

# Two decades of productivity growth in poultry dressing and processing

*Since 1963, this industry has witnessed varying degrees of productivity improvements, new processing techniques, and changes in demand; the largest increase in output per employee hour occurred in the early 1980's*

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Output per employee hour in the poultry dressing and processing industry rose at an average annual rate of 2.9 percent between 1963 and 1985—slightly higher than the rate for all manufacturing, 2.3 percent.<sup>1</sup> Output increased 5.2 percent a year and employee hours, 2.3 percent. This long-term trend in productivity masks four distinct periods during which annual rates changed markedly. These rates moved as follows:

	<i>Poultry</i>	<i>Manufacturing</i>
1963–85 .....	2.9	2.3
1963–70 .....	.9	1.6
1970–76 .....	2.7	2.7
1976–80 .....	2.0	1.1
1980–85 .....	3.7	3.9

Prior to 1970, poultry processing was a predominantly manual operation, although some mechanization, such as killing machines, was introduced in the 1960's. Increases in output during this period nearly matched those in employee hours. In the early 1970's, automated eviscerating and cutting machines were widely installed, and helped hold down employee hours even as the output of poultry products increased. Output per employee hour jumped to about three times the annual rate registered in the 1960's. However, by the late 1970's, most of the productivity gains stemming

from this wave of automation had been realized, and output gains were often matched or exceeded by increases in employee hours. (See table 1.)

Between 1980 and 1985, output per employee hour again rose rapidly (3.7 percent). Poultry output increased at an average annual rate of 4.0 percent, spurred by growing consumer demand, higher valued poultry products (such as preformed patties), and new retail outlets in the fast food industry. Concurrently, the introduction of new processing technologies and streamlined Federal inspection procedures contributed to an average 0.3-percent a year advance in employee hours. In comparison, output of all manufacturing industries rose by 3.3 percent per year during this period, and employee hours fell at a rate of -0.5 percent.

## **Output and demand factors**

The poultry dressing and processing industry changes live chickens and turkeys into ready-to-cook or precooked products. The industry's output primarily includes whole fresh or frozen birds, cut-up parts, preformed products (such as patties and nuggets), luncheon meats, frankfurters, and frozen entrees.

Year-to-year movements in output were volatile. Between 1972 and 1973, output declined by almost 10 percent, largely because of increased grain and poultry prices which dampened demand. Between 1980 and 1981, output increased by slightly more than 10 percent. Over the long term, however, the demand for poultry meat and products

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**Table 1. Productivity and related indexes for the poultry dressing and processing industry, 1963–85**  
[1977=100]

Year	Output per employee hour	Output	All employee hours	Employees
1963	73.4	53.3	72.6	71.6
1964	75.1	56.2	74.8	72.8
1965	75.2	58.0	77.1	73.7
1966	74.1	60.0	81.0	76.8
1967	80.6	72.7	90.2	87.0
1968	77.9	71.4	91.7	89.5
1969	76.8	75.0	97.7	93.9
1970	78.3	78.1	99.7	94.9
1971	85.5	80.1	93.7	92.0
1972	88.1	87.3	99.1	94.2
1973	77.5	78.7	101.5	98.2
1974	87.3	88.4	101.3	98.1
1975	87.9	83.3	94.8	94.1
1976	98.6	98.8	100.2	99.1
1977	100.0	100.0	100.0	100.0
1978	101.3	106.5	105.1	104.5
1979	106.1	119.5	112.6	111.0
1980	105.7	127.7	120.8	120.2
1981	116.4	140.9	121.1	122.2
1982	125.6	153.1	121.9	120.3
1983	131.7	159.2	120.9	118.7
1984	130.5	152.7	117.0	114.6
1985	125.7	158.4	126.0	124.0
<b>Average annual rates of change</b>				
1963–85	2.9	5.2	2.3	2.4
1980–85	3.7	4.0	.3	-.1

has grown steadily. For example, in 1963, the average American consumed 37½ pounds of poultry; in 1985, this figure rose to 70 pounds—an increase of almost 90 percent. This demand was met almost entirely by the domestic poultry industry because imports remained negligible over this period.<sup>2</sup> In contrast, per capita consumption of beef declined from about 94 pounds in 1976 to about 77 pounds in 1985, with imports making significant inroads.<sup>3</sup>

