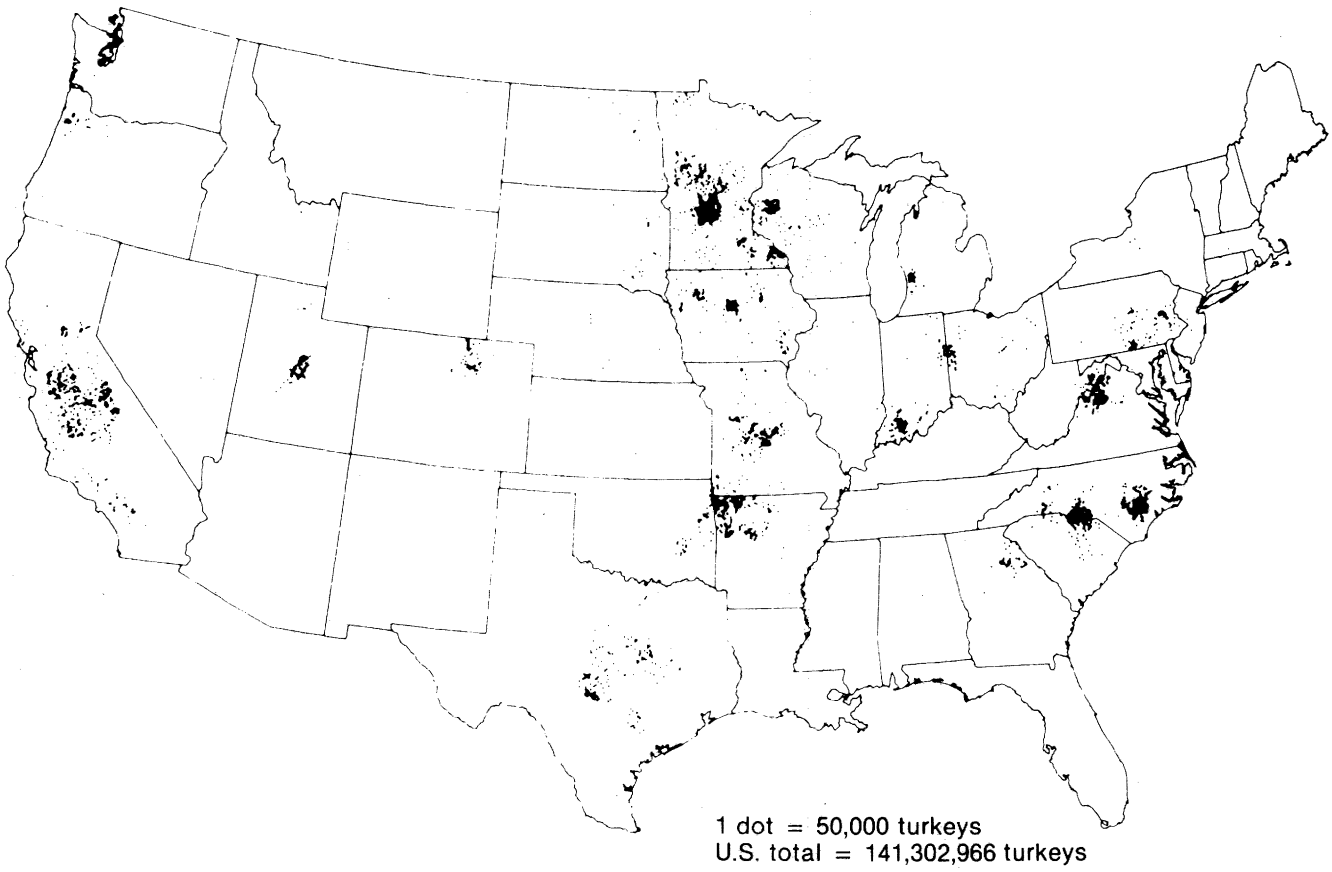
Despite gains in production efficiency, the cost to produce a pound of turkey has fluctuated widely on a year-to-year basis, largely because of changes in feed prices, especially during the past decade *(66, 67, 68)* (see app. table 1).

Labor productivity has also benefited from improvements in feed efficiency, but technology, housing, and equipment have made the major gains. These gains permitted a grower to care for larger flocks and made labor more efficient. A farmworker spending 2,000 hours per year during 1976-80 could produce a half-million pounds of turkey, whereas a 1945-49 farmworker produced only 15,267 pounds per year (table 7).

Housing and equipment used to produce a pound of turkey have not been reduced as much as have feed and labor. Buildings and equipment generally substitute for labor and to some extent for feed because good housing improves feed efficiency by providing favorable temperature and humidity. Automatic waterers and feeders substantially reduce labor requirements per pound of output. Confinement rearing requires more housing but less labor than range growout. Confinement both facilitates and encourages year-round turkey production. It allows rearing four broods per year, which lowers costs by increasing output per square foot of brooding and growout houses. Lower mortality rates have also reduced brooding requirements per pound of turkey sold because fewer poults must be started to sell a given number of pounds of turkey. The changes from range to confinement growout makes direct comparisons of housing and equipment

Figure 2

Turkeys Sold in 1978



Source: *(77)*.

Table 4—Leading counties in U.S. turkey production, selected years

County	Turkeys					Rank				
	Sold[1]			Produced[1]						
	1982	1978	1974	1969	1959	1982	1978	1974	1969	1959
	Number (thousand)					*Number*				
Duplin, N.C.	12,224	7,767	5,044	3,498	250	1	1	1	1	—
Union, N.C.	9,467	6,581	3,054	771	342	2	2	6	26	—
Fresno, Calif.	7,207	4,665	2,693	2,094	2,094	3	4	8	3	3
Rockingham, Va.	6,891	4,855	3,427	2,053	3,209	4	3	2	5	1
Stearns, Minn.	3,413	2,991	3,315	1,614	508	5	7	3	10	24
Barron, Wis.	(D)	3,120	3,058	1,619	787	6	6	5	9	14
Dubois, Ind.	3,257	2,451	1,420	1,122	784	7	11	18	16	15
Benton, Ark.	3,216	2,948	1,655	1,259	280	8	8	15	15	—
Kandiyohi, Minn.	3,215	4,280	3,076	1,277	2,143	9	5	4	4	2
Weld, Colo.	3,186	2,242	2,371	1,466	248	10	12	9	11	—
Madera, Calif.	2,717	1,416	2,190	1,386	696	11	22	12	13	17
Merced, Calif.	2,709	2,679	1,711	1,049	1,447	12	9	14	20	5
Otter Tail, Minn.	2,617	1,856	2,302	1,462	745	13	15	10	12	16
Franklin, Ark.	2,539	1,344	1,164	360	124	14	23	24	—	—
Sanpete, Utah	2,328	2,502	1,913	1,687	877	15	10	13	8	9
Hamilton, Iowa	2,285	1,863	1,551	651	1,124	16	14	17	36	6
Todd, Minn.	2,143	934	441	503	48	17	33	—	—	—
Anson, N.C.	2,055	1,769	1,249	462	84	18	17	22	—	—
Carroll, Ark.	1,984	1,687	1,303	1,045	484	19	18	20	21	26
Miller, Mo.	1,950	1,825	1,255	1,108	212	20	16	21	17	—
Meeker, Minn.	1,761	1,514	985	431	189	21	19	28	—	—
Kings, Calif.	1,753	1,314	1,171	427	386	22	24	23	—	—
Morrison, Minn.	1,733	1,203	1,088	665	173	23	26	27	35	—
Stanislaus, Calif.	1,677	1,417	2,203	2,707	1,452	24	21	11	2	4
Wayne, N.C.	1,655	602	205	72	45	25	—	—	—	—
Washington, Ark.	1,625	1,126	842	1,104	540	26	28	36	18	22
Sampson, N.C.	1,591	1,956	1,587	1,333	217	27	13	16	14	—
Pendleton, W.Va.	1,537	1,266	752	187	329	28	25	—	—	—
Ottawa, Mich.	1,519	857	897	848	331	29	38	33	24	—
Daviess, Ind.	1,509	734	629	434	273	30	—	—	—	—
Augusta, Va.	1,453	673	608	584	440	31	—	—	39	23
Placer, Calif.	1,335	1,004	556	670	327	32	31	—	34	—
Shenandoah, Va.	1,286	887	716	742	885	33	37	—	28	8
Adams, Pa.	1,158	780	449	163	82	34	—	—	—	—
Gillespie, Tex.	1,154	(D)	752	213	173	35	—	—	—	—
Osage, Mo.	1,133	1,481	928	733	188	36	20	31	29	—
Chesterfield, S.C.	1,120	939	976	704	124	37	32	29	31	—
Becker, Minn.	1,118	806	842	409	409	38	40	35	—	31
McLennan, Tex.	1,112	925	475	1,901	58	39	35	—	6	—
Morgan, Mo.	1,033	897	1,106	567	60	40	36	25	—	—

— = Not in top 40 counties that year.

(D) = Withheld to avoid disclosing data for individual farms; assumed Barron, Wis., held 1978 ranking.

[1]Agricultural Census reported number sold in 1978 and 1974, number produced in 1969 and 1959.

Table 5—Number of farms with turkeys raised or sold and number of turkeys reported, selected years

Turkeys sold per farm[1]	Farms reporting	Sales of turkeys	Percentage distribution	
			Farms	Turkeys
	Number	*1,000*	*Percent*	
1982:				
1-1,999	4,745	234	63.3	0.1
2,000-3,999	98	289	1.3	.2
4,000-7,999	219	1,258	2.9	.7
8,000-15,999	329	3,794	4.4	2.2
16,000-29,999	499	10,984	6.7	6.4
30,000-59,999	771	32,346	10.3	18.8
60,000-99,999	439	32,232[2]	5.8	18.7
100,000 or more	398	90,898	5.3	52.8
Total	7,498	172,035	100.0	100.0
1978:				
1-1,999	4,485	273	61.7	.2
2,200-3,999	128	359	1.8	.3
4,000-7,999	305	1,735	4.2	1.2
8,000-15,999	421	4,904	5.8	3.5
16,000-29,999	538	11,543	7.4	8.2
30,000-59,000	701	29,110	9.6	20.6
60,000-99,999	389	28,658	5.3	20.3
100,000 or more	304	64,721	4.2	45.8
Total	7,271	141,303	100.0	100.0
1974:				
1-1,999	1,398	302	31.7	.2
2,000-3,999	173	487	3.9	.4
4,000-7,999	425	2,377	9.6	1.9
8,000-15,999	648	7,371	14.7	5.9
16,000-29,999	584	12,595	13.3	10.1
30,000-59,999	645	26,115	14.6	20.9
60,000-99,999	294	21,529	6.7	17.3
100,000 or more	240	53,963	5.4	43.6
Total	4,407	124,738	100.0	100.0
1964:				
1-24	29,719	219	71.0	.2
25-99	4,124	171	9.9	.2
100-299	1,070	162	2.6	.2
300-999	691	379	1.7	.4
1,000-2,499	681	1,127	1.6	1.1
2,500-4,999	1,046	3,750	2.5	3.6
5,000 or more	4,531	98,942	10.8	94.5
Total	41,862	104,750	100.0	100.0
1959:				
1-49	72,910	685	82.5	.9
50-399	6,667	793	7.5	1.0
400-799	1,035	550	1.2	.7
800-1,599	1,191	1,370	1.3	1.7
1,600-3,199	1,476	3,566	1.7	4.4
3,200-9,999	2,976	17,149	3.4	21.3
10,000 or more	2,144	56,285	2.4	70.0
Total	88,399	80,398	100.0	100.0

[1]Data for 1978 are for 7,271 farms, the total number selling turkeys (5,328 of these were included as "over $2,500 in sales"); 1974 data are for farms with sales of $2,500 selling turkeys (7,224 farms reported turkeys); 1964 and 1959 data are for farms reporting turkeys raised. Different increments in number of turkeys sold reflect differences in how the Census survey data were reported.

[2]Estimated by authors; not shown by preliminary Census.

Source: (*77*).

Table 6—Regional production of farms producing turkeys, total raised or sold, and average number per farm, selected years[1]

Item	North Atlantic	East North Central	West North Central	South Atlantic	South Central	West	United States
				Number			
Farms reporting:							
1959	4,523	5,550	13,659	14,741	38,118	10,121	86,712
1964	2,091	3,109	8,054	6,232	17,802	4,538	41,862
1969	544	936	1,624	708	872	740	5,424
1974	423	755	1,272	720	593	644	4,407
1978	678	906	1,286	927	765	766	5,328
				Thousands			
Turkeys:							
1959	3,492	13,164	27,735	11,778	7,376	18,970	82,517
1964	3,310	17,194	33,716	15,539	12,196	22,795	104,750
1969	2,885	14,328	30,632	17,576	15,442	22,592	103,455
1974	3,475	15,069	39,066	25,711	16,289	25,128	124,738
1978	4,530	15,082	41,240	36,657	19,605	24,046	141,160
				Number			
Turkeys per farm:							
1959	772	2,372	2,031	799	194	1,874	952
1964	1,583	5,530	4,186	2,493	685	5,023	2,504
1969	5,304	15,307	18,862	24,826	17,708	30,530	19,074
1974	8,215	19,959	30,712	35,710	27,469	39,019	28,305
1978	6,681	16,647	32,068	39,544	25,627	31,392	26,494

[1]Turkeys sold from farms with annual sales of $2,500 or more for 1969, 1974, and 1978; 1964 and 1959 data for all farms reporting.

Source: (*77*).

Table 7—Turkey production efficiency factors, selected years

Item	Unit	1945-49	1955-59	1965-69	1976-80	1981-82
Feed per 100 pounds of turkey	Pounds	NA	487	441	319	301
Labor per 100 pounds of turkey	Hours	13.1	4.4	1.3	.4	.3
Farm labor in total turkey production	Million hours	89.3	57.3	27.1	11.1	9.6
Turkey produced per hour of labor	Pounds	7.6	22.7	76.9	250.0	333.3
Index of hours of labor in turkey production	100 = 1965-69	329.6	211.4	100.0	40.9	35.6
Index of turkey production per hour of labor	Do.	9.9	29.5	100.0	325.0	433.3

NA = Not available.

Sources: (*60, 68*).

costs for different time periods and regions difficult *(15, 17, 31, 33, 35, 39, 50, 59)*.

Newer brooder houses tend to be 50 feet wide and 250-feet long. Roofs and sides are generally insulated. Some use concrete floors, but most have dirt floors. Gas brooders dominate, although some Midwest growers use coal furnaces to reduce fuel bills. The overhead fan has quickly become standard equipment, also enabling growers to reduce fuel bills and to maintain greater control over temperature and humidity. Most brooding and growout units are equipped with automatic feeders and waterers.

Building costs vary considerably with the Southeast and West Coast well below other areas, but most estimates for a brooder house in 1982 were close to $5-$6 per square foot, including equipment (about a third of the total). Depreciating the building over 20 years and the equipment over 7 years (straight line basis) would mean an annual depreciation of 44 cents per square foot. Allowing 1 square foot per poult placed, 10-percent mortality, and three broods per year would mean a brooder facility depreciation of 16 cents per poult raised. Raising four broods per year would lower depreciation to 12 cents per poult. Southeastern growers push this still lower by using brooding facilities five to six times per year.

Current recommendations feature a three-stage system using the brooder (brooding house), an intermediate growing house, and a finishing barn (house). Generally, poults are in the brooder through the 6th week, are transferred to the growing house through the 13th week, and then are moved to the finishing barn until marketing at 16-22 weeks of age. Hen poults could be placed at the rate of 0.6 square foot per poult in the brooder, 1.2 square feet in the growing barn, and 2.4 square feet in the finishing barn. Toms would be allowed 1, 2, and 3 square feet in the respective stages, with more space for those finished at heavier than 24 pounds. This three-stage plan uses the birds' body heat better and reduces both fuel and facility cost per pound produced. Although moving birds requires extra labor, the main disadvantage of the three-stage plan is that turkeys of two or three different ages are on the farm at the same time with no complete break between flocks.

Building and equipping new growout barns in 1982 for the more common two-stage system cost approximately $3 per square foot, with the Southeast and West Coast perhaps 20 percent lower. These buildings were 50 feet wide, and 250-400 feet long to correspond with the brooder space.

Usually two or three growout barns are used in combination with each brooder house. Most growers insulate the ceiling or roof and use side curtains. Finishing toms to 24 pounds liveweight requires about 2.5 square feet per bird, with many growers lowering the density by 10 percent and some allowing 3.5 square feet. Using the same schedule as for the brooder house and with equipment representing a third of the total facility cost, depreciation costs on new growout barns are 8 cents per tom with three broods per year and 6 cents if four broods are raised.

Buildings and equipment for a typical two-stage production unit capable of brooding and growing out 20,000 hens or 15,400 toms per brood requires an investment of approximately $258,000. A 50- by 400-foot brooder house costs about $108,000, and three 50- by 335-foot growout barns cost approximately $150,000. The four buildings provide a total of 70,250 square feet (1.6 acres) of floor space.

Typically, growers have three broods of toms, four broods of hens, or two broods of each sex per year. This permits at least a 4-week vacancy between broods for the growout barns.

Regional Cost Differences

Production costs vary significantly among regions. Feed represents about 60 percent of the total cost of producing live turkeys, and feed conversion rates differ relatively little from region to region. Therefore, feed price is the dominant factor in production cost differences among regions. Midwest growers, with plentiful grain available to mills from nearby farms, enjoy a feed price about $22 per ton below the average U.S. price. Grain in other regions is priced to feed mills at the appropriate terminal elevator price plus freight and handling, whereas grain to most Minnesota producers' mills is priced at the Twin Cities market price quote less transportation. Feed cost per pound of live tom turkey in 1982 averaged 22.20 cents in the Midwest, 26.73 cents in the South and East, and 28.12 in the West for an overall average of 25.18 cents (table 8).

The West has lower mortality rates for both toms and hens than other regions. Western producers also realize a higher proportion of grade A birds and a lower condemnation rate than do growers in other areas. Because the cost comparisons in table 8 are based on net pounds live weight, the lower mortality and condemnation rates offset some of the West's feed cost disadvantage.

Comparing costs among regions is difficult because of structural differences. Most Midwestern growers operate as independent producers, buying the poults, feed, medication, and other inputs. Growers in the South and East (other than in Pennsylvania) generally grow birds under contract, in which case the grower provides the labor and facilities, and the contractor provides the poults, feed, and medication. Although both types of organization function in the West, data for this region are largely based on contract production. Costs in table 8 are shown for independent producers in the Midwest and for contractors in the other areas. Housing and equipment

Table 8—Estimated turkey production costs by region, 1982

Item	Unit	Toms				Hens			
		South and East	Midwest[1]	West[2]	Average	South and East	Midwest[1]	West[2]	Average
Average weight	Pounds/bird	25.11	25.70	24.18	25.16	14.14	13.87	14.30	14.06
Age	Weeks-days	20-2	19-6	19-0	20-0	16-4	16-2	16-3	16-3
Mortality	Percent	11.35	11.30	9.50	10.90	7.86	8.50	5.10	7.56
Grade A	do.	73.45	79.20	82.20	77.50	83.00	86.00	91.00	85.80
Condemns and DOA	do.	2.03	3.98	1.52	2.71	1.25	1.80	1.00	1.42
Feed conversion	Pounds feed/ pound gain	2.92	3.02	3.04	2.98	2.69	2.92	2.91	2.83
Feed price	Dollars/ton	183	147	185	169	185	149	187	171
Feed cost	Cents per	26.73	22.20	28.12	25.18	24.88	21.75	27.21	24.09
Poult cost	pound net wt.	4.72	5.09	4.20	4.76	6.03	6.42	5.92	6.16
Medication	do.	.45	.78	.41	.57	.42	.85	.41	.59
Litter	do.	.40	.28	.82	.44	.44	.30	.81	.46
Fuel	do.	.58	1.36	.55	.88	.74	1.52	.72	1.05
Insurance	do.	.11	.17	.14	.14	.09	.14	.12	.12
Interest	do.	1.49	1.80	1.73	1.66	1.44	1.70	1.56	1.57
Miscellaneous	do.	.36	.16	.34	.28	.41	.37	.40	.39
Live haul	do.	1.60	1.60	1.50	1.58	1.60	1.60	1.50	1.58
Flock service	do.	.49	.49	.49	.49	.55	.55	.55	.55
Hired labor[2]	do.	—	1.67	—	1.67	—	2.16	—	2.16
Grower fee[2]	do.	4.17	—	4.64	4.33	4.82	—	5.92	5.19
Building and equipment:[3]									
Depreciation	Dollars	1.18	2.01	.80	1.44	1.13	1.57	.72	1.22
Repair and taxes	do.	.20	.85	.30	.48	.19	.77	.30	.44
Interest	do.	.74	1.10	.57	.85	.59	.88	.46	.68
Electricity	do.	.20	.24	.15	.21	.20	.24	.15	.21
Total[4]	do.	41.10	39.80	42.94	40.95	41.42	40.82	45.12	41.92

DOA = Dead on arrival.
— = Not applicable.
[1]Midwestern costs are estimated for independent producers; costs for other regions are estimated for contract producers (integrators).
[2]Western producers often brood straight run poults, separating them by sex after brooding.
[3]Grower fee includes labor, building, and equipment. No return or charge is made for Midwest growers' labor.
[4]Aggregate total weighted to account for independent and contract production.

Source: Data provided by hatcheries, processors, growers, contractors, and specialists at various universities.

represent fixed costs for both independent and contract growers, but are cash costs for the contractor as these and the growers' labor costs are included in the fee paid to growers by the contractor. Hired labor costs are shown for independent Midwestern growers at the rate paid by those using hired labor, but no charge was made for growers' labor. Hired labor is not shown (even though used) for contract production because labor is included as part of the growers' fee.

Severe winter weather requires Midwestern producers to use higher cost, environment-controlled housing, although some Eastern and Southern growers are also using environmentally controlled housing. Confinement rearing increases total housing costs compared with range systems for a given flock capacity, but on an annual basis confinement rearing costs can be more than offset by increased output per unit of capacity with year-round production and lower per-unit labor and feed requirements. Midwestern and Western growers generally use fenced aprons or runs on either side of the growing barn, thereby increasing growout capacity. Midwestern winter weather limits this practice so that growout capacity is reduced during the winter months.

Midwestern producers are therefore not as time-flexible as those in other areas. If they house poults too early to use their aprons for growout, they will reduce their annual output. This seasonal aspect also influences processing schedules and costs, creating a tendency for growers to schedule placements at the same time, adding considerably to the problem of coordinating processing and marketing. Processing schedules in the Midwest are more difficult to fill during mid-April, because having a 14,000-bird flock ready at that time means growers must sacrifice 40,000 birds later in the season if they are to move their last brood to slaughter by mid-November *(3, 4, 13, 14, 20, 38, 52, 63)*.

Costs and Returns

Net returns for whole turkeys varied markedly during the 1955-83 period. Highest returns, 17.2 cents per pound ready-to-cook (RTC), were realized in 1978. Four years of high returns in 1977-80 were followed by losses of 3.0 cents per pound. Producers suffered net losses in 8 of the 29 years between 1955 and 1983 (table 9).

Production costs for live turkeys increased substantially only twice during the past three decades—in 1973 and in 1979-81. These were periods of rapidly rising feed costs due to higher feed prices. Feed prices have historically helped stabilize production costs. Production costs other than feed doubled during the 29 years, slowly rising from a low of 5.7 cents per pound in 1961 to a high of 13.2 cents per pound in 1983.

Marketing costs to transform live turkeys on the farm into RTC turkey at the wholesale level steadily rose to 15.7 cents per pound RTC in 1983, up from 6.9 cents in 1965.