The dramatic rise in demand for poultry was abetted by a long-term decline in the real cost of poultry. Poultry consumption is fairly price elastic—that is, reductions in real prices spell a proportional or more than proportional increase in demand. Reductions in real prices, however, do not completely explain the increase in demand because consumer preferences change and increases in income levels have continually been associated with a shift from poultry to red meat.<sup>4</sup>

Another factor contributing to increased demand has been the changes in product over the years. The poultry industry went from supplying mainly whole fresh or frozen birds to the market in the 1950's to supplying cut-up parts in the 1960's. In 1965, less than one-fifth of all young chickens slaughtered were cut into parts for retailing. By 1981, more than two-fifths were cut into parts. Further product diversification occurred in the mid- to late-1970's with the development of items such as prepackaged part trays, preformed patties, luncheon meats, and frankfurters. As an example, poultry hot dogs quadrupled their share of the frankfurter market from about 3 percent in 1977 to 13 percent in 1980.<sup>5</sup>

Product development continued into the 1980's with the introduction of "fancy" frozen entrees, such as stuffed chicken breasts, and specialty items for the fast food and restaurant industries, such as nuggets and breast slivers. Overall, the proportion of poultry used for further processing rose from 9.4 percent of all poultry products in 1963 to 30.3 percent in 1984.<sup>6</sup>

The shift towards two-income families has been among the factors creating increasing demand for convenience foods that are easy and quick to prepare, as well as for more meals away from home. Combining this trend with a growing belief that poultry and fish are healthier than conventional red meats<sup>7</sup> also increased the demand for poultry.

**Employment and hours.** Employment in the poultry industry rose from 70,000 workers in 1963 to about 120,000 in 1985. Overall, employment increased at an annual average rate of 2.4 percent between 1963 and 1985, compared with a 0.3-percent annual growth rate for all manufacturing industries combined.

Average annual employment gains in poultry processing were strongest in the 1960's and the later part of the 1970's:

	<i>Average annual percent change</i>
1963–85	2.4
1963–70	4.8
1970–76	.8
1976–80	5.0
1980–85	-.1

The relatively low gains for the 1970–76 period reflect a balancing out of increases and decreases in individual years, while the 1980–85 decline was magnified by a 3.5-percent drop in 1984.

The strong employment performance was tempered by relatively low average weekly hours and high quit rates. Between 1974 and 1985, production workers in the poultry industry averaged about 37 hours per week, compared with 40 hours for their counterparts in total manufacturing. However, average weekly overtime hours were basically the same (about 3 hours per week in both cases). Poultry workers were also five times more likely to leave their jobs voluntarily than were other manufacturing workers. Over the 1974–80 period, there were about 10 voluntary quits a year per 100 production workers, opposed to about 2 quits per 100 production workers in all manufacturing.<sup>8</sup>

### Occupational structure

The poultry processing industry's work force mainly consists of manual and semi-skilled occupations predominantly staffed by women. The industry is also primarily located in the South.

In a typical manufacturing establishment, about three-fourths of the employees are production workers, while in a poultry plant the average is about nine-tenths. Moreover, production workers fall mostly into two broad occupational

groups—hand assemblers or fabricators and manual helpers, laborers, or material handlers.<sup>9</sup> In 1984, these two categories accounted for just over two-fifths of total employment in the entire meatpacking industry, compared with just under one-fifth in the rest of manufacturing. Skilled machine operators made up 11 percent of meatpacking employment, compared with 23 percent of all manufacturing.

Another characteristic of poultry industry employment is the large proportion of women. Traditionally, about one-half of the poultry work force are women. In the rest of manufacturing, the proportion of women is much smaller—increasing from a little more than one-fourth of the work force in 1963 to about one-third in 1984.

Wages in the poultry industry have been relatively low. In 1985, production workers averaged \$217 a week, compared with \$386 for their counterparts in all manufacturing.

### Industry structure

Since World War II, the structure of the poultry industry has undergone three major transformations—increasing vertical integration of operations, increasing establishment size and concentration, and changing regional location.

Starting in the 1940's, improved techniques for raising poultry made large-scale operations feasible. However, financing these improvements tended to make most poultry farmers dependent upon poultry processors and feed suppliers, either via outright buyouts or through production contracts. This merger of poultry raising and processing operations—vertical integration—was basically completed by the mid-1950's, when about nine-tenths of all broiler production fell within this system.<sup>10</sup>

In the 1960's, processing plants began supplying poultry directly to retailers, thus assuming the role formerly played by wholesalers.<sup>11</sup> This trend accelerated in the 1980's, with processors selling directly to the fast food industry and developing and marketing new products on their own.

To fully reap the benefits from technological changes made in processing operations, the poultry industry concentrated its operations in large-scale plants. The number of poultry dressing plants declined from 522 in 1972 to just 375 in 1982, while the number of companies fell from 407 to 231. Employment per establishment rose from 140 to 299 over the same period.

Poultry and egg processing establishments are smaller than dressing establishments, although this segment of the industry is likewise highly concentrated. In 1982, for example, only 21 of 157 establishments, or 13 percent of all establishments, employed between 250 and 999 employees. However, these establishments accounted for 56 percent of all employees and 48 percent of total shipments.

Since the 1950's, broiler production has increasingly located in southern States. The South's share of total broiler output grew from 67 percent in 1950 to 70 percent in 1960 and to 89 percent in 1980.<sup>12</sup> Poultry dressing operations closely followed this migration, although at a slightly less

fevered pace—by 1982, the South accounted for about two-thirds of both employment and total shipments. This linkup between broiler production and dressing operations increased efficiencies by moving processing operations closer to the supply of birds. The South also supplied a relatively large labor pool and low-cost real estate for the expansion of poultry processing facilities.<sup>13</sup>

### Capital investment

Partly reflecting their drive towards automation, poultry processors greatly increased their capital expenditures between 1963 and 1984, with investments growing at an average annual rate of 4.6 percent (the rate for all manufacturing industries was 3.2 percent). Total capital expenditures rose in constant-dollar terms<sup>14</sup> from \$47 million in 1963 to more than \$100 million by 1978, before tapering off to around \$80 million in 1983 and 1984. Nevertheless, the constant-dollar capital expenditure per poultry employee was much less than that for the average manufacturing worker. (In 1984, it was \$1,499 and \$4,207, respectively.)

Capital expenditures, of course, vary from year to year. Outlays have also been skewed towards purchasing new machinery and equipment—in 1982, almost three-fourths of all capital investments were for machinery rather than buildings.

### Technology in processing operations

The technology of poultry dressing and processing plants has changed drastically since the early 1960's, when the introduction of mechanical killing and defeathering machines led the industry to institute large-scale operations. Much of the work in a processing plant is now automated and the trend towards automation is continuing.<sup>15</sup>

Poultry processing plants mainly convert live birds into ready-to-cook whole birds or parts. This involves unloading the cooped birds, hanging them on conveyors, and stunning, slaughtering, defeathering, eviscerating, chilling, grading, packing, and shipping them. It also includes cutting birds into parts, deboning, or further processing them into specialty items.

The first stage of the processing operation, unloading the cooped birds, is partially mechanized.<sup>16</sup> Usually, a conveyor takes the full coops to the hanging area, where the birds are manually shackled to an overhead monorail conveyor. The birds are then stunned electrically within a watertank, which is required for proper slaughtering, satisfactory bleeding, and feather release.

After stunning, the birds are slaughtered and bled. In manual operations, a skilled worker with a sharp knife can kill about 66 birds a minute. Manual killing was replaced in the early 1960's by mechanized killing machines which kill 5 birds per second, or five times faster than manual killing.<sup>17</sup> One worker is usually assigned to monitor the machines to ensure that cuts are properly made.

The birds are then passed through a defeathering ma-

chine. This machine processes 160 birds per minute.<sup>18</sup> Only one worker is needed to adjust the machines and keep the area clean. Pinning and singeing are manually done after defeathering is completed.

Defeathered birds are turned into ready-to-cook form by removing inedible parts. The operation also includes giblet harvesting, that is, trimming and separating the gizzard, heart, liver, and neck from the inedible, and possibly contaminating, parts. Mechanical eviscerating machines were invented in the early 1970's. Today, about nine-tenths of the eviscerating process is automated (each machine replaces about four workers).<sup>19</sup>

Also introduced in the 1970's were automatic oil removing machines and open-cut machines, which have further reduced labor time requirements (replacing, on average, two and four workers, respectively).<sup>20</sup> Two or three backup workers still are usually necessary to remove the parts missed by the machine. Before the 1970's, evisceration required eight persons to complete the operation and ensure that the viscera would not contaminate the edible parts of the bird.