Total costs to wholesale varied from 32.9 cents in 1965 and 1968 to a high of 67.2 cents in 1981. Turkey production suffered net losses in both the lowest and highest cost years, 1968 and 1981. Changes in net returns were more closely associated with changes in wholesale prices than in costs. During the 1955-83 period, net returns and prices moved in the same directions all but 4 years, but net returns and costs moved in different directions 13 years. The average change in annual costs was 2.2 cents overall, 2.6 cents for the 16 times costs increased, and 1.7 cents for the 12 times costs decreased. Wholesale price changes averaged 5.2 cents. Prices gained in 10 years (averaging 7.4 cents) and dropped in 17 years (averaging 3.9 cents). The average change was 5.2 cents for net returns, 5.7 cents for the 11 gains, and 4.8 cents in the 16 years returns declined.

Simulated Costs and Prices

Improved technology in turkey production and marketing has lowered real prices for turkey meat during the past two decades. Plentiful supplies of high-quality products are now available year round. The industry has been a leader in making technical and organizational improvements in production and marketing and has passed these benefits on to consumers.

Simulating costs and prices offers a way to describe some of the changes in these economic relationships over time. We can estimate the cumulative effect of productivity gains by the turkey industry by assuming that technology is held constant and by allowing input costs to vary directly with changes in their market prices. We can thus simulate costs and product prices and then compare them with actual prices to illustrate the technological gains realized and passed on to consumers. Technology and input-output ratios are held constant at the 1960 level, and inputs are valued at actual average annual

prices. We set the base at the 1960 level because benchmark data were available and price relationships were relatively stable, although some major industry changes had already begun.

During 1960-72, relatively stable feed prices helped stabilize production costs as feed prices increased the cost per pound of turkey by only 2 cents (table 10). Then, in 1973, feed prices increased dramatically, boosting feed costs 10 cents per pound of turkey in 1 year. Feed prices rose again in 1979-81, adding another 10 cents to costs. Without the efficiency gains, these 1960-81 feed price increases would have tripled the feed costs per pound of turkey. Cumulative gains in feed efficiency, however, offset half the effect of feed price increases so that feed costs only doubled.

Table 9—Annual cost and returns for turkeys

Year	Live turkey production costs			Ready-to-cook turkey				
	Feed	Other	Total	Production cost[1]	Marketing cost	Total cost to wholesale	Wholesale price	Net returns
				Cents per pound				
1955	20.0	7.0	27.0	33.8	8.8	42.6	47.9	5.3
1956	19.1	6.7	25.8	32.3	8.6	40.9	45.0	4.1
1957	18.3	6.3	24.6	30.8	8.3	39.1	39.0	-.1
1958	17.8	6.1	23.9	29.9	8.3	38.2	42.5	4.3
1959	18.0	5.9	23.9	29.9	7.9	37.8	37.6	-.2
1960	15.6	5.8	21.4	26.8	7.6	34.4	43.5	9.1
1961	15.2	5.7	20.9	26.1	9.7	35.8	35.6	-.2
1962	15.0	5.9	20.9	26.1	7.6	33.7	34.8	1.1
1963	15.1	6.0	21.1	26.4	7.4	33.8	36.5	2.7
1964	14.6	6.2	20.8	26.0	7.1	33.1	33.6	.5
1965	14.4	6.4	20.8	26.0	6.9	32.9	37.0	4.1
1966	14.7	6.5	21.2	26.5	7.9	34.4	38.0	3.6
1967	14.3	6.6	20.9	26.1	9.4	35.5	33.5	-2.0
1968	13.2	6.6	19.8	24.8	8.1	32.9	32.4	-.5
1969	13.5	6.7	20.2	25.3	8.2	33.5	36.3	2.8
1970	14.0	6.8	20.8	26.0	8.3	34.3	40.9	6.6
1971	13.3	6.9	20.2	25.3	8.4	33.7	37.5	3.8
1972	13.5	7.0	20.5	25.6	8.5	34.1	36.6	2.5
1973	25.6	7.5	33.1	41.4	9.2	50.6	64.5	13.9
1974	22.5	8.2	30.7	38.4	10.5	48.9	47.0	-1.9
1975	22.1	8.6	30.7	38.4	11.0	49.4	55.1	5.6
1976	22.4	9.0	31.4	39.3	11.6	50.9	51.0	.1
1977	22.6	9.0	31.6	39.5	11.9	51.4	56.2	4.8
1978	22.1	9.6	31.7	39.6	12.1	51.7	68.8	17.2
1979	25.3	10.5	35.8	44.8	13.4	58.2	67.0	8.8
1980	26.0	11.0	37.0	46.3	14.6	60.9	64.6	3.7
1981	30.5	11.6	42.1	52.6	14.6	67.2	64.2	-3.0
1982	24.5	11.8	36.3	45.3	14.8	60.1	62.2	2.1
1983	26.1	13.2	39.3	49.1	15.7	64.8	62.5	-2.3

[1]Production cost is calculated by the division of live production cost by the dressing percentage to convert to a ready-to-cook basis. Net returns are to production and marketing through the wholesale level.

Source: (*68*).

Table 10—Simulated retail prices and costs of producing and marketing turkeys[1]

Year	Simulated costs and farm value, live weight				Simulated marketing costs, RTC basis						Simulated retail price[2]	Actual retail price
	Feed cost	Nonfeed costs	Returns	Farm value	Farm value	Labor	Energy	Packaging and materials	Overhead and other	Total marketing		
	Cents/pound											
1955	16.9	5.3	6.1	28.3	36.5	5.0	2.3	1.8	7.7	16.8	53.3	61.6
1956	16.6	5.4	6.2	28.2	36.3	5.3	2.3	1.9	7.9	17.4	53.7	56.9
1957	16.4	5.6	6.4	28.4	36.6	5.6	2.5	2.0	8.2	18.3	54.9	53.5
1958	16.4	5.8	6.5	28.7	37.0	5.9	2.4	2.1	8.4	18.8	55.8	52.6
1959	16.3	5.8	6.6	28.7	37.0	6.1	2.4	2.1	8.3	18.9	55.9	51.5
1960	15.6	5.8	6.7	28.1	36.2	6.4	2.4	2.1	8.4	19.3	55.5	55.5
1961	15.7	5.8	6.8	28.3	36.5	6.6	2.4	2.1	8.4	19.5	56.0	44.8
1962	15.9	5.8	6.8	28.5	36.7	6.8	2.4	2.1	8.4	19.7	56.4	49.0
1963	16.3	5.8	6.9	29.0	37.4	7.0	2.4	2.1	8.4	19.9	57.3	49.4
1964	16.2	5.8	7.0	29.0	37.4	7.2	2.3	2.1	8.4	20.0	57.4	49.4
1965	16.3	5.9	7.1	29.3	37.7	7.4	2.4	2.1	8.6	20.5	58.2	49.8
1966	16.5	6.1	7.3	29.9	38.5	7.6	2.4	2.2	8.9	21.1	59.6	50.7
1967	16.5	6.2	7.6	30.3	39.0	8.0	2.5	2.2	9.0	21.7	60.7	47.0
1968	15.8	6.4	7.9	30.1	38.8	8.5	2.5	2.3	9.2	22.5	61.3	48.7
1969	16.2	6.6	8.3	31.1	40.1	9.0	2.5	2.3	9.6	23.4	63.5	52.8
1970	17.1	6.8	8.8	32.7	42.1	9.6	2.7	2.4	9.9	24.6	66.7	55.8
1971	17.5	7.0	9.2	33.7	43.4	10.3	2.9	2.6	10.2	26.0	69.4	56.3
1972	17.8	7.3	9.5	34.6	44.6	10.9	3.0	2.7	10.5	27.1	71.7	56.6
1973	28.7	7.9	10.1	46.7	60.1	11.6	3.4	2.8	11.5	29.3	89.4	90.3
1974	31.4	9.1	11.2	51.7	66.6	12.6	5.2	3.3	13.2	34.3	100.9	71.4
1975	30.3	10.1	12.2	52.6	67.8	13.9	6.1	3.8	14.6	38.4	106.2	78.3
1976	31.5	10.5	12.9	54.9	70.7	15.1	6.6	4.0	15.3	41.0	111.7	78.2
1977	33.4	11.2	13.7	58.3	75.1	16.3	7.5	4.2	16.2	44.2	119.3	81.4
1978	33.1	12.1	14.8	59.9	77.2	17.6	8.1	4.7	17.4	47.8	125.0	87.7
1979	36.7	13.4	16.4	66.5	85.7	19.0	10.2	5.2	19.4	53.8	139.5	88.2
1980	40.5	15.3	18.6	74.4	95.8	20.8	14.3	5.8	22.1	63.0	158.8	95.7
1981	45.2	16.9	20.6	82.7	106.6	22.6	17.3	6.2	24.4	70.5	177.1	92.7
1982	41.6	17.2	21.8	80.6	103.9	24.0	17.3	6.4	25.2	72.9	176.8	92.5

RTC = Ready-to-cook.
[1]Simulated by holding technology and inputs constant at the 1960 level and passing through the input price changes.
[2]Price needed to cover costs based on 1960 technology and input-output relationships, with inputs valued at current prices.

Source: (*33*).

Nonfeed costs also have risen less rapidly than have the prices of these inputs. Returns to producers per pound of turkey (liveweight) in 1982 was approximately 40 cents, about 10 cents above the 1960 level, but just half what it would have been if it had kept pace with rising input prices.

Improved efficiency in marketing has cushioned the effect of inflation. Wage rates in the food industries have almost quadrupled; fuel and energy is up sevenfold; and packaging prices have tripled since 1960. Passing these price increases through the system would have boosted marketing costs to 73 cents per pound in 1982; however, actual marketing costs were only 43 cents.

Simulated production and marketing costs totaled a 1982 retail price of $1.77 per pound; yet, consumers paid only 92.5 cents. Technical and organizational improvements made producers far more efficient than their 1960 counterparts. This gain, plus part of the reduced returns per pound, has been passed on to the consumer *(25, 33, 34)*.

Processing

The turkey processor is generally the integrator, coordinating all stages of production and marketing through direct ownership and contractual arrangements. Turkey processing plants tend to be relatively large and specialized, a major change from the earlier sideline slaughtering of turkeys in chicken processing plants during their slack seasons.

Number and Size of Plants

Turkey processing plants continue to drop in number and grow in volume (table 11). Only 128 plants slaughtered turkeys in 1981; this number dropped to 115 in 1982, down from 156 in 1980 and from 281 in 1962. Specialized turkey plants have nearly replaced seasonal slaughtering of turkeys by other plants, a common practice in the midsixties.

Only 7 percent of the Nation's turkeys are now processed in dual slaughter plants. In 1982, processors operated 30

Table 11—Federally inspected turkey processing plants and annual average pounds slaughtered per plant, by region, selected years, 1962–81

Item	1981	1972	1970	1968	1965	1962
			Number			
Processing plants:						
North Atlantic	36	27	21	27	31	37
East North Central	19	25	28	34	43	62
West North Central	28	41	36	46	52	67
South Atlantic	10	17	20	25	28	32
South Central	9	20	19	27	32	36
West	26	33	32	34	38	47
United States	128	163	156	193	224	281
			1,000 pounds			
Average live turkeys per plant:						
North Atlantic	3,577	2,107	2,367	1,593	1,591	946
East North Central	15,873	9,803	8,275	6,115	4,629	3,046
West North Central	35,917	18,923	17,073	12,802	11,518	6,949
South Atlantic	72,926	22,249	15,733	11,212	6,966	3,457
South Central	35,687	15,731	15,350	10,527	7,222	4,013
West	22,137	15,425	15,183	12,586	10,394	9,246
United States	23,922	13,986	12,745	9,494	7,448	4,908

Source: 1981 data compiled from unpublished U.S. Department of Agriculture's Food Safety and Inspection Service data; prior years from *(60)*.

plants slaughtering both turkey and chicken which processed 227 million pounds of turkey (liveweight), 408 million pound of broilers, and 29 million pounds of fowl. Five of these plants slaughtered predominantly turkey and 25 slaughtered predominantly chicken. Eight major processors operated 10 of these plants, which processed 96 percent of the turkey and 78 percent of the chicken slaughtered by all dual plants. Of the remaining dual plants, 9 could be classed as specialty meat vendors and the other 11 as grower-processors; these 20 plants slaughtered about 9 million pounds of turkey, 74 million pounds of broilers, and 28 million pounds of fowl.

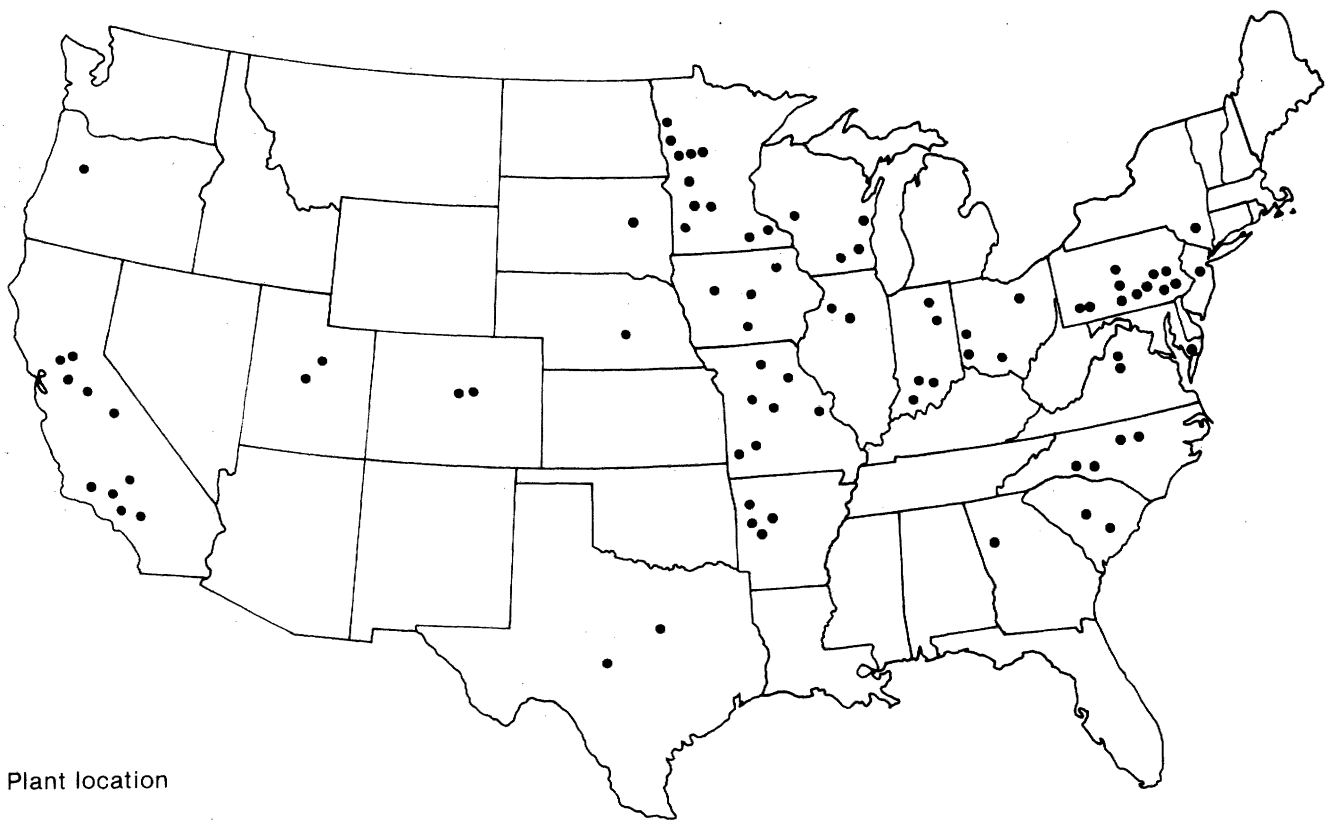
Plant numbers have declined more rapidly in regions of heavy production (fig. 3). The North Atlantic region now has about the same number of plants as it had in 1962. Northeastern plants tend to be small and several are operated seasonally by grower-processors, primarily to process for the fresh market. The 10 smallest plants in the United States each slaughter less than 1,000 pounds per year, and 6 of these plants are in the North Atlantic region (the only region without a plant slaughtering over 50 million pounds per year).

Average volume per plant is greatest in the South Atlantic region where the 10 plants average almost 73 million pounds each. Plants in the West North Central and South Central regions average almost 36 million pounds, just half the volume of the South Atlantic group. Plants in the larger size group account for an increasing share of the total volume processed for all regions (table 12).

Four plants slaughtered more than 100 million pounds each in 1981, and 20 others slaughtered more than 50 million pounds. The 16 largest plants processed 50 percent of the total volume, and the top 50 plants processed almost 95 percent *(8, 12, 16, 48)*.

Figure 3

Turkey Plants Slaughtering 20,000 Head or More in 1982



• Plant location

Table 12—Turkey processing plants under Federal inspection and annual slaughter volume (liveweight), by region and plant size, selected years, 1962-81

Year and region	Plants with annual volume (in 1,000 pounds)				Annual volume (in 1,000 pounds)			
	Less than 5,200 pounds	5,200-15,599 pounds	15,600 pounds and over	Total	Less than 5,200 pounds	5,200-15,599 pounds	15,600 pounds and over	Total
	Number				*Million pounds*			
1981:								
North Atlantic	31	2	3	36	17	[1]	107	124
East North Central	11	1	7	19	10	[1]	284	294
West North Central	5	2	21	28	2	[1]	937	939
South Atlantic	1	1	8	10	[2]	[1]	701	701
South Central	2	1	6	9	[2]	[1]	321	321
West	11	5	10	26	5	[1]	561	566
United States	61	12	55	128	34	(108)[1]	2,911	2,945
1972:								
North Atlantic	23	4	0	27	14	43	0	57
East North Central	16	3	6	25	16	28	200	244
West North Central	11	7	23	41	3	88	686	777
South Atlantic	5	3	9	17	4	28	346	378
South Central	10	3	7	20	11	27	277	315
West	11	10	12	33	8	113	388	509
United States	76	30	57	163	56	327	1,897	2,280
1970:								
North Atlantic	17	4	0	21	13	37	0	50
East North Central	15	8	5	28	16	74	142	232
West North Central	7	12	17	36	7	161	446	614
South Atlantic	9	[3]	8	17	10	[3]	261	271
South Central	10	5[3]	7	22	20	63[3]	252	335
West	10	12	10	32	17	146	323	486
United States	68	41	47	156	83	481	1,424	1,988
1962:								
North Atlantic	36	[4]	0	36[4]	30	[4]	0	30[4]
East North Central	53	8[4]	[5]	61[5]	69	66	[5]	135[5]
West North Central	35	22	12[5]	69[45]	54	202	269[5]	525[5]
South Atlantic	24	8	0	32	26	85	0	111
South Central	26	8	[6]	34[6]	32	78	[6]	110[6]
West	20	16	13[6]	49[6]	15	145	310[6]	470[6]
United States	194	62	25	281	26	576	579	1,381

[1]Included in larger size category.
[2]Less than 500,000 pounds.
[3]Plants and volume for South Atlantic and South Central regions have been combined to avoid disclosure of individual plants.
[4]Plants and volume for North Atlantic and East North Central regions have been combined to avoid disclosure of individual plants.
[5]Plants and volume for East North Central and West North Central regions have been combined to avoid disclosure of individual plants.
[6]Plants and volume for South Central and Western regions have been combined to avoid disclosure of individual plants.

Source: Compiled from unpublished data, Food Safety and Inspection Service, U.S. Department of Agriculture.

Concentration by Leading Firms

Turkey processing has become more concentrated in larger firms over the past two decades. Concentration ratios reflect the portion of total industry volume represented by the largest firms. These ratios increased until the midseventies as the largest firms increased their share of the total volume slaughtered (table 13 and 14). Concentration has changed little since 1975, although the leading companies have increased their share of plants operated. The four largest firms operated 14 percent of the 115 total plants in 1982 and slaughtered 33 percent of the total volume. The eight largest firms operated 25 percent of all turkey plants and slaughtered 55 percent of the volume. The 20 largest firms operated 39 percent of all plants and 87 percent of the volume; thus, these plants had more than twice the industry average volume. However, the largest firms also are consolidating their slaughtering operations and continuing to close selected plants. Only 86 firms operated turkey slaughter plants in 1982, down from 249 in 1960.

Concentration of Further Processing Firms

Further processing—using RTC turkey meat to make ground, formed, boned, cooked, or prepared products—is the most rapidly growing sector of the turkey industry. In 1982, 438 firms used over 1 billion pounds of RTC turkey in further processing in 472 plants. Fifty firms each used more than 2 million pounds of turkey to produce further processed turkey products in 1982 (table 15). These 50 firms operated 84 further processing plants, accounting for 92.8 percent of the total volume. The top eight firms further processed 54.7 percent of

Table 13—Federally inspected turkey slaughter, by firm size and plants operated, selected years, 1960–82

Firm size	1960	1964	1968	1972	1975	1980	1981	1982
				Percent				
Share of federally inspected turkey slaughtered:								
4 largest firms	22	22	30	32	37	38	34	33
8 largest firms	32	33	44	46	54	58	54	55
20 largest firms	50	51	65	72	82	86	84	87
				Number				
Plants operated by:								
4 largest firms	34	29	30	23	28	19	23	16
8 largest firms	41	37	38	32	39	34	32	29
20 largest firms	60	56	54	49	55	53	49	45

Source: (*33, 40*).

Table 14—Turkey processing firms accounting for specified proportions of federally inspected output, selected years, 1960–82

Federally inspected output	1960	1964	1968	1972	1975	1980	1981	1982
				Number of firms				
30 percent	6	6	4	4	3	3	4	4
50 percent	18	17	10	9	7	7	7	8
70 percent	40	35	21	19	14	12	13	13
80 percent	57	48	30	26	19	17	18	17
90 percent	87	69	43	38	28	24	27	24
95 percent	121	93	53	48	41	40	40	31
100 percent	249	189	102	163	99	102	99	86

Source: 1960 and 1964 data from (*40*). Later material from unpublished inspection data, Food Safety and Inspection Service, U.S. Department of Agriculture.

Table 15—Firms further processing turkey, 1982

Firm size	Plants further processing	Turkey used in further processing		Turkey slaughtered by further processors	
		Volume	Share of total	Volume	Share of total slaughter
	Number	*1,000 lbs RTC*	*Percent*	*1,000 lbs RTC*	*Percent*
4 largest firms	11	364,097	36.27	650,379	26.45
8 largest firms	20	549,452	54.73	1,008,395	41.01
12 largest firms	36	673,909	67.13	1,247,892	50.75
20 largest firms	52	815,972	81.28	1,594,597	64.85
50 largest firms[1]	84	931,854	92.82	2,184,487	88.84
74 largest firms[2]	108	965,537	96.18	2,205,142	89.68
103 largest firms[3]	137	985,620	98.18	2,205,277	89.69
Total 438	472	1,003,939	100.00	2,365,462	96.20

RTC = Ready to cook.
[1]Firms which used 2 million or more pounds of turkey per firm for further processing.
[2]Firms which used 1 million or more pounds of turkey per firm for further processing.
[3]Firms which used 500,000 or more pounds of turkey per firm for further processing.

Source: Computed from unpublished data, Food Safety and Inspection Service, U.S. Department of Agriculture.

total further processed volume and also slaughtered 41.0 percent of all turkeys.

Although some firms are more specialized, the leading turkey slaughterers are also among the leaders in further processing. The top 50 further processing firms accounted for 88.8 percent of the total turkey slaughter, although 25 of these firms did not slaughter.

Although plant numbers are decreasing in most sectors, further processors are expanding by operating more plants and increasing the size of these plants. In 1974, statistics on further processed products were first reported separately from whole-body further processed; 384 plants used 510 million pounds of turkey in further processed items. By 1982, the number grew to 472 plants further processing over 1 billion pounds (table 16). Most of these plants further process relatively small volumes of turkey; the 335 which use less than 0.5 million pounds processed only 18 million pounds. A few plants handle large volumes; 11 plants each used more than 27 million pounds (the size of the largest plant in 1974). These 11 largest plants in 1982 processed 511 million pounds—the same volume as the total industry processed in 1974.