Mechanized cutting is increasingly done in processing plants, rather than by meatcutters in supermarkets and other retail outlets. Mechanized cutting machines, using motor-driven equipment with shielded circular blades, split the carcasses into up to nine pieces. A halving machine processes about 70 birds a minute (saving the labor of an estimated 40 workers).<sup>21</sup> In the five-piece cut, a machine removes the legs and backbone, and splits the breast into two pieces. The eight-piece cut consists of the wings, thighs, drumsticks, and two breasts. Generally, four machines with four operators can equal the output of a comparable manual operation requiring 14 or more employees.<sup>22</sup> However, some processing work, such as deboning the breast, is still a largely manual operation, performed with a knife.

In the late 1970's, automatic deboning machines were introduced. These machines process up to 800 pieces of chicken a minute, separating edible meat from the bonier parts of the birds. They also harvest meat scraps from partially defleshed carcasses. The separated meat is then used for further processing into a variety of products—for example, preformed patties, soups, luncheon meats, and so forth.<sup>23</sup>

Most of the chilling and packaging operations are mechanized. Modern chilling operations use several methods. The most common is the immersion of carcasses in long flow-through tanks containing agitated slush ice, which brings the internal body temperature below 40°F. By reducing the required space, up to 6,000 birds may be chilled in the same space as were 1,200 birds in the past.<sup>24</sup> Usually, only one worker monitors and services the operation for a 12,000 bird per hour chill operation.

Several types of both automated and manual packaging are used, including ice, dip chill, snow, dry, and frozen. In the icepack method, birds and ice are placed into boxes

manually. The boxes are then sealed, weighed, dated, and priced by machines. Individual icepack trays are handled similarly, but are wrapped by machines at the rate of 30 trays per minute.<sup>25</sup>

Whole chill-packed birds are hung on a bar-type trip shackle and conveyed slowly through a room with a 20°F air blast for a little more than an hour, lowering their body temperature to 28–29°F. The parts are packed in trays, wrapped and placed in racks, then passed through a blast freezer for between 1 to 1½ hours. Because they are prepackaged, prepriced, and have a long shelf life, chill-packed birds and parts are very popular with retailers. Another packing method is dry pack where birds and parts are passed through a blast freezer and kept at just above the freezing point until shipping.

Pricing has also been automated in recent years, with computerized pricing machines being much more efficient than manual pricing. Each machine prices 50 packs per minute, compared with a manual rate of about 3 to 4 per minute.<sup>26</sup>

From the time the birds are shackled to the conveyor to the time they leave the plant, the speed of all manual and mechanical operations is determined by the conveyor line speed, which, to an extent, is limited by the U.S. Department of Agriculture (USDA) inspection system. Average line speeds, however, have increased from 56 to 70–90 birds per minute over the past 10 to 15 years, depending on the inspection system used.<sup>27</sup> This increase in speed is partly attributable to changes in the inspection system, which now concentrates more on actual product inspection and less on plant operations. The shift in inspection strategy has resulted in an increase in the number of inspections without a proportional increase in the number of inspectors.<sup>28</sup>

Overall, inspection productivity has continuously increased. Under the USDA's "traditional" system, introduced in 1959, an inspector would review one bird at a time, directing a trimmer on what needed to be done for the bird to pass inspection. After the instructions were carried out, the bird would be re-inspected for acceptable quality and chilling requirements. On average, not more than 18 birds per minute per inspector could be passed under this system.

In 1978, the USDA began a "modified traditional" inspection system under which three inspectors divide their tasks—one inspects the bird's exterior, another its viscera, and a third does the final inspection. This method raised inspection speed to about 23 birds per minute per inspector.

Line speeds also vary according to the weight and size of the birds being processed and the types of products being produced. When plants were mainly whole-bird operations, adjusting line speed was relatively simple. Today's modern plant, however, produces a panoply of products, with each product having specific processing needs and volume. It is not surprising, therefore, that since the late 1970's, computers have been increasingly used in overall plant operations.<sup>29</sup> For example, computers help to control the supply

of live whole birds to the various processing lines to achieve maximum efficiency as well as monitor energy use.

### Broiler production

Although outside the scope of poultry processing, the hatching and raising of broilers also play a critical role in processing operations because automated processing depends on a supply of basically standardized birds. In addition, because the cost of live birds is a large material cost in the processing industry, efficiencies in broiler production help maintain the relative cost advantage of poultry over other meats.<sup>30</sup>

Since the 1960's, the cost of producing broilers has been reduced substantially by improved feed conversion, which results in more meat per pound of feed. Improved feed conversion, in turn, has reduced both feed costs and labor required to handle the feed. With rations specifically developed to ensure proper growth, today's chicken is genetically designed for faster and meatier growth. Because of antibiotic feed additives and vaccines, birds are also less likely to die. Mechanized feeding and cleaning devices have ameliorated arduous manual tasks.<sup>31</sup>

### Outlook

There are factors contributing to continued gains in productivity in this industry which are somewhat offset by other

concerns. On the plus side, advances in processing techniques and increasing demand for poultry products are expected to continue. The industry, however, may still experience periods of dampened output related to factors outside its control—such as increases in feed and fuel costs—and declines in output have been associated with slackened productivity growth.<sup>32</sup>

In processing operations, the search continues for ways to mechanize currently manual functions, especially the handling of live birds and breast deboning.<sup>33</sup> Research is also focused on methods to reduce waste and rejection of birds because of mishandling or machine processing errors. Increasingly sophisticated use of computers is also likely to improve processing operations, material handling, inventory control, energy management, and waste disposal. Outside of plant operations, changes are also expected in both the poultry product line and marketing techniques—for example, brand-named chicken parts, specialty fowls (such as game hens), and national, rather than local or regional, markets.

Demand for poultry products continues to be strong. Per capita consumption increased 6 percent between 1985 and 1986.<sup>34</sup> Much of this growth was in processed products, such as frozen entrees and preformed parts, and will probably continue because of the aging of the population (older people find poultry easier to digest than red meat) and the perceptions of poultry as a healthy and appealing meat. □

—FOOTNOTES—

<sup>1</sup> The poultry dressing and processing industry consists of two segments, poultry dressing plants, designated as SIC 2016 by the 1972 *Standard Industrial Classification Manual* of the Office of Management and Budget; and poultry and egg processing, SIC 2017. SIC 2016 consists of establishments primarily engaged in slaughtering and dressing poultry for sale or for use in the same establishment in further processing, including cooking, deboning, canning, freezing, and so forth. SIC 2017 embodies establishments primarily engaged in preparing processed poultry products from purchased carcasses. Establishments primarily engaged in the cutting up and resale of purchased fresh carcasses are classified in the trade industries. SIC 2017 also includes establishments which dry, freeze, or break eggs. (This portion of the SIC is scheduled to become a separate SIC.) The cleaning, oil treatment, packing, and grading of eggs are classified in SIC 5144.

Average annual rates of change are based on the linear least squares of the logarithms of the index numbers. Extensions of the indexes will appear in the annual Bureau of Labor Statistics bulletin, *Productivity Measures for Selected Industries*.

<sup>2</sup> U.S. Department of Agriculture, Statistical Reporting Service, and U.S. Department of Commerce, *U.S. Exports, Schedule B, Commodity by Country* and *U.S. Imports, Schedule B, Commodity by Country*.

<sup>3</sup> *Ibid.*

<sup>4</sup> U.S. Department of Agriculture, *The Chicken Broiler Industry: Structure, Production, and Cost*, Marketing Research Report 930, May 1971, pp. 41–43.

<sup>5</sup> Paul B. Brown, "Food Processors," *Forbes*, Jan. 4, 1982, pp. 205–206.

<sup>6</sup> U.S. Department of Agriculture, Statistical Reporting Service.

<sup>7</sup> U.S. Department of Agriculture, FRS Planning Office, *Economics of the Red Meat Industry*, Aug. 21, 1985, p. 24; and Donn A. Reimund, J. Rod Martin, and Charles V. Moore, *Structural Change in Agriculture, The Experience for Broilers, Fed Cattle, and Processing Vegetables*, Bulletin 1648 (U.S. Department of Agriculture, Economics and Statistics Service,

April 1981), pp. 4–8.