In 1974, 15 plants used more than 9 million pounds each; 11 of these 15 plants continued to use at least that volume in 1982. These 11 plants used a total of 177 million pounds in 1974 and 378 million pounds in 1982, more than doubling their volume in 8 years. In 1982, a total of 25 plants each further processed more than 9 million pounds of turkey.

Processing Costs

Specialized turkey processing plants can transform a 24-pound liveweight tom turkey into a 19-pound frozen RTC whole bird at a total cost of less than 15 cents per pound RTC (table 17). About a third of the cost of the transformation is for processing labor and about a sixth is for packaging. Energy costs about 1 cent per RTC pound, excluding freezing. Freezing and storing for the first month cost about 1.4 cents per pound. Building, equipment, administrative, and overhead costs are about 3.5-4.0 cents per pound RTC turkey. These are average costs for commodity-packed frozen whole turkeys, free-on-board (f.o.b.) processing plant. Storage charges for each additional month add 0.8 cent per pound (plus interest) and freight adds 2-5 cents per pound. Premium products entail more service and materials; hence, there are added costs for basting, packaging, cooking thermometers, storage, advertising, shipping, and distributing.

Although regional costs differ only slightly, processing costs tend to be lowest in the South and highest in the West. Processing labor costs about 0.5 cent less per pound RTC turkey in the South than the U.S. average. Building and equipment costs in the West are about 1.0 cent above the U.S. average, whereas these costs in the

other regions are about 0.5 cent below average. Costs in the West are about 0.9 cent above the U.S. average, whereas costs in the South are 0.5 cent below average.

Processing costs for tom turkeys are about 0.2 cent per pound below the average, and processing costs for hens are 0.2 cent above the average. Fryers cost 4-6 cents per pound more than the average to process, due mostly to the smaller average bird size and lower yield.

The 1982 average processing cost of 14.2 cents for hens and toms compares with 1970 costs of 8.5 cents per pound for hens and 7.2 cents for toms. Greater use of offseason capacity has held down increases in average processing costs. Increased output per hour of processing labor is the next most important factor in restraining cost increases *(4, 20)*.

Value Added by Manufacture

The Census of Manufactures measures value added by manufacturing for establishments by subtracting the cost of materials, supplies, fuel, and energy from the value of shipments (table 18). Total labor costs run about 50 percent of the value added by turkey dressing plants, which is comparable to poultry dressing plants and meat packing plants. Labor efficiency is therefore important, and new technology is critical in boosting output per hour of labor.

Turkey processors have been increasing capital expenditures at a relatively higher rate than the overall poultry dressing industry and at a much higher rate than the meat packing industry. This difference is due to rapid expansion of the turkey industry and to the continued development of new further processed products. Turkey processors made new capital expenditures of $27.9 million in 1977 compared with only $6.0 million in 1972 (table 18). Capital expenditures for turkey processors in 1977 as a ratio of value added by manufacturers, value of shipments, hours worked, wages, and payroll were well above expenditure ratios for poultry and meat packers, although the three industries were comparable in 1972. However, these industries do have cyclical pat-

Table 16—Further processing of turkey, by size of plant, 1974 and 1982

Annual plant volume	1974				1982			
	Plants	Annual volume	Share of total volume	Cumulative share of total volume	Plants	Annual volume	Share of total volume	Cumulative share of total volume
	Number	*1,000 lbs*	*Percent*		*Number*	*1,000 lbs*	*Percent*	
0-9,999 lbs	140	458	0.1	0.1	158	453		
10,000-49,999 lbs	76	1,761	.3	.4	96	2,370	0.2	0.2
50,000-99,999 lbs	18	1,370	.3	.7	38	2,785	.3	.5
100,000-299,999 lbs	36	6,941	1.4	2.1	43	7,823	.8	1.3
300,000-499,999 lbs	13	5,200	1.0	3.1	21	8,235	.8	2.1
500,000-999,999 lbs	21	14,462	2.8	5.9	29	20,645	2.1	4.2
1.0-1.999 million lbs	21	30,577	6.0	11.9	24	34,625	3.4	7.6
2.0-4.999 million lbs	24	73,692	14.4	26.4	26	84,621	8.4	16.0
5.0-9.999 million lbs	22	153,335	30.1	56.4	15	102,151	11.2	27.2
10.0-14.999 million lbs	6	70,161	13.8	70.2	4	57,098	5.7	32.9
15.0-19.999 million lbs	2	36,082	7.0	77.2	3	52,529	5.2	38.1
20.0-24.999 million lbs	4	88,946	17.4	94.7	3	68,250	6.8	44.9
25.0-29.999 million lbs	1	27,179	5.3	100.0	3	83,853	8.4	53.3
30.0-49.999 million lbs	0	—	—	—	5	198,381	19.8	73.1
50.0-84.999 million lbs	0	—	—	—	4	270,145	26.9	100.0
Total	384	510,164	100.0	100.0	472	1,003,939	100.0	100.0

— = Not applicable.

Source: Computed from unpublished data, Food Safety and Inspection Service, U.S. Department of Agriculture.

Table 17—Turkey processing plant costs, 1982[1]

Item	Cents per pound RTC
Labor	4.83
Packaging	2.59
Energy[2]	1.04
General operating and supplies	.75
Freezing and 1 month storage	1.37
Building and equipment	1.45
Administrative and overhead	2.16
Total processing cost	14.19

[1]Approximate adjustments in cents per pound from U.S. average for ready-to-cook (RTC), frozen whole bird, commodity pack:

Variable	*Cents*
Hens	+ 0.2
Toms	− .2
Fryers	+ 4.0 to 6.0
West Coast	+ .9 (primarily due to building and equipment cost)
South	− .5 (primarily due to labor costs)
Storage	+ .8 per additional month
Shipping	+ 2.0 to 5.0

Premium packs, advertising, cutting up, and further processing also are additional costs.

[2]Excluding energy for freezing.

Source: Data provided by representative processors.

terns in production and prices which influence capital investment by changing their need for new capacity and the financial ability of the firms. Availability of new technology also influences timing of investment.

Turkey and poultry processors in 1977 and 1972 added about 20 percent of the value of their sales; meat packers added about 13 percent. However, meat packers added twice as much dollar value per hour of labor as did turkey or poultry plants. Wages constitute a slightly higher proportion of total payroll for turkey processors than for meat packers.

Seasonal Processing

More uniform processing throughout the year accounts for much of the capacity required to process the greater volume of turkey production in recent years (tables 19 and 20). Monthly proportions of total volume in 1982 certified as RTC varied from 5.0 percent in February to 11.8 percent in November. Monthly proportions in 1965 ranged from 1.0 percent in February to 20.7 percent in November (table 20).

If producers had followed the same seasonal pattern in 1982 as they did in 1960, October's RTC production would have been 499 million pounds rather than 277 million pounds and would have required additional investment in facilities. However, March production would have been only 35 million rather than the actual 155 million pounds, implying a lot of seasonally idle capacity.

Total annual production of RTC turkey increased 1.233 billion pounds during the 1965-83 period from 1.330 billion to 2.563 billion pounds. November processing was 289 million pounds in 1983, an increase of less than 15 million pounds over 1965. February volume, however, was 136 million pounds in 1983, which was 10 times greater than in 1965. Total slaughter for the first half year (January-June) increased from 157 million pounds in 1965 to 1,044 million pounds in 1983, a jump of 887 million pounds in 17 years. The comparable increase for the last half year (July-December) was from 1.173 billion pounds to 1.519 billion pounds, an increase of 346 million pounds or 30 percent. Approximately 70 percent of the increased processing volume was realized in the first half year.

By decreasing seasonality in processing, processors have increased total annual volume with relatively limited expansion of plant facilities. Yearly volume has increased 85 percent since 1965 and, because plants tend to operate at capacity in the peak season, they would have required a much larger expansion if the seasonal pattern had not changed.

Processors could increase aggregate processing volume still further by continuing to even out the current seasonal pattern, although this method would require increased storage. Assuming that processing facilities operate at capacity during October and November, uniform volume for the full 12 months would allow a current annual capacity of 3.4 billion pounds. Even if each plant shut down for 1 month, these plants could process 3.1 billion pounds RTC turkey with current facilities, a 25-30 percent potential expansion. The industry has not yet fully utilized its processing capacity.

If individual plants were to fully utilize their current plant capacity, they could process 3.8 billion pounds of RTC a year, about 35 percent more than their actual 1982 volume (table 21). We calculated unused capacity by multiplying peak monthly output for each individual plant by 12 to get annual capacity. The plants' actual 1982 output was subtracted from this calculated capacity, with the difference representing the annual capacity

unused because of seasonal variation in processing at levels below the peak month. However, plant managers doubt they could operate all year at the same intensity as during their peak month, so not all of this unused capacity would be available for increased output.

Individual plants have different seasonal patterns. Larger plants operate more months than do smaller plants (tables 21 and 22). All 19 plants with annual output over 50 million pounds operate at least 10 months, and 15 operate in all 12 months. Of the 23 plants with 20-50 million pounds of output, 6 operate 12 months and 16 operate at least 10 months. Even though these 42 largest plants have the most uniform seasonal patterns, they also have the most reserve capacity.

Small plants tend to be highly seasonal. Only 2 of the 39 plants processing below 500,000 pounds RTC per year operate more than 7 months, and 21 plants operate 3 months or less. Most of these small plants are turkey producers who process and even retail much of their farm output. Most of their workers are part-time seasonal employees. Thus, smaller plant capacity would be difficult to use other than seasonally. If all 60 plants with less than 10 million pounds per year each were to operate year round at peak capacity, their production would add only 120 million pounds to annual volume.

Most plants (42 of the 55) slaughtering 10 or more months also further process turkey. However, only 16 of the 60 plants operating fewer than 10 months further process, and their further processed volume totals only 34 million pounds. Seasonal plants tend to be whole bird plants. Further processors also tend to be larger plants. Only 11 of the 50 plants under 1 million pounds RTC per year further process. Of the 65 plants above 1 mil-

Table 18—Selected characteristics of turkey dressing, poultry dressing, and meat packing plants, 1972 and 1977[1]

Item	Unit	1977			1972		
		Turkey dressing plants	Poultry dressing plants	Meat packing plants	Turkey dressing plants	Poultry dressing plants	Meat packing plants
Establishments	Number	56	446	2,590	72	522	2,475
Employees	1,000	13.2	86.8	146.2	11.3	77.6	157.6
Total payroll	Million dollars	89.2	612.3	2,110.6	58.4	391.8	1,533.1
Production workers	1,000	11.6	77.7	116.5	10.2	70.7	123.4
Wages	Million dollars	71.3	496.3	1,625.9	47.2	331.1	1,149.1
Hours worked	Millions	19.6	143.6	237.2	18.7	139.3	254.6
Value added	Million dollars	176.0	1,236.9	4,010.0	116.0	724.4	2,970.1
Cost of materials	do.	774.8	4,520.1	27,239.9	428.1	2,527.0	20,138.6
Value of shipments	do.	961.4	5,746.1	31,208.2	546.5	3,254.1	23,024.0
New capital expenditures	do.	27.9	126.1	236.7	6.0	45.5	167.9
Wages as share of payroll	Percent	79.9	81.1	77.0	80.8	84.5	75.0
Wages as share of value added	do.	40.5	40.1	40.5	40.7	45.7	38.7
Payroll as share of value added	do.	50.7	49.5	52.6	50.3	54.1	51.6
Value added as share of value of shipments	do.	18.3	21.5	12.8	21.2	22.3	12.9
New capital expenditures as share of:							
Value of shipments	do.	2.9	2.2	.8	1.1	1.4	.7
Value added	do.	15.9	10.2	5.9	5.2	6.3	5.7
Wages	do.	39.1	25.4	14.6	12.7	13.7	14.6
Payroll	do.	31.3	20.6	11.2	10.3	11.6	11.0
New capital per hour worked	Dollars	1.42	.88	1.00	.32	.33	.66
Value added per hour	do.	8.98	8.61	16.91	6.20	5.20	11.67
Wages per hour	do.	3.64	3.46	6.85	2.52	2.38	4.51

[1]Type of plants is based on primary product class.

Source: (*78*).

Table 19—Turkey slaughter and processing under Federal inspection, by months for selected years, 1960–83

Item	January	February	March	April	May	June	July	August	September	October	November	December	Annual
							Millions						
Turkeys inspected:													
1960	1.8	1.4	1.6	1.9	2.7	3.9	4.5	9.2	10.9	12.9	11.9	8.1	71
1965	1.9	1.2	1.5	1.7	2.4	4.6	7.8	12.3	15.1	17.1	17.2	9.9	93
1970	2.6	1.7	2.1	2.4	3.7	8.2	12.4	14.5	16.0	17.5	15.2	9.2	106
1975	4.3	3.6	4.4	5.3	6.2	10.2	13.9	14.4	15.6	17.0	14.3	10.1	119
1980	9.0	7.5	9.3	10.1	12.7	14.5	16.9	15.8	16.7	18.2	16.0	12.2	159.1
1981	9.0	8.3	9.7	10.4	11.9	15.3	17.0	17.6	18.3	18.6	17.6	12.7	166.3
1982	7.9	7.8	10.7	9.8	10.9	14.3	15.3	17.9	17.8	17.8	18.5	11.7	160.4
1983	8.5	8.5	12.0	10.6	12.1	15.2	14.9	18.4	17.4	18.1	17.9	11.3	165.0
							Million pounds						
Liveweight:													
1960	27.4	17.5	17.1	20.8	33.9	57.6	64.8	138.7	188.0	241.6	227.3	155.3	1,190
1965	39.2	17.2	18.5	19.7	34.0	68.3	119.7	204.7	280.6	328.5	345.9	192.6	1,669
1970	52.3	28.4	28.6	35.5	57.0	138.5	217.0	267.1	310.3	351.4	211.7	190.0	1,988
1975	82.7	60.0	68.8	86.5	103.1	175.0	242.8	256.4	288.3	324.3	277.3	198.5	2,164
1980	179.0	138.9	157.0	178.5	223.0	256.3	302.4	284.2	303.4	342.7	305.2	237.0	2,908
1981	180.2	152.8	173.3	188.7	224.4	284.4	316.9	330.0	344.7	366.4	351.4	258.5	3,171.7
1982	167.3	155.7	196.1	185.8	205.4	269.8	285.1	332.4	334.2	346.4	364.3	242.5	3,085.1
1983	182.6	172.1	229.7	208.8	230.5	290.4	282.7	341.8	331.1	353.4	362.1	237.4	3,222.6
Total certified RTC:[1]													
1960	22.1	14.0	13.4	16.2	27.1	46.0	51.9	109.5	149.6	192.3	181.3	125.0	948.4
1965	31.2	13.7	14.5	15.6	27.0	54.7	95.7	163.6	224.4	262.1	275.1	152.5	1,330.1
1970	40.5	22.2	22.1	27.6	44.9	109.5	172.1	212.0	244.6	276.9	244.9	149.2	1,566.5
1975	64.9	47.1	54.4	68.7	81.9	138.4	193.2	203.3	229.0	257.5	220.2	157.5	1,716.1
1980	141.2	109.4	127.9	143.0	178.4	206.9	240.3	227.0	244.3	276.3	246.3	190.8	2,332.4
1981	142.1	119.6	136.4	149.3	178.3	225.7	250.4	261.7	273.1	290.1	278.3	204.2	2,509.1
1982	132.2	123.3	154.9	147.4	164.3	216.2	228.3	265.4	267.7	276.6	289.8	192.7	2,458.9
1983	144.1	135.5	182.7	166.5	183.7	231.3	224.8	271.8	263.7	281.3	288.7	189.0	2,563.1
Frozen:													
1960	20.0	12.3	11.0	12.5	22.8	39.0	43.8	95.5	129.1	168.4	144.1	102.0	800.4
1965	23.9	11.3	11.1	11.4	19.1	40.9	75.8	136.1	188.8	217.8	208.1	105.4	1,049.7
1970	30.3	16.5	16.2	20.1	33.7	90.6	142.9	179.0	207.7	232.7	183.8	103.4	1,256.9
1975	46.9	33.8	37.9	52.3	64.9	109.2	162.7	171.9	190.7	209.1	160.1	110.0	1,349.5
1980	92.9	74.9	89.1	101.3	131.9	155.9	185.7	175.9	189.9	208.8	163.1	130.1	1,699.3
1981	102.1	85.1	97.1	108.5	135.9	177.5	201.4	203.9	211.0	214.4	180.3	129.9	1,847.1
1982	91.4	82.0	99.1	97.4	115.4	153.8	166.5	191.7	193.4	196.9	181.5	116.1	1,685.2
1983	88.0	83.1	114.8	110.6	128.9	167.2	164.6	190.9	190.5	198.4	176.5	105.9	1,719.4
Chilled:													
1960	2.1	1.7	2.4	3.8	4.3	7.0	8.1	14.0	20.5	23.9	37.2	23.0	148.1
1965	7.3	2.3	3.4	4.2	7.8	13.8	19.9	27.6	35.7	44.3	66.9	47.1	280.3
1970	10.2	5.7	5.9	7.4	11.2	19.0	29.2	33.0	36.9	44.2	61.1	45.8	309.6
1975	18.0	13.3	16.6	16.4	17.1	29.2	30.5	31.3	38.3	48.4	60.1	47.4	366.6
1980	48.4	34.6	38.9	41.7	46.5	51.1	54.6	51.1	54.5	68.0	83.2	60.7	633.1
1981	40.0	34.6	39.3	40.8	42.4	48.1	49.1	57.8	62.1	75.7	98.0	74.3	662.1
1982	40.8	41.4	55.8	49.9	48.9	62.4	61.8	73.7	74.4	79.7	108.3	76.6	773.7
1983	56.1	52.4	67.9	55.9	54.8	64.0	60.1	81.0	73.2	82.9	112.2	83.1	843.7

[1]RTC = Ready-to-cook.

Source: (*76*).

Table 20—Seasonality of turkey slaughter, cutup, and further processing, monthly processing as percentage of yearly total[1]

Item	January	February	March	April	May	June	July	August	September	October	November	December	Annual volume
							Percent						*Million pounds*
Certified RTC:[2]													
1960	2.3	1.5	1.4	1.7	2.9	4.9	5.5	11.6	15.8	20.3	19.1	13.2	948
1965	2.3	1.0	1.1	1.2	2.0	4.1	7.2	12.3	16.9	19.7	20.7	11.8	1,330
1970	2.6	1.4	1.4	1.8	2.9	7.0	11.0	13.5	15.6	17.7	15.6	9.5	1,567
1975	3.8	2.7	3.2	4.0	4.8	8.1	11.3	11.8	13.3	15.0	12.8	9.2	1,716
1980	6.1	4.7	5.5	6.1	7.6	8.9	10.3	9.7	10.5	11.9	10.6	8.8	2,332
1981	5.7	4.8	5.4	6.0	7.1	9.0	10.0	10.4	10.9	11.6	11.1	8.1	2,509
1982	5.4	5.0	6.3	6.0	6.7	8.8	9.3	10.8	10.9	11.2	11.8	7.8	2,459
1983	5.6	5.3	7.1	6.5	7.2	9.0	8.8	10.6	10.3	11.0	11.3	7.4	2,563
Cutup:													
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1965	5.8	3.7	5.4	4.0	4.1	5.4	5.6	11.1	14.4	15.9	14.2	10.2	97
1970	5.7	5.5	5.2	5.1	5.1	7.4	10.5	11.0	12.1	13.1	10.3	9.2	191
1975	6.9	5.5	5.3	6.7	6.9	8.1	8.7	9.5	10.6	12.6	10.0	9.2	313
1980	8.7	7.3	7.3	7.4	8.1	9.1	8.1	8.1	7.9	10.1	9.0	8.9	656
1981	8.5	6.8	7.8	7.1	8.1	8.4	8.0	8.6	8.5	9.6	9.2	9.4	701
1982	7.3	7.7	8.5	6.6	7.3	8.8	6.8	8.9	9.2	10.3	9.9	8.7	734
1983	7.8	7.5	8.2	7.9	8.4	7.8	7.3	9.3	9.0	9.3	9.3	8.2	809
Further processed, whole body:													
1960	5.7	5.0	6.9	5.6	6.3	6.9	6.5	8.5	9.8	13.1	13.5	11.7	54
1965	6.7	6.0	7.0	7.1	6.6	7.6	8.7	8.4	9.2	11.0	11.0	10.5	105
1970	7.6	6.4	5.8	5.4	5.2	7.4	9.9	10.2	11.1	12.7	10.4	8.3	201
1975	5.1	4.5	4.9	5.4	5.0	7.6	10.9	11.8	12.3	14.2	10.9	7.4	372
1980	4.3	4.6	5.1	4.7	6.8	8.3	10.4	10.8	12.5	15.3	10.1	7.2	671
1981	4.2	3.3	4.6	5.3	6.5	10.2	12.3	13.0	12.6	12.3	10.0	5.6	706
1982	4.2	4.3	5.3	5.3	7.1	8.4	10.8	14.0	13.7	12.0	9.8	5.3	747
1983	3.5	3.4	6.7	5.8	7.3	10.4	11.8	12.6	12.0	13.0	8.9	4.8	709
Further processed, other than whole:													
1960	5.5	5.1	6.6	5.3	6.2	6.6	6.4	8.3	9.6	13.2	13.4	13.4	47
1965	6.7	6.0	6.9	7.1	6.5	7.6	8.6	8.4	9.1	10.9	11.0	11.4	147
1970	7.6	6.3	5.7	5.4	5.1	7.4	9.8	10.2	11.1	12.7	10.4	8.3	278
1975	5.0	4.4	4.9	5.4	5.0	7.6	10.9	11.8	12.3	14.2	10.9	7.4	536
1980	7.0	7.0	7.0	7.0	8.4	8.9	9.0	9.3	10.4	10.2	8.1	7.8	953
1981	7.3	7.0	8.1	7.7	7.9	8.5	8.4	9.4	9.3	9.6	8.9	7.9	985
1982	6.4	6.2	8.7	6.5	7.3	8.2	7.2	9.2	9.6	10.1	9.0	8.7	1,034
1983	6.9	7.2	8.2	7.6	7.8	8.7	8.0	9.7	9.6	9.9	9.2	7.2	1,144

NA = Not available.
[1]Cutup and further processed volumes are not additive.
[2]RTC = Ready-to-cook.

Source: (*76*).

lion pounds, 47 further process turkey products. Thus, large-volume turkey plants tend to slaughter year round and to further process; small volume plants are seasonal and do little further processing *(9, 16, 57)*.

Industry Coordination

Industry adjustments to the following three major problems have helped to bring about the types of coordination today's turkey industry uses: (1) bearing risk, (2) procuring inputs, and (3) assuring markets. The structure of the industry is dynamic and adjusts to current pressures. Coordination has been achieved through a combination of three types of organization: (1) open market (price), (2) direct ownership, and (3) contracts *(18, 20, 21, 26, 32, 33, 34, 36, 43, 44, 49, 51, 55, 56, 58)*.

Open Market Pricing

Each industry participant responds individually to price changes. Prices provide the incentive to guide production and utilization at each stage and to allocate both costs and returns to each participant. Consumers may bid up to the price, which is then relayed back through the system, resulting in additional capital and labor so as to increase production. If consumers want less turkey or change their preference for turkey products, production decreases. Cost savings from improved techniques work their way though the market, beginning with producers and ending with lower prices to consumers.

Considerable lag time can be expected as each entrepreneur assesses the market situation, making decisions and individual adjustments. Each will independently secure the necessary financing and bear the risk of production and market changes.

This chain reaction of responses illustrates both why the open market system is not always totally acceptable and what opportunities exist to create a more effective system. Responses by producers and by others in different stages of the industry vary both in timing and degree of adjustment. Economies of scale also differ at each stage. Marked changes in volume and quality, especially over short periods, may result in higher unit costs. Growing turkeys is a batch process, whereas most of the other stages are part of a flow process. Risk of physical loss is greatest for growers, who also bear the greatest risk of price changes between the time a commitment is made and the product is sold. Growers also experience the greatest price fluctuations and have the most difficulty obtaining financing.

Direct Ownership

Many production and marketing uncertainties, risks, and other problems can be decreased by a firm's owning all

Table 21—Effect of seasonality on use of capacity by turkey processing plants, 1982[1]

Annual plant volume RTC[2]	Plants	Annual capacity	Actual volume RTC	Capacity not used	Capacity not used	Range of percentage of plant capacity not used
	Number	*Million pounds*			*Percent*	
0-99,000 lbs	20	5.4	1.2	4.2	86.3	59-92
100,000-499,000 lbs	19	28.2	4.5	23.7	84.0	51-92
500,000-999,000 lbs	11	42.9	8.4	34.5	80.4	55-89
1.0-9.9 million lbs	10	117.4	59.9	57.5	49.0	23-73
10.0-19.9 million lbs	13	406.3	200.0	206.3	50.8	28-72
20.0-49.9 million lbs	23	1,350.6	775.9	574.7	42.6	15-59
50.0 million lbs and up	19	1,838.7	1,409.0	429.7	23.4	6-39
Total	115	3,789.5	2,458.9	1,330.6	35.1	6-92

[1]Annual capacity calculated by multiplying peak monthly volume for each individual plant by 12 and adding the plant totals for each size grouping. Subtracting actual plant volume from this calculated total equals unused capacity.
[2]RTC = Ready-to-cook.

Source: (*76*).

Table 22—Seasonal patterns of turkey processing, slaughter plants, 1982

Item	Plants operating specified number of months											Total slaughter		Further processing by slaughter plants	
	1-2	3	4	5	6	7	8	9	10	11	12	Plants	Volume RTC	Plants	Turkey used in further processing
	Number											*Number*	*Million pounds*	*Number*	*Million pounds*
Plant volume:															
1,000-99,000 lbs	12	2	2	2	1	—	—	1	—	—	—	20	1.2	2	*
100,000-499,000 lbs	6	1	3	2	3	3	—	—	—	—	1	19	4.5	5	*
500,000-999,000 lbs	1	2	2	1	—	—	—	1	3		1	11	8.4	4	.6*
1.0-9.9 mil. lbs	—	—	—	—	2	—	1	—	4	2	1	10	59.9	7	27.5
10.0-19.9 mil. lbs	—	—	—	2	2	—	—	1	1	4	3	13	200.0	9	32.1
20.0-49.9 mil. lbs	—	—	—	—	2	1	1	3	5	5	6	23	775.9	15	142.2
50.0 mil. lbs and up	—	—	—	—	—	—	—	—	3	1	15	19	1,409.0	16	418.5
Plants total	19	5	7	7	10	4	2	6	16	12	27	115			
Plants further processing[1]	1	1	1	4	4	2	1	2	10	9	23			58	
	Million pounds														
Volume, ready-to-cook	2.0	2.6	1.7	32.5	86.1	31.0	31.0	113.4	376.3	357.2	1,425.1		2,458.9		
Volume, cumulative	2.0	4.6	6.3	38.8	124.9	155.9	186.9	300.3	676.6	1,033.8	2,458.9				
Volume, further processed	*	*	*	*	*	*	8.8	20.3	75.8	21.4	490.0				620.9
	Percent														
Cumulative percentage of RTC volume	.1	.2	.3	1.6	5.1	6.3	7.6	12.2	27.5	42.0	100.0				

Blanks indicate not applicable.
— = No plants operating in that combination.
* = Volumes not shown for individual classes; volume included in total.
[1]Further processing of turkey by turkey slaughtering plants only; does not include other plants. A total of 1,034 million pounds of turkey was utilized in further processing by all type of plants.

Source: Compiled from unpublished data, Food Safety and Inspection Service, U.S. Department of Agriculture.

or most of the major stages of production and processing. The firm can coordinate the flow of physical product through all stages and reduce the risks both of physical loss and price changes. Labor can be scheduled more effectively and adquate financing is more readily available. Direct ownership as a form of economic integration is expanding (table 23).

Direct ownership, however, raises new problems. Net returns to the different stages tend to differ, with growout often having low returns by industry standards. Owners need large sums of investment capital and operating funds. The turkey industry has been a cyclical industry, with recurring periods of low or negative returns. Maintaining and supervising the necessary farm and other labor at numerous locations is difficult. Incentives to encourage efficiency have not always worked satisfactorily. Many firms are unwilling to accept the total risk of price changes. Complete ownership of facilities may deter some innovations because of the difficulty of initiating and supervising different systems. Some firms have found that their own managerial styles are not well suited to all stages of production and marketing.

Table 23—Types of coordination in the turkey industry, 1955–77

Year	Percentage of total output involved in—			
	Owner-integrated enterprises	Contract production	Contract marketing	Total coordinated production
	Percent			
1955	4	21	11	36
1960	4	30	16	50
1965	8	35	13	56
1970	12	42	18	72
1975	20	47	14	81
1977	28	52	10	90

Source: (*45*).

Contracts

Contracting for certain services may alleviate some of the problems with either open-market pricing or direct ownership. Feed mills, using a variety of payment provisions, often contract with growers to expand feed sales and to better utilize mill capacity. Growers enter contracts to obtain financing and reduce risk. Processors seek assurance of a supply of live birds of specified weight and grade to meet their processing needs. Processors are now the primary firms contracting with growers and, with their access to market and to storage, are in a stronger position to provide growers with price protection.

Contract production with growers has increased as a proportion of total turkey meat production and now accounts for more than half of all turkeys produced (table 23). Production contracts are of two types: (1) resource-providing contracts and (2) cost-plus contracts. A third type of contract, generally between processors and independent growers, specifies pricing arrangements or formulas to be used at marketing. A discussion of each type of contract follows.

The three types of contracts we describe are used in varying degrees in each of the major turkey producing areas. Different firms, primarily because of the nature of their operations, prefer different arrangements. As the open market for live turkeys at the farm level has dwindled nearly to the point of disappearing, processors and growers have adjusted their operations. When adequate supplies of turkeys were not available as processors needed them, processors began raising their own turkeys or contracting for assured supplies. This practice reduced the sales outlets for independent growers, who began demanding assurance of shackle space at the time their turkeys would be ready for market. Similar structural changes confront hatcheries and growers in the poult market.

The balance between the marginal quantities available in the open market and the marginal quantities demanded became more volatile. This volatility in turn resulted in greater price volatility. Faced with uncertain supply, uncertain outlets, and volatile prices, all parties were under pressure to reduce these uncertainties; contracts appeared to be the logical answer.

Some feed millers have taken the lead in developing contracts to suit the special needs of each stage. Feed millers sometimes contract to supply processors with a given number of turkeys; sex, size, grade, and time are all specified. The feed miller then contracts with a number of growers to brood and grow out the birds. Contracts with processors are generally formula-pricing contracts whereas those with growers are mostly resource-providing contracts. Cost-plus contracts also are used at both stages, but represent only a small volume, usually to provide off-season birds. Discussions with processors and feed millers indicated that they used the futures market

to hedge the cost-plus contracting phase of their operations more than any other. This practice is consistent with conditions leading to use of cost-plus contracts—namely, the greater risk, marginal decision to produce, and depletion of financial reserves by a period of adverse prices. In such cases, the higher perceived risk is transferred to the mill or processor, who then covers it—or at least reduces it—by hedging the main cost, feed.

Resource-Providing Contracts. These contracts represent the major means of procuring live turkeys for processing. Both processors and feed millers employ these contracts to help expand their volume and to reduce seasonal and day-to-day fluctuations in the use of their facilities. This type of contract requires a lower capital investment than does direct ownership for the contractor, and it provides operating capital for the grower. The contractor generally provides the poults, feed, medication, part of the litter, some fuel allowance, and managerial assistance through a field service representative who visits each flock at least once a week. The grower provides the building and equipment, labor, water, part of the litter, and most of the fuel. The grower is paid on a per-pound or a per-bird basis. Although growers' fees ranged from 2 to 8 cents per pound sold, they averaged 4.33 cents for toms and 5.19 cents for hens in 1982. As they compete in procurement, contractors vary these fees and resources such as fuel, litter, and minor equipment. Almost all contracts provide incentives for efficiency in feed conversion, mortality, and grade out. Over time, net fees to growers by various contractors tend not to vary as much as they do for a single brood.

Contractors bear the risk of physical loss (birds or feed), part of any inefficiency in production, and most price changes for inputs and product. Although hedging may reduce price risk, the industry does little hedging by using the futures market—perhaps because most contractors place poults with several growers so that a flow of product is marketed over time rather than marketing most of the year's production in a short time. Thus, contractors receive average annual prices for their sales and pay average prices for feed—just as if they had used the market to hedge every flock. This averaging of prices and costs has been a major factor in strengthening the position of large contractors. Smaller contractors or feed millers who do not process turkeys often pass on part of their product price risk through pricing contracts with processors. Some smaller contractors split their operations by bearing the risk on some of their flocks and passing on the risk for other flocks.

Growers with resource-providing contracts are subject to placement decisions made by the contractor. Quick turnarounds between broods may press growers for time to clean and prepare barns and equipment. However, longer periods between broods leave growers with underused facilities, raising fixed costs per pound and lowering total pounds produced per year.

Contractors are in a high-risk position regarding variable and adverse cash flow because they lack both the cushion effect of unpaid labor and the noncash depreciation costs agricultural producers so commonly use to maintain their businesses during adverse periods. Neither do contractors have the fixed cost of owning growout facilities when cutting back on the number brooded. Housing and equipment are fixed costs for growers, but are part of cash variable costs for contractors who make the production decisions. Labor, included in the fee paid to growers, also is a cash cost to contractors.

Cost-Plus Contracts. These contracts protect the growers against losses due to low turkey prices, but growers bear normal production risks. These contracts base payment to producers on production costs estimated at stated performance levels. A profit margin is provided, along with incentives based on performance. Inefficiencies in feed conversion, mortality, or grade will lower the incentive payment to producers. Cost-plus contracts often provide for profit sharing when turkey prices or profits rise above certain levels. Some companies combine the resource contract with the cost-plus contract—for example, when poults, feed, medication, and fuel are provided by contractors. Growers provide housing and equipment, litter, and labor and receive 2.5 cents per pound sold, liveweight. All cash costs (including the 2.5 cents) are subtracted from the proceeds at sale. Growers receive the first 2 cents per pound above the cash costs and the remainder is divided equally.

Contractors and growers stated that cost-plus contracts offer new or expanding growers a source of financing not readily available elsewhere and also protect them against price risk. Both agreed that established, well-financed growers would realize lower returns over time by growing under a cost-plus contract than they would as independent producers. Some processors preferred not to use cost-plus contracts, but realized that they might

have to use them to maintain growers who provided their own resources. Cost-plus contracts can help independent growers experiencing extended periods of negative returns. Processors and feed millers can also use this contract to encourage some producers to grow turkeys in the off-season.

Formula-Pricing Contracts. These contracts do not set the price to be paid, but specify the formula to apply to a specified market quote at the time of sale. Contractors are usually processors seeking to assure that a given number of turkeys will be delivered to their plant during a given time period. The contract, written before poults are placed, usually specifies the week of delivery with the day selected by the processor. It is common practice to specify the market quote for RTC turkey on a given wholesale market either on the day of sale or on the average sales for the week. (Some contracts use the average for a 4-week period.) A margin for processing and shipping is deducted from the wholesale quote, and the agreed dressing percentage (usually 80 percent) is applied to convert RTC to a liveweight basis. For example:

New York wholesale quote	= 68.3 cents	
Less processing margin	= 18.5 cents	(including transportation cost to New York)
	49.8 cents	
80-percent yield	= 39.8 cents	(basic liveweight price)

Specified premiums or deductions are used to adjust for grade.

Processors generally encourage independent growers to schedule their operations so as to even out seasonal swings in processing volume. Processing plants operate at peak capacity from October to mid-December and have slack periods, especially during the first quarter of the year. Some processors vary the margins specified in contract formulas during the year about 3-6 cents per pound RTC turkey. They charge the highest processing margins during mid-September to mid-December and the lowest margins during January through May (table 24).

Processors normally post their margins in the fall for the following year. This arrangement gives growers, mills, and hatcheries (who also post their prices about the same time) vital cost information for scheduling operations when annual contracts are being drawn up to cover both processing and poult orders from the hatchery. The arrangement also provides coordination for advanced scheduling by processing plants, growers, feed mills, hatchery, and breeder flock operators and helps to utilize resources more effectively.

Government Regulatory Influences on the Turkey Industry

The turkey industry, unlike some industries, is not subject to direct economic controls by Government. However, a variety of Government regulations and policies influence various segments of the industry and provide the framework within which it operates. Without these government influences, the industry would have a different structure and would respond differently to changes in the marketplace. Some regulations have increased industry costs, while others have directly or indirectly reduced costs. These regulations fall into three categories: (1) economic regulation, (2) environmental, health, and safety regulation, and (3) social regulation.

Economic regulation involves direct Government action as intervention into the market for goods and services—

Table 24—Average processing margins charged in 1982 formula pricing contracts, RTC turkeys[1]

Processing period	Toms	Hens	Fryers
	Cents per pound		
January	17.0	17.5	19.5
February	16.5	17.0	19.0
March-April	15.5	16.5	18.2
May	15.0	16.0	17.5
June	16.0	16.6	18.2
July	17.5	18.1	19.4
August	19.3	19.8	21.1
September-December	21.0	21.6	22.6
Weighted average	18.5	19.2	20.3

RTC = Ready-to-cook.

[1]Margins specified in annual contracts made by representative processors in fall 1981; actual charges could be lowered by the plant. Charges not covered by annual contracts might move up or down.

Source: Data provided by representative processors.

that is, where prices, wages, supplies, or market structure are controlled or regulated. The objectives are to alter the pricemaking process in favor of certain groups or commodities, to make the market system more efficient or less monopolistic, or to eliminate dishonesty and fraud. Environmental, health, and safety regulations involve setting Government standards on various products, services, and activities to protect consumers and workers and to improve the quality of life. Social regulation is concerned with broad social programs to improve the welfare of certain groups or individuals by redistributing income or protecting people from disruptive changes *(27, 62)*.

Economic Regulation

Farm price-support programs for crops generally lead to more stable, but higher, prices for turkey feed. To qualify for support prices, farmers normally must reduce crop acreage, thereby reducing supplies. The payment-in-kind (PIK) program of 1983 substantially reduced acreage planted, resulting in a much smaller crop and in higher feed prices.

Government food programs affect the demand and price structure for turkey products through direct purchase of foods and by food assistance programs. The Government began these programs in the thirties to help eliminate surpluses brought about by its price-support programs. These programs have gradually expanded, and their primary emphasis has shifted from surplus disposal to food assistance. Turkeys have been bought for various food programs for the past 27 years, influencing demand and raising prices in the short run, especially when supplies were heavy. Direct purchases in 1982 totaled 75 million pounds, 3 percent of total turkey meat production, and cost $62.7 million.

Government credit programs influence both availability and terms of credit to agriculture. These programs generally make credit for turkey production more readily available at more favorable terms, thereby lowering cost and risk. Interest on loans through these sources was about 2 percentage points below rates charged by conventional lenders in 1982.

Export market development policies influence the turkey industry in two ways: (1) increased exports of turkey products can create additional demand which would raise domestic turkey prices, and (2) increased exports of grain can increase the price of grain and cost of turkey production. Exports of turkey products are much smaller than those of feed grains, accounting for only 2.2 percent of turkey meat production in 1982; however, these exports strengthen the domestic turkey market.

Other major economic programs and regulations affecting the turkey industry include: transportation, antitrust laws, the Packers and Stockyards Act, employment and labor standards, and energy policies and regulations.

Environmental, Health, and Safety Regulation

The primary environmental, health, and safety regulations which affect the turkey industry are: (1) Food and Drug Administration regulations, (2) poultry inspections, (3) animal disease control and quarantine regulations, and (4) grading regulations.

Food and Drug Administration regulations prohibit adulteration and misbranding of food and drugs sold in interstate commerce. Regulations also apply to chemical additives and pesticides in food, animal drugs, feeds, and feed additives.

Poultry inspection was on a voluntary basis until 1957 when inspection standards were established similar to those existing for red meat. The major effect of inspection regulations has been a high level of consumer confidence. Processing plant output and costs have been affected considerably because plant layout and equipment changes must be approved and sanitation inspections are prescribed. Inspection processes or requirements affect processing costs because line speeds and labor productivity vary. Changes in labeling regulations, moisture allowance losses, or restrictions on the use of preservatives in poultry products can also influence industry practices and costs.

Animal disease control and quarantine programs help control and eradicate poultry diseases such as psittacosis, ornithosis, exotic Newcastle disease, and avian influenza. These programs include import restrictions on certain products, improvement of animal and plant health, establishment of quarantine stations, restrictions on interstate movement of diseased animals, and humane treatment of livestock and poultry. Cost savings to the poultry industry and to consumers from these programs can be substantial as virulent diseases spread rapidly and create widespread losses.

Grading regulations facilitate trading and market reporting, and they contribute to consumer confidence and willingness to buy poultry products. Nearly all turkeys today are graded by voluntary Federal-State programs, with the costs paid by processors.

Other major regulations include the Environmental Protection Laws (EPA) and Occupational Safety and Health (OSHA).

Social Regulation

The major types of social regulations affecting the turkey industry include: (1) social security laws, (2) equal employment laws, and (3) income tax policy.

Special regulations generally were developed within these broad areas to reflect the unique nature of the farm business. However, these laws increasingly influence costs in the turkey industry.

Hatchery Structure, Output, and Pricing

Turkey hatcheries have been increasing in size, but decreasing in number. Year-round turkey production means that a given incubator can produce many more poults than if it were used only seasonally, as was previously the case *(41)*. The schedule of some major turkey hatcheries now resembles that of a broiler chicken hatchery; they operate almost continuously with minimum down time for cleanup and disinfecting.

The total number of turkey hatcheries decreased from 453 in 1965 to 180 in 1975 and to 94 in 1983. Incubator capacity has declined more slowly, from 51 million eggs in 1965 to 37 million eggs in 1983 (table 25). Total capacity has remained about the same in the past 5 years, although hatchery numbers have declined.

Although hatchery numbers have dropped to only 20 percent of their 1965 number, average capacity per hatchery has increased. The average capacity of 391,000 eggs in 1982 was nearly four times as large as the 112,770-egg capacity in 1965. Average size has increased by a third in just the past 4 years as smaller hatcheries have dropped out and larger ones have expanded.

A total of 165.5 million turkeys were produced in 1982. Dividing this number by the incubator egg capacity on January 1, 1983, shows that on average 4.5 turkeys were reared for each unit of egg capacity. The ratio in 1965 was less than half that figure as the average was only 2.1 turkeys reared per unit of egg capacity. This gain has enabled hatcheries to reduce the fixed cost per poult. However, it also shows considerable seasonal slack. Allowing 28 days for incubating and a 70-percent hatch, current incubator capacity could probably hatch 50 percent more poults.

The tendency toward a less variable seasonal pattern has enabled hatcheries to hatch more poults from a reduced incubator capacity (table 26). However, despite year-round production, the turkey industry is still far from realizing a uniform production level. Light breed turkeys, used primarily as fryers or broilers, have helped level out seasonal variations in hatching, rearing, and marketing. Light breeds, however, were cut back severely in 1981-82 following overexpansion the preceding year.

This change to year-round use has put real pressure on breeder flock operations to supply hatching eggs on a more uniform basis. Several factors had to be overcome. Turkey hens normally lay their eggs in the spring and early summer, well suited to—and a major cause of—the usual seasonal production pattern. Geneticists were able to develop strains that could lay better in any season. However, building darkout houses in which operators could control lighting schedules for breeder poults, layers, and toms was necessary. Management practices became far more critical and had to be adjusted to accommodate bird requirements that vary with the season. Uniform production throughout the year depends on provisions for all these factors.

Some hatcheries are part of completely vertically integrated complexes consisting of breeder flocks, hatchery, feed mill, brooding and growout, and processing. However, there is much more of an open market structure between hatcheries and poult buyers than among the other production stages. Most hatcheries, even the completely integrated ones, also sell poults to producers outside their own firms. Most vertically integrated firms also purchase some part of their poult needs. Some poult sales are negotiated at or near the day of hatching. However, this is the exception and usually involves hen poults in the off season, when the demand is greater for tom poults to provide heavier birds for further processing rather than the whole bird market. Spot sales may also occur during those times when growers are cutting back on placements and when hatcheries have extra poults.

Table 25—Turkey hatcheries and incubator egg capacity, by size and region, selected years

Date and egg capacity	North Atlantic	East North Central	West North Central	South Atlantic	South Central	West	United States[1]	Percentage of total
	Number of hatcheries							*Percent*
Jan. 1, 1983:								
Under 100,000	[2]	[2]	[2]	5	5		29	30.9
100,000-499,000	[2]	[2]	[2]	5	5	9	37	39.4
500,000 or more	—	6	8	5	3	6	28	29.8
Total	18	11	22	15	13	15	94	100.0
Jan. 1, 1979:								
Under 100,000	15	[2]	4	[2]	[2]	4	38	30.2
100,000-499,000	4	8	19	8	14	10	63	50.0
500,000 or more		[2]	7	[2]	[2]	8	25	19.9
Total	19	13	30	16	26	22	126	100.0
Jan. 1, 1975:								
Under 60,000	11	[2]	12	[2]	12	7	51	28.3
60,000-99,000	[2]	11	6	7	21	[2]	56	31.1
200,000 or more	15	13	24	13	6	22	73	40.6
Total	26	24	42	20	39	29	180	100.0
Jan. 1, 1971:								
Less than 25,000	16	[2]7	[2]	4	[2]15	[2]	42	16.7
25,000-59,000	8	[2]22	[2]	—	[2]14	[2]	44	17.5
60,000-99,000	[2]8	[2]4	[2]	[2]6	[2]4	[2]	22	8.7
100,000-199,000	—	[2]19	[2]	8	[2]33	[2]	60	23.8
200,000 or more	—	[2]38	[2]	15	[2]31	[2]	84	33.3
Total	32	[2]90	[2]	33	[2]97	[2]	252	100.0
Jan. 1, 1965:								
Less than 25,000	41	15	24	7	8	23	119	26.1
25,000-59,000	16	18	30	5	11	22	102	22.5
60,000-99,000	[2]15	8	24	10	8	15	[2]80	17.7
100,000-199,000	—	11	27	9	17	15	79	17.4
200,000 or more	—	10	18	12	9	25	74	16.3
Total	72	62	123	43	53	100	453	100.0

See footnotes at end of table.

Continued--

Most poults are committed for sale before the eggs are set. Most are booked in the fall for specific dates for the full season's operation when growers contract with processors. This practice coordinates timing all the way from hatchery to processor and has been a major source of increased efficiency and stability. These booking contracts specify price, week of delivery, sex, number of poults, and method of servicing the poults, such as beak trimming, declawing, toe clipping, desnooding, and vaccinating (table 27). In 1982, poult prices varied seasonally about 10 cents, with the lowest prices in the off season, another incentive for growers to even out poult placement. Most hatcheries break down their price lists according to periods shorter than a full month as shown in table 27, but the dates specified tend to be quite variable, sometimes for periods as short as a week. Monthly variation in average prices paid by growers for all turkey breeds was only about 5 percent during 1966-82 (table 28). Hatcheries also deliver 2-4 percent extra poults above the number charged. Some hatcheries also post adjustments to apply to poult prices based on changes in feed prices. This arrangement was a response to a period when poults were not available to growers because breeder flocks were sold off when feed prices increased dramatically. The posted price adjustments provide yet another example of risk reduction and sharing.