<sup>8</sup> Following are voluntary separation rates in poultry processing, compared with the rates in all manufacturing combined (number of voluntary separations per 100 employees):

	Poultry industry	All manufacturing
1972	9.4	2.3
1973	11.2	2.8
1974	10.7	2.4
1975	6.8	1.4
1976	8.1	1.7
1977	9.3	1.8
1978	9.9	2.1
1979	10.3	2.0
1980	7.1	1.5

<sup>9</sup> Unpublished Bureau of Labor Statistics data. Separate data are not available for poultry dressing and processing industries. However, the general pattern of occupational groupings is basically the same as in the red meatpacking industry which is the other major component of this group. Poultry employees account for about two-fifths of total employment in the combined meatpacking group.

<sup>10</sup> Floyd Lasley, *The U.S. Poultry Industry, Changing Economics and Structure*, Agricultural Economic Report 502 (U.S. Department of Agriculture, Economic Research Service, July 1983), pp. 7–8.

<sup>11</sup> *Ibid.*, pp. 14–15.

<sup>12</sup> The South includes the following States: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

<sup>13</sup> Lasley, *The U.S. Poultry Industry*, pp. 9–10.

<sup>14</sup> Adjustments for price changes were made by using the implicit defla-

tor for nonresidential investment in structures and producers' durable equipment. See *Economic Report of the President*, February 1985, p. 236.

<sup>15</sup> Douglas Wilce, "Further processing growth spurs new equipment," *Poultry and Egg Marketing*, January 1986, pp. 1-7.

<sup>16</sup> Observation of industry operations.

<sup>17</sup> U.S. Department of Agriculture, Agricultural Research Service, *Guidelines for Establishing and Operating Broiler Processing Plants*, p. 24.

<sup>18</sup> *Ibid.*, p. 25.

<sup>19</sup> Industry sources.

<sup>20</sup> *Ibid.*

<sup>21</sup> *Guidelines for Establishing and Operating Broiler Processing Plants*, p. 30.

<sup>22</sup> Industry sources.

<sup>23</sup> *Guidelines for Establishing and Operating Broiler Processing Plants*, p. 27.

<sup>24</sup> Industry sources.

<sup>25</sup> *Ibid.*

<sup>26</sup> *Ibid.*

<sup>27</sup> Interview with Dr. Robert E. Cook, U.S. Department of Agriculture, Food Safety and Inspection Service, Meat and Poultry Inspection Technical Services, Washington, DC, July 8, 1986.

<sup>28</sup> *Ibid.*

<sup>29</sup> Wilce, "Further processing."

<sup>30</sup> Lasley, *The U.S. Poultry Industry*, pp. 14-18.

<sup>31</sup> *Economics of The Red Meat Industry*, p. 4.

<sup>32</sup> U.S. Department of Commerce, International Trade Association, *1986 U.S. Industrial Outlook*, January 1986, pp. 40-6 to 40-8.

<sup>33</sup> Wilce, "Further processing."

<sup>34</sup> U.S. Department of Commerce, International Trade Association, *1987 U.S. Industrial Outlook*, January 1987, p. 39-6.

## APPENDIX: Measurement techniques and limitations

Indexes of output per employee hour measure changes in the relation between the output of an industry and employee hours expended on that output. An index of output per employee hour is derived by dividing an index of output by an index of industry employee hours.

The preferred output index for manufacturing industries would be obtained from data on quantities of the various goods produced by the industry, each weighted (multiplied) by the employee hours required to produce one unit of each good in some specified base period. Thus, those goods which require more labor time to produce are given more importance in the index.

In the absence of physical quantity data, the output indexes for the poultry dressing and processing industries were constructed using a deflated value technique. The

value of shipments of the various product classes was adjusted for price changes by appropriate Producer Price Indexes to derive real output measures. These, in turn, were combined with employee hour weights to derive the overall output measure. These procedures result in a final output index that is conceptually close to the preferred output measure.

The indexes of output per employee hour relate total output to one input—labor time. The indexes do not measure the specific contribution of labor, capital, or any other single factor. Rather, they reflect the joint effort of factors such as changes in technology, capital investment, capacity utilization, plant design and layout, skill and effort of the work force, managerial ability, and labor-management relations.