Table 25—Turkey hatcheries and incubator egg capacity, by size and region, selected years

Date and egg capacity	North Atlantic	East North Central	West North Central	South Atlantic	South Central	West	United States[1]	Percentage of total
	Incubator egg capacity (Thousand)							
Jan. 1, 1983:								
Under 100,000	451	[2]	[2]	303	61	—	955	2.6
100,000-499,000	801	[2]	[2]	1,849	1,496	3,234	11,046	30.1
500,000 or more	—	3,960	9,547	5,188	1,937	4,123	24,755	67.3
Total	1,252	4,823	12,490	7,340	3,494	7,357	36,756	100.0
Jan. 1, 1979:								
Under 100,000	363	[2]	172	[2]	[2]	85	1,148	3.1
100,000-499,000	921	2,396	5,385	2,516	3,599	2,597	17,414	47.4
500,000 or more		[2]	5,532	[2]	[2]	4,966	18,711	49.5
Total	1,284	4,650	11,089	6,855	5,185	7,648	36,711	100.0
Jan. 1, 1975:								
Under 60,000	295	[2]	619	[2]	230	172	1,561	3.7
600,000-99,000	[2]	673	797	571	4,258	[3]	8,048	19.2
200,000 or more	1,143	4,681	12,205	5,823	2,398	7,986	32,242	77.1
Total	1,438	5,354	13,621	6,394	6,886	8,158	41,851	100.0
Jan. 1, 1971:								
Less than 25,000	167	[2]81	[2]	55	[2]194	[2]	497	1.0
25,000-59,000	282	[2]835	[2]	—	[2]538	[2]	1,700	3.4
60,000-99,000	[2]1,049	[2]327	[2]	[2]390	[2]273	[2]	1,099	2.2
100,000-199,000	—	[2]2,812	[2]	1,105	[2]5,680	[2]	10,027	20.4
200,000 or more	—	[2]16,387	[2]	6,135	[2]12,953	[2]	35,940	73.0
Total	1,498	[2]20,442	[2]	7,685	[2]19,638	[2]	49,263	100.0
Jan. 1, 1965:								
Less than 25,000	406	218	284	103	105	340	1,456	2.8
25,000-59,000	557	703	1,228	208	406	860	3,962	7.8
60,000-99,000	[2]1,496	573	2,143	788	619	1,195	[2]6,814	13.3
100,000-199,000	—	1,439	4,113	1,267	2,207	1,985	11,011	21.6
200,000 or more	—	3,281	6,891	5,235	5,235	9,560	27,842	54.5
Total	2,459	6,214	14,659	7,601	6,212	13,940	51,085	100.0

[1]Does not include Alaska and Hawaii.
[2]Combined to avoid disclosing individual operations.

Source: (*72, 74*).

Although hatcheries now are far less seasonal, they still do have a decidedly seasonal pattern. Seasonality for turkey hatcheries in earlier years resulted from the seasonal demand for poults and the seasonal availability of eggs for hatching because hens did not lay during the off-season. However, present technology can achieve a more uniform production of hatching eggs. Demand for poults, although increasing in uniformity, remains seasonal (table 26).

Marketing

Marketing includes all those functions required to move turkeys from the farm though processing, wholesaling, and retailing to the consumer. These channels have been growing shorter, with the processor performing more of the services previously done by distributors and retailers. However, new products, such as turkey ham, turkey rolls, and other further processed items, have been expanding

Table 26—Turkeys hatched by type, by month, selected years, 1960–83

Item	January	February	March	April	May	June	July	August	September	October	November	December	Yearly total
							1,000 poults						
Light breed hatchings:													
1960	601	832	998	1,101	1,626	1,701	1,633	1,131	596	468	608	873	12,168
1965	779	781	1,098	1,318	1,651	1,703	1,846	1,164	738	880	744	886	13,588
1970	919	742	994	1,030	1,190	1,279	1,718	1,477	1,000	931	1,231	1,211	13,723
1975	1,202	1,367	1,406	1,657	1,526	1,400	1,524	1,319	747	1,008	1,244	1,518	15,918
1980	1,479	1,364	1,462	1,414	1,381	1,532	1,795	1,475	912	1,312	1,226	1,472	16,824
1981	1,253	1,014	1,034	1,001	1,085	1,066	951	844	415	363	555	814	10,395
1982	631	812	732	834	754	784	994	789	186	174	166	616	7,472
1983	589	568	583	675	651	688	742	591	171	159	222	230	5,869
Heavy breed hatchings:													
1960	3,155	6,924	13,933	16,596	16,118	11,491	5,018	1,720	1,014	1,385	1,989	3,547	82,890
1965	3,191	7,801	18,282	20,848	21,149	16,119	8,167	2,408	980	824	1,254	2,167	103,290
1970	6,696	10,935	18,174	20,472	20,309	15,992	9,591	3,580	1,622	2,033	2,597	4,020	116,021
1975	7,487	10,657	14,719	16,960	17,568	16,140	12,734	7,329	3,590	3,457	4,147	6,370	121,158
1980	14,327	15,299	18,992	19,762	19,875	18,796	16,949	10,700	8,019	8,734	9,033	11,356	171,842
1981	14,368	15,512	18,872	19,577	21,144	20,390	17,703	11,837	7,793	9,199	9,343	11,201	176,939
1982	12,634	13,644	17,362	20,491	19,635	19,800	19,306	13,016	7,922	9,609	11,504	11,845	176,768
1983	13,306	14,617	18,239	19,089	20,234	20,339	18,491	11,987	7,915	9,034	10,747	12,246	176,244
Total turkey hatchings:													
1960	3,756	7,756	14,931	17,697	17,444	13,192	6,651	2,851	1,610	1,853	2,597	4,420	95,058
1965	3,970	8,582	19,380	22,166	22,900	17,822	10,013	3,572	1,718	1,704	1,998	3,053	116,878
1970	7,615	11,677	19,168	21,502	21,499	17,271	11,309	5,057	2,622	2,964	3,828	5,231	129,743
1975	8,689	12,024	16,125	18,617	19,094	17,540	14,258	8,648	4,337	4,465	5,391	7,888	137,076
1980	15,806	16,663	20,454	21,176	21,256	20,328	18,744	12,175	8,931	10,046	10,259	12,828	188,666
1981	15,621	16,526	19,906	20,578	22,229	21,456	18,654	12,681	8,208	9,562	9,898	12,015	187,334
1982	13,265	14,456	18,094	21,325	20,389	20,584	20,300	13,805	8,108	9,783	11,670	12,461	184,240
1983	13,895	15,185	18,822	19,764	20,885	21,027	19,233	12,578	8,086	9,202	10,969	12,476	182,122
							Percent						
Yearly hatch:													
1960	3.95	8.16	15.71	18.62	18.67	13.88	7.00	3.00	1.69	1.95	2.73	4.65	100.0
1965	3.40	7.34	16.58	18.96	19.56	15.25	8.57	3.06	1.47	1.46	1.71	2.61	100.0
1970	5.87	9.00	14.77	16.57	16.57	13.31	8.72	3.90	2.02	2.29	2.95	4.03	100.0
1975	6.34	8.77	11.76	13.58	13.93	12.80	10.40	6.31	3.16	3.26	3.93	5.76	100.0
1980	8.38	8.83	10.84	11.22	11.27	10.78	9.94	6.45	4.73	5.32	5.44	6.80	100.0
1981	8.34	8.82	10.63	10.99	11.87	11.45	9.96	6.77	4.38	5.10	5.28	6.41	100.0
1982	7.20	7.85	9.82	11.57	11.07	11.17	11.02	7.49	4.40	5.31	6.33	6.76	100.0
1983	7.62	8.34	10.33	10.85	11.47	11.55	10.56	6.91	4.44	5.05	6.02	6.85	100.0

Source: (*72, 74*).

Table 27—Prices for day-old turkey poults, 1982[1]

Hatching date	Toms	Hens	Straight run
		Cents per poult	
January	106	91	96
February	112	97	102
March	114	99	104
April	115	100	105
May	114	101	104
June	115	102	105
July	116	104	106
August	114	101	104
September	105	95	99
October-December	[2]	[2]	[2]

[1]Average of prices as posted in fall of 1981 by hatcheries for which price lists were available. Prices were subject to change at any time before orders were placed. Actual prices were generally 5-10 cents per poult lower because of lower feed costs. Prices quoted are on a per-poult delivered, vaccinated, debeaked, desnooded, toes clipped basis. Prices for these services priced separately were: vaccination 2.5 cents, sexing 2.3 cents, debeaking 1.7 cents, desnooding 1.0 cent, and toe clipping 2.5 cents. Hatcheries generally quoted prices to include 2-4 percent extras. Some included a schedule by which poult prices would be adjusted according to changes in feed prices.

[2]Hatcheries generally indicated poults for delivery in October-December would be priced at later dates.

most rapidly. These products help to make turkey a year-round consumer item, which fits in well with year-round production and processing.

Supply and Utilization of Turkey Meat

Turkey meat is generally consumed within a short time (2 months) after the birds are processed. Storage facilitates orderly movement of heavy supplies through the market and provides supplies for periods when utilization exceeds current production; most storage serves both these functions.

Frozen turkeys represent the most common method of marketing. Therefore, stocks move in and out of storage throughout the marketing year. Because of increased further processing and more nearly even seasonal patterns of production and consumption, yearend stocks account for a decreasing proportion of the total supply of turkey. Since 1975, yearend stocks have represented less than 10 percent of the supply available during the year. Prior to 1975, yearend stocks were running at about 11-15 percent of that year's production (table 29). Stocks are built up during the summer and early fall to a November peak in preparation for the heavy consumption season (table 30). The November peak tends to more than double yearend stocks. Stocks reach their seasonal low during the spring. Over the past two decades, the period of low spring stocks seems to have been pushed forward.

Some people think the industry does not need to carry such large stocks and that heavy storage stocks may be difficult—even disruptive—for the market. They base this opinion on the declining proportion purchased by consumers as frozen whole turkeys and on the decreasing seasonality of production *(5, 9, 20, 55, 65, 68, 69, 71, 76)*.

Exports and Imports

Turkey exports make up only a small portion of total U.S. production, about 2-3 percent in the early eighties (table 31). Imports are also of low volume. Export markets fluctuate much more than the domestic market. Foreign markets generally buy turkey to supplement their own supplies, which makes purchases irregular. It is difficult for individual processors to ship from normal production. Product and handling specifications can be a problem because exporters may fill orders by purchasing from several processors. The product must often be processed for a specific order, and a group of processors cooperates in servicing the export sale.

Export volume expanded significantly during 1979-80. Demand by some major importers increased and heavy U.S. supplies lowered prices, making trade quite advantageous for both parties. In view of reduced demand by foreign buyers, a strong increase in shipments made by other exporting countries, and the relatively strong position of the U.S. dollar, U.S. turkey exports have dropped from the high levels of 1980—despite continued low prices.

Marketing Costs

Each sector of the industry has contributed to the gains that enable consumers to buy turkey at favorable prices. Although gains in individual sectors have often been small, the cumulative effect of changes in all sectors has been substantial.

Marketing costs, which account for almost half the retail price of turkey meat, have increased over time (table 32). However, increased productivity in the marketing sector

Table 28—Average monthly prices paid by farmers for turkey poults, all breeds, 1966–83[1]

Year	January	February	March	April	May	June	July	August	September	October	November	December	Average
						Cents per poult							
1966	58.3	59.4	60.5	61.0	61.8	62.8	61.8	61.4	54.7	57.8	61.0	60.8	60.1
1967	59.6	59.2	57.9	58.3	59.0	59.8	60.7	59.7	59.0	59.1	59.0	59.3	59.2
1968	58.9	57.7	57.6	57.4	58.5	58.6	58.2	58.0	57.3	57.9	56.5	56.1	57.7
1969	56.0	55.8	56.3	56.5	57.4	58.0	56.4	53.6	50.5	51.0	52.0	53.1	54.7
1970	54.9	55.4	55.8	57.1	56.9	56.9	56.3	54.7	53.0	54.6	53.6	52.9	55.2
1971	55.2	55.8	56.1	57.3	57.9	58.2	57.2	56.9	56.3	56.2	54.9	55.3	56.4
1972	57.0	57.3	57.6	57.8	57.8	58.0	58.0	57.1	55.3	55.0	53.9	55.1	56.7
1973	54.5	56.3	57.3	57.8	58.4	60.2	60.8	64.1	64.7	67.8	64.4	64.0	60.9
1974	64.8	65.1	67.0	68.3	67.9	69.0	68.4	67.4	67.3	67.4	67.2	68.8	67.4
1975	68.7	69.5	70.1	70.0	70.2	71.0	73.9	70.6	70.4	68.6	67.6	68.8	70.0
1976	68.6	69.9	70.8	71.1	71.0	70.6	71.3	69.6	68.8	67.8	66.4	67.0	69.4
1977	67.9	70.6	72.7	73.1	74.0	74.9	75.2	75.1	72.0	70.7	69.4	69.0	72.1
1978	71.5	71.4	72.7	73.0	75.0	75.0	75.0	75.0	74.0	75.0	74.1	72.5	73.7
1979	75.8	75.5	76.8	78.6	79.3	80.2	80.0	79.1	78.2	79.1	79.1	78.8	78.4
1980	79.0	80.9	81.8	82.1	81.8	81.5	81.6	82.4	81.6	81.9	81.3	81.7	81.5
1981	83.2	83.7	86.0	86.5	88.0	88.6	89.8	90.2	90.1	90.6	89.4	88.3	87.9
1982	88.4	88.5	89.2	91.8	90.4	92.6	92.5	92.9	91.9	91.2	90.0	89.3	90.7
1983	89.7	91.7	90.6	94.1	93.7	93.7	93.6	93.2	94.6	92.3	92.5	93.3	92.8
18-year average	67.3	68.0	68.7	69.5	69.9	70.6	70.6	70.1	68.9	69.1	68.4	68.6	69.2

[1]1966-68 heavy breeds only; prior years used different classifications.

Source: (*70*).

Table 29—Supply and utilization of turkey, 1950–83[1]

Year	Supply					Disappearance			
	Production[2]	Beginning stocks[3]	Total	Ending stocks[3]	Ending stocks as percentage of total supply	Exports and shipments[4]	Military[5]	Civilian	
								Total	Per capita, ready-to-cook[6]
	Million pounds				*Percent*	*Million pounds*			*Pounds*
1950	615	127	742	110	14.8	—	20	612	4.1
1951	703	110	813	107	13.2	—	35	671	4.4
1952	795	107	902	147	16.3	—	41	714	4.7
1953	758	147	905	122	13.5	—	42	741	4.8
1954	871	122	993	121	12.2	—	30	842	5.3
1955	818	121	939	95	10.1	—	26	842	5.0
1956	957	95	1,052	162	15.4	—	39	860	5.2
1957	1,034	162	1,196	177	14.8	—	29	990	5.9
1958	1,038	177	1,215	162	13.3	6	32	1,015	5.9
1959	1,123	162	1,285	149	11.6	12	32	1,092	6.3
1960	1,156	149	1,305	160	12.3	24	31	1,090	6.1
1961	1,506	160	1,666	263	15.8	28	29	1,346	7.4
1962	1,302	263	1,565	203	13.0	37	34	1,291	7.0
1963	1,355	203	1,558	217	13.9	31	40	1,270	6.8
1964	1,459	217	1,676	207	12.4	43	36	1,390	7.3
1965	1,521	207	1,728	200	11.6	58	40	1,430	7.4
1966	1,685	200	1,885	267	14.2	47	56	1,515	7.8
1967	1,883	267	2,150	367	17.1	49	53	1,681	8.6
1968	1,620	367	1,987	317	16.0	41	63	1,566	8.0
1969	1,614	317	1,931	192	9.9	37	48	1,654	8.3
1970	1,757	192	1,930	219	11.3	35	49	1,646	8.2
1971	1,809	219	2,028	223	11.0	32	42	1,740	8.5
1972	1,915	223	2,138	208	9.7	42	42	1,846	9.0
1973	1,933	208	2,141	281	13.1	54	31	1,774	8.5
1974	1,910	281	2,191	275	12.6	57	14	1,846	8.7
1975	1,804	275	2,079	195	9.4	54	20	1,812	8.5
1976	2,046	195	2,241	203	9.1	71	17	1,948	9.1
1977	2,023	203	2,226	168	7.5	56	11	1,991	9.3
1978	2,111	168	2,279	175	7.7	60	15	2,029	9.3
1979	2,345	175	2,520	240	9.5	18	18	2,205	10.1
1980	2,425	240	2,665	198	7.4	81	16	2,370	10.5
1981	2,576	198	2,774	238	8.6	68	15	2,452	10.8
1982	2,522	238	2,761	204	7.4	56	12	2,489	10.8
1983	2,506	204	2,838	162	5.7	54	13	2,608	11.2

— = Not available.

[1]Certified, ready-to-cook (RTC) weight.

[2]Includes turkey sold from and consumed on farms where produced. The factor for converting from live to RTC weight was increased gradually from 75 percent in 1950-55 to 80 percent in 1961.

[3]Stock data in terms of product weight as reported.

[4]Exports prior to 1958 were negligible, and data were not reported separately from chicken.

[5]Includes U.S. Department of Agriculture donations to military and military feeding of civilians in occupied territories.

[6]Includes giblets.

Sources: U.S. Department of Agriculture (*64, 68, 69*).

Table 30—Cold-storage holdings of turkeys, beginning of month, selected years, 1955–83

Year	January	February	March	April	May	June	July	August	September	October	November	December
						Million pounds RTC						
1955	121.0	124.0	110.7	92.7	70.7	60.2	51.5	45.0	48.0	76.9	144.3	129.0
1960	149.2	142.3	124.0	105.2	87.3	74.3	66.7	70.9	112.5	186.1	282.2	209.9
1965	207.4	197.1	168.9	137.0	105.7	82.5	70.0	88.4	147.2	243.6	362.8	280.3
1966	200.1	182.4	156.5	122.0	92.3	69.4	69.7	103.6	171.4	282.5	395.5	312.1
1967	267.1	272.1	253.9	206.6	176.1	149.4	159.9	221.3	332.1	441.5	550.8	428.7
1968	366.9	360.6	310.3	267.8	225.1	194.1	185.3	226.0	304.7	385.9	504.4	385.7
1969	317.1	293.6	254.4	201.4	155.0	123.0	119.3	162.7	237.1	329.4	435.6	283.8
1970	191.9	162.1	132.7	101.1	81.5	73.7	94.7	155.5	237.9	343.0	450.5	313.1
1971	218.9	207.1	177.3	146.0	119.4	111.5	140.3	202.8	307.6	389.0	475.2	308.7
1972	223.1	211.3	180.5	145.9	120.8	110.8	142.3	214.1	313.0	407.5	475.7	297.0
1973	208.1	188.4	152.6	115.4	91.3	88.1	137.1	199.4	261.2	350.7	450.5	321.1
1974	281.0	274.0	250.5	235.9	225.0	227.4	265.8	335.8	431.8	528.7	554.6	372.6
1975	272.0	267.1	239.9	207.3	180.2	162.7	193.2	248.6	328.3	409.8	472.4	286.2
1976	195.2	186.8	160.7	140.7	114.5	120.8	177.3	261.9	370.3	459.7	512.3	298.8
1977	203.4	190.3	167.8	142.3	130.3	138.2	201.4	253.6	329.9	409.3	444.5	269.4
1978	167.9	168.3	136.6	122.9	101.1	103.6	152.1	212.7	297.9	370.4	430.1	235.7
1979	175.1	170.7	154.7	135.7	128.0	153.1	200.9	272.5	382.5	432.3	445.5	281.2
1980	240.0	246.8	225.0	208.9	206.9	233.8	286.6	325.8	384.0	398.8	420.2	257.6
1981	198.0	207.9	207.9	220.7	228.7	255.8	327.3	400.8	466.0	532.1	528.1	305.1
1982	238.4	236.9	236.4	232.8	N.S.	281.7	292.0	335.9	N.S.	435.8	N.S.	N.S.
1983	203.9	193.8	187.7	185.3	192.2	210.5	255.7	323.5	384.3	432.2	460.1	251.6

RTC = Ready to cook.
N.S. = No survey.

Source: (*68*).

Table 31—U.S. exports of turkey, by month, 1960–83

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
							1,000 pounds RTC						
1960	1,242	1,442	1,274	1,278	502	615	1,372	2,851	5,008	3,925	3,114	1,522	24,145
1961	916	1,724	1,507	823	885	1,177	2,236	3,338	3,753	6,225	3,042	2,236	27,862
1962	2,108	2,237	2,096	1,234	3,406	3,074	1,972	1,894	5,505	6,383	4,807	2,135	36,851
1963	1,081	2,828	1,512	872	580	809	1,287	3,534	6,017	7,580	3,506	1,282	30,888
1964	1,768	2,162	2,491	2,008	1,741	2,839	3,024	3,206	6,440	8,939	4,278	4,336	43,232
1965	1,282	2,200	3,728	2,923	2,410	2,980	3,314	6,086	9,524	11,319	7,900	4,833	58,499
1966	3,798	2,976	1,770	1,183	1,412	1,791	1,800	4,905	6,221	9,642	8,182	3,270	46,950
1967	2,543	2,333	1,896	2,689	3,112	2,539	2,587	5,076	6,678	7,652	8,087	3,691	48,883
1968	3,349	4,724	2,342	2,349	1,601	1,388	2,159	3,344	4,783	4,699	6,402	4,132	41,272
1969	1,179	2,442	4,133	2,575	2,404	1,770	1,966	3,529	4,672	5,186	3,248	3,493	36,597
1970	2,741	2,069	1,835	1,965	1,390	1,807	1,877	3,525	4,686	6,368	3,974	2,736	34,973
1971	925	2,275	1,644	1,370	794	1,069	1,529	1,986	3,899	2,357	2,494	2,688	23,030
1972	1,675	2,258	1,587	1,597	1,105	1,650	2,911	3,930	3,168	5,354	6,317	4,837	36,389
1973	2,927	3,180	4,805	1,712	1,613	3,245	4,175	5,392	5,016	5,236	6,678	5,980	49,959
1974	4,386	3,477	4,732	2,195	2,770	3,574	2,897	2,788	1,924	4,108	3,664	4,570	47,307
1975	1,385	2,551	2,979	2,952	2,851	3,807	4,389	4,023	5,293	7,139	5,368	6,152	65,170
1976	5,135	5,993	7,719	3,958	3,864	6,267	4,050	4,513	4,923	6,327	6,269	6,036	53,873
1977	2,947	3,303	2,138	2,435	3,909	5,034	5,210	6,875	6,133	4,383	5,470	4,025	51,067
1978	4,335	3,631	6,123	4,385	2,197	3,297	3,034	4,471	5,266	5,891	5,412	4,575	50,010
1979	3,741	2,736	2,900	2,747	3,097	3,577	4,883	5,224	5,885	6,210	4,435	7,252	75,066
1980	4,165	4,088	4,576	4,615	6,703	4,143	7,375	8,294	6,933	9,527	7,395	7,252	75,066
1981	3,119	4,327	4,603	3,039	7,527	5,512	3,902	4,161	5,529	6,551	8,030	6,684	62,984
1982	5,270	6,378	5,583	3,269	4,304	3,036	2,925	3,062	3,507	5,065	5,882	2,744	52,025
1983	3,284	3,445	4,693	3,512	3,336	3,888	6,251	2,362	4,841	2,952	4,056	4,702	47,322

RTC = Ready to cook.

Source: (*68*).

has helped moderate these cost increases. Although input prices for labor, energy, and packaging tripled during 1960-80 (app. table 1), marketing costs per pound of turkey doubled. Total costs of assembling, processing, transporting, wholesaling, and retailing make up the farm-to-retail price spread (table 32).

Increased density in turkey production areas, limited procurement distances, larger houses concentrated on fewer production units, and partial mechanization of loading and unloading have held procurement and assembly cost increases down, even though transportation and labor are major cost components.

Processors have benefited from economies of scale, more effective use of facilities, less seasonality in production, improved and more uniform quality of birds, shorter hauls from fewer and larger volume growers, and mechanization in processing and handling. Four important changes in the economic system during the seventies, however, caused processing costs to rise:

1. Energy prices increased rapidly.
2. Persistent inflation boosted many input prices by an unusually high rate.
3. Environmental considerations forced rapid installation of costly equipment without increasing output. However, some of this impact has now been offset by reclaiming waste as byproducts.
4. More responsibility for functions such as cutup and packaging has been shifted to the processing level.

Wholesaling, including all activities between processors and retailers, has been shortened and made more direct. Processors now perform more functions formerly performed by wholesalers, and they move large volumes directly to retail warehouses. Improved transportation and refrigeration have also provided economies at these stages, although long-distance shipping costs have increased from about 1.5 cents per pound in the late fifties to nearly 3.0 cents in the early eighties.

Retailers' margins have more than doubled since the late fifties (table 32). The retailing function claims the largest individual share of marketing costs, but is less influenced by adjustments within the turkey industry than are the other marketing stages. Retail performance is determined by factors outside a particular commodity industry. Although some marketing functions have been shifted from retailer to processor and costs have increased at each stage, the relative margins for these two functions have not changed much.

Surplus-Deficit Areas

Turkey production is highly concentrated in a few areas (see fig. 2). These production areas do not generally coincide with concentrations of population, and turkey must be moved from the surplus production areas to deficit areas. Actual data are no longer collected on regional consumption or interregional shipments. Therefore, we estimated regional consumption by multiplying population in the region by the average U.S. per capita consumption. We then compared this level of consump-

Table 32—Estimated farm equivalent value, retail price, and components of farm-to-retail price spreads for turkeys[1]

Period	Farm equivalent value	Procurement and assembly	Processing	Long distance transport and wholesaling	Retailing	Farm-to-retail price spread	Retail price
				Cents per pound RTC			
1955-59	34.3	0.7	6.3	3.8	9.5	20.3	54.6
1960-64	29.0	.7	6.0	3.9	9.5	20.1	49.1
1965-69	27.4	.7	6.1	4.2	10.1	21.1	48.5
1970-74	37.8	.8	10.0	4.3	13.2	28.3	66.1
1975-79	49.9	.9	11.1	5.6	13.6	31.2	81.1
1980-81	52.0	1.7	14.0	7.1	19.3	42.1	94.2
1982	48.7	2.0	14.2	7.4	20.3	43.9	92.6

RTC = Ready to cook.
[1]Medium turkeys, 8-16 pounds, October-December average.

Sources: (*46, 63*).

tion with regional turkey production to determine regional surplus and deficit balances (table 33).

All regions except New England have increased turkey production in the past quarter-century. The increases have been neither uniform nor in proportion to population changes or to changes in per capita consumption. Therefore, surplus-deficit balances have changed. With greater specialization in production, both regional surpluses and deficits have grown, except in the Mountain and Pacific regions, which are now self-supporting rather than surplus areas. The West North Central and the South Atlantic regions have heavy surpluses available for shipping to other regions. The New England, Middle Atlantic, and the East North Central regions, with their heavy urban populations, must ship increasing quantities of turkey from other regions.

Because of the combined effects of population changes and production shifts, interregional movements represent a decreasing proportion of total turkey production. In 1960, three regions had a combined surplus of 441.5 million pounds, about 47 percent of federally inspected production, with offsetting deficits in the other five regions. In 1980, however, the 691 million pounds of surplus in four regions which was used for interregional movement represented only 30 percent of total production. Increasing quantities are moved, but the proportion of total production involved is decreasing. With expansion of production in the South Atlantic region, average shipping distances and times are decreasing *(47, 71, 75)*.

Product Form

Most turkeys are marketed as young turkeys and grown to a matured market age, usually 4-7 months (table 34). Young turkeys represented 97 percent of total weight of turkey slaughtered under Federal inspection and certified RTC in 1980-82. Fryer-roasters, young immature birds usually under 14 weeks of age, represented less than 2 percent of turkey certified under Federal inspection in 1980. These small birds have varied in volume over the years, but declined from about 6 percent of the total in 1965-69. Old turkeys, fully matured birds held for breeders, represented more than 4 percent of the annual volume of turkeys certified in 1960, but they represented less than 1 percent in 1980-82. Technological improvements in the turkey industry during the past 20 years have allowed turkey production to increase without a proportional increase in the size of the breeding flock.

Turkeys are usually marketed frozen or in chill packs. Frozen turkeys and turkey products represented about 80 percent of turkeys certified at slaughter in the late sixties, while chill packs accounted for about 20 percent (table 34). By 1983, the proportion of turkeys sold in frozen form decreased to about 67 percent while the pro-

Table 33—Regional turkey production compared with estimated consumption of turkey, selected years[1]

Year	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	South Central	Mountain	Pacific
				Million pounds, RTC equivalent[1]				
1955	−33.3	−129.4	−63.0	167.3	−5.8	−59.6	25.5	98.2
1960	−56.0	−184.4	−66.1	297.4	−70.8	−63.8	28.6	115.2
1965	−77.4	−238.7	−76.9	362.0	−38.2	−36.9	35.8	81.4
1970	−87.8	−256.5	−118.6	336.3	31.2	−.3	39.7	56.0
1975	−101.9	−274.4	−144.7	408.3	75.2	−36.5	46.7	27.4
1979	−119.3	−301.3	−188.3	440.8	210.4	−53.2	17.3	−6.5
1980	−129.8	−308.5	−201.6	476.9	193.8	−51.2	12.2	8.1

RTC = Ready to cook.

[1]Northeast = combined New England (Me., N.H., Vt., Mass., R.I., Conn.) and Middle Atlantic (N.Y., N.J., Pa.). East North Central (Ohio, Ind., Ill., Mich., Wis.). West North Central (Mn., Iowa, Mo., N. Dak., S. Dak., Nebr., Kans.). South Atlantic (Del., Md., Va., W. Va., N.C., S.C., Ga., Fla.). South Central (Ky., Tenn., Ala., Miss., Ark., La., Okla., Tex.). Mountain (Mont., Idaho, Wyom., Colo., N. Mex., Ariz., Utah, Nev.). Pacific (Wash., Ore., Calif.). Excludes Hawaii and Alaska.

[2]Minus sign (−) indicates that consumption in region was greater than production and that inshipments were made from surplus regions.

portion marketed in chill packs increased to about 33 percent. These trends can be accounted for partly by decreases in seasonality of production and consumption (table 35), increases in the proportion of turkeys marketed cutup (table 36), and introduction of expanded lines of further processed and cutup turkey products (tables 37 and 38). A somewhat larger proportion of turkeys certified in the last quarter of the year is marketed in chill packs (including bulk packed) than in the first three quarters (table 36). The fourth quarter includes the holiday seasons when per capita turkey consumption is highest and when there is net movement of turkey products from storage.

Turkeys certified at the processing plant as frozen RTC generally go into short-term storage, but freezing also facilitates long-distance hauling and handling. Chilled RTC may be sold for consumption as fresh turkey, used for cutup, or used in further processing. The chilled proportion has risen to almost a third of the total RTC volume, double the proportion in 1960. The expansion in further processing caused most of this steady increase.

Table 34—Quantity of turkey certified RTC in federally inspected plants, by class and product form

Year	Total turkey[1]	Young turkey	Fryer-roasters	Type of pack		Further processed			
				Chill pack[2]	Frozen[2]	Cutup[3]	Total[3]	Whole[4]	Other[4]
	Pounds per capita[5]			*Percent of total*		*Pounds per capita*[4]			
1960	5.3	4.6	0.5	—	—	—	0.6	—	—
1961	6.9	6.0	.6	—	—	—	.6	—	—
1962	5.9	5.2	.5	13.2	86.8	0.2	.8	—	—
1963	6.2	5.5	.5	13.4	86.6	.3	1.0	—	—
1964	6.6	5.8	.5	14.0	86.0	.3	1.1	—	—
1965	6.9	6.2	.5	21.1	78.9	.5	1.3	—	—
1966	7.6	6.9	.6	21.0	79.0	.6	1.7	—	—
1967	8.5	7.8	.5	18.3	81.7	.6	1.6	—	—
1968	7.4	6.9	.4	18.7	81.3	.7	2.0	—	—
1969	7.2	6.7	.3	21.1	78.9	.8	2.5	—	—
1970	7.8	7.3	.4	19.8	80.2	1.0	2.4	—	—
1971	8.0	7.5	.4	20.0	80.0	1.0	2.7	—	—
1972	8.8	8.2	.4	21.8	78.2	1.5	3.1	—	—
1973	8.6	8.0	.4	21.8	87.2	1.2	3.8	—	—
1974	8.7	8.1	.5	21.0	79.0	1.4	4.2	1.8	2.4
1975	8.0	7.6	.4	21.4	78.6	1.4	4.3	1.7	2.6
1976	9.1	8.6	.4	23.6	76.4	1.8	4.9	2.0	2.9
1977	8.8	8.4	.3	27.1	72.9	2.0	5.3	2.1	3.2
1978	9.1	8.8	.2	28.7	71.3	2.1	5.6	2.3	3.3
1979	10.0	9.6	.3	27.2	72.8	2.4	6.2	2.4	3.7
1980	10.2	9.8	.3	27.2	72.8	2.8	6.9	2.9	4.0
1981	11.1	10.7	.3	26.1	73.9	2.8	7.4	3.1	4.3
1982	10.7	10.4	.2	31.4	68.6	3.2	7.5	3.2	4.3
1983	11.0	10.8	.1	32.9	67.1	3.5	8.0	3.1	4.9

RTC = Ready to cook.

— = Not available.

[1]Total certified as RTC in federally inspected plants will differ from consumption because of (1) production not federally inspected, (2) exports, (3) net change in storage.

[2]Chilled plus frozen = 100 percent of certified RTC.

[3]Further processed and cutup are not additive.

[4]Further processed was not reported separately for whole and other before 1974.

[5]Per capita is based on civilian population.

Source: (*68, 76*).

Because freezing adds cost and reduces product yield slightly, further processors prefer to use fresh turkeys. Not enough chilled turkey is produced at all times, however, so considerable quantities of frozen turkeys are also used for further processing.

Marketing of value-added products is an important part of most integrated poultry operations. Frozen whole turkeys are considered basic products, but the emphasis has been on cutup and further processed products. The proportion of turkeys certified and classified as cutup increased from about 9 percent in the late sixties to 30 percent in 1983 (table 36). The proportion cut up was somewhat larger in the first three quarters of the year than in the final quarter; however, there has been a trend toward decreasing the seasonal difference. Not all turkey classified as cutup is sold to consumers as turkey parts cutup at the processing plant; some is used in further processing.

The major slaughter firms are also the leading processors of cutup and further processed poultry. More plants are cutting and further processing than are slaughtering (table 39). Many of the cutting and further processing operations purchase poultry meat from slaughter plants.

A rapid increase in production of further processed turkey products began in the midsixties. In the late sixties, about 25 percent of the volume processed was sold as further processed products (table 36). Most of this further processed turkey was in the form of frozen raw meat in roasts, dinners, and pies sold to consumers; cooked turkey rolls sold to institutional markets; and bulk meat and parts sold to specialized outlets. By 1982, about 42

Table 35—Per capita consumption of turkey, by quarter, 1960-83

Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
			Pounds per capita		
1960	0.6	0.8	1.3	3.4	6.1
1961	.6	1.0	1.7	4.1	7.4
1962	.7	.9	1.5	3.9	7.0
1963	.5	.9	1.5	3.9	6.8
1964	.7	.9	1.8	4.0	7.4
1965	.7	.8	1.8	4.1	7.4
1966	.7	1.0	2.0	4.1	7.8
1967	.8	1.1	2.2	4.5	8.6
1968	1.0	1.1	1.9	4.0	8.0
1969	.9	1.2	2.0	4.2	8.3
1970	.9	.9	2.2	4.2	8.2
1971	1.0	1.2	2.1	4.2	8.5
1972	1.1	1.3	2.2	4.5	9.1
1973	1.2	1.3	2.1	3.9	8.5
1974	1.2	1.6	2.0	4.0	8.8
1975	1.1	1.4	2.0	4.0	8.5
1976	1.2	1.5	2.1	4.3	9.1
1977	1.3	1.5	2.2	4.1	9.1
1978	1.3	1.7	2.2	4.0	9.2
1979	1.5	1.9	2.3	4.2	9.9
1980	1.8	2.0	2.7	4.0	10.5
1981	1.6	1.9	2.5	4.6	10.7
1982	1.8	2.1	2.7	4.3	10.8
1983	2.1	2.2	2.5	4.4	11.2

Source: (*66, 68*).

Table 36—Turkeys certified RTC in federally inspected plants, by product form, by quarter[1]

Year	Annual output certified in quarter 4	Cutup		Further processed				Chilled	
		Quarters 1-3	Quarter 4	Quarters 1-3		Quarter 4			
				Whole	Other	Whole	Other	Quarter 1-3	Quarter 4
	Percent	*Percent of RTC certified[2]*							
1967	44.6	8.6	4.8	25.1		11.7		16.8	20.2
1968	47.1	12.5	5.6	34.2		17.5		16.7	20.9
1969	44.9	14.4	7.2	42.8		24.3		18.1	24.9
1970	42.9	14.4	9.3	36.8		22.3		17.7	22.6
1971	39.3	13.7	9.5	39.7		25.8		17.8	23.5
1972	38.8	18.9	13.0	40.3		28.1		19.8	24.9
1973	40.1	17.3	10.8	47.4		39.6		21.6	26.9
1974	32.5	17.5	13.2	20.4	29.9	22.5	23.1	18.1	26.9
1975	37.0	19.7	15.7	21.9	34.8	21.3	25.2	19.5	24.6
1976	33.6	22.0	15.8	23.8	33.3	21.5	27.2	20.1	26.9
1977	34.1	24.9	18.0	24.0	39.5	24.7	26.7	26.1	28.9
1978	34.1	26.1	18.5	24.3	39.3	27.1	29.1	27.7	30.7
1979	33.2	25.9	20.4	23.9	38.6	26.1	32.8	27.2	31.6
1980	30.4	28.5	25.5	26.9	41.6	31.4	34.6	26.0	28.4
1981	28.7	27.1	26.5	28.1	41.6	23.7	24.2	23.9	31.5
1982	30.8	30.5	28.4	31.5	41.9	27.9	37.0	30.0	34.8
1983	29.6	32.9	28.4	28.8	46.8	24.9	39.6	31.3	35.8

RTC = Ready to cook.
[1]Further processed and cutup are not additive.
[2]Further processed reported as total 1967-73; reported separately as further processed whole and further processed "other" starting 1974.
[3]Product form as a percentage of total RTC certified in period.

Source: (*68, 76*).

Table 37—Cutup turkey products produced by 13 Pennsylvania further processors, 1978-79

Products	Number of products[1]	Number of firms[2]
Breasts	8	6
Breast roasts or rolls	3	3
Drumsticks, thighs (separate)	5	4
Drumsticks and thighs	2	2
Wings	3	3
Tails	1	1
Giblets	3	1
Meatloaf, sausage	3	3

[1]One product for each firm producing an item in the product group.
[2]Number of firms producing one or more items in the product group. Nine of the surveyed firms cut up turkeys; 55.7 percent of cutup parts went into cooked products; 9.2 percent of cutup parts were sold to other processors.

Source: Pennsylvania State University survey of Pennsylvania processors.

percent of turkey meat marketed by processors was further processed. Beginning in 1974, turkey certified as further processed was reported in two categories: "whole birds" and "other" (products). Further processed whole turkeys are "whole carcass turkeys which have been injected, basted, marinated, smoked, barbecued, etc., and packed as such." "Other" further processed turkey products include the further processed items mentioned above that were marketed in the sixties, plus a variety of new consumer products, such as turkey ham, introduced in the seventies. Plants use both whole turkeys and cutup turkey parts from processing plants for "other" further processed turkey products.

Statistical reports on product forms in which turkeys are marketed do not enable researchers to precisely estimate the distribution of final output among the various turkey products. However, a survey of nine Pennsylvania turkey processing firms with both cutup and further processing operations showed that 55.7 percent of cutup parts in 1978-79 went into cooked products ("other" further pro-

Table 38—Plants producing various types of further processed turkey products, by region, 1981[1]

Region[2]	Processed turkey whole/ parts[3]	Chicken and turkey				Turkey rolls or roasts
		Pot pies	Entrees	Dinners	Deli products	
		Number				
Northeast	2	4	3	0	2	1
Middle Atlantic	22	1	4	2	10	12
East North Central	13	2	2	3	3	4
West North Central	17	3	3	2	1	4
South Atlantic	12	3	0	2	6	5
East South Central	2	0	0	0	1	1
West South Central	8	1	2	1	2	2
Mountain	3	0	0	0	3	2
Pacific	12	1	2	0	6	3
Total plants[4]	91	15	16	10	34	34

[1]Compiled from survey results reported in (*53*).
[2]Regional designations based on Bureau of Census definitions. Excludes Alaska and Hawaii.
[3]Includes only plants that slaughter, eviscerate, or cut up turkeys.
[4]Number of plants not additive because of multiple processing of products in some plants.

cessed products). About 9 percent was also sold to other processors, presumably for further processing. There was a somewhat consistent upward trend in annual per capita pounds of turkey sold as further processed in 1974-82 (table 34). Most of the increase (1.9 pounds per capita) is accounted for by "other" further processed products.

Excluding 1961 and 1967, annual average per capita production of turkeys marketed as whole birds ranged from about 4.6 to 5.8 pounds during the 1960-82 period. (Per capita production was exceptionally high in 1961 and 1967, years when year earlier net returns for turkey production were extremely favorable.)

Consumers have shifted somewhat to cutup and further processed turkeys for flexibility and convenience. Retailers also prefer handling precut and prepackaged items because these items are more economical than cutting turkey in their stores, and they can reduce space, labor, and the clutter associated with receiving, storing, cutting, and wrapping. Selling cutup and further processed products generally allows processors to increase both sales volume and markup per unit. Multiplant processors often specialize by concentrating further processing operations in selected plants, although most slaughtering plants do have cutup operations. Specialized further processing plants often process red meat also, thus providing a wider product line, enabling them to reach more outlets and more fully utilize facilities and distribution services *(28, 29, 33, 48)*.

Consumption, Demand, and Prices

Consumers respond to changes in the price of turkey relative to other food prices. However, consumer tastes and preferences also change over time; they respond to new products and to availability of the product. Each of these factors has played a major role in strongly increasing the consumption of turkey.

Consumption Trends

Per capita consumption of turkey has risen by about 2 pounds each decade, from 4.1 pounds in 1950 to 10.8 pounds in 1982 (tables 29 and 35). Consumption is still highest during the Thanksgiving and Christmas seasons, but turkey is also widely sold at other times of the year. In 1980, about 40 percent of the yearly turkey consumption was during the last quarter. Twenty years earlier, about 55 percent of the yearly total was consumed during the last quarter. Over the 20-year period, fourth-quarter consumption rose by 16 percent, but consumption during the other three-quarters rose by 41 percent. Lower turkey prices and new product forms helped increase off-season consumption.

Turkey Price Trends

The retail price for whole turkeys trended downward from the midfifties through the midsixties. Since then, it has trended upward, approaching $1 per pound (table

40). Deflated retail turkey prices (in constant value dollars) trended downward through most of the 1955-83 period. There were only 8 years in the 29-year 1955-83 period when the average deflated retail price of whole turkeys was greater than the average for the previous year. In only 5 of these years was the increase from the previous year greater than 1.0 cent per RTC pound. There is a close relationship between turkey prices and costs. Deflated turkey prices declined, whereas actual prices increased because actual turkey prices increased less rapidly than the general price level for all goods and services.

Turkey meat competes with other meats for consumer dollars. During the 1960-82 period, 1 pound of turkey was equal in price to 1.2-1.3 pounds of frying chicken (table 41). During the 1960-64 period, 1 pound of turkey was equal in value to about 0.9 pound of pork or 0.6 pound of beef at retail. By 1980-82, retail prices for both pork and beef increased by about a third relative to whole turkey prices. This trend favors turkey consumption, and if it continues, additional boosts in turkey consumption can be expected.

Table 39—Structural comparisons of turkey slaughter, cutup, and further processing for plants under Federal inspection, 1981

Type of processing	Turkey	Total poultry
	Million pounds	
Total:		
Slaughter (certified RTC)	2,509	15,179
Cutup[1]	688	1,404
Further processing[2]	985	2,712
	Number	
Plants performing:		
Slaughter	129	NA
Cutup	175	1,452
Further processing[2]	445	1,144
Plants with 20 percent of volume:		
Slaughter	5	NA
Cutup[1]	—	NA
Further processing[2]	3	10
	Percent	
Volume under Federal inspection processed by eight largest firms:		
Slaughter	52.6	NA
Cutup[1]	68.5	NA
Further processing[2]	56.0	34.5

RTC = Ready to cook.
NA = Not available.
— Not shown to avoid disclosure of individual firms.
[1]Quantity inspected and used for cutup.
[1]Quantity inspected and used in further processing, excluding further processing of whole birds.

Source: Compiled from unpublished Food Safety Inspection Service inspection data.

The pork and beef prices used to calculate exchange values in table 42 are weighted-average prices for retail cuts of pork and beef. Turkey prices are for the basic commodity whole bird. However, as the proportion of turkey meat sold in product forms other than whole birds increases, the difference between the average retail price for all turkey marketed and the retail price for whole bird increases. Table 42 compares retail prices for selected frozen further processed products. Prices for these products have trended upward over the last several years, but detailed information on prices for turkey products and on the distribution of output among products marketed is not available for calculation of weighted-average retail prices for turkeys.

Consumer preference for the higher priced products is increasing. So, too, is processors' interest in marketing such products. Wholesale prices for turkey parts and cooked products generally run higher than whole turkey prices (table 43). However, relative prices for different turkey parts and different size birds change with supply and demand conditions, both in the short run and long run.

An imbalance occasionally arises between the quantity of various parts available and effective demand. Parts prices vary in the short term, but the most desired parts have increased in price relative to other parts or whole birds (table 44). The New York wholesale price of turkey breast, for example, increased from 73 cents per pound in 1974 to 105 cents in 1982, a 44-percent rise, whereas drumstick and wing prices decreased by 10-20 percent. During the same time, prices for whole hens rose by 33 percent, from 46 to 61 cents. Relative prices for different size birds also varied *(5, 6, 7, 12, 14, 37, 51, 66, 67)*.

Demand Relationships for Turkey

The increase in per capita turkey consumption during 1960-83 (table 35 and fig. 4) could represent either an increase in demand for turkey with price assumed con-

stant, or a greater consumption at lower turkey prices due to increasing turkey supplies at lower costs (fig. 5). A combination of these two factors is most likely.

Demand for a good is traditionally defined as the schedule of quantities of that good which consumers are willing and able to purchase at various prices. Variables other than the price of the particular good are assumed constant. These other variables, which change per capita demand for a good, are usually associated with changes in consumers' incomes, changes in the prices of substitute or complementary goods, and changes in consumers' tastes and preferences. Consumers can, therefore, purchase varying quantities of a good without changing demand if they vary the quantity they take in response to a change in the price of the good.

Table 40—Turkey prices, farm-to-retail price spreads, and per capita consumption[1]

Year	Farm value	Farm-to-retail price spread	Retail price		Annual per capita consumption
			Actual	Deflated[2]	
	Cents/pound, RTC				*Pounds*
1955	40.9	20.7	61.6	76.8	5.0
1956	33.8	23.1	56.9	69.9	5.2
1957	31.5	19.3	50.8	60.3	3.9
1958	30.9	21.7	52.6	60.7	5.9
1959	34.4	16.9	51.3	58.8	6.3
1960	36.2	19.3	55.1	62.1	6.1
1961	22.0	22.8	44.8	50.0	7.4
1962	29.7	19.3	49.0	54.1	7.0
1963	29.7	19.7	49.4	53.9	6.8
1964	27.2	19.6	46.8	50.4	7.3
1965	28.9	19.2	48.1	50.9	7.4
1966	29.9	20.5	50.4	51.9	7.8
1967	25.5	23.2	48.7	48.7	8.5
1968	25.1	21.3	46.4	44.5	7.9
1969	27.5	21.6	49.1	44.7	8.2
1970	30.2	25.9	56.1	48.2	8.0
1971	29.9	26.4	56.3	46.4	8.3
1972	30.2	26.4	56.6	45.2	8.9
1973	58.1	32.2	90.3	67.8	8.5
1974	40.4	31.0	71.4	48.3	8.8
1975	46.4	31.9	78.3	48.6	8.5
1976	38.6	35.3	73.9	42.9	9.1
1977	46.9	30.4	77.3	42.6	9.1
1978	58.3	29.5	87.8	44.9	9.1
1979	59.2	29.9	88.2	40.6	9.9
1980	61.8	33.9	95.7	38.8	10.5
1981	42.3	50.4	92.7	34.0	10.8
1982	48.7	43.9	92.6	32.1	10.8
1983	54.0	36.8	90.8	30.4	11.2

RTC = Ready-to-cook basis.
[1]Prices and spreads are averages for Oct.-Dec.
[2]Deflated prices are current prices deflated by the consumer price index for all items, 1967 = 100.

Source: (*6, 7, 23, 63, 65, 68, 69*).

Figure 4 shows the relationship between deflated retail prices for whole turkeys and annual per capita turkey consumption from 1960 through 1983. As real price of turkey declined from 70-80 cents per pound in the fifties to 40 cents per pound in the late seventies and early eighties, the quantity of turkey consumed increased from 5 pounds to over 11 pounds per capita. It appears that increased annual per capita consumption between 1960 and 1983 resulted principally from lower prices. Relationships between annual per capita production and previous-year average deflated production costs and farm values show that annual average production costs decreased through most of the past 20 years and that producers were willing and able to produce increasing quantities of turkey at decreasing prices (fig. 5). These increases in quantities supplied contributed to lower prices and higher per capita consumption during 1960-83. However, it is likely that consumer demand has also increased during the period in response to increasing consumer incomes and increases in prices of competing goods, mainly beef and pork, relative to turkey prices. It is also likely that consumers' tastes and preferences shifted toward turkey meat during that period, particularly as many new turkey product forms were introduced *(54)*.

Table 41—Selected competing meats equal in cost to 1 pound of turkey at retail, 1960-81

Period	Pork	Beef	Frying chicken
		Pounds	
1960-64	0.86	0.63	1.22
1965-69	.70	.57	1.21
1970-74	.70	.51	1.31
1975-79	.59	.51	1.23
1980-82	.59	.39	1.28

Seasonal relationships in turkey meat consumption (fig. 6 and 7) suggest that between 1964 and 1981 per capita demand for turkey increased in the first three quarters

Table 42—Retail price trends per package for selected frozen further processed poultry products, 1970-83

Year	Chicken or turkey pies (8 oz.)[1]	Chicken or turkey dinners (11 oz.)[2]	Turkey roasts (32 oz.)[3]	Chicken or turkey and gravy (32 oz.)	Chicken or turkey boiled in bags (5 oz.)
	Cents		*Dollars*		*Cents*
1970	19.9	44.0	2.61	1.18	—
1971	19.0	42.9	2.45	1.08	—
1972	19.5	46.5	2.67	1.13	26.0
1973	22.3	42.3	3.06	1.26	26.4
1974	23.8	47.7	2.90	1.20	26.0
1975	23.5	50.7	2.19	1.11	27.6
1976	23.6	51.4	2.96	1.10	24.3
1977	25.2	44.0	3.08	1.10	26.7
1978	26.2	62.0	2.89	1.30	30.0
1979	27.8	61.0	3.36	1.60	38.6
1980	30.2	63.0	3.12	1.56	48.7
1981	33.9	74.0	3.32	1.59	42.6
1982	38.4	77.0	3.04	1.58	41.5
1983	37.9	82.1	2.85	1.61	41.1

— = Not available.

[1]Prices for turkey pies and chicken pies are about the same as prices for meat pies.

[2]Prices for turkey and chicken frozen dinners are similar to prices for meat dinners.

[3]Includes a wide range of package sizes with both white meat and mixed meat combinations. Prices adjusted for package size to 32-ounce equivalent.

Sources: Data for 1970-76 derived from monthly averages of advertised retail prices in 21 trading areas of the U.S. from *(42)*. Data for 1977-83 derived from retail prices for Atlanta, Ga., market areas as advertised in *(2)*. Prices adjusted for package size where appropriate.

Table 43—Wholesale price trends for certain further processed turkey products, selected years, 1965-82

Type of product	1965	1970	1972	1974	1979	1980	1981	1982
	Dollars per pound							
Boneless turkey roasts (raw, LCL 60-percent white, 40-percent dark)	0.79	0.81	0.74	1.00	1.28	1.42	1.64	1.48
Turkey breasts (boned, oven-roasted)	1.42	1.55	1.40	1.73	1.83	1.78	1.87	1.22
Cooked turkey rolls:								
60-percent white and 40-percent dark	.82	.84	.77	1.07	1.23	1.05	1.14	1.22
All white meat	1.02	1.05	.97	1.21	1.36	1.16	1.24	1.31
Cooked, diced turkey meat (60-percent white and 40-percent dark) mixed portions	1.12	.92	.92	1.14	1.22	1.14	.99	1.33
Ground turkey meat (raw, frozen 40-lb. box, dark ground, T/L)	—	—	—	.74	.77	.70	.75	.55
Turkey hot dogs (frozen, T/L)	—	—	—	—	—	.68	.53	.63

— = Not available.
LCL = Less than car load.
T/L = Truck load.

Source: (*61*).

Table 44—New York wholesale prices of selected turkeys and turkey parts, 1974–82

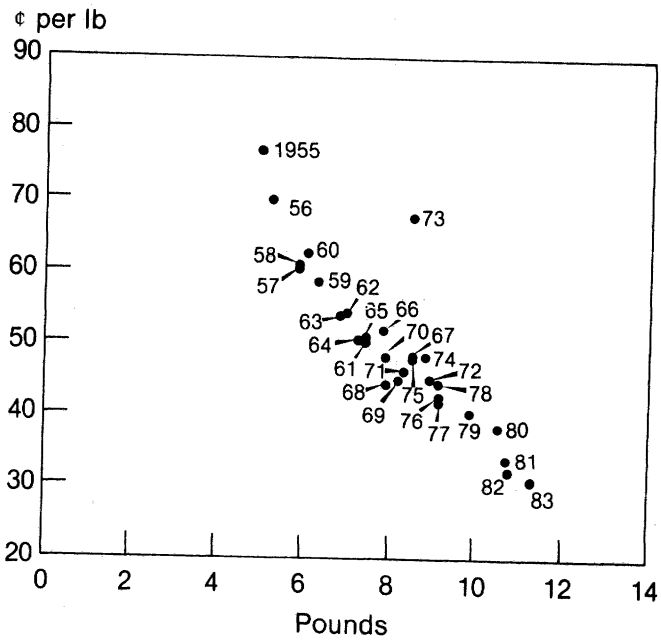
Year	Fryer-roasters, 4-9 pounds	Young hens, 8-16 pounds	Young toms		Breasts, 10-12 pounds	Bulk parts	
			14-20 pounds	28-30 pounds		Drumsticks	Wings, full cut
			Cents per pound				
1974	48.8	46.5	43.9	48.3	73.0	27.8	31.6
1975	55.8	53.2	50.8	55.8	87.4	28.0	34.6
1976	50.5	48.7	48.7	64.4	85.0	24.0	24.8
1977	[1]	54.0	53.3	64.9	93.9	21.6	26.7
1978	[1]	66.7	65.0	74.2	106.2	28.6	32.3
1979	[1]	67.5	63.7	79.8	107.5	32.8	33.6
1980	[1]	63.6	62.6	65.8[2]	110.8	33.1	27.5
1981	65.5	60.7	61.1	66.7[2]	102.0	27.8	26.7
1982	[1]	60.8	61.7	63.8[2]	104.8	25.8	25.4

[1]Insufficient data reported.
[2]24- to 26-pound toms.

Source: (*65*).

Figure 4

Per Capita Turkey Consumption and Real Retail Prices*



*Prices in 1967 constant dollars.

of the year and that demand in the final quarter may have decreased. Furthermore, consumption now appears more responsive to price changes in the first three quarters, but less responsive in the final quarter. These trends are reasonable as turkey consumption increased mostly in the first three quarters, and this increase was primarily in further processed products or cutup parts, product forms which are more adaptable than whole turkey as substitutes for other meats.

Most studies assume that the quantity of turkey demanded is a function of whole turkey prices and certain demand determinants. Before 1970, most turkeys were purchased by consumers as whole birds and there was little reason to question this assumption. However, during the seventies, increasing proportions of turkey were marketed in value-added forms, cutup parts, or further processed whole birds or products. These product forms are sold to consumers at prices higher than are whole birds (table 42). Thus, average prices consumers pay for increasing quantities purchased are now considerably higher than traditional whole bird prices, and this difference is increasing. The immediate result of using whole bird prices to estimate turkey demand is either that increases in demand for turkey are likely underestimated or that decreases are overestimated. The problem is further complicated by the fact that value-added products, particularly further processed items, are likely to be differentiated goods sold as branded products, and prices for these goods are not so closely related to whole bird prices. Prices for cutup parts are more closely associated with whole bird prices. Because 40 percent of turkey meat is now further processed, there is a wide range of retail prices that consumers actually pay for the variety of cutup turkey parts and further processed turkey products.

Elasticity of demand of turkey meat is defined as the percentage change in quantity of turkey purchased which accompanies a 1-percent change in the price of turkey or in one of the demand determinants. Direct price elasticities are usually negative because relationships between quantities of goods demanded and their own prices are usually inverse. Cross elasticities and income elasticities measure the response in quantity purchased of a particular good to changes in prices of other goods or in consumers' incomes. Cross elasticities of demand for turkeys associated with prices of other meats are expected to be positive because turkey meat and other meats are substitute goods. The income elasticity of demand for turkey would also be expected to be positive because consumers will vary the quantity taken in direct relationship to their ability to purchase turkey.

Estimates of demand elasticities for turkeys at the retail level reported in various studies include -1.555 for the 1946-68 period *(22)*, -1.404 for the 1955-57 period *(10)*, and -0.6485 for the 1953-77 period *(24)*. Estimates of income elasticities of demand for turkeys reported in these first two studies were 0.768 and 0.490, respectively. The estimate of income elasticity in the third study was not statistically significant. In another study, price elasticities of demand for turkeys at the farm level were estimated for the 1960-67 period at -0.36 in the first quarter, -0.99 in the second quarter, -0.90 in the third quarter, and -0.45 in the fourth quarter *(50)*. Demand elasticities at the farm level would be expected to be less than those at the retail level as farm prices are lower and a given change in price represents a larger percentage change.

We estimated more recent demand relationships at the retail level for the 1969-81 period (see appendix). We used monthly data and measured all prices and income in deflated dollars. Table 45 gives estimated elasticities

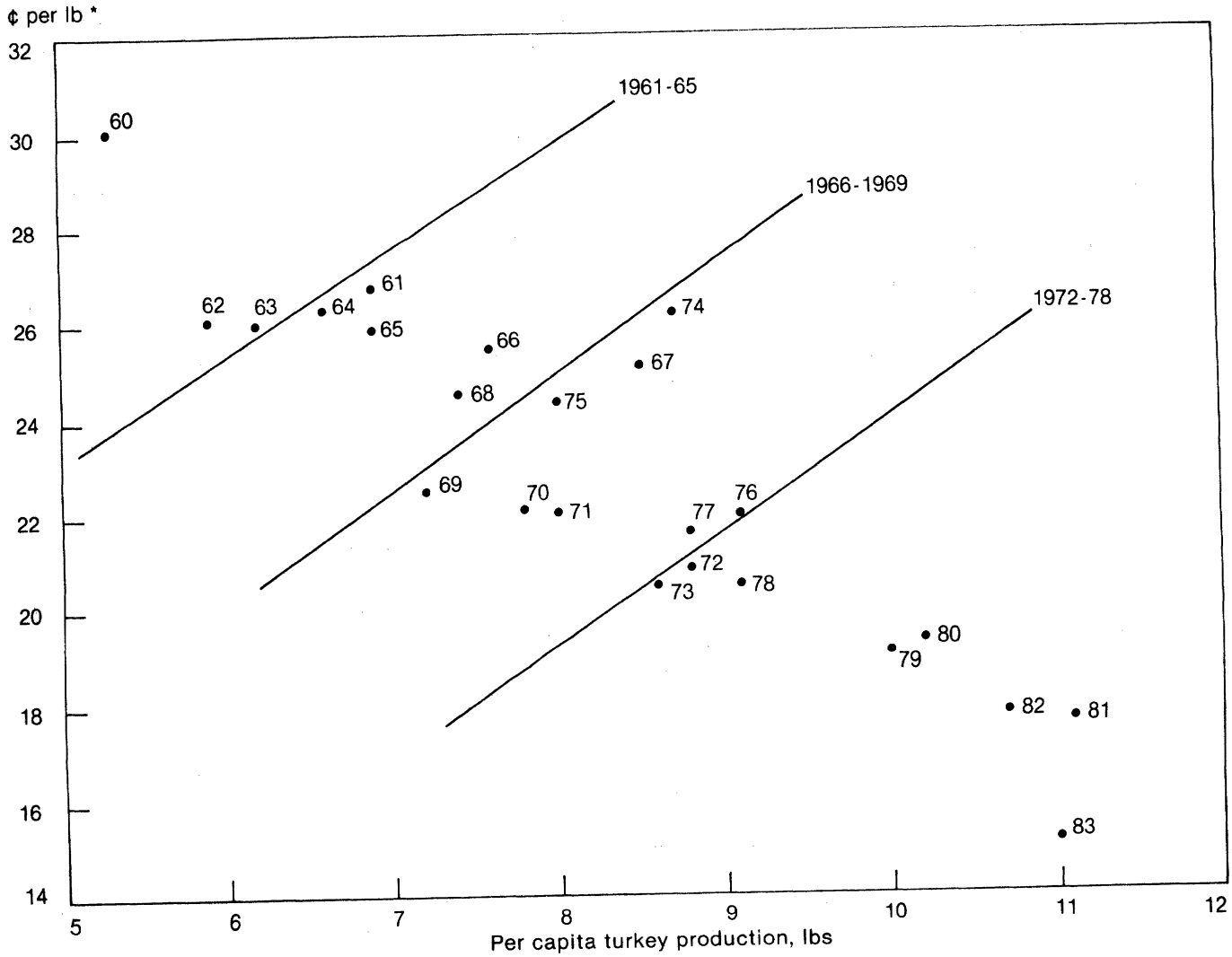
and an estimate of the annual trend in the level of demand for turkeys. The annual trend is a proxy for changes in consumer tastes and preferences for turkeys (including marketing innovation). If one compares results of studies in which data for different time periods were analyzed, one sees that the direct price elasticity for turkeys is decreasing over time and that consumers are becoming less responsive to changes in turkey prices. Perhaps most of the price effect has already been realized through the extended period of relatively low real prices for turkey.

Even if improvements in efficiency of turkey production continued to decrease the real price of turkeys, opportunities to increase turkey consumption by reducing turkey prices have diminished.

Pork was the only meat we identified as a substitute for turkey. Although the relationship was statistically significant at a high probability level, a major large change in pork prices would be required to generate any substantial change in the demand for turkey.

Figure 5

Annual Turkey Production



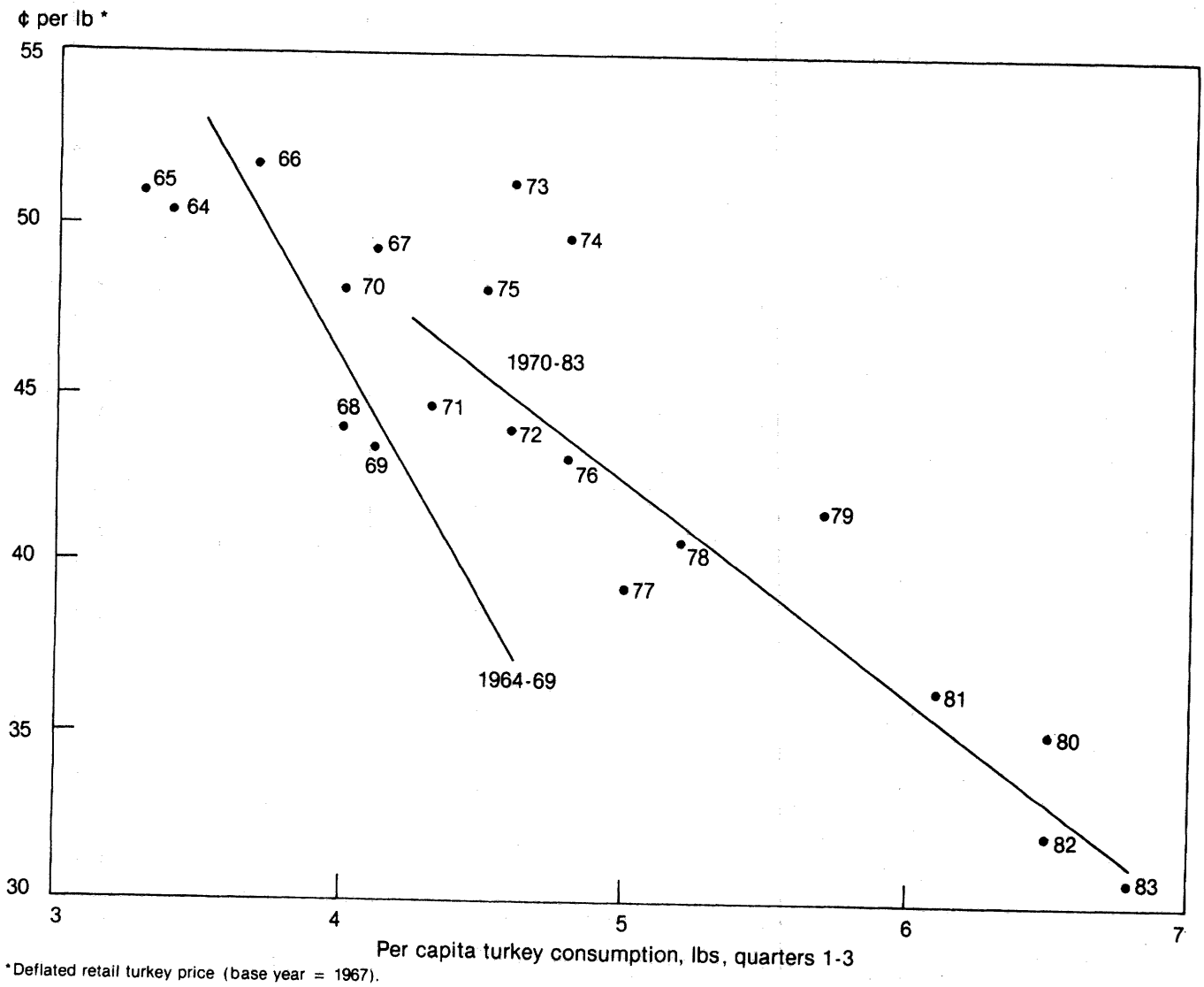
* Deflated retail turkey production cost lagged 1 year.

The estimated response of turkey demand to changes in consumer income was also less than estimates calculated by use of data from earlier time periods. Therefore, future increases in turkey demand due to increasing consumer income will likely occur at a proportionally slower rate. The estimated 1969-81 trend increase in demand for turkey was 0.111 pound per year. In the first three quarters of the year, demand trended upward at an annual rate of 0.168 pound, whereas in the fourth quarter, demand trended downward at an annual rate of -0.060 pound (see appendix). Demand seasonality for turkey averaged about 1 pound higher per consumer per month in November than in any other month. The level of demand was lowest in the first quarter and increased progressively through the fourth quarter.

Average per capita turkey consumption in 1965-69 was 8.0 pounds per year, whereas it was 10.7 pounds in the 1980-82 period, an increase of 2.7 pounds. We used the demand relationships in table 46 to estimate the distri-

Figure 6

Per Capita Turkey Consumption



*Deflated retail turkey price (base year = 1967).

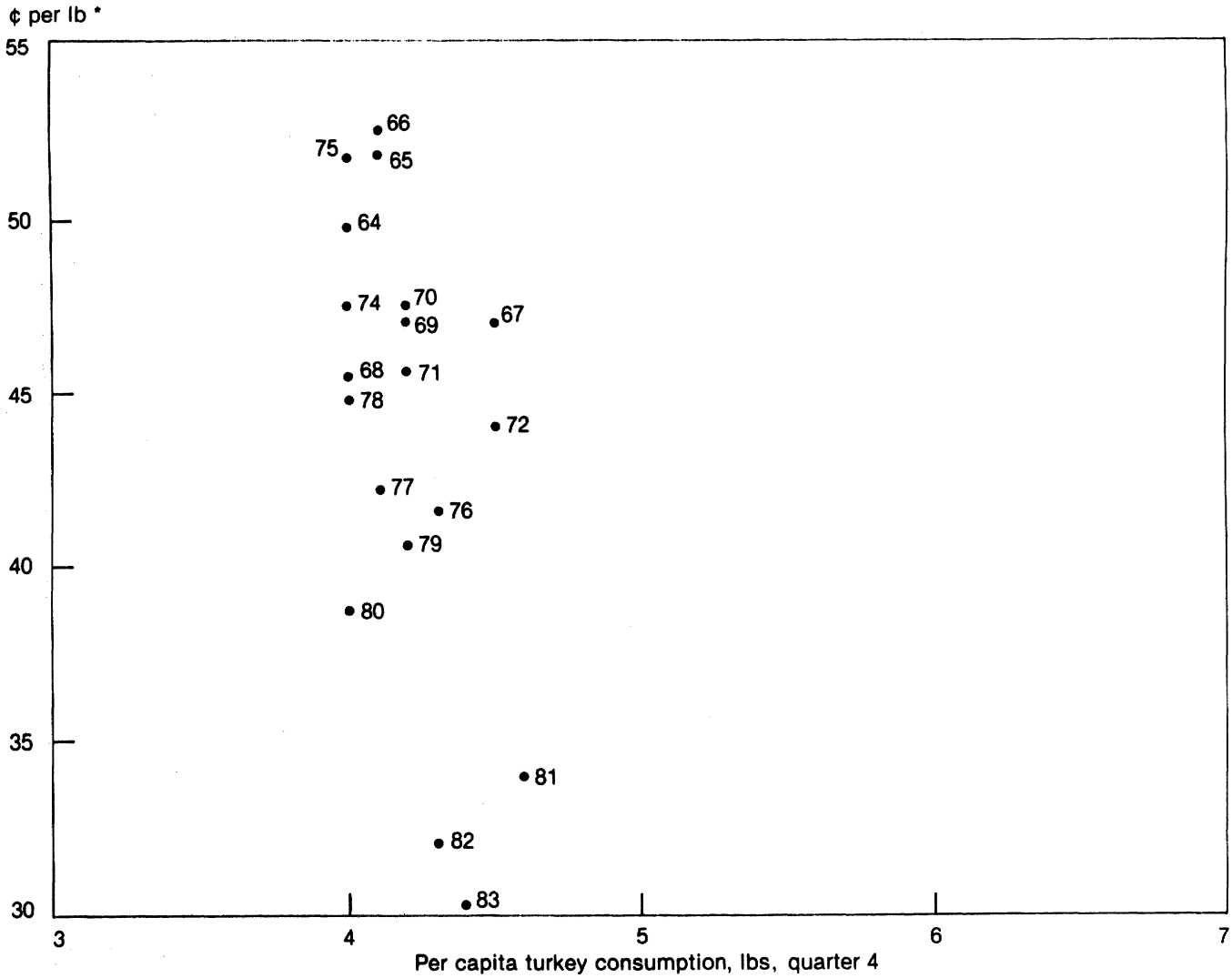
bution of the change in turkey consumption among sources. About 41 percent of the net increase [2] in annual average turkey consumption during the period can be accounted for by the decrease in real turkey prices. This portion represents an increase in the quantity of turkey purchased in response to a lower price; it does not represent an increase in the demand schedule for turkey.

[2]Net increase accounts for a decrease in demand for turkey because of a decrease in real prices for pork.

The cross elasticity of demand for turkey associated with changes in pork prices was relatively small. However, the real price of pork decreased during the period and exerted a downward pressure on turkey demand; the impact of this change in annual consumption was about -0.2 pound per person. The 18.8-percent increase in average per capita income accounted for 0.2 pound, or 8 percent of the net increase in per capita turkey consumption (table 46). However, the annual trend (the proxy for consumers' tastes and preferences) accounted

Figure 7

Quarterly Per Capita Turkey Consumption



*Deflated retail turkey price (base year = 1967).
1973 price, beyond the scale of this chart, was 66.5 cents per lb. and consumption dropped to 3.9 lbs. per capita.

Table 45—Demand elasticity relationships for turkey, 1969-81

	Percent
Direct price elasticity for turkey (retail level)	−0.472
Cross elasticity with pork price	+.186
Income elasticity for turkey	+.131
	Pounds per capita
Annual trend in level of demand	.111

for 1.6 pounds or 60 percent of the estimated net increase in per capita turkey consumption in 1965-82. This finding is reasonable as the upward trend in demand was in the first three quarters when consumers are more likely to use turkeys in product forms other than the traditional whole bird. Most of the increase in turkey consumption was in new products which cater to consumer desires other than that for the traditional holiday consumption of whole turkeys. Continuing development of new turkey products which appeal to changing consumer tastes will likely provide the turkey industry with the best opportunity for growth.

Note that the above relationships were estimated based on whole turkey prices even though more and more turkey sales are in forms other than whole birds and are priced higher than whole birds. Therefore, demand has likely increased more than the estimates reported above would suggest. Because most of the increased consumption in recent years has been in products with higher-than-whole-bird retail prices, the magnitudes of demand elasticities are probably somewhat more elastic (responsive to price change) than the estimates reported. The discrepancies are probably larger for estimated relationships for the first three quarters of the year when relatively large proportions of turkey consumption are in the higher priced, less traditional forms. The fourth-quarter holiday season favors consumer purchases of the traditional whole bird at lower prices, consumed at relatively stable annual per capita rates.

Table 46—Factors responsible for change in annual per capita turkey consumption, 1965-69 to 1980-82

Factor	Share change contributed	Change in turkey consumption	
	Percent	*Percent*	*Pounds*
Retail price of turkey (deflated)	28.1	13.26	1.06
Retail price of pork (deflated)	-15.1	2.81	-.22
Per capita income (deflated)	18.8	2.46	.20
Annual trend (14 years)	NA	NA	1.55
Total change	—	—	2.59

NA = Not available
— = Not applicable.

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Appendix: Demand Equations for Turkeys

We used monthly data for 1969 through 1981 to estimate retail demand for turkeys. Prices and income were deflated by the Consumer Price Index, with 1967 = 100. We used ordinary least squares to estimate the parameters of the model. A single-equation model was estimated because turkey supply within a given month is mostly predetermined. Turkey consumption was specified as a function of the price of turkey, prices of other meats (beef, pork, and chicken), and consumer income. The model included an annual trend variable to account for changes over time in consumer tastes and preferences. We used discrete variables to test for variations among months in the level of turkey demand. We used interaction variables to test for seasonal variations in demand relationships. The final model estimated was:

$$
\begin{aligned}
CT_t = \; & \underset{(11.0620)}{1.0401} - \underset{(4.0936)}{0.0080\, PT_t} + \underset{(4.0329)}{0.0011\, (PP_t QP_t)} \\
& + \underset{(6.1914)}{0.4393\, (Y_t TR_t)} + \underset{(32.6936)}{0.9655\, NOV_t} - \underset{(20.4961)}{0.7664\, Q1_t} \\
& - \underset{(17.8890)}{0.6699\, Q2_t} - \underset{(12.4050)}{0.4611\, Q3_t} - \underset{(4.2716)}{0.0185\, Q4_t TR_t} \\
& R^2 = 0.96 \quad \text{Durbin-Watson} = 1.96 \qquad (1)
\end{aligned}
$$

where:

- CT_t = consumption of turkey, pounds per capita in month t;
- PT_t = deflated retail price of turkey, whole birds, cents per pound in month t;
- PP_t = deflated retail price of pork, cents per pound in month t;
- QP_t = consumption of pork, pounds per capita in month t;
- Y_t = deflated disposable personal income, $100,000 per capita annual rate in month t;
- TR_t = annual trend; TR_t = 1 for 1969, TR_t = 2 for 1970, TR_t = 3 for 1971,..., TR_t = 13 for 1981;
- NOV_t = discrete variable for demand shift in November; NOV_t = 1 in November, NOV_t = 0 in all other months; and
- $Q1_t$ $Q2_t$, $Q3_t$, and $Q4_t$ = discrete variables for seasonal demand shifts;
- $Q1_t$ = January 1 through March, $Q1_t$ = 0 in all other months;
- $Q2_t$ = April 1 through June, $Q2_t$ = 0 in all other months;
- $Q3_t$ = July 1 through September, $Q3_t$ = 0 in all other months; and
- $Q4_t$ = October 1 through December, $Q4_t$ = 0 in all months.

The numbers in parentheses are Student t-statisitics. All parameters in the model are statistically significant at the 99-percent probability level. The model accounted for 96 percent (R^2) of the variation in monthly average per capita turkey consumption during 1969-81. The Durbin-Watson statistic indicates no serial correlation in the estimated residuals. The signs of the coefficients are those expected.

Estimates of relationships between turkey demand and prices of beef and chicken were not statistically significant at an acceptable level. Prices for these meats were not included in the final model. To reduce the problem of intercorrelation among prices of meats, we used expenditures (for example PP_tQP_t) for substitute goods instead of prices (PP_t) (see *30,* p. 11). There was a strong inter-relationship between per capita income and the annual trend. This relationship was accounted for by use of a variable in the model which was the product of income times trend. Except for November, differences among estimates of monthly demand shifts within quarters were not statistically significant at an acceptable level. Thus, quarterly demand shifters were included in the final model. The rate of increase in per capita demand for turkeys was less in the fourth quarter than in the first three quarters. We accounted for this difference by including a variable calculated as a product of the fourth-quarter demand shifter ($Q4_t$) and the trend variable (TR_t).

We used parameters in the demand equation to calculate the elasticities reported in the text. At the means of the data, the general equation for estimation of elasticities is:

$$E = b\,\frac{Y}{X} \qquad (2)$$

where:

b = regression coefficient of Y with respect to X,
Y = average value of the independent variable, and
X = average value of the dependent variable.

Average values of CT and PT were 0.757 and 44.627, respectively. Thus, based on monthly data, the direct price elasticity of demand (E) for turkeys is:

$$E = -0.008 \frac{44.627}{0.757} = -0.472 \qquad (3)$$

We estimated the cross elasticity of turkey consumption with respect to pork price using a procedure outlined by Kung and Jack (*30*, pp. 27-30), because of the relationship between pork prices and pork consumption. Average values of PP_t and QP_t were 70.237 and 5.016, respectively. Haidacher and others (*24*, p. 14) estimated the direct price elasticity of demand for pork (Pe) was −0.730. Thus:

$$Pe = b \frac{\overline{PP}}{QP} = -0.730 = b \frac{70.237}{5.016}$$

$$b = -0.052 = \frac{QP}{PP}$$

$$QP = -0.052 \quad PP \qquad (4)$$

From the turkey demand equation, one derives:

$$\frac{CT}{(PP\ QP)} = 0.011$$

$$\frac{CT}{PP\ QP + QP\ PP} = 0.011$$

$$\frac{CT}{70.237\ QP + 5.016\ PP} = 0.011 \qquad (5)$$

Substituting equation (4) in equation (5), one derives:

$$\frac{CT}{70.237\ (-.052\ PP) + 5.016\ PP} = 0.011$$

$$\frac{CT}{PP} = 0.002$$

Cross elasticity of demand for turkey with respect to *pork price* is:

$$Ep = \frac{CT}{PP} \times \frac{\overline{PP}}{CT} = 0.002 \frac{70.237}{0.757} = 0.186$$

We also estimated the income elasticity at the means by using the general equation for calculation of elasticities. Averages of Y and TR were 0.032 and 7.039, respectively. Income elasticity of demand (Ey) for turkey was:

$$Ey = (0.4393 \times 7.039) \frac{0.032}{0.757} = 0.131 \qquad (6)$$

The trend (proxy for change in the level of demand because of changes in consumers' tastes and preferences including marketing innovation) was estimated in pounds per month. Monthly average trends were aggregated to provide an estimate of the annual trend.

The trend on a monthly basis for the first 9 months was: TQ1-3 = (0.439) (0.032) = 0.014 pound per month. The trend for the last 3 months was: TQ4 = (0.439 × 0.032) − 0.019 = −0.005 pound per month. The annual trend in the demand for turkeys was: (9 × 0.014) + (3 × (−0.005)) = 0.111 pound per year.

Appendix table 1—Consumer price index and price indexes for selected production inputs

Year	Consumer price index (CPI)	Producer price index (PPI)	Containers	Fuels and related products and power	Wages in food and kindred industries	Turkey ration
			1960 = 100			
1950	81.3	84.3	75.4	90.6	59.7	106.4
1951	87.7	92.3	88.5	94.0	64.0	115.5
1952	89.6	91.8	83.7	93.8	68.2	121.6
1953	90.3	90.8	83.8	96.4	72.6	113.8
1954	90.8	91.0	85.3	95.0	75.3	114.8
1955	90.4	91.2	86.5	94.9	78.7	108.4
1956	91.8	93.8	92.8	97.8	83.5	106.2
1957	95.0	97.2	96.9	103.1	87.7	104.9
1958	86.4	99.5	99.2	99.2	92.0	105.1
1959	98.4	99.3	98.6	99.2	95.7	104.3
1960	100.0	100.0	100.0	100.0	100.0	100.0
1961	101.0	100.0	99.2	101.1	102.9	100.9
1962	102.1	100.3	100.4	100.6	106.1	102.1
1963	103.4	100.0	99.2	100.2	109.0	104.7
1964	104.7	100.4	98.4	97.5	112.4	103.7
1965	106.5	102.1	100.3	99.4	115.1	104.5
1966	109.6	105.4	103.0	101.8	119.5	105.6
1967	112.7	106.7	104.7	104.1	125.2	105.7
1968	117.5	109.7	107.2	102.9	132.8	101.6
1969	123.8	113.8	111.3	105.0	140.3	103.8
1970	131.1	117.7	116.6	110.5	149.8	109.7
1971	136.8	121.3	122.1	119.9	160.2	112.2
1972	141.3	125.1	127.6	123.4	170.2	113.8
1973	150.1	136.5	135.3	139.8	181.1	183.9
1974	166.5	157.4	159.4	216.8	197.2	201.2
1975	181.7	174.4	179.5	255.0	216.6	194.3
1976	192.2	181.8	189.9	276.4	235.2	202.2
1977	204.6	192.7	202.2	314.5	254.6	213.9
1978	220.3	207.7	222.5	335.6	275.0	212.4
1979	245.1	230.6	246.4	424.7	297.2	235.3
1980	278.2	263.4	275.8	596.7	325.2	259.5
1981	307.0	290.7	296.6	722.6	353.6	289.8
1982	325.6	299.6	306.7	721.3	374.5	266.5
1983	336.3	304.3	300.1	691.7	387.8	287.4

Sources: (*69, 78, 79, 80*).

Appendix table 2—Volume of turkey certified under Federal inspection, by product form, by months for selected years, 1960–83

Item	January	February	March	April	May	June	July	August	September	October	November	December	Annual
							Million pounds						
Cutup RTC weight:													
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1965	5.6	3.6	5.2	3.9	4.0	5.2	5.4	10.8	14.0	15.5	13.8	10.2	97.2
1970	10.8	10.4	9.9	9.8	9.8	14.2	20.0	20.9	23.1	24.9	19.6	17.5	190.7
1975	21.6	17.2	16.5	21.1	21.7	25.4	27.1	29.8	33.0	39.3	31.2	28.9	312.8
1980	56.9	47.9	47.9	48.0	53.4	59.5	52.0	53.9	51.6	66.2	58.9	58.6	655.8
1981	59.7	47.9	54.6	50.1	57.1	58.7	56.1	60.3	59.7	67.0	64.2	65.9	701.3
1982	53.8	56.7	62.1	48.3	53.4	64.7	49.9	65.2	67.2	75.7	72.8	64.2	734.0
1983	63.1	61.4	66.2	64.1	67.7	62.7	58.7	74.8	73.4	74.6	74.9	66.0	809.2
Further processed as whole body:													
1960	3.1	2.7	3.7	3.0	3.4	3.7	3.5	4.6	5.3	7.1	7.3	6.3	54.0
1965	7.0	6.3	7.4	7.5	6.9	8.0	9.1	8.8	9.7	11.5	11.6	11.0	105.0
1970	15.3	12.8	11.6	10.8	10.4	14.9	19.8	20.5	22.3	25.5	20.9	16.7	201.0
1975	18.8	16.6	18.3	20.1	18.6	28.3	40.6	44.0	45.8	52.9	40.5	27.5	372.0
1980	29.1	30.7	33.9	31.3	45.5	55.9	70.0	72.6	83.6	102.4	67.9	48.0	671.1
1981	29.8	23.6	32.2	37.5	45.9	72.0	86.8	92.0	88.6	86.6	70.8	39.6	705.5
1982	31.2	31.9	39.5	39.8	53.0	62.9	80.5	104.3	102.6	89.6	72.9	39.4	747.4
1983	24.5	24.4	46.7	40.8	52.4	73.6	83.8	88.8	84.7	91.6	63.5	33.6	708.7
Further processed other than whole:													
1960	2.6	2.4	3.1	2.5	2.9	3.1	3.0	3.9	4.5	6.2	6.3	6.3	47
1965	9.8	8.8	10.2	10.5	9.5	11.1	12.6	12.3	13.4	16.0	16.1	16.7	147
1970	21.2	17.6	15.9	14.9	14.3	20.5	27.3	28.3	30.9	35.2	28.8	23.0	278
1975	27.0	23.8	26.4	29.0	26.7	40.8	58.5	63.4	66.0	76.2	58.4	39.7	536
1980	66.3	66.5	66.8	67.1	79.8	84.8	85.9	88.8	99.1	96.8	76.8	74.0	952.8
1981	72.0	69.0	79.9	75.7	77.8	83.8	83.2	92.7	91.4	94.1	87.4	77.4	984.6
1982	66.1	63.9	89.6	67.6	75.0	85.1	74.7	95.5	98.8	104.7	93.3	89.7	1,033.9
1983	78.8	81.7	94.2	87.3	89.2	100.2	91.0	110.7	109.8	112.9	105.0	82.5	1,144.4

RTC = Ready to cook.
NA = Not available.

Source: (*76*).

Appendix table 3—Product usage and forms as percentage of turkey certified RTC at slaughter by months, selected years, 1960–83[1]

Item	January	February	March	April	May	June	July	August	September	October	November	December	Annual
							Percent						
Further processed:													
1960	11.8	17.1	23.1	15.4	10.7	6.7	5.8	3.6	3.0	3.2	3.5	5.0	5.0
1965	31.4	64.2	70.3	67.3	35.2	20.3	13.2	7.5	6.0	6.1	5.9	10.6	11.1
1970	52.3	79.3	71.9	54.0	31.8	18.7	15.9	13.3	12.6	12.7	11.8	15.4	17.7
1975	41.6	50.5	48.5	42.2	32.6	29.5	30.3	31.2	28.8	29.6	26.5	25.2	31.2
1980	47.0	60.8	52.2	46.9	44.7	41.0	35.7	39.1	40.6	34.7	31.2	38.8	39.2
1981	50.7	57.7	58.6	50.7	43.6	37.1	33.2	35.4	33.5	32.4	31.4	37.9	39.2
1982	50.0	51.8	57.8	45.9	45.6	39.4	32.7	36.0	36.9	37.9	32.2	46.5	42.0
1983	54.7	60.3	51.5	52.4	48.6	43.3	40.5	40.7	41.6	40.1	36.4	43.4	44.7
Cutup:													
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1965	17.9	26.3	35.9	25.0	14.8	9.5	5.6	9.9	9.4	5.9	5.0	6.7	7.3
1970	26.7	46.8	44.8	35.5	21.8	13.0	11.6	9.9	9.4	9.0	8.0	11.7	12.2
1975	33.3	36.5	30.3	30.7	26.5	18.4	14.0	14.7	14.4	15.3	14.2	18.3	18.2
1980	40.3	43.8	37.5	33.6	29.9	28.8	22.0	23.7	21.1	23.9	23.9	30.7	28.1
1981	42.0	40.0	40.0	33.6	32.0	26.0	22.4	23.0	21.9	23.1	23.1	32.3	28.0
1982	40.7	46.0	40.1	32.8	32.5	29.9	21.9	24.6	25.1	27.4	25.1	33.3	29.9
1983	43.8	45.3	36.2	38.5	36.9	27.1	26.1	27.5	27.8	26.5	25.9	34.9	31.6
Chilled, RTC:													
1960	9.5	21.1	17.9	23.5	15.9	15.2	15.6	12.8	13.7	12.4	20.5	18.4	15.6
1965	23.4	16.8	23.4	26.9	28.9	25.2	20.8	16.9	15.9	16.9	24.3	30.9	21.1
1970	25.2	25.7	26.7	26.8	24.9	17.4	17.0	15.6	15.1	16.0	24.9	30.0	19.8
1975	27.7	28.2	30.5	23.9	20.9	21.1	15.8	15.4	16.7	18.8	27.3	30.1	21.4
1980	34.3	31.6	30.4	29.2	26.1	24.7	22.7	22.5	22.3	24.6	33.8	31.8	27.1
1981	28.1	28.9	28.8	27.3	23.8	21.3	19.6	22.1	22.7	26.1	35.2	36.4	26.4
1982	30.9	33.6	36.0	33.9	29.8	28.9	27.1	27.8	27.8	28.8	37.4	39.8	31.5
1983	38.9	38.7	37.2	33.6	29.8	27.7	26.8	29.8	27.8	29.5	38.9	44.0	32.9
Frozen, RTC:													
1960	90.5	87.9	82.1	77.2	84.1	84.8	84.4	87.2	86.3	87.6	79.5	81.6	84.4
1965	76.6	82.5	76.6	73.1	70.7	74.8	79.2	83.2	84.1	83.1	75.6	69.1	78.9
1970	74.8	74.3	73.3	72.8	75.1	82.7	83.0	84.4	84.9	84.0	66.8	69.3	78.9
1975	72.3	71.8	69.7	76.1	79.2	78.9	84.2	84.6	83.3	81.2	72.7	69.8	78.6
1980	65.8	68.5	69.7	70.8	73.9	75.4	77.3	77.5	77.7	75.4	66.2	68.2	72.9
1981	71.9	77.8	75.9	75.9	76.2	78.6	80.4	77.9	77.3	73.0	64.8	63.6	73.6
1982	69.1	68.6	64.0	66.1	70.2	71.1	72.5	72.4	79.2	71.1	62.6	60.2	68.5
1983	61.1	61.3	62.8	66.4	70.2	72.3	73.2	70.2	72.2	70.5	61.1	56.0	67.1

RTC = Ready to cook.
NA = Not available.
[1]Further processed and cutup are not additive.

Source: (*75*).

Appendix table 4—U.S. Department of Agriculture contracts to purchase turkey, by month, 1960-83[1]

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
						Million pounds							
Ready-to-cook weight:													
1960	0	0	0	0	0	0	0	0	15.5	3.4	0	0	18.9
1961	0	0	0	0	0	0	0	7.8	40.2	11.9	.1	0	60.1
1962	0	0	0	0	0	0	0	0	10.3	23.8	8.8	0	42.9
1963	0	0	0	0	0	0	0	1.5	30.9	11.2	0	0	43.6
1964	0	0	0	0	0	0	0	12.8	31.4	16.6	0	0	60.8
1965	0	0	0	0	0	0	0	0	13.3	15.2	1.4	0	29.7
1966	0	0	0	0	0	0	0	8.0	4.9	0	0	0	12.9
1967	0	0	0	0	0	0	11.8	17.2	26.5	19.4	0	0	74.8
1968	0	0	0	0	0	0	0	30.9	13.7	0	0	0	44.6
1969	0	0	0	0	0	0	0	5.9	12.1	2.6	0	0	20.6
1970	0	0	0	0	0	0	0	10.9	13.7	8.4	2.1	0	35.0
1971	0	0	0	0	0	0	8.2	6.8	10.4	12.7	7.1	0	45.2
1972	0	0	0	0	0	0	1.5	14.8	14.0	11.6	8.5	1.3	51.6
1973	0	0	1.5	5.0	0	0	0	2.4	10.1	11.3	5.3	0	35.6
1974	0	0	0	0	0	0	9.3	3.1	15.8	9.5	3.7	9.8	51.4
1975	2.2	0	0	0	0	0	0	2.1	6.9	10.4	0	0	21.6
1976	3.9	4.6	0	0	0	0	0	6.6	13.9	14.4	0	0	34.9
1977	6.2	7.2	0	0	0	0	5.8	16.6	14.3	3.9	10.3	9.0	73.4
1978	9.6	6.8	8.0	0	0	0	0	7.7	14.5	14.0	9.4	9.8	80.0
1979	13.3	3.7	2.8	0	0	0	6.6	9.5	15.3	15.3	10.9	18.8	96.2
1980	16.3	10.4	1.5	0	0	0	3.9	7.7	8.2	23.0	13.2	15.4	99.6
1981	7.2	0	0	0	0	0	3.2	10.2	14.3	15.1	4.2	0	54.2
1982	12.9	7.8	1.4	0	0	0	5.1	12.3	18.0	10.0	5.0	2.5	75.0
1983	1.7	11.2	10.4	0	0	0	9.2	10.4	10.1	5.5	0	0	58.5
						1,000 dozen cans							
Canned boned turkey:													
1968	0	0	0	0	0	0	0	0	0	3.4	299.2	533.8	918.0
1969	81.6	0	0	0	0	0	193.8	533.8	734.4	523.6	0	0	2,067.2
1970	0	0	0	0	0	0	20.4	23.4	0	78.2	306.0	44.2	472.8
1971	85.0	40.8	23.8	0	0	0	149.6	207.4	0	0	0	0	486.2
1972	0	0	0	0	0	0	397.8	108.8	190.4	153.0	129.2	74.8	1,054.0
1973	104.7	89.9	0	18.7	22.4	37.4	34.0	139.4	119.0	142.8	10.2	153.0	871.4
1974	95.2	0	0	0	0	0	0	0	0	0	0	0	95.2
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	1.7	.5	.7	0	3.0
1977-83	0	0	0	0	0	0	0	0	0	0	0	0	0

[1]Not adjusted for contract cancellations.

Source: (*67*).

*U.S. GOVERNMENT PRINTING OFFICE: 1985-460-941:20051-ERS